

Processing Corn for Optimum Utilization

Spence Driver & Rod Martin

Carbohydrates comprise 70 to 80% of the dry matter in typical rations. Structural carbohydrates or cell wall carbohydrates represent the fibrous component. They are measured as neutral detergent fiber (NDF). The availability of energy from the NDF fraction of feeds is determined by factors that limit a cow's dietary intake (bulk density, digestibility, rumination time, total chewing time, and rate of digestion and passage).

Non-Fiber Carbohydrates (NFC) measures the starch, sugars and pectins which are highly digestible. Given the growing popularity of corn silage along with feeding corn as the primary grain source, starch becomes the predominant NFC and dietary energy source for our milking herds.

On a dry matter basis, starch makes up over 70% of the total weight in corn. But, new corn varieties appear to have a faster field dry down rate and a harder kernel. As a result, the starch matrix is less available for microbial digestion. This, coupled with today's higher feed intakes (that increase the rate of passage and lower rumen pH) may result in lost or undigested starch in the diet.

The bottom line is less energy available to the cow and decreased milk production. Production and health problems can often be traced to either too little, too much, or the wrong kind of carbohydrate fractions being fed. In addition, the ration that is balanced on paper and delivered to the cow may not be supplying the expected digestible nutrients due to crop or growing season factors that affect digestibility.

When Balancing Rations . . .

Cows require a minimum amount of fiber for proper rumen function. Always balance rations to meet the minimum required effective fiber taking into account both chemical and physical fiber. Use of a forage shaker box to measure particle length should be a regular part of effective fiber analysis of dairy rations. In addition, watch for sorting. TMR sorting can have a huge impact on herd health and milk production.

- Evaluate both NFC and total starch fractions. Many rations have adequate levels of NFC, but are low in starch. This reduces rumen microbial efficiency. Conversely, other rations may be high in total starch while being within recommended NFC guidelines. The use of high fiber, low starch byproducts (cottonseed, soy hulls, beet pulp, etc.) should be considered to correct this imbalance.
- Provide adequate levels of degradable and soluble protein.

Consider Starch Sources . . .

- Become familiar with typical starch values of various feed ingredients.
- Chemically analyze corn silage and grains for starch. Amounts vary greatly based on varieties and growing conditions.
- The total amount of starch and the rate of rumen degradation are important. Refer to the chart below outlining the different degradation rates of the various grains:

FAST-----INTERMEDIATE-----SLOW
 Wheat-----Barley----- Oats-----Corn-----Sorghum



Recognize the importance that processing and moisture play in affecting both the rate and total amount of starch digested in grains and corn silage. For example, processed corn silage that is harvested at the correct moisture has a different feeding value and digestibility than unprocessed corn silage that was harvested too dry.

Herd Evaluation Conditions . . .

Track dry matter intake. Fluctuations in intake may indicate acidosis caused by too much starch or rapid degradation of starch. Consistently low intakes may be the result of too much fiber, inadequate starch, or both.

- Low milkfat test can indicate excess starch, inadequate effective fiber, or low starch intake. At least 50 percent of cows should be chewing their cud when resting.
- You may want to check rumen pH using ruminocentesis. Acidosis is a problem when more than 25 percent of a sample group of cows has a pH of less than 5.5. Normal is a pH above 5.8.
- Inconsistency of manure within a group of cows may indicate acidosis. Whole or partially undigested grain or large fiber particles may indicate a problem. Washing manure through a fine screen can help evaluate starch and fiber utilization.
- Finally, high incidence of laminitis and sole abscesses may indicate acidosis. Corn particle size and moisture content will affect the rate of starch degradation. Use screens to determine corn particle size distribution. We have developed an onfarm chart as a method to quickly determine the approximate particle size of corn being fed. The chart also includes factors that determine the optimum particle size.

Those factors include:

- If you feed high levels of corn silage, wetter silage or finely chopped forage, increase the particle size of the grain.
- High moisture shell corn should be coarser because the fermentation makes starch more available in the rumen. If high moisture corn is less than 25% moisture, use the same guidelines as for dry shell corn.
- If corn is component fed, it should be coarser to prevent rapid degradation causing excessive rumen pH decline.

One size will not fit all farms and the optimum particle size can change from year to year. Using the tools available to monitor your herd's performance to make the necessary corrections will ultimately maximize profitability. Remember the goal is to provide a highly digestible ration that promotes efficient rumen function and optimum milk production while providing the necessary effective fiber intake to maintain herd health.

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