Feeding corn silage to dairy cattle

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Take-Home Message

Using brown midrib hybrids and increasing chop height have been among the most consistent and adopted strategies to increase corn silage fiber digestion and milk production by dairy cows. However, these benefits come at the expense of reduced forage mass harvested per area. Adequate kernel breakage at harvest remains crucial to ensure starch becomes ruminally available. Furthermore, research supports the use of inventory planning so a newly harvested crop would be fed only after three to four months in storage. Although prolonged storage of corn silage would be a valid management practice, several factors should be taken into consideration when implementing this practice. Prolonged storage requires proper silo management during filling, packing, and covering to ensure beneficial fermentation patterns.

Abstract

Whole-plant corn silage is the predominant forage used in dairy cattle diets worldwide. Besides providing energy for maintenance and lactation, coarser corn silage particles stimulate chewing and salivation, rumination, gut motility and health, regulate feed consumption, modulate feeding patterns and are the structural basis of the ruminal mat, which is crucial for ruminal digestion. Starch and fiber are the main sources of energy for dairy cows fed corn silage-based diets and therefore improvements in digestibility of these nutrients may increase milk production or reduce feed costs through enhanced feed efficiency.

Incomplete fiber digestion reduces the profitability of dairy production by limiting intake and animal productivity. Lignin is the key obstacle to fiber digestion as it obstructs the enzyme access to the digestible fiber fractions, cellulose, and hemicellulose. Besides, rumen microorganisms cannot breakdown lignin. Improvements to fiber digestibility of forages are often accomplished by reducing lignin or undigested NDF concentrations. Brown midrib mutant hybrids (BMR) have lower lignin concentrations compared to conventional forages and thereby greater milk production when fed. A meta-analysis of published studies revealed greater total tract NDFD (44.8 vs. 42.3% of intake), intake (55.0 vs. 53.0 lb of DM/d), yields of milk (85.5 vs. 82.2 lb/d) and protein (2.60 vs. 2.49 lb/d) for cows fed BMR-based diets instead of conventional corn silage-based diets. These benefits are associated with lower rumen gut fill as conventional forage-based diets may have lower rates of passage and digestion, causing physical constraints in the rumen that limit intake. Although genetic improvements of BMR hybrids increased yields than earlier hybrids, it is still important to account for potential lower yields when deciding on which hybrid to grow.

Breaking kernels during corn silage harvest is crucial to ensure starch is available for digestion. Obtaining optimal kernel processing requires targeting for proper kernel maturity, proper processor maintenance from wear, frequent quality-control monitoring of kernel breakage during harvest, and adequate chop length and roll-gap settings for the chopper and processor used. Keeping silage longer in the silo improves starch availability and prolonged storage became an important practice for herds feeding corn

silage, high-moisture corn and earlage. Briefly, starch digestion in the rumen requires that starch granules be accessible for microbial degradation. Starch accessibility is increased when starch-protein matrices (i.e. zein proteins) surrounding starch granules are broken down. Proteases in the degrade these zein protein matrices surrounding starch granules in corn kernels, particularly bacterial proteases. Besides, the continuous decrease in pH and accumulation of acids as fermentation progresses favors the activity of kernel proteases. Although prolonged fermentation increases starch availability across a wide range of hybrids, maturities, and processing degrees, it does not attenuate or overcome reduced starch digestibility associated with these factors.

References

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