

# Harvesting Corn Silage at the Right Moisture

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## Factsheet

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The importance of harvest moisture and maturity to corn silage quality and animal performance is often underestimated. Not only is it important to minimize fermentation dry matter and spoilage losses, it is difficult to compensate for poor forage quality in ration balancing and animal performance. Don't get caught harvesting corn silage past optimum moisture and maturity. In areas that are extremely dry, optimum moisture may occur before optimum maturity. Focus on harvesting at the correct moisture.

### IMPORTANCE OF CORRECT MOISTURE

Ensiling at the correct whole plant moisture and optimum stage of maturity is critical. Corn maturity is very dynamic. As corn matures from dent to black layer, yield increases, starch increases, starch digestibility decreases, and fibre and fibre digestibility decrease.

#### Too Wet

Harvesting at moisture levels above 70% will not only yield less but will result in seepage and a very undesirable clostridia fermentation. Clostridia bacteria are very inefficient and convert forage sugars and organic acids into butyric acid, carbon dioxide and ammonia. This silage will have high levels of foul-smelling butyric acid, with a higher pH, high dry matter losses, and poor feed quality, palatability and intake potential. Laboratory fermentation profile analysis is available to determine relative amounts of lactic, acetic, butyric and propionic acids, all of which affect quality. Seepage results in a loss of nutrients and can be harmful to the environment. Very wet or frozen silage can be difficult to unload in the winter.

#### Too Dry

Harvesting at moistures that are too low will result in poor packing, inadequate air exclusion, poor fermentation and heating. This will mean higher dry matter losses, greater

spoilage and poor bunk life. Low-moisture corn silage also has lower starch and fibre digestibilities. Kernels that are too dry will become hard and pass through the cow undigested. The use of a processor or finer chopping can help to compensate to some extent. Fibre digestibility has been found to decrease by over 10% as moisture decreases from 70% to 58%.

### “NEW SILAGE” SLUMP

Nutritionists have described the “new corn silage slump” where cows do not milk according to ration balancing when being fed newly fermented corn silage in the fall. This is attributed to the reduced starch digestibility of hard-textured, dry kernels in newly fermented, unprocessed corn silage. This can be very frustrating for milk producers trying to fill fall quota. This problem is usually reduced after 3 months when the kernels have a chance to absorb silage moisture, become softer and fracture more easily.

### CORRECT MOISTURE & SILO TYPE

The best livestock performance and silage fermentation usually occurs when whole plant moisture is 65%–70%. This corresponds well to horizontal and bag silos, but silage may have to be a bit drier in tall tower silos to prevent seepage. Variability between fields and within fields can make this even more complex. Recommended moisture contents for corn silage are as follows:

Horizontal bunker silos	65%–70%
Bag silos	60%–70%
Upright concrete stave silos	62%–67%
Upright oxygen limiting silos	50%–60%

## **SILKING DATE**

Silking date can be used as an indicator to give you an estimate of timing for corn silage harvest. This usually occurs 42–47 days after silking. Of course, this will be affected by crop heat units (CHUs) during that period and may come earlier or later, depending on temperatures. It can be useful to predict which fields are ahead of others.

## **KERNEL MILK LINE**

The kernel milk line is often used to determine when to harvest corn silage. This is done by breaking a cob in half and looking at the kernels. After denting (0% milk line), a whitish line can be seen on the kernels. This line is where the solid and liquid parts of the kernel are separated while maturing and drying. This line will progress from the outer edge of the kernel towards the cob. When this milk line reaches the cob (100% milk line), a black layer will occur. The traditional recommendation has been to harvest when the milk line is between one-half and two-thirds.

There is considerable variation in the percent kernel milk line and the moisture percent of the whole plant. University of Wisconsin data over many years show a range in whole plant moisture at one-half milk line of 52%–72%, with an average of 63%. This will be too wet for some and much too dry for others. The two most significant causes of the variation are weather and hybrid differences.

### **Weather**

It has generally been found that when the weather is relatively dry between silking and harvest, the whole plant moisture will be lower than expected at any given milk line position. The typical milk line guidelines can overestimate whole plant moisture by 2%–3% or more during dry weather. Abnormal plant development due to extended dry conditions may result in kernel milk line being very misleading in estimating percent moisture.

### **Hybrid**

Hybrid differences also affect the accuracy of using kernel milk line. Corn hybrids have varying degrees of “stay-green” characteristic. Good stay-green means there is faster grain dry-down relative to stover dry-down. This is good in a grain hybrid because as the grain dries, the stalk stays green and healthy, and is less likely to have broken stalks and lodge in late season. Some hybrids are designed only for use in silage and have less stay-green, so that the grain will have higher moisture relative to the whole plant. Lodging is less important in silage and having more moisture in

the grain portion increases starch digestibility. In other words, hybrids with good stay-green ratings will have milk lines that are more advanced relative to whole plant moistures. Silage-only hybrids that have less stay-green characteristic will be ready to harvest at less advanced milk line. Check with your seed company representative for historic milk line recommendations for a given hybrid.

## **MOISTURE TESTING**

The most accurate method for determining when to harvest is to measure the moisture content. This takes a little more effort but is well worth it when you consider the impact correct moisture will have on your animal performance for the whole year.

Sample at least 10 plants from the field, avoiding the headlands. Watch for moisture variability within fields. Chop a sample using a harvester or yard chopper. Use a Koster Tester™, microwave or laboratory to determine percent dry matter. For more information on moisture testing, visit the OMAFRA website at [www.ontario.ca/crops](http://www.ontario.ca/crops) and click on “Forages” (see the section Corn Silage).

Be aware that samples have residual moisture that is not removed when dried with a Koster Tester or microwave, but will be removed in laboratory ovens and Near Infrared (NIR) procedures. Miner Institute has estimated that Koster Testers and microwaves underestimate moisture by about 3%. A 68% moisture sample reading is actually about 71%. In a typical year, that 3% is equivalent to almost a week in harvest time. If using a Koster Tester or microwave, taking the time to carefully dry the sample is important. The finer the sample is chopped, the easier it will be to dry, and the more accurate the result.

## **MILK LINE TRIGGERS**

Because of the variation between milk line and whole plant percent moisture, the current recommendation is to determine a whole plant moisture shortly after denting when the milk line is about 20%. This can be done by sampling, chopping, drying and measuring as described above. Experience shows that in a typical year, corn silage at this stage dries approximately 0.5% per day. Therefore, if the sample was 70% moisture, and 65%

moisture is the target, harvest should be done about 10 days after the corn was sampled. In dry years, the drying rate will be more rapid. During wetter years, the drying rate will be slower. Moistures can be checked again closer to harvest.

## **RESOURCES**

Visit the OMAFRA website at [www.ontario.ca/crops](http://www.ontario.ca/crops).

- For more information on corn silage, click on “Forages” (see the section Corn Silage).
- For more information on dry conditions and low water, click on the Adverse Weather button.

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