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Corn Maturity and Ensiling Corn

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CORN MATURITY

The rate of corn growth between plant emergence and tassel emergence most significantly affects the total time required for maturity and establishes the date it will be ready for harvest. These stages of growth can range from 45 days to 75 days. This period is shorter for 80-day hybrid corn than 120-day hybrids. The period from silking to physiological maturity is more uniform and averages 50 to 55 days for most hybrid varieties. The silks emerge from the husks about four to eight days after tasseling. Most pollination occurs one to three days after silking. Pollen may be shed for as long as two weeks. Proper soil moisture levels and temperatures are critical at this time for pollination. Cob growth accelerates shortly after pollination.

About 10 to 15 days after silking, leaf and stalk growth stops and sugars produced by photosynthesis in the leaves move into the grain where they are converted to starches, proteins, oils, etc. Grain development is very rapid during the next 30 to 35 days. The rate declines as the plant matures. **It takes 50 to 55 days for most common hybrids to reach physiological maturity after they silk.** Maturity can be estimated by looking at the milk line in the kernel shortly after denting. Table 1 provides an estimated days left for maturity when daily highs are in the mid 80's and lows in the 60's ^{O}F.

Table 1. Milkline estimates of maturity based on high temperatures in the mid 80's and lows in the 60's ^{O}F.

Stage of development	Days to maturity	Maximum yield		Moisture	
		---------- % ----------		---------- % ----------	
		Grain	Plant	Grain	Plant

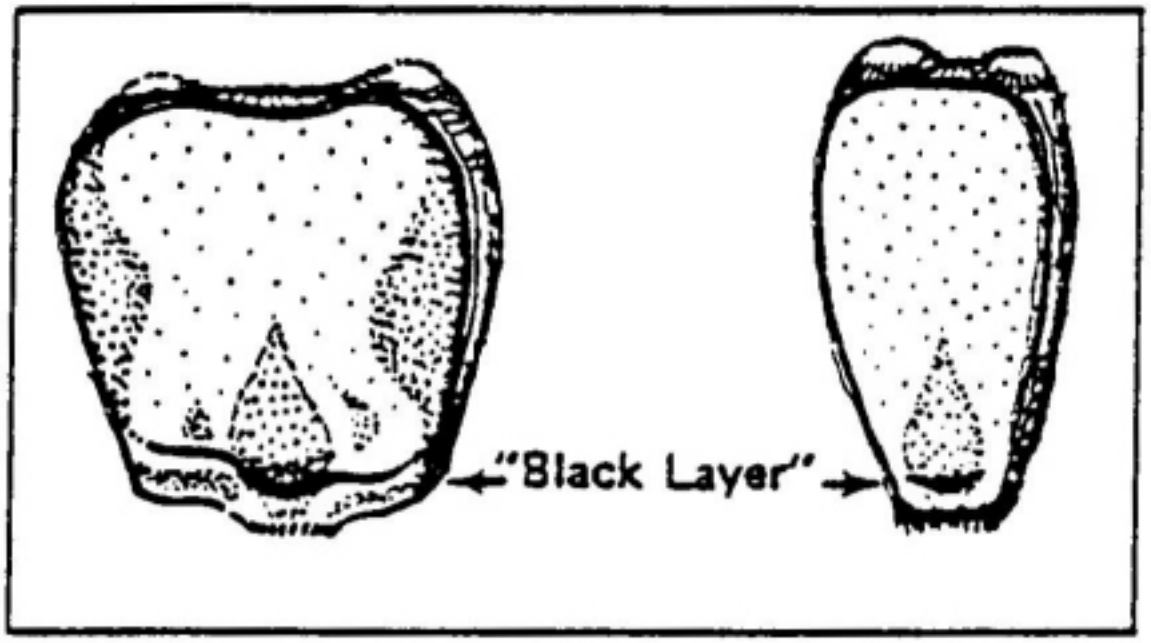
Late milk	30-40	30-50	65-75	60 - 80	75 - 80
Early dent	20-25	60-70	75-85	50-55	70-75
50% milk line	10-15	90-95	100	35-40	65-70
Black layer	0	100	95-100	30-35	55-65

As the corn plant matures changes in the components of the plant occur. The grain content increases and the percent of stalk and leaves decrease. Lignification of the stalk decreases the cell wall digestibility and the starch content of the grain increases. This stage of maturity is just prior to physiological maturity. The rule then should be to harvest corn silage as close to physiological maturity as possible without allowing the stalk and leaves to lignify therefore reduce the digestibility of the plant material. The whole plant dry matter levels should be greater than 30 percent at this time.

