by Limin Kung, Jr.

Consider silage inoculant choices carefully

MICROBIAL inoculants can make silage fermentation more efficient, thereby preserving more nutrients and dry matter and sometimes improving milk production. Some inoculants also have been designed specifically to improve aerobic stability. This is important because a large portion of the dry matter lost in a silo actually is due to aerobic spoilage.

There are so many silage inoculants and claims that it is no wonder people often are confused as to which inoculant to use. Here are a few tips that might help you make a more informed choice when you think about what you're going to do next crop year.

Research, research, research . . .

An effective silage inoculant will have independent, statistically analyzed, and published data supporting its use. Of course, the more of this, the more credibility a product has. I will take an educated guess and say that no more than 10 to 15 percent of the silage inoculants on the market have more than a handful of publications showing that they work.

Be cautious. I have seen brochures from companies showing "research data" from many university studies that never had been published. Personally, I put much more weight on research that was independently published, was statistically analyzed, and is in a citable form that can be found in an indexed search of the literature. (This would include reports published as journal articles and abstracts such as Journal of Dairy Science, Journal of Animal Science, Animal Feed Science and Technology, and so on.)

When reviewing the published literature on a product, I also check to see if there are some studies where the product did not work. No product works all the time. But the better products work a high proportion of the time. Companies with high integrity will share both the positive and negative results with you.

You may hear the argument that because a company sells an inoculant that has bacteria with the "same name" used in other studies, that those studies support its use. Many bugs have the same name but not necessarily the same activity or properties. Thus, this is not a valid argument. Again, use caution.

It's the bugs . . .

The most common types of bugs that are in our silage inoculants include homolactic acid bacteria, heterolactic bacteria, and sometimes, Propionibacteria. Homolactic acid bacteria (include *Lactobacillus plantarum, Enterococcus faecium*, and several species of *Pediococci*). These improve the initial fermentation process by speeding up production of lactic acid.

A quick drop in pH can reduce protein degradation and prevent the growth of several undesirable microbes in silage (such as enterobacteria and clostridia). This can lead to improvements in the recovery of dry matter and sometimes improvements in milk production because of more efficient fermentations.

However, homolactic acid bacteria are not very effective at improving the aerobic stability or shelf life of silage. On a typical farm, a large portion of dry matter loss in a silo actually is due to poor shelf life . . . not just fermentation losses.

Of the heterolactic acid bacteria, only *Lactobacillus buchneri* is acceptable as a silage inoculant. *Lactobacillus buchneri* by itself has minimal effects on the initial fermentation process, but during storage it converts moderate amounts of lactic acid to moderate amounts of acetic acid which is a potent inhibitor of yeasts and molds. As an added benefit, sometimes there is production of propionic acid, another good inhibitor of yeasts and molds, in silages treated with *L. buchneri* (but this is not a direct end product from *L. buchneri*).

Theoretically, propionibacteria convert moderate levels of lactic acid to acetic and propionic acid. However, there is not enough compelling research to support the fact that this happens in silage consistently. Thus, the effect of these bacteria in silage is questionable.

Many silage inoculants contain several types of bacteria. In some studies, combinations of organisms have led to improved efficacy, but all combination products are not necessarily better than an inoculant with only one organism. Recently, homolactic acid bacteria have been combined with the heterolactic organism, *L. buchneri*, to provide stimulation of early fermentation and prolonged shelf life during storage and feedout.

What's enough?

In order for silage inoculants to be effective, they must be added at a high enough rate to compete against detrimental organisms and essentially dominate the ensiling process. For homolactic acid bacteria, the industry standard is a final application rate of 100,000 colony forming units (cfu) per gram of fresh forage. The probability of a silage inoculant being effective is markedly reduced if it supplies less than this number of homolactic acid bacteria.

In some formulations containing *L. buchneri*, the final application rates are several times higher (400,000 cfu/g for silages and 600,000 cfu/g for high-moisture corn). These higher rates improve its probability of success in the field.

Accurate calibration of equipment and distribution of the inoculant onto the silage also are essential to using a silage inoculant. Never add half the recommended rate to save a few cents. By doing this, you have reduced the chances of the product working. Likewise, I am skeptical of companies that tell you to add two to four times more than the recommended rate. That really drives up the cost of using the product. (If you already paid $1 per treated ton for the inoculant, can you really afford to put four times the level and drive the cost to $4 per ton?)

Consider technical service . . .

Although technical service is not directly related to the effectiveness of a silage inoculant, this should be factored into your decision making. Certainly, you should give more consideration to companies whose representatives are willing to help when you have questions or problems.

Paying either a low or premium price alone should not influence you. Again, research, research, research!

In general, homolactic acid inoculants are less expensive than those containing *L. buchneri* because this organism is more difficult to produce and because the final application rate is very high in some formulations.

Also, you should not make a comparison between a homolactic acid-based inoculant and one that contains *L. buchneri* on cost alone. The two products are designed for different goals. In the end, most silage inoculants will only cost a few cents per cow per day but yet provide some good insurance.

Here are a few examples of how to choose the best type of inoculant based on some specific situations:

- Any time you have silage from any silo type that has poor bunk life or heats up after being fed in summer, you could benefit from a more efficient fermentation. Consider a homolactic acid-based inoculant.
- Suppose you have a large bunker or pile with a face that may be too wide and, thus, prone to spoilage because of a slow rate of feedout. Consider using an inoculant with *L. buchneri,* with homolactic acid bacteria as an option.
- Let's say the silage is sold and left on intermediate feeding piles for several days, or you have silage that will be moved from one silo to another. Both are prone to spoilage because of the exposure to air. I would recommend an inoculant with *L. buchneri,* again, with homolactic acid bacteria as an option.
- You have several silo bags. Three will be fed out during cold winter months, but two will be fed out during summer, when there will be issues with silage heating.

Treat winter bags with a homolactic acid inoculant. Treat summer bags with an inoculant containing *L. buchneri* (with homolactic acid bacteria as an option).

- The top portion of your one large upright silo is fed out during winter, and the bottom is fed out during summer. Treat the top with a good homolactic acid bacteria-based inoculant, treat the bottom with *L. buchneri* (with homolactic acid bacteria as an option). Or, as an option, treat the entire silo with a *L. buchneri* and homolactic acid bacterial inoculant.
- When you get caught putting in very wet forages, you will face the problem of not getting the pH low enough in grass and alfalfa silages to prevent clostridial fermentations that produce butyric acid and may excessively degrade proteins. That's a good time to consider using a homolactic acid-based inoculant.
- Real dry corn or alfalfa silages often have the problems of excessive heating and spoilage. Consider an inoculant with *L. buchneri* (with homolactic acid bacteria as an option).
- Let's say you're using a sealed storage structure, but there are bunk life issues, and you still want to optimize fermentation. I would suggest a homolactic acid-based inoculant.

Always remember that silage inoculants should not be used in place of good management. However, there are a variety of silage inoculants that are extremely helpful in improving the fermentation and bunk life of silages.

"I'd like to start off by saying we've had our best year ever. Boy, would I like to!"

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