Northwest Veterinary Associates, Inc.

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Under the plastic: What goes on in those feed bunkers

May Newsletter Prepared by Dr. Peter Averill

I have been so impressed over the years with how our local Vermont dairymen and women have been able to realize the importance of timing when it comes to producing good quality forages to feed their cattle. Cutting hay at the appropriate stage of plant maturity will give us the best chance of producing a most palatable and nutritious forage base on which to build a great ration for optimal milk production. It is important to keep in mind, however, that there is more that needs to be done correctly to be able to transform that hay crop into a feed that is well preserved and one that can help keep our cows ruminating and healthy throughout their lactational and dry periods. To help in understanding what all is required to convert grass into high-quality silage, I would like to take you all on a journey through the process of fermentation. I will begin with the way it should go (normal fermentation) and then point out where the common pitfalls are that can lead to reduced silage quality as well as quantity, and an abnormal fermentation that can produce a feed that is not very palatable and that can cause health problems in the cattle consuming it.

The goal, in a nutshell, is to get the forage cut, dried to proper dry matter levels, and packed into a silo or pile so that an anaerobic (without oxygen) environment can be created that will lead to the production of lactic acid produced from plant carbohydrates. The conversion of fresh forage to silage progresses through four phases of fermentation that are normally completed within 21 days of ensiling.

The first phase, plant respiration, occurs aerobically, as the plants are still alive after cutting and they take in oxygen and consume plant sugars. The aerobic bacteria present on plant at harvest begin to grow and also consume plant sugars, break down plant proteins, and produce byproducts including heat. This is not good, but unfortunately is inescapable until the hay crop reaches dry matter levels between 30-35% and is then packed in the bunk or pile. Thorough packing forces oxygen out of the forage pile. The aerobic “bugs” die off and anaerobic ones grow and multiply and take us to phase two.

Phase two is where acetic acid is produced by the anaerobic bacteria that have started to grow in the absence of oxygen. The better the job done here, the more quickly the silage can start its pickling process where the organic acids are produced. This phase is a transient one that will start pH levels dropping and lead us to the most important phases.

Phases three and four are associated with the growth and development of bacteria that produce lactic acid from plant carbohydrates; acetic acid bugs start to die as pH levels drop to below 5; lactic acid production results in a drop of pH to levels as low as 4. Phase four is the longest phase and continues for about two weeks until the acidity of the forage pack has dropped low enough to restrict all bacterial growth, including the lactic acid producers. Silage becomes stable in about three weeks.

Remember; oxygen is the enemy during normal fermentation. It consumes plant carbohydrates via aerobic bacteria that grow if the hay crop is delayed getting to the bunk or pile and can continue this within the pile if not packed adequately. This leads to high losses of nutrients because the lost carbohydrates cannot be converted to lactic acid. This reduces energy levels in the silage produced.

Excessive heat is also produced in the presence of oxygen and this can bind protein and ADF also adding to reduced forage quality.

The rapid production of lactic acid is the most important change in the process of fermentation. If plant sugars are in short supply, then proper pH levels will not be achieved. Undesirable bacteria, yeasts and molds will grow, and they compete with the lactic acid-forming bugs, reducing the rate and level of pH drop, leading to a shortened phase four. To complicate the issue, if forage moisture levels are not right (target is between 65-70% moisture), a lower pH is ultimately required to prevent the growth of these unwanted bugs. If clostridial organisms are present at this time, the higher pH levels and presence of oxygen allow them to grow and produce butyric acid. This results in the production of not very palatable silage, with the potential to lead to ketosis problems. Death may also result due to hemorrhagic bowl syndrome, if the clostridial organisms are producing toxins, and/or Aspergillus molds have grown as well.

Adequate packing of the bunk or pile is thus crucial in preventing this undesirable fermentation. The target is for a silage density of 15 pounds per cubic foot of forage. Increased density means more silage and less oxygen. To achieve this, several steps need to be addressed. Length of chop is the first one. Most recommendations show cutting grass and alfalfa around ½" TLC. Shorter does pack better, but longer is better for the cow. Using the Penn State particle separator at the start can help fine-tune this important part of your harvest. Work with your nutritional consultant to get this right. Remember, harvest time is the only opportunity to make forage particles longer. Once the crop is cut, storage, mixing, and feeding can only reduce particle size.

Proper tractor(s) weight, time packing, and depth of forage being packed are also very important. A couple rules-of-thumb include a packing tractor weight of 800 times the tons of hay crop delivered per hour to the bunk/pile; time packing should be figured by dividing 18 by the weight, in tons, of the tractor being used to pack. This gives you the number of minutes of packing required, per ton of wet feed coming in. Layers of forage being run over each time packing should be no more than six inches deep. Otherwise, air is trapped in the layers if much more than this amount is packed at a time. Timely covering of the bunk/pile is required to finish the process and get a thorough fermentation started.

It is important to remember that oxygen is the enemy right on through this entire process, right up until the silage is consumed by our cows. How the bunk is managed can have a big influence on potential reintroduction of air into our silage leading to further spoilage and dry matter loss. Things like being too aggressive with removal of feed from the face, removing too much feed at a feeding leaving behind a pile to heat until next feeding, feeding less than six inches off the entire face of the silo at each feeding, or splitting a bunk, exposing a large "side" face, all will cause aerobic changes to occur, increase silage losses and increase the chances for molds and yeasts to grow, with potential health risk to those eating the feed.

Lastly, new technologies can also help in improving silage quality. Speak to your crop experts about the use of silage inoculants at harvest. In certain situations, they have been shown to accelerate the drop in acidity that is needed to "pickle" your hay crop to the right pH level. Oxygen barriers placed on the pile prior to the plastic covering can reduce spoilage significantly.

My hope is that this newsletter will reach you all prior to first cutting time. With some added knowledge of what goes on under that plastic cover on your feed bunkers and piles, you will be able to make some adjustments in the way you fill, pack, and feed out of your silage inventory so as to help your bottom line and have a healthier and more productive herd.

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Office Reopens – Masks Required

Effective immediately, our office doors will once again be open to clients, with the requirement that masks be worn inside at all times. If you forget your mask or are comfortable calling in orders, we are still happy to place items outside for you.

We understand guidelines are changing as more of us get vaccinated but without knowing everyone's status, indoor masking will be NWVA's next step to resuming normal operations.

We are excited to welcome you back and appreciate you masking up to keep everyone safe!