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# FORAGER

*Agronomics with livestock in mind!*

## DETERMINING CORN SILAGE DIGESTIBILITY

Accurately predicting the digestible energy of corn silage for ration formulation and animal performance is important. This is particularly true during dry years, when there can be tremendous variations in the proportions of grain and stover. Corn silage often makes up a higher portion of rations, particularly during years when forage inventories are lower than required. Fortunately, there is improved technology available to us that determines the digestible energy of corn silage and intake more accurately than the old Acid Detergent Fiber (ADF) / Neutral Detergent Fiber (NDF) approach.

### Digestible Energy Differences Exist

Digestible energy differences in corn silage exist. We've just not been very good at measuring those differences in the past. Corn silage is unique in that it consists of a mixture of two very different components – high moisture grain corn and high fiber stover. Digestible energy of corn silage is primarily determined by the amounts of starch and fiber contained in the plant, along with their digestibility. In typical corn silage for example, about 45% of the digestible energy comes from the starch, 25% from the fiber, and 10% [each] from fat, protein and sugars plus organic acids.

### Measuring Corn Silage Digestible Energy

Digestible energy cannot be directly measured by a single analysis. For many years the industry used ADF to predict Total Digestible Nutrients (TDN) and Net Energy (NE) of corn silage, and NDF to predict intake, but these measurements alone do not always accurately estimate digestible energy. The use of energy prediction equations (Net Carbohydrate Protein System) gives us more accuracy by including estimates of the various digestible energy values of crude protein, fat, ash and non-structural carbohydrates (NSC), and by using NDF and % lignin to predict NDF digestibility.

### Fiber Digestibility & Starch

Lower fiber (NDF) and increased fiber digestibility (NDFD) significantly improve dry matter intake as well as digestible energy. Improved starch digestibility minimizes kernels passed in the manure. A modified, more precise system *(Schwab-Shaver, University of Wisconsin)* was introduced [a couple of years ago] that uses *in vitro* NDF digestibility (NDFD) to predict both digestible energy and intake. *In vitro* digestibility uses incubated live rumen fluid to measure the amount and rate of digestion under simulated rumen conditions. NDFD in corn silage can range from 48 to 71%. Hard, dry kernels reduce starch digestibility, so the model also measures starch and adjusts starch digestibility to reflect % moisture and kernel processing. These lab measurements are more expensive but also more accurate. "Milk 2006" has been developed to predict forage impacts on animal performance by determining "Milk per Ton" and "Milk per Acre" (Shaver et al., U of WI-Madison). NIR technology is being improved to make this analysis cheaper, faster and easier. Research is also being done to develop lab techniques that more accurately estimate starch digestibility, while accounting for kernel texture, particle size and moisture.

### Managing For Forage Quality

Corn silage quality deserves the same consideration as haylage quality. In the 1970's we analyzed for crude protein by measuring nitrogen, so we learned how to cut alfalfa earlier and also made big improvements in digestibility. Now that we have better measuring tools, corn silage quality is receiving more consideration. These analyses also give us the tools to more accurately measure how management affects forage quality, which includes the % moisture, maturity, hybrids, processed versus unprocessed, cutting height, etc.

### Different Dairy & Beef Emphasis

Feedlot cattle are fed to achieve high daily gains. They are on a positive energy balance. Corn silage with a high grain content and digestibility is desired because less grain will be required in the ration. With feedlot rations, shortfalls in forage energy can more easily be compensated for by adding grain.

High producing dairy cows may be in a negative energy balance. There is a limit to how much grain can be added to the ration while maintaining minimum effective fiber requirements for rumen function and health. Fresh cows are frequently "near the edge". High producing dairy cows not receiving adequate digestible energy not only produce less, but lose excessive body condition, have metabolic problems and problems getting bred back. Fiber digestibility is extremely important because it allows higher forage intake and more digestible energy, so more emphasis is placed on NDF and NDFD.

If feed is being produced for cattle with high nutritional requirements, such as high producing dairy cows, it may be a good idea to harvest better corn fields for silage, rather than for grain. Grain corn can more easily be replaced than high quality forage. It is difficult to balance rations and "get milk out of cows" with poor quality corn silage.

There can be large differences in digestible energy of corn silage. Laboratory analysis and how the quality and energy value of corn silage is determined can have a tremendous effect on ration formulation and production.

*(edited from an article by Joel Bagg, Forage Specialist ~ Ministry of Agriculture and Rural Affairs, Ontario, Canada)*