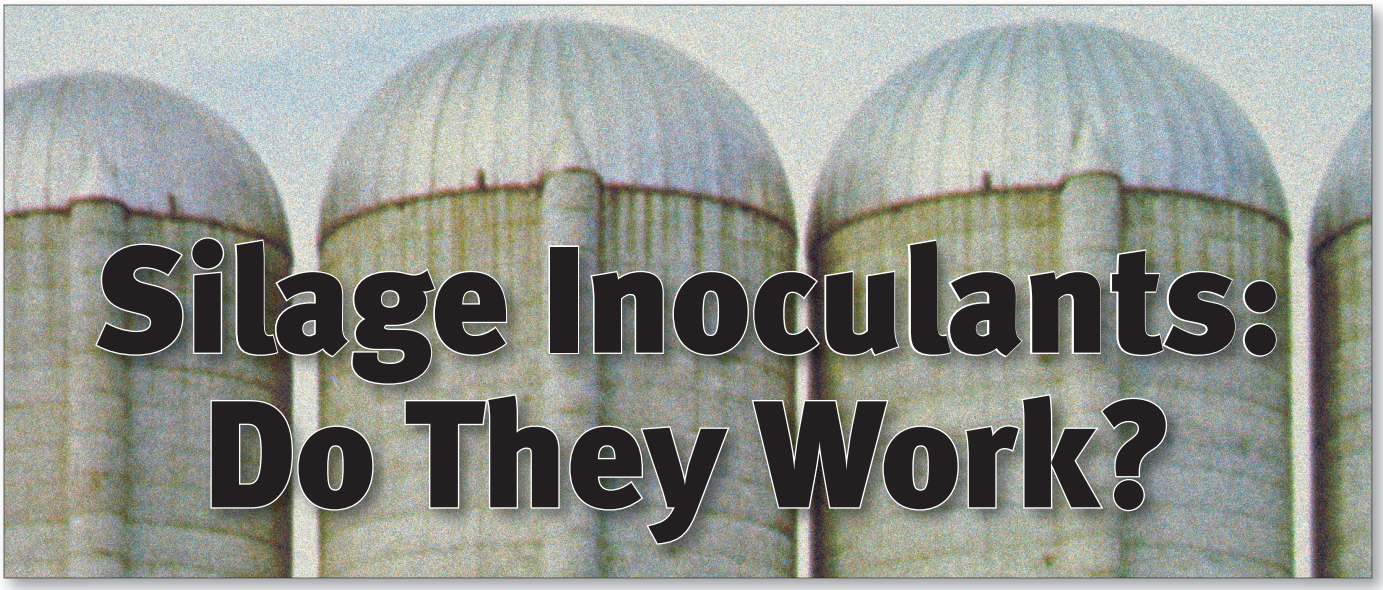

Silage Inoculants: Do They Work?

Good silage management is still the key to storage success.

by ***Troy Smith***

Whether you are talking about making silage or haylage, the fundamental process is the same. The objective is to preserve a forage crop by "pickling" it in acid. The acid is produced through the fermentation of plant sugars by anaerobic bacteria — those that live in the absence of free oxygen. Chopping the crop, packing it tightly into a silo and excluding oxygen creates an environment favorable for the bacteria to do their stuff.

Crops used to make silage, including grasses, legumes, small grains and corn, typically carry enough natural bacteria to induce fermentation. However, some producers use silage inoculants — commercial products whose purpose is to introduce live, fermentation-friendly bacteria to the silage crop. Other producers will swear it is a waste of money.

There is logic behind the use of silage inoculants. The aim is to provide an ample population of bacteria that produce the right kind of acid and hasten fermentation. Lactic acid is essential to silage preservation because it lowers forage pH (increasing the level of acidity) and halts the growth of other naturally occurring microorganisms. These other microorganisms compete with desirable lactic-acid-producing bacteria for nutrients and produce end products that reduce silage quality. Rapid fermentation is important to stop the bad "bugs" from robbing silage of nutrients.

Companies marketing silage inoculants tell producers that using these products will pay dividends by reducing feed losses, improving palatability, and boosting animal performance through enhanced feed intake and average daily gain (ADG). But do they really work?

Feeding & Feedstuffs

The winning team

When presented with questions about silage inoculants and their efficacy, university forage specialists often defer to Richard Muck. An agricultural engineer at the U.S. Dairy Forage Research Center [U.S. Department of Agriculture (USDA)-Agricultural Research Service (ARS)] in Madison, Wis., Muck says silage inoculants are effective. He also says they don't always work.

"That might not make sense if you're looking for a clear-cut answer, but that's how it is," Muck says. "I would expect a good silage inoculant to be effective at least two-thirds of the time when making silage from a hay crop. The products are inexpensive enough that routine use will pay you back. A good product is cost-effective, on average, but you can't expect it to work every time."

To grasp that seemingly contradictory answer, Muck advises producers to remember that many different kinds of microorganisms are already present when the silage crop is harvested. They are engaged in competition for available nutrients. Most silage inoculants contain homofermentative species of bacteria, which produce only lactic acid. The idea is to bolster the lactic-acid-producing team's roster of players and defeat that motley team of microorganisms that produces undesirable end products and reduces feed value.

When the lactic-acid-producing team wins, the reward is better-preserved silage. Sometimes, however, the other team puts up a real fight and overwhelms the favorites. Even the addition of star players won't guarantee a win every time.

Trying to secure more victories, researchers keep looking for standouts. So far, studies indicate *Lactobacillus plantarum,* various *Pediococcus* species and *Enterococcus faecium* are the most common lactic-acid-producing bacteria in silage inoculants. Muck says most commercial inoculants contain single or multiple strains of *L. plantarum* and may have one of these other species as well.

