EXTENSION

BEEF CATTLE RESEARCH UPDATE
Britt Hicks, Ph.D., PAS
Area Extension Livestock Specialist
Oklahoma Panhandle Research & Extension Center

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Impact of Corn Silage Moisture at Harvest on Steer Performance in Growing and Finishing Diets and Nutrient Digestibility by Lambs

Management decisions, such as silage harvest maturity, can affect the quality and yield of corn silage and impact performance in growing and finishing cattle. As silage harvest is delayed whole-plant yield and total digestible nutrients (TDN) in tons/acre) increase. The increase in energy occurs because of grain development. The total amount of starch increases as the plant matures and since starch provides more than 50% of the energy in corn silage, this increase in starch content represents a large increase in total energy yield by harvesting corn silage with more maturity. However, as corn silage is harvested later in the harvest season with advanced maturity, whole plant neutral detergent fiber (NDF) decreases as well as NDF digestibility.

Corn silage should typically be harvested between 65 to 70% moisture (30 to 35% dry matter, DM) for horizontal bunker silos. The kernel milk line (represents starch content of the grain) is a common visual tool used to determine kernel moisture content (Figure 1). One examines the milk line 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 (considered optimum for both yield and quality) has been to harvest corn silage when the milk line is between one-half and three-fourths down the kernel (moisture content of 60 to 70%).

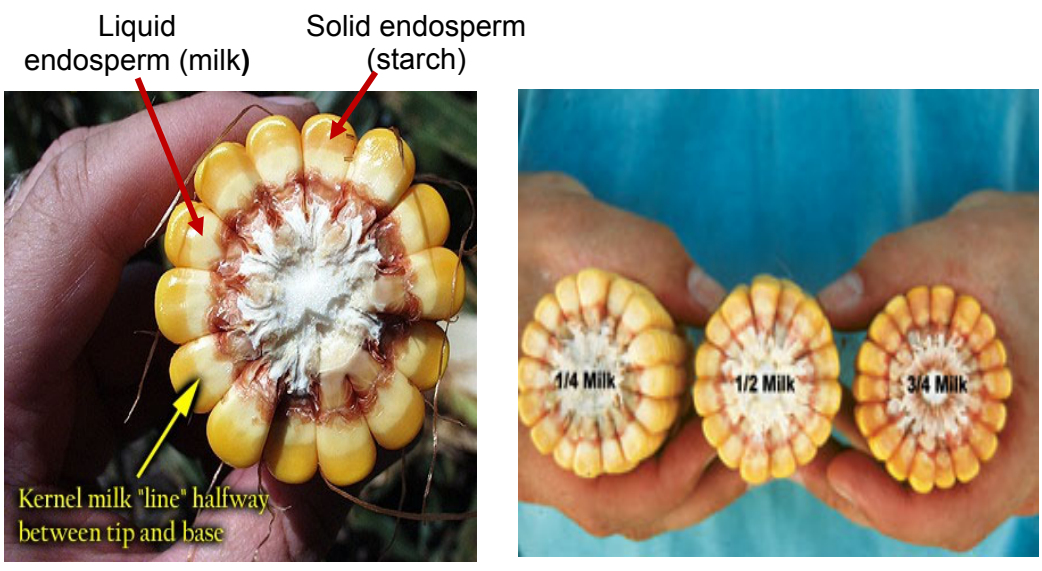

Figure 1. Illustration of kernel milk line.

University of Nebraska research (three experiments) evaluated the effect of delaying corn silage harvest on performance and nutrient digestibility in growing and finishing diets.[1] In these experiments, corn silage was either harvested to mimic traditional corn silage harvested at 37% DM or a delayed harvest at 43% DM. Harvest for 37% DM corn silage was harvested when the corn was at approximately ¾ milk line and whole plant corn silage samples were greater than 35% DM as determined by a moisture tester before harvest. Silage harvest for 43% DM corn silage occurred 2 weeks later which coincided with black layer formation and moisture tester samples were greater

than 42% DM before harvest. Both silages were stored in separate side-by-side plastic silos (~3.3 yards diameter by ~67 yards long, AgBag, St. Nazianz, WI) and allowed to ferment for 28 days before commencing the feeding trials.

These researchers reported that corn silage DM yield was greater for the 43% DM silage vs. the 37% DM silage (10.07 vs. 9.55 DM tons/acre, $P < 0.01$). They noted that the increase in DM yield is the result of increased grain development. As the plant matures, the grain fraction of the plant is increased as more nutrients are shuttled into the corn kernels for them to fully develop.

In Experiment 1, 180 crossbred yearling steers (944 lb initial weight) were fed finishing diets containing 40% modified distillers grains with solubles for 108 days. As DM of corn silage increased from 37% to 43%, no differences ($P \geq 0.30$) in dry matter intake (DMI), average daily gain (ADG), gain efficiency (Gain:Feed ratio), or carcass weight were observed.

In Experiment 2, 60 crossbred steers (598 lb initial weight) were individually fed silage growing diets 83 days using a Calan gate system. As DM of corn silage increased from 37% to 43%, ADG (3.20 vs. 2.93 lb/day, $P < 0.01$) and gain efficiency (0.177 vs. 0.164, $P < 0.01$) decreased.

In Experiment 3, 9 crossbred lambs were used to evaluate nutrient digestibility of 37% or 43% DM corn silage in silage growing diets fed ad libitum or restricted to 1.5% of body weight. There were no differences ($P \geq 0.56$) in DM digestibility and organic matter digestibility between silage harvest DM and intake level. Neutral detergent fiber (NDF) intake was reduced ($P < 0.01$) for lambs fed the delayed harvest corn silage compared to earlier corn silage harvest. In addition, as silage harvest was delayed from 37% to 43% DM, NDF digestibility decreased ($P < 0.01$) from 64.4% to 53.4%.

These authors concluded that delaying corn silage harvest increased corn silage yield and maximized grain yield. In addition, delayed corn silage harvest did not affect performance of finishing cattle. However, delayed silage harvest in growing cattle resulted in lower gains and efficiency, possibly due to increased starch or maturity leading to decreased NDF digestibility.

These data suggest that delaying corn harvest in order to increase harvested corn silage tonnage could provide an economic incentive to put up drier corn silage provided the silage is fed to finishing cattle. However, the packing and storage of high DM corn silage could be a concern with traditional bunker silage. This occurs because dryer corn does not pack well, producing more air pockets during packing. This may lead to poor fermentation causing higher DM losses (shrinkage), greater spoilage and poor bunk life.

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[1] Hilscher, F. H., D. B. Burken, C. J. Bittner, J. L. Gramkow, R. G. Bondurant, M. L. Jolly-Breithaupt, A. K. Watson, J. C. MacDonald, T. J. Klopfenstein, and G. E. Erickson. 2019. Impact of corn silage moisture at harvest on performance of growing steers with supplemental rumen undegradable protein, finishing steer performance, and nutrient digestibility by lambs. Transl. Anim. Sci. 3:761-774.