Dealing with High Yeast Levels in High Moisture Corn and Corn Silage

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Introduction

Aerobically unstable corn silage and high moisture corn at feedout is a common problem on dairy operations in the upper Midwest region of the United States. Aerobically unstable corn silage and high moisture corn is defined by heating, mold growth, or mustiness occurring a few inches to several feet on the face or surface of the silo during feedout. Surprisingly little research is available that specifically defines negative nutritional effects associated with feeding aerobically unstable corn silage on high moisture corn, but reduced feed intake, milk production, and milk fat depression are commonly reported from the field.

Mechanism

A cool growing season and resulting late harvest for both corn silage and high moisture corn create conditions that are highly unfavorable for bacteria species responsible for the fermentation and preservation of these feeds. As a result, fermentation is slow and provides an excellent environment for various yeast species which include the nonfermenting species Cryptococcus, Thadotorala, and Sporabolomyces as well as Candida and Hansenula which can metabolize lactic acid. The mechanism of yeast and aerobic instability (heats upon exposure to oxygen) of corn silage and high moisture corn is as follows:

1. High endemic yeast populations are ensiled.
2. During slow fermentations, moderate growth of yeast occurs until oxygen is expired in the silage.
3. At feedout, yeasts are re-exposed to oxygen.
4. Yeast growth becomes exponential.
5. Lactic acid is consumed.
6. Heating occurs.
7. Silage acids are volatized.
8. Silage pH rises.
9. Molds with low oxygen requirements (Mucor) invade the silage.
10. Aerobic instability.

Yeast Count Interpretations

Aerobic stability deceases as yeast counts increase. Well-preserved feed will normally have yeast counts less than 10,000 cfu/g. At this level, feed will be aerobically stable for 120-140 hours. At 1 million cfu/g, aerobic stability will decrease to 40 hours. Yeast counts of 25-50 million can occur in inadequately fermented feed. Due to the fact that oxygen can penetrate the silage face up to 2 feet during feedout, removal rates are seldom great enough to stay ahead of exponential yeast growth.

Possible Solutions at Feedout

Because aerobically unstable feed is caused by yeast, aerobically unstable feed is not typically associated with mycotoxin production. Mycotoxins may be in the feed, but they are most likely the result of mycotoxin production of molds in the field prior to ensiling. The reason there is a high emphasis on silage making procedures and silage additives to prevent aerobic instability is because there is limited research and/or proven effective

management options available once silages or high moisture corn become aerobically unstable. Following are some common sense management alternatives that may or may not work to abate surface aerobic instability in silage or high moisture corn.

- Discontinue feeding aerobically unstable feed during warm weather and concentrate feedout in colder weather.
- The feedout face should be a smooth surface that is perpendicular to the floor and sides in the bunker or pile.
- Proper unloading technique includes shaving silage down the feedout face and never 'digging' the bucket into the bottom of the silage feedout face.
- Remove 6 to 12 inches per day or more in cold weather months; 12 to 18 inches per day or more in warm months.
- Feed from 'larger feedout faces' in cold weather months.
- Feed from 'smaller feedout faces' in warm weather months.
- Minimize the time between silage or high moisture removal and feeding. Do not pile aerobically unstable silage or high moisture corn for later feeding, not even for short periods of time (i.e. 1 hr.).
- It might be necessary to remove silage from a bunker or pile and move it to the commodity area two times per day.
- Consider using a silage facer as an alternative to a front-end loader.
- Discard any visibly moldy feed.
- If free of mycotoxins, consider feeding the feed to as many livestock groups as possible at higher inclusion rates in the diet to increase silo feedout rates.

Minimizing Aerobic Spoilage in the TMR

If nothing can be done to alleviate the heating at the silo face, then preservatives (commonly referred to as "TMR-savers") based on buffered propionic acid are available that can be added directly to the TMR to improve aerobic stability. The degree to which silages or high moisture corn are unstable in the silo and ambient temperatures will determine the doses required to stop further spoilage in the TMR. Thus, if the silage or high moisture corn is extremely unstable (hot) before mixing into the TMR, high levels of additives (perhaps 6 to 8 lb of additive per ton of TMR) may be required to prevent further spoilage in the TMR. To stop heating in the TMR with such preservatives, start with a high dose for several days. This should temporarily fix the problems in the TMR right away. If stability in the bunk has been achieved, producers can slowly back off to a lower level that keeps the TMR from heating in the bunk.

For short term use, TMR-savers can be helpful, but they are not economical for long term use because the rates of addition are typically high. For example, even added only at 4 lb/ton of TMR, the equivalent would be adding 8 lb of the product per ton of forage. In addition, stopping further heating and spoilage in the TMR does nothing to stop the heating and loss of nutrients that can occurred in the silo. While redundant, research data suggest that it is more economical to control yeasts at the time of ensiling than after the fact in a TMR. Remember that the more yeasts that are present in the silage and TMR, the higher the dose of a TMR-saver will be needed to keep the feed from spoiling.