Dairy One

Forage Laboratory

Yeast and Molds in Silage

By Sarah Fessenden and Dr. Limin Kung Jr.

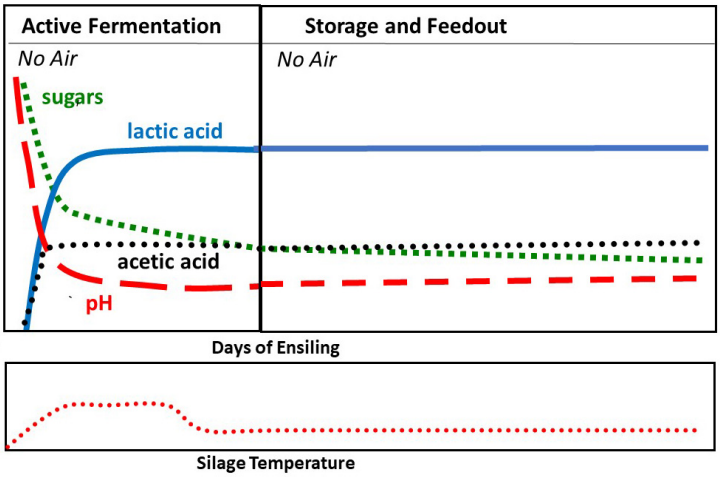
Spring planting is well under way and farms are feeding 2020 silages. A recent talk given by Dr. Limin Kung Jr. of the University of Delaware focused on wild yeasts and molds and their impact on silage preservation. It's important to keep silage quality in mind throughout all stages of silage creation, from planting to feeding.

The main avenues to lose energy in silo management are in respiration, fermentation, seepage, and aerobic instability during storage/feeding. Aerobic instability can account for 50-60% of total dry matter losses, an amount not always recognized. Different conditions in fermentation, storage, and feed out will affect forage quality.

Yeasts can occur in silage in both anerobic and aerobic conditions. In anaerobic conditions, the fermenting yeasts convert sugars to ethanol, CO2, and H2O; overall a loss of significant amounts of dry matter (but not necessarily energy) from the feed. In aerobic conditions, lactate utilizing yeasts, the primary initiators of aerobic spoilage, oxidize lactic acid to CO2 and H2O; this results in a loss of dry matter, but also energy. Air is the enemy of making and storing silage. During the fermentation stage it delays fermentation and encourages the growth of yeasts and aerobic bacteria, using nutrients. During storage and feed out, air stimulates the growth of spoilage microbes, reduces aerobic stability, and results in losses in dry matter and nutrients.

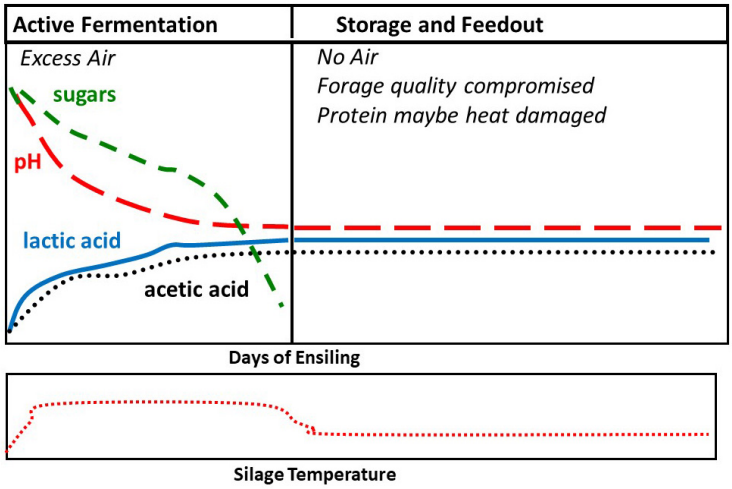
In ideal fermentation and storage conditions, there would be no air during the fermentation phase which stimulates good lactic acid producing bacteria to use sugars. Over time as the lactic acid drives down pH and decreases the concentration of sugar, some acetic acid is also produced. The low pH and antifungal attributes of acetic acid result in a stable, high quality feed. During storage and feed out, if exposure to air continues to be kept to a minimum, silage quality will be maintained.

Ideal Fermentation and Good Storage Conditions



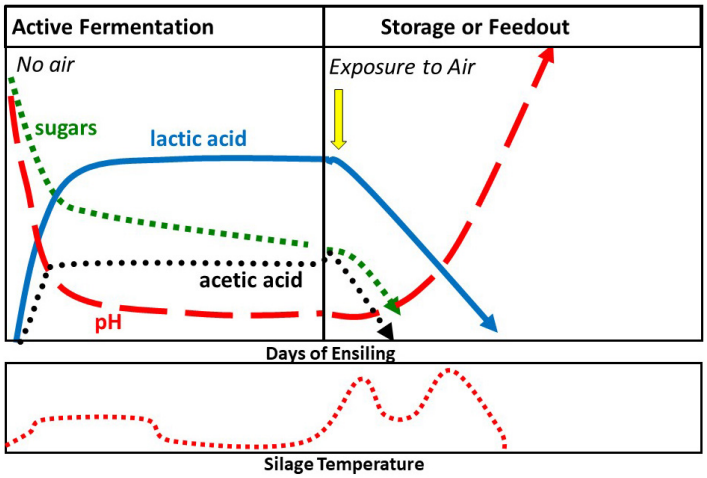
In a scenario where there is excess air at the start of fermentation, sugar levels drop slower and lactic rises slower, causing pH to slowly drop. This results in a prolonged heating period yielding higher levels of CO2 and potentially heat damaged protein, which is prone to occur in drier haylage crops.

Excess Air at the Start of Fermentation



If fermentation has been ideal, and depending on the amount of air being introduced during storage or feed out, there will be heating spikes as lactic acid levels drop and pH rises. This in turn causes sugar and acetic acid to drop, followed by secondary heating peaks, resulting in more loss of DM and energy.

Example of an Ideal Fermentation - but Poor Aerobic Stability



There is a misconception that molds cause aerobic instability. In reality there is a domino effect where silage exposed to air causes yeasts to wake up and degrade lactic acid. This increases the number of yeasts, highly degradable nutrients (sugars) are destroyed, heat is produced, pH increases, and this then 'wakes up' molds and bacteria. Those molds and bacteria cause further spoilage where additional heating can occur, finally re-

sulting in massive spoilage. Spontaneous combustion can correspondingly be a risk in these feeds as aerobically spoiling silages can often reach 140F and greater and combust at 160F.

The more hours of stability before spoilage, the lower the number of yeast colony forming units per gram. The lab can help determine fermentation quality and potential stability through our Fermentation Profile and Mold and Yeast analyses, as well as ADI-CP, starch, ESC, and WSC. Use some degree of caution when interpreting yeast and mold numbers from any lab. The number of yeasts and molds can increase dramatically during transport to the forage lab, especially in warmer weather. We recommend that damp or wet samples be shipped chilled (e.g. on ice packs) and with expedited shipping for the best results. If you are not requesting analysis for lactic acid bacteria, yeasts, or molds, freezing samples is acceptable and helps to minimize potential changes in nutrients during shipment.

While high yeast counts on a standing crop can be alarming, the negative impact can still be managed during storage. Feeding strategies, inoculants, and additives have been shown to be successful when feeding high wild yeast count feeds. Work with your nutritionist or trusted advisor to develop specific strategies for your herd. Check out our factsheet regarding interpreting mold and yeast counts for more information.