

Whole versus Chopped or Ground Corn as an Energy Source

Corn is one of the most commonly used grains for supplementing energy deficiencies in beef cattle diets. Whole corn is generally cheaper per ton than cracked, rolled or ground corn because of the added cost associated with grain processing. In addition, some cattle producers have the opportunity to purchase corn directly from farmers after harvest or plan to purchase bulk loads of whole corn or corn screenings.

Most cow-calf operations do not have grain processing and mixing equipment. For this reason, the question often arises as to whether certain grains can be fed whole or do they need to be processed. This question arises from the fact that whole grains can be seen in the fecal patties, alerting the producer that the animal may not be getting the nutrients out of the grain.

In theory, processing grain should improve the digestibility and feed conversion of a feed by (1) reducing particle size that allows for more sites of attachment for rumen microbes and (2) some processing methods change the structure of the starch rendering the feed grain more digestible. However, as previously stated, further processing always comes with additional cost, and the improvement in grain digestibility and feed conversion must outweigh the cost for additional processing.

Corn is one grain that can be fed whole when it is being used a supplement. A study conducted at the University of Arkansas in the early 90's reported no difference in the growth performance of steers grazing bermudagrass pasture and supplemented with either whole or ground corn at one percent of body weight over an 84-day grazing period.

Researchers in Canada evaluated the effects of chewing on the digestibility of whole grains when fed to cows at one percent of body weight. They found that chewing during ingestion and rumination resulted in extensive damage to corn kernels. The damage that occurred to the corn kernel during these processes would help support the idea that cattle supplemented with whole corn might perform similarly to cattle fed chopped corn. They also noted that the whole grain observed in the feces appeared to be greater than what was actually present. Interestingly, eleven percent of the kernels that appeared to be whole in the feces were actually empty inside, indicating minor damage to the whole kernel made the starch within the kernel accessible to rumen microbes and digestive enzymes.

Researchers in Ohio collected the corn kernels excreted daily from cows fed a forage diet and supplemented with corn at 0.3% body weight or fed at high corn ration where corn intake was at 0.8% body weight. From determining the amount of kernels fed and collecting the whole kernels in the feces, these researchers found that 88% of the kernels fed had been digested.

The effects of processing corn extends beyond supplements to feeding high levels of corn in high concentrate rations similar to those used in bull test rations and finishing rations. A review of processing methods on average daily gain and feed conversion revealed that cattle gained at a similar rate (3.19 lbs per day) among studies where whole corn was fed as compared to dry rolled corn. Feed conversion (pounds of feed required per pound of gain) were significantly lower with whole corn (5.95 lbs) as compared to dry rolled corn (6.57 lbs) as a result of cattle fed whole corn consuming nearly 2 lb less per day than cattle consuming dry rolled corn. However, the authors noted that this may also be an artifact of finishing diets with whole corn generally contains less roughage as compared to finishing diets with processed corn.

Although dry rolling and cracking have not consistently improved animal performance, this assumption is not the same for corn that has been exposed to steam prior to rolling. Processing corn in this manner, generally termed "steam rolled" or "steam flaked," alters the structure of the starch within the grain through a process called gelatinization. Steam, unlike dry processing methods, significantly improves the metabolizable energy content of corn.

Processing corn may become necessary when small amounts of additional ingredients such as protein feeds (e.g. soybean meal), mineral and vitamin premixes, or feed additives are going to be blended with the corn. Mixing large quantities of whole corn with minute amounts of other feedstuffs or feed additives will result in the blend becoming unevenly distributed due to sifting of the smaller feed particles during shipping and handling.

Although corn can be fed whole as a supplement, this concept cannot be applied to all feed grains. Some feed grains contain a hard external coat. Feed grains that benefit from processing before feeding include rice, sorghum and wheat. Since there is a slight reduction in digestibility associated with feeding whole corn, an energy value of 88% total digestible nutrients, or TDN (dry matter basis) is often used for formulating diets with whole corn, as compared to 90% TDN for cracked corn.



Cracked corn can be seen on the left with whole corn on the right.