Stability Of Silages

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with several of the newer buffered propionic acid products. Label recommendations range from 1- to 4-pounds per ton of forage.

As expected, our initial research suggests that higher application levels are better than lower. An optimum dose level cannot be recommended at this time because we cannot predict how many yeasts are naturally occurring on a forage in a particular field.

In addition, packing, moisture, fill rate, and feedout rate markedly affect growth of yeasts in the silo.

To date, there is insufficient data to show that any one product is consistently better than another.

A less commonly used additive to control yeasts and molds is anhydrous ammonia (5-7 Lbs./ton). The major drawback with ammonia is operator safety during application.

Ammonia is quite dangerous to work with and safety precautions should always be taken when it is used (protective eye-ware and respirator if needed). Rations with ammonia treated silage must be carefully balanced for proper amounts of rumen-degradable and -undergradable protein.

Both ammonia and propionic acid are most effective in controlling yeasts when applied at the time of ensiling.

Table 1 shows some results from tests conducted in my lab with ammonia and propionic acid based preservatives. Comparisons cannot be made between the two preservatives as each was tested separately. In addition, these numbers should not be used as absolute values for aerobic stability because they were generated under controlled laboratory conditions. What is important when viewing this data is the relative difference among treatments.

Diagnosing Problems

All fermented feeds contain some yeasts and molds. Yeasts make alcohol, so if silage smells like alcohol, many yeast are present.

Silage with over 100,000 to 1,000,000 (also denoted as 10^5 to 10^6) yeast per gram are usually very unstable and will heat quickly. This is especially true when silage is exposed to air during hot weather. Cold weather usually retards the growth of yeasts and molds so producers tend to see less of a problem with heating silages during the winter.

Silage can be sent to a laboratory for analyses of yeasts and molds. However, caution should be taken to ensure that the sample is frozen, because yeasts and molds can grow rapidly while in transit and thus give a false reading.

A question that is often asked is, when should propionic acid-type products be used?

Here are some scenarios.

As an additive used at ensiling, propionic acid can be used to treat historic problems of silages heating in the silo or bunk (oversizing, slow feedout rate, poor packing and filling).

Corn silage or high moisture corn that has been stored for prolonged periods of time (more than 6-9 months) or silage fed during hot weather are other good candidates for treatment.

Treating an entire silo or all of your silage may not be justifiable if the problem occurs for only a few weeks out of the year. However, one could rationalize against this logic because it is extremely difficult to predict in advance whethter silage will remain cool.

Silage moved from one silo structure to another and purchased silage that is moved and exposed to air for several days before feeding should be considered for treatment with buffered propionic acid. However, ammonia and bacterial inoculants should not be used to treat silages that have completed the fermentation process.

Sprayiong the face of a bunk with a propionic acid-based preservative is probably not useful because only silage on the immediate face is protected as air can penetrate deeply into the silage mass.

In an attempt to reduce costs, some suggest that only the top several loads of silage in a tower silo or bunk should be treated with a propionic acid-based product. However, this will not help to improve the aerobic stability of the remainder of the silage.

Because of their relatively high cost, preservatives designed to be added directly to the totally mixed ration (TMR) should be used only in instances where they are to be used for short periods of time.

In a heating TMR, be sure to evaluate all sources of yeasts. For example, a silage may remain cool and stable by itself, but when mixed with other feeds, the mixture may spoil rapidly. The primary source of heating may have come from the other dietary components such as other silages or high moisture corn.

If given a choice, preliminary data from our lab suggests that it is better to control yeasts at that time of ensiling rather than after the fact in a TMR.

Molds, Mycotoxins

Mycotoxins can cause major health problems for cows. Unfortunately, our understanding of their control and knowledge is very poor.

Molds produce most mycotoxins and for the most part, mycotoxins are a separate problem from spoiling feed in the bunk. The majority of mycotoxins are produced in the field while a much smaller amount may be produced in the silo. None of the additives discussed in this article are effective in reducing mycotoxin concentration in the silo.

Justification For Preservatives

The cost of a preservative may be justifiable if silage is constantly spoiling and leading to poor animal performance.

I have created a table projecting theoretical costs of treating a ton of 35 percent DM corn silage ranging from $1 to $4/ton (Table 2). The cost per cow per day was calculated depending on how much of this silage a cow was eating (20, 40, 60, or 80 lb./day).

Based on this simple calculation, if a cow lost 1 lb. of milk per day (worth $0 14/day) because of consuming spoiled silage, it would be justifiable to treat this silage in all situations with the exception of where 80 pounds of silage treated at a cost of $4 per ton were fed.

It has been difficult to measure the amount of milk production lost when cows are fed spoiled silage, but in a recent study by Wisconsin researchers, cows fed spoiled high moisture corn produced about 7 pounds less milk per day than those fed unspoiled silage.

Preservatives also often help to reduce loss of nutrients in the silo. Calculations can be made for potential savings of dry matter and used to justify the use of the preservative.

Heating and spoiling silage is undesirable because of losses in nutrients and lowered animal performance.

In instances where spoilage is still a major factor, preservatives such as buffered propionic acid and ammonia can be used. Conditions on each farm should be carefully evaluated.

Table 1 Effect of preservatives on the aerobic stability[1] of corn silage under controlled laboratory conditions [2]

Preservative	Untreated Silage	Treated Silage
	---Aerobic Stability---	
Ammonia[3]	< 1 5 days	> 6 days
Buffer propionic acid[4]	2 4 days	3 4 days (2 lb /ton) 4 0 days (4 lb /ton)

[1]Aerobic stability = days before silage heats after exposure to air
[2]Data from the University of Delaware
[3]6 lb of anhydrous ammonia equivalent/ton of 35% DM corn silage
[4]A commercial product containing buffered propionic acid as the primary active ingredient

Table 2 The cost treating corn silage with a preservative

Corn silage, lb per cow/day	Cost the preservative			
	$1 00/ton	$2 00/ton	$3 00/ton	$4 00/ton
	---Cost (cents) per cow per day---			
20	1	2	3	4
40	2	4	6	8
60	3	6	8	10
80	4	8	12	16