

## *Alkaline Treatment of Corn Stover*

### **What is it?**

Alkaline treatment is an old process dating back to the 1880s in papermaking. It was later discovered that feedstuffs treated with calcium oxide increased cellulose digestibility, improving the feed value of byproducts such as corn stover and straw. Recent work from the University of Wisconsin has suggested that NDFD may increase as much as 10 percentage points.

### **What's the process?**

Water must be added to the corn stover to reach 50% moisture (this is a critical step) and either calcium oxide is added at 5% of feedstuff dry matter or calcium hydroxide is added at 7% of feedstuff dry matter. Thorough mixing and adequate processing of the material is essential.

Example: A ton of 70% DM stover (1,400 lb DM) would have to have 800 lb of water (100 gallons) added to yield a mixture with 50% moisture (1,400 lb DM and 1,400 lb water). The calcium oxide or calcium hydroxide requirement for such a mixture would be 70 lb calcium oxide (5% of DM) or 98 lb of calcium hydroxide (7% of DM).

The process can be slow and tedious. Tub grinders are most commonly used to process the stover. It's then moved to a mixing wagon where the water and alkali material can be added during mixing. Adequate mixing may require 15-20 minutes and is critical to the process.

### **Feeding and performance**

A trial with yearling feedlot cattle at the University of Nebraska reduced dry corn from 46% of the diet to 36% of the diet by adding 20% of the diet as alkaline-treated corn stover and removing 10% of the diet roughage (cobs, straw and dry stover) without sacrificing performance or carcass yield. Recently, it has been used successfully in western feedlots. Application for dairy rations is generally untested.



**Storing the feed**

The chemical reaction that raises pH to at least 8.0 and breaks down cellulose takes at least one week, so feeding should not occur prior to that timeframe. Typically, producers process two weeks of feed at a time and repeat the process every other week. Treated stover can be stored successfully for longer periods of time, but packing and covering with good quality plastic that is weighted down (much like fermented feed) is essential to exclude oxygen and limit mold growth. Bags have worked well for short-term (bi-weekly) storage.

**Economics**

Producers need to calculate the cost of the alkali material (\$300-\$350 per ton) plus the cost of the stover, grinding, and labor, and then weigh that against an equivalent source of corn, such as corn silage. These costs are highly variable, but the University of Nebraska has determined that including 20% treated corn stover in feedlot diets results in similar performance and carcass quality and lowers diet cost. Add in the need for an emergency source of forage and the economics may favor this process rather quickly. Very little is known about this feed in dairy rations. Feedlots are replacing up to 50% of the corn silage in very high concentrate rations. The amount used in dairy rations should probably be less than that.

**Safe handling**

Comments from the field suggest that calcium oxide can be very caustic to human skin. Blisters and skin irritation have been associated with handling this material. The process also involves a fair amount of dust that should not be breathed in or come in contact with skin. In addition, these materials are very difficult to clean from equipment. One feedlot is now using calcium hydroxide instead of calcium oxide. It is delivered in semi-loads and pneumatically transferred, eliminating the need to handle bags.

The chemical reaction generates a lot of heat and temperatures will rise as high as 190° F. Adequate moisture is essential for the process to work and to avoid ignition. Fires have been known to occur.

**Further information**

To learn more about alkali treatment of corn stover, visit <http://beef.unl.edu/cornresidues>. Scroll down to the presentation on “Alkaline Treatment of Forages.”

