Texas A&M AgriLife Extension

Texas Dairy Matters

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GOOD SILAGE REQUIRES TIME

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After planting, growing and harvesting forage for silage, everyone is anxious to start feeding the new silage. This is particularly true now with the shortage of forage resulting from drought and high grain prices. But fermentation needs to occur before feeding so shrink can be minimized.

Three phases of fermentation exist – an initial aerobic (with oxygen), an anaerobic (without oxygen), and a second aerobic phase whenever the silage is re-exposed to air when the pile is fed.

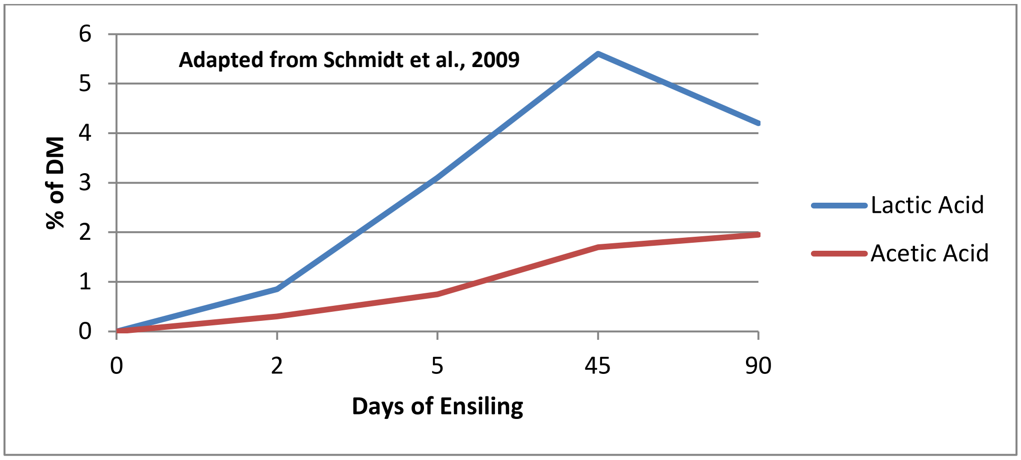
There are two parts to the first aerobic phase. Initially water soluble carbohydrates are consumed through cell respiration and by aerobic organisms. Carbon dioxide, water and heat are generated as oxygen is depleted over 12 to 24 hours. Minimize time in this period of dry matter loss by rapidly creating well-packed piles of forage that was harvested in the desired moisture range.

In the second part of this phase, acetic and lactic acid bacteria take over to drop pH, which reduces microbial activity. Temperature will begin to drop. Lactic acid, acetic acid and ethanol are produced as fermentation products during the process, which can take two to three days.

During the next or anaerobic phase, the lactic acid bacteria take over to reduce pH further. The silage temperature usually stabilizes in the 65 to 70 degree Fahrenheit range. Protein solubility and starch digestibility both increase. This anaerobic phase varies with the crop and whether an inoculant is used or not. This phase lasts until the microbes run out of water soluble carbohydrates or the pH drops so low that bacterial growth is stopped.

The concentration of beneficial volatile fatty acids increases during the anaerobic phase, which can last several months. Figure 1 depicts the change in concentration of lactic and acetic acids over the first 90 days of ensiling alfalfa that was not treated with an inoculant.

A pH in the range of 3.8 to 4.2 is typical for corn silage, while hay crop silages range from 4.0 to 4.8. A laboratory analysis of the volatile fatty acid (VFA) profile can be used in



troubleshooting fermentation issues. The expected profile can be influenced by which inoculant is used, the crop species, and the dry matter at harvest. Lactic acid should be more than 60 per cent of the total VFA and butyric acid should always be less than 0.1%. Clostridia produce butyric acid, which reduces palatability and feed intake.

Once the anaerobic phase is complete, the silage is preserved and fermentation stops until oxygen enters the pile again. The goal then becomes to minimize the time the crop spends in the final aerobic phase. This phase occurs when the plastic sealing the pile is punctured/torn or feed out begins. Since oxygen is again present, fermentation resumes. Significant dry matter losses can occur as yeast and mold activity take over. The silage also heats as decomposition takes place.

When it is time to remove silage, mechanically shave piles or bunks from top to bottom or horizontally. Using the tractor bucket to lift silage from the bottom can create dangerous overhangs and allows more oxygen to penetrate the face of the silage pile. Removing at least 6 inches (12 in the summer) of silage per day off the face helps minimize the impact of the final phase of aerobic fermentation on animal performance.

Understanding the fermentation process and using it to your advantage can help you get the most out of your silage. Properly fermented silage improves animal performance.