



Dairy Briefs

The Latest Information on Dairy Cattle Nutrition



Unstable Silage: Silo Guard® II Can Help

By: Pedro Nogueira

Another silage season has gone by and most farms are already feeding the new corn silage. In some cases corn silage and/or high moisture corn (HMC) is warm or hot and is said to have poor aerobic stability (aerobic means in the presence of air). Aerobic stability is a term that nutritionists have used to define the length of time that silage remains cool and does not spoil after it is exposed to air. The objective of this article is to try to understand why silage gets hot and what can be done to minimize the problem.

In the silage environment we have the good guys (mainly lactic acid bacteria) and the bad guys (other types of bacteria, yeasts and moulds). During the ensiling process lactic acid bacteria ferments sugars to lactic acid. High concentrations of this acid are a good thing because it drops the pH of silage quickly, it makes the silage acid. Its quantity is usually considered a good indicator of the quality of the fermentation.

The main problem with lactic acid is that it has poor antifungal properties. So when we have high concentrations of lactic acid, like in corn silage and high moisture corn, and the conditions are right, we can have more of the bad guys developing, especially yeasts. The main reason for this is that yeasts feed on lactic acid, so if there is plenty available and the circumstances are right, they will develop very fast. In fact, under optimum conditions, yeasts can double in number in about 2 hours. Dr. Limin Kung, from the University of Delaware, gives the following example: if a sample of corn silage starts with 100,000 yeasts per gram, which is quite normal, that sample could contain 1,600,000 yeasts per gram in 8 hours! Although there is not a lot of research in this topic, feedback from the field suggests that producers often have problems when the numbers of yeasts are more than 1,000,000 per gram of silage.



This is a bit annoying: on one hand we want high amounts of lactic acid and on the other hand, in certain circumstances, this high concentration of lactic acid can in fact lead to unstable silage.

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Inside this Issue...

*Unstable Silage:
Silo Guard II Can Help*

By: Pedro Nogueira

**WHY FIGHT THE
FORAGE BATTLE?
LET MOTHER NATURE
SOLVE THE PROBLEM
WITH THE HELP OF
SILO GUARD® II**



**Forage Additive for Alfalfa,
Corn Silages and Baled Hay**

Corn Silage - Increases average daily gain and feed efficiency in beef heifers fed corn silage ensiled at 65-75% moisture.

Alfalfa Silage - Improved the conservation of dry matter in alfalfa silage ensiled at 60-70% moisture.

Hay - Improves the conservation of dry matter in hay baled at 20-25% moisture.



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What conditions make silage more prone to heating and spoilage?

There are many factors which affect the silage fermentation process. An important one is the type and number of microorganisms that dominate the fermentation process. If there is a cool growing season and resultant late harvest for both corn silage and high moisture corn, this can create conditions that are highly unfavourable for the good lactic acid bacteria. There will be less of them in the plant and, as a consequence, fermentation will be slow, acid production is slow and use of oxygen in the silage is also slow. This provides an excellent environment for various yeast species. Researchers from the Dairy Science Department of the University of Wisconsin explain the mechanism of yeast and aerobic instability of corn silage and high moisture corn as follows:

- High yeast populations are ensiled.
- During slow fermentations, moderate growth of yeast occurs until oxygen is eliminated from the silage.
- At feedout, yeasts are re-exposed to oxygen.
- Yeast growth increases very fast leading to utilization of lactic acid and production of carbon dioxide, water and producing heat.
- Due to the heat, silage acids are volatilized.
- Since there are less acids, silage pH rises.
- Moulds with low oxygen requirements and aerobic bacteria are revived and further degrade the silage.
- Aerobic instability and spoilage.

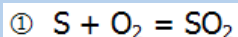
This is a negative spiral that goes on because as more acid is used the less stable the silage is and more yeast and moulds are able to grow.

The take home messages from this information are:

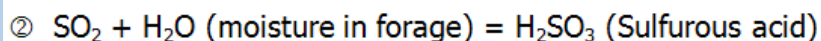
- Yeasts are mainly responsible for these events and yeasts work better when there is oxygen. The longer it takes to get the oxygen out, the more mould and yeast spores are produced.
- Oxygen is very negative to silage quality so rapid removal of air from the forage mass and the ability to prevent air from infiltrating the silage mass during storage and feedout can have profound effects on feed quality.

ENTER SILO GUARD®II!

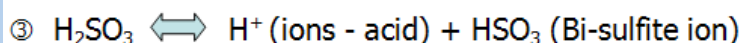
Silo Guard®II, with its unique mode of action, is able to help eliminate the oxygen in the ensiled mass. The sulphur compounds in Silo Guard®II, in the presence of the moisture and plant acids from the forage, produce sulphur compounds (gases) that slow the growth of undesirable bacteria and moulds. At the same time the oxygen is no longer available for the yeast and moulds, so their growth and development is reduced. Let's have a short course in chemistry - the following equations show the mode of action of Silo Guard®II:



Sulfur is an oxygen scavenger - helps prevent mould and yeast growth



Sulfurous acid helps inhibit gram negative bacteria



Bi-sulfites are effective on mould and yeast – reduces competition with the good bacteria (on the crop) for available plant sugars.

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HOW SILO GUARD®II WORKS

Apply Silo Guard®II at the earliest stage possible.



Yeasts and Moulds are present in all crops and begin to multiply as soon as they are exposed to oxygen.

Silo Guard®II may help eliminate the oxygen, so yeasts and moulds cannot reproduce. Without oxygen yeasts and moulds go dormant and the naturally occurring bacteria can get to work faster.



Silo Guard®II helps remove the competition of yeasts and moulds away from the "good guys on the crop".