HARVESTING CORN SILAGE:

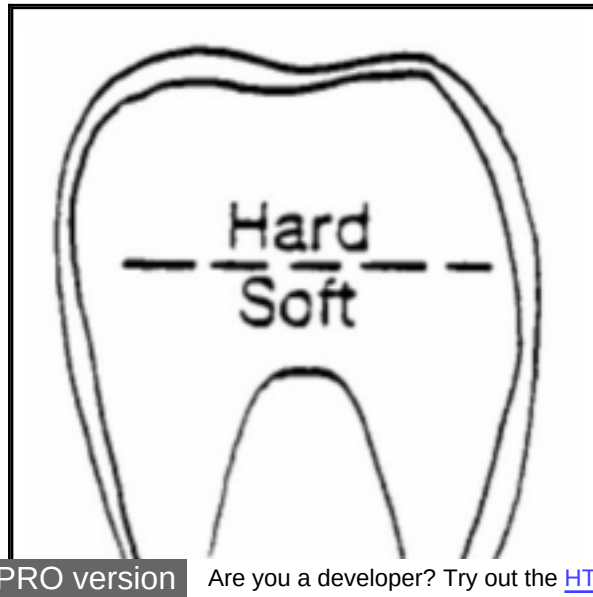
The ideal harvesting time is when the corn plant has reached physiological maturity and is in the full dent. The maximum yield of dry matter per acre is achieved at this time. Dry matter yields are reduced about 1 percent for each day harvested prior to physiological maturity. At physiological maturity the whole corn plant will have a dry matter of 32 to 38 percent. The corn kernel contains about 62 to 65 percent dry matter; ear corn contains about 55 to 60 percent dry matter. At this time the black layer (Figure 1) will be forming at the tip of the kernel. Conditions at this time are also right for good fermentation in the silo and seepage losses will be low. Much of the corn silage is harvested prior to black layer formation due to concerns of frost and traditional needs for silage. To maximize feeding values corn silage should be harvested after early dent. At this time the milk line (Figure 2) should be 1/3 down the kernel.

Figure 1.



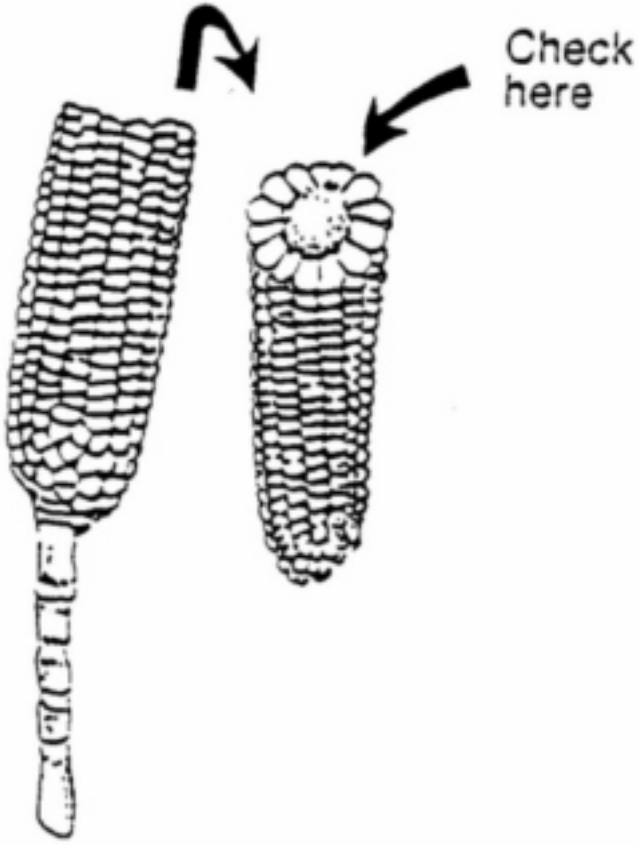
Milk line formation proceeds down the kernel at the same time as the kernel proceeds through full dent. This line advance down the kernel towards the cob with maturity and dry down. When the hard starch line approaches the cob, the black layer will form. Ideally most corn silage will be harvested from 1/3 milk line to black layer maturity.

