



# Inoculants for Haylage and Corn Silage

Heather Darby and Sid Bosworth, UVM Extension - Agronomists

Once the bunks, silos, and ag-bags are filled and sealed, the process of silage fermentation begins. Inoculants are a tool that can be used to help aid in the fermentation process. Application of silage inoculants has become a common practice, however, inoculants are not always successful in improving fermentation, and therefore this article will review tips on how to improve the effectiveness of inoculation.

## What are Inoculants?

Silage inoculants contain anaerobic (do not need oxygen) bacteria that produce lactic acid. Bacteria in commercial products usually contain one or more of the following species: *Lactobacillus plantarum* or other *Lactobacillus* species, various *Pediococcus* species and *Enterococcus faecium*. These bacteria have been selected to grow rapidly and efficiently resulting in an increased fermentation rate. In addition, the products of fermentation include higher levels of lactic acid and lower levels of acetic acid. The primary economic benefits of using an inoculant include improved dry matter recovery and animal performance. Applying inoculants can reduce dry matter losses 2 -3 % in a well-managed bunker. The shift in fermentation products (higher lactic acid and lower acetic acid) should increase animal feed efficiency since animals can utilize lactic acid more efficiently than acetic acid.

## Under What Conditions Do Inoculants Work Best?

Not all conditions are conducive for inoculation. According to research conducted by Richard Muck, at the USDA Dairy Forage Research Center in Wisconsin, the success of an inoculant is most impacted by the size of the natural population of lactic acid bacteria on the crop. The greater the natural population the less able bacteria (non-native lactic bacteria) added by inoculation will be able to dominate the crop and provide a benefit during fermentation. The populations of natural lactic acid bacteria increase with long wilting times (> 2 or 3 days), rainfall during wilting, and higher wilting temperatures. Inoculants will work best when applied to forage harvested at the recommended moisture contents for the various storage structures (45 – 70 % moisture). Natural populations of lactic acid bacteria do not grow well under dry conditions suggesting that inoculants may be more successful in drier crops.

## **What Are the Best Inoculants to Apply?**

There are many inoculants on the market and it is difficult to compare one to another. However, there are some key factors to consider when purchasing an inoculant that may help improve success. First off, look for a product that guarantees to supply at least 90 billion live lactic acid bacteria per ton of crop. Certain strains of lactic acid bacteria are selected for particular crops (i.e. corn or grass), therefore make sure you purchase an inoculant labeled for the crop that you are going to ensile. There are both liquid and dry inoculants commercially available. Either type can do the job, however liquid formulations have some advantages over dry. Liquid applications generally are more uniform, begin to work faster, and are easier to store (smaller packets that can go in the refrigerator) than dry products. However, if using a liquid inoculant avoid chlorinated water (less than 1 ppm) because it can kill the bacteria. If you have chlorinated water purchase inoculants that contain compounds that will neutralize the chlorine. Not all inoculants are created equal so don't be afraid to ask the dealer for product research (preferably done by an independent researcher). Once you purchase an inoculant, proper storage (cool and dry conditions) will help maintain bacterial viability. Improper storage of your inoculant can result in death of the bacteria and dead bacteria are useless.

## **What Is the Best Way to Apply Inoculants?**

These bacteria cannot move; they grow where they are placed, and therefore uniform coverage is essential for maximum effectiveness. A liquid sprayed on the crop at the chopper is the best opportunity to distribute and mix the inoculant the most uniformly with the crop. There are many other ways to apply inoculant, however, this does not include throwing dry inoculant on to a wagonload of forage and hoping for even distribution. It is important to use the recommended rate as application of less or more of the inoculant will not be helpful and is a waste of money. After 24h from the time of mixing, unused liquid should be discarded as the bacterial population will have begun to decline. Do not apply inoculants to silage that has already completed fermentation.

Inoculants when used properly can improve silage quality and animal performance. You may be able to increase the effectiveness of inoculants on your forage crops by taking into consideration the aforementioned points. Remember inoculants are one tool that can be used to improve silage quality; however, they are not a replacement for good management practices. Proper chop size and adequate packing are still important to assure an oxygen-free environment, and wilting the forage before storage is extremely important to not only reduce seepage but also increase forage sugar content (an important food source for the bacterial inoculant).