They can then use the natural plant sugars and the additional sugars Silo Guard®II provides to produce large volumes of the natural lactic acid producing bacteria, lowering the pH of the forage.



Silo Guard®II also provides enzymes that help break down starches in your forage to sugars for the lactic acid producing bacteria to consume which speeds up the fermentation process and saves nutrients for your livestock.

The result is a stable forage that will remain cool longer on feedout because yeasts and moulds in the forage have been dormant and require a longer time to begin to multiply again once re-exposed to oxygen.



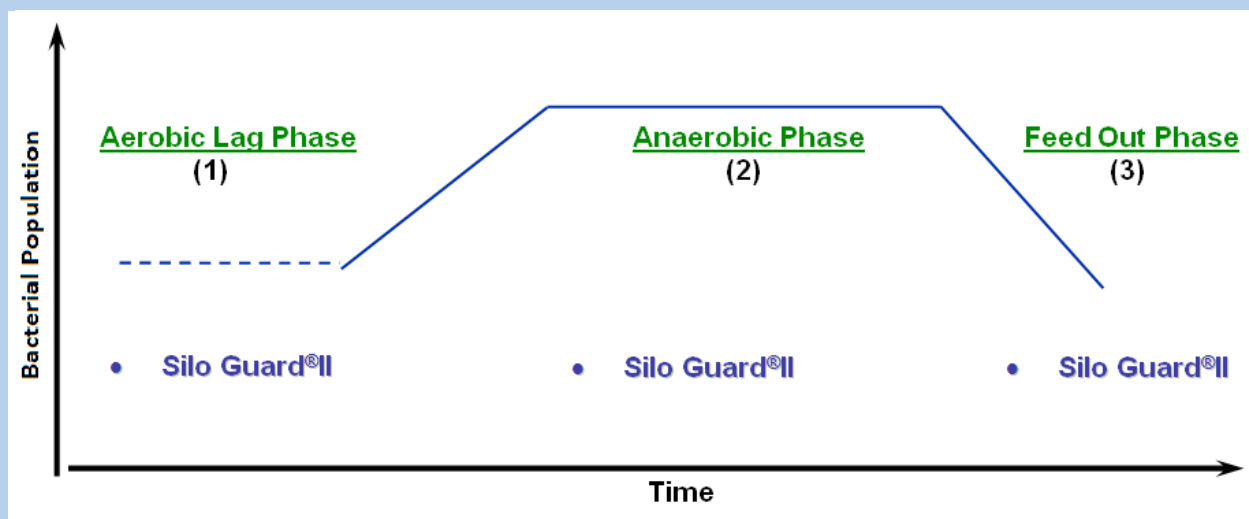
Silo Guard®II is also unique in the sense that it works on all phases of the ensiling process. These phases are:

- (1) Aerobic Phase: Freshly cut plant. Plant is still breathing, there is oxygen available. Moulds, yeast and good bacteria compete for plant sugars. This phase should have a short duration.
- (2) Anaerobic Phase: No oxygen available, so:
 - a) Natural lactic acid bacteria develop and produce lactic acid
 - b) pH lowers – silage becomes acid
 - c) Moulds and yeasts are dormant, except in air pockets
- (3) Feed-Out Phase:
 - a) Air re-introduced
 - b) Moulds & yeasts can be re-activated & multiply
 - c) If step b) happens there is heating and loss of nutrients

The following graph illustrates how Silo Guard®II works on all the 3 phases:

- The initial reactions between the sulphur compounds and oxygen help reducing the amount of oxygen present. This reduces the numbers of mould and yeast making it easier for the natural lactic acid bacteria present in the plants to start doing their job. **Silo Guard®II works with Mother Nature.**
- On the next phase, the silage is packed and covered, so there is no oxygen. It's time for the natural lactic acid bacteria to work at full power. To do this they need fuel. This fuel is the sugars present on the plants. **Silo Guard®II helps in this phase** because of an enzyme in its formulation that breaks down complex sugars that would take longer for the bacteria to reach. Due to the action of this enzyme the bacteria have now a fast source of simple sugars to do what they do best: produce lactic acid that will acidify and preserve the silage;
- The final phase, the feed out phase, can sometimes have bad surprises, with silage turning warm or hot in time. This means that nutrients that should be used by the cows are being lost. This process begins when the silage is stored. Yeast and other undesirable organisms come into the silo with the forage. If the forage includes soil or slurry residues, the total quantity of undesirable organisms is greatly increased. **Silo Guard®II helps in the feed-out phase** because it reduces the initial yeast and mould population in the first phase. With less yeasts and moulds present the silage will remain fresher for longer.

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Phases:

- 1) **Sulfur Salts** → Oxygen scavengers help reduce presence of air, SO₂ reduces yeasts & mould spores.
- 2) **Amylase Enzyme** → Breaks down starches to sugars for lactic acid bacteria. Enhances fermentation, saves nutrients.
- 3) **Feed-out Phase** → Cool silage, reduced mould & yeasts. More nutrients - more intake.

Conclusions

Heating and spoiling silage is undesirable because of losses in nutrients and lowered animal performance. Good silage management practices are not only needed to make good silage but to keep it stable at feed out. Again, the key to making quality silage is the rapid elimination of air from the forage mass and also preventing the penetration of air into the silage mass during storage and feeding time. Proper management for removal of silage and high moisture corn from silos and management at the feed bunk can help producers to maximize profits.

Silo Guard®II is a proven silage additive which, due to its unique formula and mode of action, can help in:

1. reducing the oxygen present in the ensiled mass,
2. slowing growth and development of yeast and moulds
3. providing nutrients to the natural lactic acid bacteria present in the plants.

Silo Guard®II is safe to the user, easy to apply, and it is available in ready-to-use dry and liquid formulations.

Contact Kenpal or ISF for more information about this special product!

References:

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