Inside the ZONE™

Managing Silage Quality During Unfavorable Growing Conditions

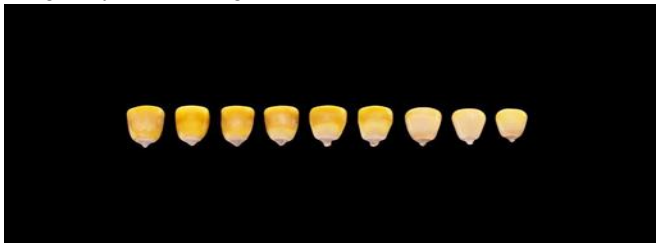
With unfavorable growing conditions due to low moisture conditions, maximizing the value of the 2015 crop will be critical. Understanding and executing on proper harvest techniques will help producers maximize yield and maintain quality of their high value crop.

Harvest Maturity

Corn must be ensiled at the proper moisture for ideal fermentation for good preservation of the crop. But, determining when to harvest corn at the right whole plant moisture is difficult. Each storage structure properly ensiles at slightly different moisture optimums. Harvesting corn too wet for the storage structure will result in reduced yield, souring and seepage of the ensilage, and low intake by dairy cows. Harvesting too dry may increase yields, can cause mold to develop, and lowers digestibility, protein and vitamins A and E. Kernel milkline may be the most widely used indicator for determining when to harvest corn for silage. However through experience it has been found that milkline is not accurate because of the variation of dry down between different hybrids and environmental conditions. But, it may be able to use it as a "trigger" in that once a corn hybrid reaches a certain kernel milkline stage, farmers should begin testing the field for whole plant moisture.

Silo Structure	Moisture for ensiling	Kernel milk line
Horizontal silos	62 - 68%	¼ - ¾
Bagged	60 - 68%	¼ - ¾
Upright stave	62 - 68%	½ - ¾
Upright Sealed	60 to 65%	¾ - blacklayer

Once kernel milkline begins to move, measure moisture of fields intended to be harvested for silage. Taking a chopped sample from the intended field, a Koester® moisture tester or microwave can be used to determine whole plant moisture. Use an estimated 0.5 – 1.0% percent drydown rate per day to predict the date when the field will be ready for harvest and storage in your silo, bag or bunker.



¼ milk line

½ milk line

¾ milk line

Full milk line

Uneven Maturity

Uneven maturity of the crop due to uneven emergence from dry seeding conditions will make it very difficult to assess proper silage timing. Some plants will be mature and ready to silage, and some may still be very immature. In order to determine proper timing, the producer will have to estimate the amount of plants that are at proper maturity (1/2 milk line) and those that are below maturity. Once 50-70% of the field appears to be close to proper harvest stage a whole plant chop on average number of plants will give a guideline for harvest timing. If there are fields that have more even emergence, one strategy may be to harvest a poor field in combination with a good field and layer the forage into the silo during the filling and packing process.

	% of Max Yield		Moisture Content %	
Stage	Grain	Whole Plant	Grain	Whole Plant
Silking	0	50-55	----	80-85
Blister	0-10	55-60	85-90	80-85
Late-Milk	30-50	65-70	60-80	75-80
Early Dent	60-75	75-80	50-55	70-75
½ Milk Line	80-95	100	35-40	65-70
Mature	100	95-100	25-35	55-65

Source: Journal of Prod. Agriculture 6:94-99. 1993.

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Frost damage

It is difficult to know when to harvest frost-damaged corn because we cannot use the "kernel milk line" guidelines as an indicator of moisture content as in normal silage. The moisture content will vary with the stage of grain maturity and the degree of freezing. Corn that experiences a killing frost in the blister and milk stage of development will likely contain moisture content in excess of 75%. Although the loss of leaves gives the appearance of rapid dry down, most of the moisture is in the stalk and grain. Immature, frozen corn does not dry down significantly faster than unfrozen corn, and may require several days of drying to reach the correct moisture content. Allow the plants to dry down to below 70% before harvesting or add dry materials like ground straw, ground hay, dried beet pulp, etc. to dilute the moisture content to below 70%.

Immature frost damaged corn that has dented can make good silage. In general, immature corn silage will have higher fiber (NDF) and crude protein and lower starch levels than normal corn silage. However, fiber and starch digestion may actually be higher in immature corn silage so the overall Net Energy value will typically be 80-90% of normal corn silage. Very immature corn silage (blister/milk) may only have 75 to 80% to energy value of mature corn silage and should be fed to animals with lower nutrient requirements.

Chop length and Crop Processing

When deciding on chop length you need to balance meeting the effective fiber needs for the rumen with the ability to pack the silage to ensure efficient fermentation. If the silage is dry and chopped too long, it will be difficult to remove all the oxygen thus allowing molds, yeast and other spoilage organisms to grow. Theoretical Chop Length (TLC) should be set between ¼" and ¾" depending on conditions. Having sharp knives and a well-conditioned shear bar will minimize shredding and keep cut length as consistent as possible.

Kernal Processor Checklist:

Check roller mill wear

- ~400 hours unless chromed roller mills ~1000 hours, However manufacturer guidelines should be referenced for actual life expectancy of the roller mill.
- Roller mill gap set at 1-3mm for adequate kernel damage.

Do not set chop length over 19mm (3/4")

- Set shorter (17mm) if you do not need the peNDF (physically effective NDF; also known as scratch factor) because all choppers will do a better job of processing at shorter chop lengths
- Set shorter as the crop gets dryer.

Check the roller mill differential

- Typically desire between a 20-30% differential
- More aggressive differential speed required if more aggressive processing is needed when roller mill is already set at 1 mm clearance

It is a good idea to monitor performance of the kernel processor during the day. Use the Pioneer Silage Processing Cup to measure a representative silage sample. Throw it on a flat surface and count undamaged kernels. If you are finding more the 1-2 undamaged kernels, the processor needs to be adjusted.

Filling Storage Structure

Fill rapidly to reduce respiration losses, but yet not too fast that results in less ideal packing of the forage. Rate of fill is very important and needs to be orchestrated with pack tractor capacity so the silage has time to be packed properly before new silage is brought to pit. With large chopper capacity, producers will need to ensure silage is not brought into pit too fast. Fill bunkers from back to front not bottom to top. Length of ramp depends on rate of input.

Packing

Remember … oxygen is the enemy. Packing is key to limiting losses due to spoilage.

Rule of 6 and 800:

Limit packing to not more than 6 inches of silage at time on the pile and use 800lbs of tractor per ton of silage per hour. So, 100 tons of silage per hour would require 80,000 lbs of tractor (or tractors) on the pile per hour.

Testing for Whole Plant Moisture

- Test with a microwave, Koster tester or NIR—most of these methods tend to predict moisture lower than what comes out of a chopper. Add two to three points of moisture to your test result.
- Grab Test method (Hicks, Univ. of Minnesota) using a handful of chopped plant material squeezed as tightly as possible for 90 seconds.
  - 75-85% moisture if juice runs freely or shows between fingers
  - 70-75% moisture if ball holds its shape and hand is moist
  - 60-70% moisture if ball expands slowly and no dampness appears on the hand