TECHNICAL TOPICS

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INOCULANT CONSIDERATIONS

BRIAN VAASSEN

STANDARD NUTRITION COMPANY

KEY TAKEAWAYS

- Homolactic Inoculants lower pH in upfront fermentation
- Heterolactic Inoculants increase aerobic stability during feed-out
- Ask for peer-reviewed research. The more, the better
- Inoculants will not replace good silage management but will make good silage management better
- Cost alone should not be the primary factor when choosing an inoculant

BRIAN VAASSEN
Midwest Regional Business Manager
Cuba City, WI

bvaassen@standardnutrition.com
608-778-0329

INOCULANTS - DECISIONS, DECISIONS, DECISIONS

BRIAN VAASSEN

Every year, dairies need to decide whether to inoculate silages or not. Factors that go into this decision are the price of milk, the cost of feed, the price of the inoculant and, sometimes, the willingness of the chopper. These are valid reasons for whether or not to use a microbial inoculant, and this decision could significantly impact your profitability during the upcoming year.

When producers have challenges with silage during storage and feed out, they often have a number of questions. Such as: What happened? Was it too dry or too wet? Did it lay in the field too long? Did it get rained on? Did I miss the correct chop length? Did this influence the packing density? What plastic did I use when I covered it? Did I use an oxygen barrier plastic? Am I feeding off enough each day? Maybe it was the inoculant, so did that stuff work?

Clearly, a variety of factors culminate to determine the success of silage storage and feed out, so an efficacious inoculant may go a long way to make up for some potential shortcomings.

Microbial homolactic inoculants contain live bacteria that make silage "upfront" fermentation more efficient. This will preserve more feed faster, retain more nutrients and dry matter, and some data suggests an improvement in milk production. Other inoculants – like heterolactic inoculants - have been designed to help improve aerobic stability at feed out (when the silage is exposed to oxygen). This can be important because a large percentage of dry matter lost in a silo, bunker or pile is due to aerobic spoilage.

The number of silage inoculants on the market and their claims is overwhelming, and it is no wonder confusion often occurs when considering multiple inoculants. Given this, I hope to provide information to help you decide which inoculant is worthy of applying to your crop next year.

Keep the following considerations in-mind when you purchase an inoculant:

- Research - look for peer-reviewed published data
- It is all about the bugs
- Technical support
- On-farm service/support throughout the year

RESEARCH

The use of research to verify an inoculants' effectiveness is essential. Peer-reviewed, independently studied, statistically analyzed and published in The Journal of Dairy Science or The Journal of Animal Science is a great start. More research showing the benefits of the inoculant completed over multiple years and different crops further increases its odds of repeating success on your silage. One could assume that less than 20% of inoculants have this type of published data, so proceed cautiously! For example, companies will sometimes create brochures showing "research data" from studies done by universities that were never published.

BUGS, BUGS, BUGS

There is a considerable variation in the numbers of epiphytic lactic acid bacteria on growing crops and at varying stages of maturity. Because there is no easy method to determine bacterial content before ensiling, one should inoculate. Inoculation with a live inoculant should help direct the fermentation toward lactic acid production. Unfortunately, not all bugs are created equal. Some work over the entire range of pH in silages, while others work in select pH ranges. Commonly found homolactic bacteria include Lactobacillus plantarum, Enterococcus faecium, and several strains of Pediococci. In some studies, combinations of bacteria have increased efficacy, but all combination products are not necessarily better than a single strain of bacteria. These bacteria will improve the initial fermentation process by speeding up lactic acid production, which will drop the pH quickly. Homolactic bacteria only affect pH drop and are not very effective in altering the aerobic stability

of silage or what some call "shelf life." On most farms, a high percentage of dry matter losses in a silo, bunker or pile is due to poor aerobic stability, not just fermentation losses.

The industry standard for the final application rate of homolactic acid bacteria is 100,000 colony-forming units per gram of fresh forage. This is the amount needed for the product to be effective. One should check product documentation or labels (paying close attention to units) to ensure adequate concentrations of bugs will be present following manufacturer application instructions.

To help aerobic stability, we would need to use a heterolactic acid bacteria; the only acceptable silage inoculant to do this is Lactobacillus buchneri. By itself, Lactobacillus buchneri has minimal effects on up-front fermentation, but during storage and typically after 45 days, it will convert generous amounts of lactic acid to a moderate amount of acetic acid. Acetic acid is a strong acid that is a potent inhibitor of yeast and molds, which typically are the main culprit in creating aerobic stability issues. A few research-proven inoculants have combined homolactic and heterolactic bacteria to cover the broad spectrum of initial fermentation and helping stabilize silage to decrease further losses during storage.

FERMENTATION PROFILES

	Corn Silage	Haylage	High Moisture Corn
DM, %	*32-35*	*40-45*	*68-75*
pH	*<4.0*	*<4.2*	*<4.5*
Lactic acid, %	*4-7*	*2-4*	*0.5-2.0*
Acetic acid, %	*1-3*	*0.5-1.5*	*<0.5*
Butyric acid, %	*0*	*<0.1*	*0*

TECHNICAL SERVICES AND SUPPORT

One must always consider technical services and on-farm support from your inoculant provider. These services will not directly correlate to the effectiveness of a silage inoculant, but you should consider them in your decision on which inoculant to purchase. They can provide vital support by:

- Providing inoculant in a timely matter
- Helping ensure it has been appropriately handled until it gets to your farm
- Helping make sure applicators are calibrated correctly
- Making certain distribution on the chopper is covering the entire crop
- Guidance to make sure your inoculant survives during application
- Providing support to choppers during harvest
- Helping to determine proper density in your structure while packing
- Taking samples throughout the year to make sure the inoculant is doing its job
- Providing feed out rates during the year to maximize the best silage possible

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TIPS ON HOW TO HANDLE INOCULANTS

- Store inoculants in a cool place
  - Follow the label if it says to refrigerate or freeze
- Care during transit
  - Avoid direct sunlight, truck beds or hot vehicles
- Water
  - Keep it cool with water out of a hydrant
  - Only use non-chlorinated water
  - Keep it under 90 degrees while in the applicators tank
- Keep applicator clean and operational
  - Regular maintenance and cleaning during the harvest season
- Get it gone
  - Use all mixed solutions within 24 hours

Bottom line, silage inoculants will not replace good management, but they can certainly help good management make better silage.

Finally, it is also important to remember the following: More published research is better; the manufacturer's reputation and its support; and not all inoculants are the same. Cost alone should not be the primary factor in your decision making, as quality control and handling are also important and may often improve the return on your investment.

Heterofermentative

Examples: *Lactobacillus buchneri*

- Aids fermentation by Producing lactic acid and acetic acid
- Often times will increase bunk life and aerobic stability
- Little effect on animal Performance, except in keeping silage cool
- Slow growing bacteria may take 45-60 days to improve bunk life

Homofermentative

Examples: *Lactobacillus plantarum. Pediococcus species and Enterococcus facium*

- Enhance fermentation by producing lactic acid.
- Works to improve dry matter recovery and animal performance.
- Optimum for hay crop silages
- Less beneficial on corn silage

References are available upon request.

Standard Dairy Consultants (SDC) is a proven leader in providing innovative and customized solutions to dairy producers throughout the United States. As a part of this, we utilize a network of experienced consultants that work closely with clients to provide hands-on expertise and guidance with a wide range of customized consulting services designed to support business success and maximize herd health and productivity. For more information on the innovative solutions and expertise SDC provides the dairy industry, visit: www.standarddairyconsultants.com.

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