Figure 2



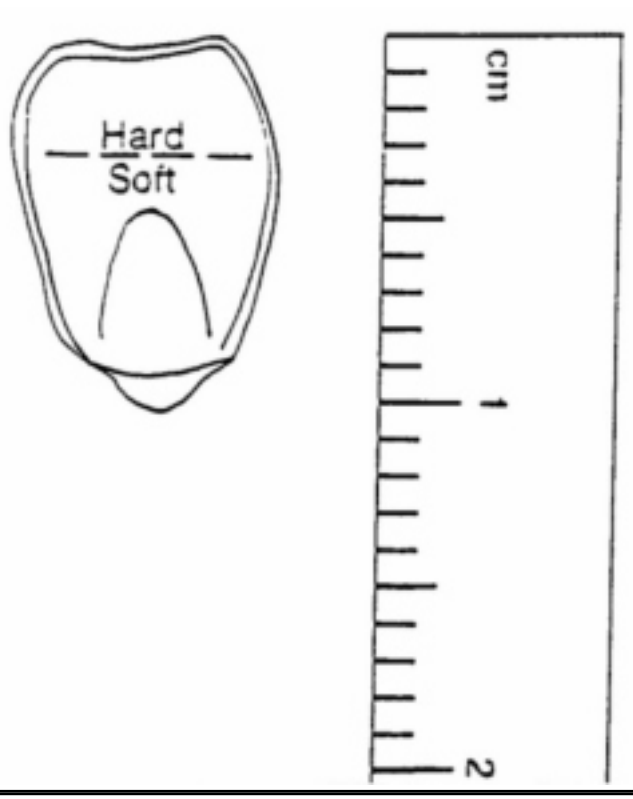
Milk Line

After kernels are dented, a milk line appears across the kernel opposite the embryo side. This line advances down toward the cop with maturity and dry down. When the hard starch line approaches the cob, the black layer will form.



Checking for the Milk Line

Remove the top one-half of the ear and view kernels on the broken end of the top half (side opposite to embryo). The accumulated starch above the line will be hard with the area below the line soft. Splitting the kernel may help to locate the line. Running a knife toward the dented end will also help locate the line. With experience, the line can be determined with accuracy.



Measuring the Progress of the Milk Line

To chart the movement of the starch line, you will need a metric ruler. Measure the distance from the dent end of the kernel to the milk line. Also measure the total kernel length. Use these two values to express the position of the milk line (percent down the kernel). Calculate an average of 10 ears (1 kernel from each).

When weather and growing conditions alter the rate of physiological maturity and require the harvesting of immature corn silage, the yield of dry matter per acre decreases and the energy levels of the resulting silage are lowered. Less grain is present in the silage and the silage is higher in moisture. Both of these factors alter the fermentation patterns in the silage. The fermentation is slower and seepage losses are generally higher. If corn silage is frosted the nutrient flow to the kernels is slowed; then is increase after 5 to 7 days. Freeze damaged corn should be harvested and ensiled seven to ten days after the freeze. This will improve the quality of the harvested forage and minimize the field losses from dried leaves and stalk breakage. The quality of silage harvested in this manner will be equal to silage from non-frozen corn harvested at the same physiological maturity.

At times silage is harvested at earlier stages to prevent freeze damage or when maturity is late because of cool weather. To prevent excessive seepage losses from corn silage harvested in this manner other feeds may be ensiled with the silage to reduce seepage and improve the fermentation of the silage. Ground alfalfa hay, rolled grain or other feeds are used to reduce the overall moisture levels of the silage. The choice of dry feed additions should be related to the final diet fed to the producer's livestock. Use feeds you would normally add to the silage at the time of ration formulation.

ANIMAL PERFORMANCE:

The overall feeding values, dry matter digestibility and protein digestibility are not greatly affected by corn silage maturity after the plant reaches a maturity equal to a 1/3 milk line in the kernels. This is because as the plant matures the grain content increases and therefore the energy value of the grain and ear are increased, at the same time the digestibility of the stalk and leaves is decreased due to the lignification of these plant parts.

The biggest concern to animal performance is the impact of immature high moisture silage on palatability and the resulting feed intake reduction from these silages. Wet silage does not ferment in the silo as well as optimum dry mater silage (30 - 35 percent dry matter). Wet silage may have a sour smell and taste, therefore reducing palatability. With the exception of poorly fermented corn silage animal performance as measured by daily gain of beef cattle and milk production from dairy cows, does not vary much from silages made from corn of differing maturity past the 1/3 milk line.

SUMMARY:

While corn silage maturity may influence animal performance by affecting feed intake because of palatability, the digestibility of the resulting corn silage is not changed drastically until the corn plant becomes mature past the full dent stage. The greatest concern is the ability of the silage to ferment properly, thus providing highly palatable forage without an abnormal fermentation and a sour tasting and smelling silage. If the dry matter of corn silage is in the optimum range (30 - 35 percent dry matter) the resulting corn silage will be palatable and animal performance will not be influenced.

When weather conditions reduce the rate of physiological maturity of corn silage, producers should be aware of the implications of harvesting immature corn and take precautions to ensile the corn at the proper dry matter levels. This can be accomplished by mixing the immature high moisture silage with dry feeds or by letting the silage field dry to the proper moisture levels.

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