



## The Science behind BONSILAGE Inoculant Development

You know how important silage inoculants are in your forage management program. But how important is the process of creating the inoculant to the effectiveness of the inoculant? Let's take a look behind the curtain at how BONSILAGE inoculant through intense research is proven to be effective before it ever hits a customer's forage.

### Step 1: Isolation of lactic acid bacteria

Our scientists examine a wide variety of substrates; using silages is proven, but vegetables, manure, or other organics can be sources of lactic acid bacteria as well. Thinking outside the box is key.

### Step 2: DNA Sequencing to identify strains

Isolated strains are precisely identified for a better understanding of each individual strain's 'fingerprint'.

### Step 3: Gene-expression analysis

Using gene-expression analysis allows us to identify if the strain will be beneficial. It provides insights into normal cellular processes and tells us whether the characteristics we are looking for are present in the strain.

### DEVELOPMENT STEPS

- 1: Isolation of lactic acid bacteria
- 2: DNA Sequencing to identify strains
- 3: Gene-expression analysis
- 4: In vitro lab trials
- 5: Ensiling tests
- 6: Characterization of properties
- 7: Further lab isolation tests
- 8: Silage trials at Gut Huelsenberg
- 9: Silage trials on other farms

### Step 4: In vitro lab trials

This is where the lab work really begins and scientists work to understand the best way to grow the strain in a controlled environment. The complex process involves many trials (and many errors, as is the nature of science!), as we continually fine-tune the ideal way to nurture the strain. Additional tests are run to determine metabolites and better our understanding of the strain's growth and

reproduction. Many variables are tested in all directions. Information obtained in this step impacts where and how we use the specific strain of lactic acid bacteria.

Our in vitro tests go beyond a simple understanding of the strains. We also take a deep look at the production and storage properties. A perfect strain in the lab environment is useless if it cannot be practically produced, stored, and utilized by a farmer without damage to the product.

#### **Step 5: Ensiling tests**

A similar series of tests as in step four is replicated on a small scale during ensiling trials, using real silage like grass, corn, or alfalfa. This is where the goals we are looking for the strain or strain mixtures to achieve are determined. We are checking to make sure all elements are working together as they should. Many variables are evaluated including different strain combinations, different substrates, and how well inoculated silage was after target days of storage.

#### **Step 6: Characterization of properties**

Not as simple as it sounds, characterization is a complex process. Different markets have different regulations, so certain requirements must be met and certain properties can be cause for disqualification. Safety aspects come into play and even though bacteria in silage inoculant are considered “good” bacteria they must be proven not to be antibiotic-resistant.

#### **Step 7: Further lab isolation tests**

To prepare documentation for approval, further research is conducted at ISF Schaumann Research, our central think tank, and in conjunction with Lactosan, our in-house manufacturer of live lactic acid bacteria, as well as with external laboratories in the U.S. and Europe. Strains are put to the test at a multitude of internal and external laboratories to confirm safety and performance in order to register our strains.

#### **Step 8: Silage trials with strain mixtures on a practical scale at Gut Huelsenberg**

Gut Huelsenberg, BONSILAGE’s own research farm for feeding and ensiling trials, provides us with real-world results to back up our extensive laboratory trials.

#### **Step 9: Silage trials with strain mixtures on a practical scale on other farms**

Finally, to provide an external view of our conclusions, the product is tested at working farms around the world.

BONSILAGE prides itself on the comprehensive use of science, research, and real-world trials when developing silage inoculants. Because we have targeted specific characteristics in every strain to precisely define performance, our products do exactly what we want them to do. This means we fully trust our product in our own fields and with our own animals, so our producers can trust them with theirs.