"Generally, they will improve silage dry matter recovery out of the silo due to more-efficient fermentation. A 2% to 3% improvement can be expected, on average," Muck states. "The animal performance benefits appear to be more product-specific."

The reason why some inoculants result in improved animal performance, while others do not, is not clearly understood. When it does occur, Muck explains, milk production among dairy cows is improved by about 3%, on average. In beef animals, the average improvement to rate of gain is about 5%.

"Something goes on that we don't fully understand yet, but it happens in about half of published trials," Muck offers. "I think it has to do with differences in bacterial strains. Not all *L. plantarum* strains are equal."

Muck says good companies are spending big money on research to identify preferred strains. He advises producers to look for products backed by published research data to support product claims — particularly claims of enhanced animal performance.

Inoculant know-how

Adding a word of warning, Muck says inoculants typically are more effective for maximizing the quality of silage made from legumes and grasses than for corn silage. This may be because, as long as corn silage is put up right, there is less room for improvement. Muck says corn usually carries higher natural populations of lactic-acid-producing bacteria.

"It's more of a dicey call as to whether using an inoculant for corn silage is profitable," Muck states. "But there is a new type of product on the market [that] works in a different way. It may have more potential for use on corn silage. These products contain *Lactobacillus buchneri.* It is heterofermatative bacteria, meaning it produces more than one type of acid."

According to Muck, *L. buchneri* produces lactic acid and also acetic acid, which is a good inhibitor of yeasts and molds. It may be effective in improving aerobic stability and bunk life during summer feedout, when silage heating may be an issue.

"So when looking at silage inoculants, I'd remember the two different types. Those containing *plantarum* can make good [hay crop] silage better, while products containing *buchneri* are good alternatives to propionic acid or anhydrous ammonia for improving bunk life, for example, in corn silage to be fed in warm weather. But I wouldn't use *buchneri* for a hay crop."

Muck emphasizes the importance of using silage inoculants correctly. They might not look like it, but these products contain living organisms and should be handled accordingly. Products should be stored under cool, dry conditions.

Adequate distribution at application is essential, too, since bacteria can't move throughout the silo of their own accord. For the best distribution, Muck recommends application at the forage chopper.

He also warns that inoculants are no substitute for management. Silage still has to be put up right. And the best return from inoculants results when they are used with good silage management.

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What about hay inoculants?

While silage fermentation depends upon bacterial activity, ideal hay production occurs when forage dries sufficiently to minimize microbial growth. Hay that is baled too wet becomes a breeding ground for bacteria, yeasts and molds, and loss of feed value. Rapid growth of microorganisms can also cause heating and, in severe cases, combustion is possible.

If hay is too dry when baled there is loss of leaves, which contain higher concentrations of nutrients. Hay inoculants have been developed for the purpose of minimizing growth of unwanted microbes when moisture content at baling is too high. Different from silage inoculants, these products are formulated specifically for hay. However, Agriculture Research Service (ARS) scientist Richard Muck says the value of hay inoculants remains questionable.

"From the trials I've reviewed, it's hard to see substantial benefit," he states. "As a preservative for hay, propionic acid is the gold standard — the product by which all others are judged."

To minimize leaf loss, most forage specialists recommend baling when hay crop moisture is at least 15%. A common rule-of-thumb suggests 18% as the target when making big round bales. Spoilage is more likely when moisture levels exceed 20%. Typically, spoilage can be reduced with application (at the baler) of propionic acid-based preservatives to hay with moisture content of 20%-25%.

10 Vaccination Tips

Proper vaccine management increases effectiveness.

Vaccinations are an important key to proper animal health and herd health management. To ensure that vaccination is as effective as possible, proper vaccine handling and administration is very important. Dale Groteluеschen, veterinarian with Pfizer Animal Health, offers these 10 tips:

1. Consult your veterinarian to develop a protocol that fits the health goals of your operation.
2. Select a quality product. Consult your veterinarian to ensure you are selecting the right products for your use. It is important to purchase only federally licensed vaccines from a reliable source.
3. Carefully read the label to maximize the value and effectiveness of the vaccine. It is important to understand precautions, so vaccines are given at the right stage of the animals' lives, to animals of the right age, in the proper dosage and at the appropriate intervals if more than one dose is needed.
4. Store the vaccines according to label directions, paying particular attention to the manufacturer's recommendations for correct temperature and light conditions.
5. When transporting vaccines to your cattle processing location, store them in a cooler with an ice pack. Keep the cooler and products in the shade.
6. Always use a sterile transfer needle or disposable syringe when rehydrating products.
7. Mix only one vaccine bottle at a time prior to administration. A good rule of thumb is not to mix more vaccines than will be used in 1 hour.
8. Subcutaneous (Sub-Q) injections are the preferred route whenever label instructions allow. All injections should be given in the neck.
9. Make sure to use new, sharp needles and the correct gauge size for the vaccine being used and the size of the animal. Change needles every 10-15 animals, and never re-enter a vaccine bottle with a used needle.
10. Always properly clean equipment and syringes after vaccinating.

Groteluеschen suggests using the following steps to assure your equipment is sterilized:

- ►Reusable syringes should be washed in hot, distilled water. First wash the outside. Then take the syringe apart to wash it thoroughly.
- ►Fill the syringe with water, and cover it with damp paper towels.
- ►The wrapped syringe should be placed in an open, resealable plastic bag and placed in the microwave on high for 5 minutes. The damp paper towels prevent the metal parts from sparking.
- ►Transfer needles also should be sterilized in the microwave; wrap in damp paper towels, place in an open resealable plastic bag and microwave on high for 30 seconds.

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Editor's Note: *This article was provided by Pfizer Animal Health, a business of Pfizer Inc. For additional information visit* www.pfizerah.com.