Silage Harvest Season Is Here

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Across the Capital Region of Southcentral Pennsylvania, corn silage harvest is beginning. If it weren't for unusually wet soil conditions earlier on, harvest would be farther along.

At the beginning of the harvest season, let's take a few moments to discuss why harvesting and filling of any type of storage structure is so important to the end product.

Each season, seed companies and agronomists are working to develop better and better corn silage hybrids. However, even the best genetics and crop production system will not be able to overcome poor management at harvest and storage.

The Silage Process

Talk to many silage producers and you quickly learn that getting an end product of high quality silage is not always a simple task. Ensilaging any forage involves a series of biological events that are uncontrollable after the forage enters the silo. The key factor is eliminating oxygen in the pile.

There are four phases of ensilaging: aerobic phase, lag phase, fermentation phase, and stable phase.

- Aerobic phase. In the aerobic phase the natural respiration of plant cells continues in the pile. In this step plant cells, still living after chopping, continue to consume oxygen and release carbon dioxide. The goal is to use up all of this remaining oxygen in the pile as quickly as possible and convert the pile to an oxygen-free or anaerobic condition. Plant moisture, particle size, and rate of fill can greatly affect the speed of this occurrence. If too much oxygen remains molds can quickly become established.

As plant cells continue to respire and use up oxygen, heat is released. Ideal temperature in a silage pile is 80 to 100 degrees. Too much oxygen can lead to higher temperatures and can reduce the nutritional value of the ensilage forage.

- Lag phase. The lag phase is when the plant cell membranes are digested by bacteria and release cell contents which result in additional bacterial development. It is usually only one or two days in length and sets the stage for the next critical period.
- Fermentation phase. Since the beginning of this process the pH of the forage mass has been decreasing from 6.7 to 5.5 as the anaerobic bacteria in the pile produce acetic acid. At about pH 5.5, these bacteria stop growing and new bacteria that produce lactic acids begin to grow and reduce the pH of the pile further to a pH of 3.8 - 4.2. This phase lasts about two weeks and, eventually, the temperature of the pile drops to about 80 degrees.
- Stable phase. Eventually the pile becomes too acidic and bacteria stop growing and the silage stabilizes. If not enough lactic acid is formed other types of bacteria can reform in the pile. These include listeria and clostridia. This will not occur unless the pH of the silage is above 5.0-5.5 and the moisture is high. Then butyric acid is formed in the pile.

Filling a Bunker

Creating a dense silage mass is critical to ensuring a quality feed product. Packing reduces air space and results in rapid fermentation that reduces dry matter and nutrient losses. Researchers at the University of Wisconsin and the USDA Dairy Forage Center conducted bunker silo density studies in the late 1990s. They determined that the minimum density for bunker silo corn silage density should be 14 pounds of dry matter per cubic foot to minimize dry matter losses. What they found on core samples from 81 silos was that the density ranged from 7.8 to 23.6 pounds/cubic foot. At densities of less than 10, silage dry matter losses exceeded 20 percent in 180 days. At a density of 22, losses were 10 percent. Densities at the low end suggest little packing. Densities at the high end are typical of many upright silos.

To ensure proper bunker silage densities, spread silage in 6-inch layers and pack with heavy tractors, adding weights if possible. Dual wheels and tire pressures did not adversely affect packing. What did affect densities the most was the delivery rate layer thickness and the amount of packing time per ton of silage. The greater the time spent packing each layer, the denser the silage. Too frequently, packing time is determined by the chopper and the distance to the bunker. In many instances, producers would benefit by using several packing tractors at the same time. Research has found that the size of the equipment needed to properly pack a bunker silo can be determined by multiplying the tons per hour of delivery rate by 800 to get the weight of the packing equipment necessary. For instance, if silage is delivered at 40 tons per hour, 32,000 pounds of packing tractor is needed.

Another benefit of increasing silage density is the increased silo capacity. Increasing density from 12 to 14 pounds dry matter/cubic foot increased storage by 17 percent. Think of what 20 pounds of dry matter/cubit foot would do.

Covering Silos

Covering of bunker silos is a no-brainer. It is estimated that 25 percent of the silage is in the top three feet of most bunkers. By not sealing the silage, 50 percent or more of this silage will be lost. In a 1,000-ton capacity silo this will be 75 tons of silage, valued at more than $2,000. When properly sealed, losses can be reduced to less than 15 percent.

Cutting Height

Recent silage work with high cutting heights have shown that by increasing harvest height from 6 to 18 inches, growers will produce a higher quality silage but at a yield loss of about 5 percent. For dairy farmers, milk production/acre estimates show that when corn silage yields are high, storage space limited, and hauling distances great, increasing harvest height should be considered. However with newer hybrids and better silage digestibility, this might not be true in all situations.

Another consideration of raising cutting height is in silage that is too wet or high in nitrates. More moisture and nitrates are found in the lowest portion of the stalks and leaving them in the field will reduce levels in the harvested portions.

Processing

Processing of corn silage has increased in popularity in recent years as equipment for processing at harvest becomes more common. Processing refers to squeezing the silage through two rollers on the harvester to crush the material as it goes through. This frequently produces greater starch digestibility, better packing, a more uniform product at the feed bunk and allows for harvesting at a theoretical length of cut (TLC). When using a processor the recommended TLC should be set at ¾ inch and unprocessed silage cut at ⅜ inch TLC.

Frosted Corn

With the extremely poor planting conditions this spring, many corn fields have the risk of being frosted this fall prior to harvest. Frosted corn can present many challenges to producers. If the frost is light and leaves on the corn crop remain green, the plant will continue to grow and accumulate dry matter and dry down somewhat normally. This crop should be left in the field until proper harvest moistures are reached.

Plants that are killed by a frost and are still immature will most likely contain too much moisture for immediate harvest. This crop will dry down slowly and lose dry matter as dead leaves are lost. In addition, soluble plant nutrients will leach from frosted leaves. The best option would be to leave the crop in the field to dry to the maximum harvest moisture level unless dry matter losses become too great. In that case, producers can set their harvesters to cut plants as high as possible or anticipate seepage losses.