



Dairy cow nutrition: the corn grain dilemma

Alejandro R. Castillo and Gerald E. Higginbotham
University of California, Cooperative Extension

Numerous reports have examined the impact of ethanol plants on the U. S. corn market. The proliferation of ethanol plants will inevitably increase prices and cause lower availabilities of corn grain. In return, higher availability of corn byproducts such as corn distiller's grains will be made available to livestock producers. Corn grain has long been a base ingredient in dairy rations. According to a recent survey on 50 dairy farms in Merced County, 100% of the dairy producers were feeding corn grain to their lactating animals. The average intakes were 8.2 lb per cow per day and ranged from 2.4 to 15.6 lb. Questions have been raised if corn grain can be replaced by other grains in dairy rations and what role does corn byproducts coming from ethanol plants have in dairy rations.

Corn grains have an average of 70% of starch, which is the main component to produce alcohol from ethanol plants. The starch is also one of most critical nutrients for high yielding dairy cows. Dietary starch is necessary to maintain high rates of energy and protein production in the rumen as volatile fatty acids and microbial protein. It can be replaced by other sources of energy or other grains, but not by oils or fats. When corn grain starch is used for alcohol production, the other nutrients in the original grain are concentrated in a byproduct named distiller's grains. In general terms, crude protein in distillers' grains could be 30% or more compared the 10% in the original corn grain, fat content rises to 10% and fiber as NDF (neutral detergent fiber) increases to almost 40%. Based on these components, distiller's grains are considered a good protein and energy source. Fats, fiber and starches are energy sources for livestock, but with different rumen fermentation rates, digestion sites and metabolism. For this reason, energy from distiller's grains can not replace the energy of corn grain, therefore, it recommended that other sources of starch and soluble sugars should be included in the dairy diets.

The following four aspects need to be considered to make a good use of distiller's grains for lactating dairy cows. (1) Protein content. Distiller's grains are a good source of rumen undegradable protein. Degradable and undegradable protein contents should be used to avoid a shortage of nitrogen in the rumen. Lysine is the first limiting amino acid in corn byproducts and it is also most susceptible to heat damage. For that reason, lysine balances and insoluble nitrogen content should be evaluated to be sure that both (nitrogen and lysine) are available for rumen microorganism and the cows' metabolism. Positive results on milk protein content were observed when diets including distiller's grains were supplemented with lysine in lactating animals.

(2) Fat content. The effects of oils and fats on rumen fermentation can vary depending on other feedstuffs used. Adverse effects might be more likely when diets based on corn silage or high fiber diets, fat may have effects on rumen fermentation reducing dry matter intake. In most situations, total dietary fat should not exceed 6-7% of dietary dry matter. (3) Mineral content and mineral balances. Particularly sulfur should be monitored due to sulfuric acid is initially added in the dry grinding ethanol plants and to end the fermentation process. Excess of sulfur in dairy diets may affect absorption of other minerals, like selenium and copper, decreasing animal performance and in some situations affecting animals' health and reproduction. Finally, (4) Distiller's grains may be offered dried or wet. Due to post fermentation problems and depending on weather conditions, wet distiller's grains should be stored for no more than 7 days. Also, a high concentration of mycotoxins could be expected if the original grain was contaminated. Propionic acid or other organic acids, or mycotoxins sequestering agents should be used to control mycotoxins as necessary. Storage in silo bags could be an option, but once these are open spoilage start. It is expensive hauling wet distiller's grain long distances. Due to the high water content, rations may be too wet affecting daily dry matter intake.

Because of the different aspects discussed on this article, no more than 15-20% of a lactating cow's total ration on a dry matter basis should be composed of distiller's grains. The recommended inclusion rate for replacements and dry cows is 10-15%. Excess protein and minerals in the diets may be related to animal health problems, and environmental concerns such as air and water quality. Make a plan with your nutritionist before including distiller's grains in your dairy rations. A complete chemical analysis of each lot coming to your farm is fundamental to make a good use of this corn byproduct.