Harvest Timing: The Key to High Quality Corn Silage

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Corn is somewhat unique as a forage. Like alfalfa, corn silage quality is very high just prior to flowering (silking) and then decreases as the plant develops through silking, blister, and milk growth stages. Unlike alfalfa, forage quality begins to increase as grain filling proceeds. In fact, corn silage quality is better near maturity than at flowering. Optimum yield and quality are achieved between the stages of 50-25% kernel milk (R5.5 to R5.8). Numerous management decisions need to be made for producing high yielding, high quality corn silage.

All will be for naught, however, if the silage cannot be chopped, stored, and ensiled at the proper moisture to allow for adequate fermentation and storage. If harvest is too early: 1) the silage ferments poorly, 2) the nutrients (particularly soluble nitrogen and carbohydrates) seep out of the base causing reduced silage quality and environmental damage, and 3) the cows have lower intakes. If harvest is too late: 1) air pockets develop that prevent anaerobic fermentation and allow molds to develop, 2) kernels become harder and less digestible, 3) vitamins A and E decline , and 4) forage quality declines since crude protein levels decline, while fiber levels may increase and digestibility may decrease.

Corn harvested for silage should be at a moisture content that will ensure good storage in the silo. Harvesting within the ranges shown in Table 1 will promote good packing and will minimize losses due to heating or runoff.

The first step in the decision for harvest timing is predicting when a field is ready for harvesting. The following guidelines will help predict when a field is ready and the order in which they should be harvested.

1. Note hybrid maturity and planting date of fields intended for silage.
2. Note tasseling (silking) date. Half milk of the kernels will typically occur about 42-47 days after silking.
3. Once kernel milkline begins to move, measure moisture of fields intended to be harvested for silage. Use 0.5% per day to predict date when field will be ready for the storage structure.
4. Perform a final dry matter check prior to chopping.

Table 1. Recommended moisture contents for corn silage stored in various types of silos.

Silo Type	Recommended Moisture Content (%)
Horizontal Silos	65-70
Upright Silos	60-65
Bag Silos	60-70
Upright Oxygen-Limiting Silos	50-60

Plant Indicators for Timing Harvest

No plant indicators are accurate enough to estimate whole-plant moisture. At one time, kernel milkline was used as an indicator and moisture was ideal when the milkline was 1/2-3/4 of the way down the kernel. However, the relationship between silage moisture and kernel milkline varies depending on region, growing season, and hybrid so this technique should be used only as a rough estimate of moisture content. Whenever possible, measure the moisture content with a commercial forage moisture tester or in a microwave oven before harvesting.

Measuring Moisture Content with a Microwave Oven

To test the moisture content of corn silage with a microwave oven, weigh exactly 100 grams of fresh silage on a paper plate (remember to adjust for the weight of the paper plate). Spread the forage evenly on the plate and place in a microwave oven. Heat on high for 4 minutes. Remove the silage, weigh, and record. Heat the sample again on high for 1 minute, weigh, and record. Repeat this procedure until the weight remains the same. At this point, the weight in grams represents the dry matter content of the silage. To calculate the moisture content, subtract the dry matter content from 100. Example: After several heating cycles, the sample weight stabilizes at 34 grams. Thus, the dry matter is 34% and moisture is 66% (100-34).

Frosted Corn

Occasionally, corn is damaged or killed by frost before it reaches the desired maturity for ensiling. If the frost is early and green leaves remain on the plant, the crop will continue to accumulate dry matter and should be left in the field until it reaches the appropriate moisture content. Partially frosted corn often appears to be drier than unfrosted at the same moisture. If the plants are killed and still immature, they will likely contain too much moisture for immediate ensiling. Plants will dry slowly and dry matter losses will increase as the dead plants lose leaves in the field.

The best strategy is to leave the crop in the field to dry down to an acceptable level unless dry matter losses become too high. When a crop that is ready to be ensiled is frosted, harvest it immediately. If the crop becomes too dry, consider a finer chop and adding water or a wet forage during silo filling. Harvesting losses will likely increase, but a reasonable quality silage can still be made.

Drought-Stressed Corn

When corn is so drought stressed that it may not resume growth, it should be ensiled. Corn in this condition usually has few ears and

has leaves that have turned brown and are falling off. Be careful not to harvest prematurely because corn with ears and some green leaves may still be able to resume growth and accumulate dry matter later in the season. The net energy content of drought-damaged corn is often 85-100% of normal, and it sometimes contains slightly more crude protein. If drought stress is moderate, corn can often have higher than average energy in drought years because of a high grain content and high stover digestibility.

One concern with drought-stressed corn is the potential for high nitrate levels in the silage. High nitrate levels are found most frequently where high nitrogen rates were applied or when a drought-stressed crop is chopped within three days following a rain. Ensiling crops that are suspected to have high nitrate levels is preferred to green chopping since the fermentation process will decrease nitrate levels by ~50%. When in doubt, have the forage analyzed before feeding. High nitrate feedstuffs can be diluted by feeding with another feedstuff.

Drought can also affect the whole plant moisture content. When drought slows plant growth and delays maturity, the moisture content will be higher than suggested by the appearance of the crop. When a drought occurs at the end of the season, moisture levels may be lower than normal. Consequently, measuring the moisture content of drought-stressed corn before ensiling is recommended.

Harvest Timing Influences Energy Pools

One final consideration for timing the harvest of corn silage is that as the corn plant matures, the composition of the plant changes. More mature corn silage will have more, drier grain with harder seed coats, more starch and less sugars, and less digestible fiber than earlier harvested corn. Therefore, harvesting early will yield more digestible stover and less starch (from lower percentage of kernels), while harvesting later (2/3-3/4 milkline with some brown leaves) will mean about the same whole plant digestibility but now the energy is coming from an entirely different source (starch from the kernels) that changes rumen dynamics. The desired feeding program may influence both the maturity and storage facility chosen.