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ETHANOL FEEDS

FEEDING DISTILLERS GRAINS TO BEEF CATTLE

July, 2007

Long Term Storage of Wet Distillers Grains and CDS

By Dan Loy and Daryl Strohbehn

An Iowa Beef Center survey in 2005 indicated that well over 70% of Iowa feedlots were using ethanol co-products while only 27% of the cow-calf producers were putting them in their rations. Both types of operations have increased their usage, but cow-calf producers still lag. Why? Cow-calf producers indicated that storage of the wet feeds was their major challenge. The Iowa Beef Center based on this information identified storage of wet distillers grains as a major focus. Feedlot generally utilize a truckload quickly enough off of flat storage that major spoilage does not occur, but cow-calf, small feedlot and backgrounders are not so fortunate when it comes to effectively storing wet distillers products.

Wet distillers' grains develop noticeable spoilage in just a few days. How quickly depends on the temperature and humidity, but can be a few days in weather above 50 degrees. The key to longer term storage of wet (around 70% moisture) and modified (around 50% moisture) distillers' grains is to exclude the oxygen. The liquid by-product, condensed distillers' solubles can be stored in tanks (must be heated in winter), or mixed with other feeds and ensiled.

After an initial test of a corn stover-solubles mixture stored in a bunker silo, and with the help of a grant from the Iowa Energy Center, a series of demonstrations were initiated in the Fall of 2006. These included a bagging study at the ISU McNay research farm in Chariton Iowa and a study at the ISU Beef Nutrition Farm in Ames where solubles were mixed with fescue hay and stored in a bunker silo. In the McNay study wet distillers' grains were mixed with 20% hay on as fed basis before being bagged. This mixed product was successfully fed as a supplement to mature cows being offered low quality round bales. Modified distillers' grains were bagged without any forage additions and were fed to heifers and ewes in complete mixed rations.

In the Beef Nutrition study, a 50% condensed distillers' solubles-hay mixture proved to be too dry for effective packing and oxygen exclusion. Feed spoilage and reduced performance occurred. Storage Losses were 8.5% in this study. This data suggests that the cost of storing the liquid alone may be justified compared to forage mixtures.

Work at the McNay research farm showed that modified distillers grains could be stored in the bag for a period of 60 to 200 days and fed successfully to developing beef heifers. Growing heifers on two different levels of modified distillers grains (27% and 49% of the total ration as fed) grew equal to or better than heifers on a corn-soybean based control ration. However, it did not work with either gestating or lactating ewes due to listerosis.

Shrinkage from transportation, storage and feeding from the time of purchase to the feedbunk in the McNay study amounted to 16.7% for the bagged modified distillers grains of which 5% of the total loss was spoiled during storage and discarded and 8% was shrinkage during storage and handling. The wet distillers grains mixed with 20% hay had a shrink factor of 9% with 7.2 % of the total shrink after bagging. For comparison a University of Wisconsin study in 2000 showed that dry matter storage losses of corn silage and haylage stored in bags averaged 14 % and 9.7% if three bags with higher dry matter losses were not considered.

Potential Mold Related Problems in Ethanol Co-products

By Dr. Gary Munkvold, Department of Plant Pathology

Fungi are a fact of life on the farm, although their presence is often undetected or ignored. Unfortunately, fungal colonization of livestock feeds can be detrimental to animal health, mostly through the production of mycotoxins by some fungi. As the use of ethanol co-products increases in livestock feeding operations, it will be important to understand the nature and extent of any risks related to molds and mycotoxins.

There are essentially two ways that fungi can impact the safety of ethanol co-products as feed. Mycotoxins can be produced by some fungi that can infect corn grain. In Iowa, these are usually species of *Fusarium* that can produce fumonisins or deoxynivalenol (or other mycotoxins), or *Aspergillus flavus,* which produces aflatoxins. When grain is processed into ethanol, these mycotoxins are not destroyed, but become concentrated in the co-products.

When co-products are delivered to the farm, they can become colonized by fungi in the environment. This may cause problems with nutritive value or palatability, but some of these fungi also may be mycotoxin producers. There has not been much information available about the types of fungi that prefer to colonize in these materials, so the likelihood of mycotoxin contamination by this route is unclear. As one would expect, wet or modified distillers' grains are more likely to be quickly colonized by fungi than are dried distillers' grains.

In order to learn more about fungal colonization of co-products on the farm and the potential for mycotoxin contamination, sampling studies were conducted at the ISU Beef Nutrition Farm and the McNay Research/Demonstration Farm. At one or both locations from September through March, periodic samples were taken of wet distillers' grains (WDGS), modified distillers' grains (MDGS), dried distillers' grain (DDGS), condensed distillers' solubles (CCDS), and a hay/CCDS mixture. We tested these in laboratory for the presence of fungi, especially those that can produce mycotoxins. No attempt was made to quantify changes in the level of molds over time. The objective was to identify the major types of fungi present, and determine if any were mycotoxin producers. A few samples were checked for mycotoxins at the ISU Veterinary Diagnostic Laboratory.

Findings in Brief:

CCDS stored in a tank had very little fungal contamination other than yeast, but when it was exposed to air, *Aspergillus flavus* and *Penicillium* fungi grew on it very well.

The CCDS/hay mixture had a wide variety of fungi present both on the surface of the pile and internally. This included *Aspergillus flavus*, species of *Cladosporium*, *Penicillium, Fusarium, Rhizopus*, and *Rhizoctonia*. Most of these probably originated from the hay, but the CCDS may have promoted the growth of some of the fungi.

DDGS consistently had low levels of *Aspergillus flavus* present, but no visible growth throughout the duration of sampling

Several types of *Penicillium* were the most common fungi on MDGS and WDGS at both locations. MDGS and WDGS exposed to the air also were contaminated commonly with other fungi, including *Fusarium* species. At a given sampling date, exposed MDGS consistently had higher levels of fungal contamination and more types of fungi than WDGS. In exposed piles of WDGS and MDGS, samples taken with a probe appeared to have equal or higher contamination levels compared to the pile surface.

Visibly moldy samples of WDGS and MDGS tested positive for fumonisins

CCDS initially had trace levels of fumonisins and when mixed with hay and stored tested positive for fumonisins

No aflatoxins, deoxynivalenol, zearalenone, or zearalenol were detected

Summary

Mycotoxin-producing fungi (*Aspergillus flavus* and *Fusarium* spp.) colonizein high-moisture co-products stored on the farm, especially if they are exposed to air. These represent a risk for fumonisin and aflatoxin production, although it's not clear whether hazardous levels can be reached during a typical feeding duration.

Penicillium fungi were very common, and some species can produce mycotoxins. Species identification of *Penicillium* is not complete, and no tests for any Penicillium mycotoxins were done, so the risk, if any, is not clear.

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Ethanol Feeds is published by the Iowa Beef Center (www.iowabeefcenter.org). To receive future issues call 515-294-BEEF or email Dan Loy at dloy@iastate.edu