The "Moving Target" of Corn Silage Quality

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Understanding life cycle changes of a forage plant is key for successful management and profit optimization. The ideal forage maximizes yield, energy (high digestibility), intake potential (low fiber), and protein. To ensile, preserve and store forage, the moisture and carbohydrate levels must be adequate for fermentation. With the exception of protein, corn silage is ideal for growing and lactating animals.

Yield and quality of corn forage changes dramatically during its life cycle. Corn is unique in the world of forages having two quality peaks: prior to flowering (tasseling and silking), and about 45-50 days later near maturity. The early peak is high in quality but too wet for ensiling. The later peak is more familiar and is the one typically managed for when producing corn silage.

The MILK2000 model calculates and expresses forage quality as milk produced per ton of forage. Milk per ton provides an overall energy estimate of various forage components (i.e. starch, fiber, protein and fat) used for animal maintenance and milk production. Two important measurements are NDFD which measures the digestibility of the stover, and starch content which measures the amount of starch in the forage. Roughly, 50-65% of the stover is digestible and 80-100% of the starch is digestible by dairy cows.

Like most forages, optimum quality as measured by milk per ton, occurs just prior to flowering stage (Figure 1E). Like other forages, milk per ton decreases as development continues after flowering due to decreasing stover digestibility, NDFD (Figure 1C). Unlike other forages, as corn nears maturity, milk per ton, increases due to greater starch content in corn grain (Figure 1D). By maturity, forage yield (Figure 1A), milk per ton (Figure 1E) and milk per acre (Figure 1F) are maximized.

A significant challenge in managing corn forage is harvest timing. Harvest when quality is at a maximum, and when moisture content will ensure good fermentation, preservation and storage. The proper forage moisture in horizontal silos (trench, bunker, or bag) is 65-70%, in upright stave silos is 60-65%, and in upright oxygen limiting silos is 55-65%. Corn at flowering is too wet for ensiling (Figure 1B). It is only later in its life cycle or after a fall killing frost that the proper moisture for ensiling is achieved.

A plant indicator that proper harvest moisture is approaching occurs about 35 days after flowering as the kernel milk line begins moving from the crown to the tip of the kernel. The milk line will be halfway between crown and tip about 45 days after flowering. Farmers should note when a cornfield flowers, and when the kernel milk line begins to move. Measure forage moisture by chopping a small sample. Usually during September, corn forage dries in the field at an average rate of 0.5% per day. If frost kills the plant before the proper moisture for the storage structure is reached, then forage moisture must be closely monitored since chopping will need to occur on all fields of the farm at about the same time.

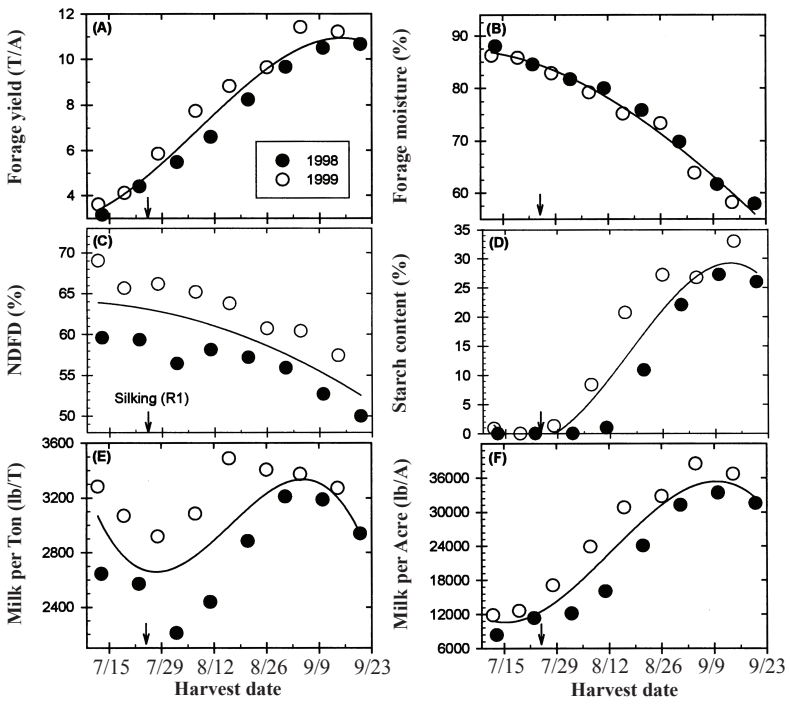

Figure 1. *Forage yield, moisture, NDFD, starch content, milk per ton, and milk per acre of corn harvested at Arlington during 1998 and 1999. The arrow indicates the average silking date of July 25. Derived from Darby and Lauer (2002).*

References: Darby, H. M. and J. G. Lauer. 2002. Harvest date and hybrid influence on corn forage yield, quality and preservation. Agronomy Journal 94:559-566. Schwab, E. C., R. D. Shaver, J. G. Lauer, and J. G. Coors. 2003. Estimating silage energy value and milk yield to rank corn hybrids. Animal Feed and Science Technology 109:1-18.