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Moldy Corn for Beef Cattle

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INTRODUCTION

Certain weather conditions and/or physical injury to the plant may result in the development of mold in various parts of the plant. Accumulation of mold and production of mycotoxins may present a risk for livestock producers. However, after examination and analysis, moldy feeds may be able to be used in beef cattle diets—with little or no risk to the health of the animal.

TYPES OF MOLDS

The risks that accompany moldy corn are not directly associated with the mold itself but rather to the mycotoxins produced by certain molds (fungi). There are a number of common molds frequently associated with mature corn ears, including *Fusarium* or *Gibberella*, *Penicillium*, and *Diplodia*. A number of other fungi, such as *Cladosporium* and *Aspergillus*, are only occasionally problematic.

Aspergillus is a mold that is generally light green or dark yellow, powdery in appearance, and is of the greatest concern to corn producers and livestock feeders. *Aspergillus* is most commonly associated with drought, extreme heat, and insect injury. *Aspergillus* produces aflatoxin, a potent animal toxin that can be very problematic for livestock producers.

More common, but somewhat lower risk, is the *Fusarium*/*Gibberella* complex. These molds range from white to pink or red in color and are associated with wet conditions and moderate temperatures. *Fusarium*/*Gibberella* often are found in stalks and ears, especially during wet periods and following insect injury. The fungi can produce several mycotoxins, including fumonisin, deoxynivalenol (DON, or vomitoxin), and zearalenone.

The other molds mentioned are much lower risk for toxin development. *Diplodia* is generally a white mold that begins forming at the base of the ear and grows toward the tip. *Diplodia* does not produce mycotoxins and is not a health risk to livestock, but it can be confused with some of the *Fusarium* molds. *Penicillium* and *Cladosporium* molds are powdery or felt-like, range from dark blue-green to gray or black in color, and often grow between husks and kernels or on injured areas of the ear. *Penicillium* and *Cladosporium* molds do not pose substantial risk to livestock.

SAMPLING AND TESTING

Regardless of the feed being harvested (e.g., dry or high-moisture grain, silage, earlage, or forage), it is a good idea to be aware of the mold risks in the feed source. Samples can be collected during the harvest and examined or analyzed for molds and mycotoxins. Sampling each load delivered would be an excellent protocol to ensure accurate representation across a given field. Samples representing a field or storage unit might be mixed thoroughly to create a single representative sample to be submitted for mycotoxin analysis. Approximately 5 to 10 lbs. of grain is required for accurate analysis in the laboratory. Samples should

be mailed in either cloth or paper sacks to prevent any more mold growth from occurring during shipment.

FEEDING MOLDY GRAIN

If the results of the mycotoxin analysis indicate that the concentrations are below the maximum total diet concentrations listed in table 1, the grain can be fed without blending. However, if the mycotoxin concentrations exceed the maximum total diet concentrations, they must be blended with other feeds that have not been infected with mold to achieve total diet mycotoxin concentrations below the maximum concentrations. It is also important to note that mycotoxins may accumulate over time and the effects may not appear for several days to several weeks. It is also possible that the presence of more than one mycotoxin may exacerbate the problems.

Table 1. Maximum total diet mycotoxin concentrations

Mycotoxin	Animal	Max. Total Diet Concentration	Notes
Aflatoxin	Feedlot cattle	300 ppb[a]	
	Breeding beef cattle	100 ppb[a]	
Fumonisin	Feedlot cattle	30 ppm[b]	Research suggests cattle can tolerate 50 ppm fumonisin.
	Breeding beef cattle	15 ppm[b]	
Deoxynivalenol	Ruminating beef cattle	5 ppm[c]	Research suggests cattle can tolerate 20 ppm vomitoxin.
Zearelenone	Virgin heifers	10 ppm	
	Mature cows	20 ppm	

[a]FDA action level

[b]FDA guidance level

[c]FDA advisory level

Significant mold accumulation may reduce the digestibility of the diet by as much as 5% for ruminants. Therefore, when formulating diets it is advisable to adjust the energy content of the moldy grains down by 5% to account for reduced digestibility.

Palatability is another concern for beef producers. Regardless of whether or not molds produce mycotoxins, molds may very well have an impact on the palatability of the feed. Reductions in feed intake would not be unexpected when feeding feeds containing appreciable amounts of mold.

ADDITIVES

Unfortunately, once the mycotoxins are present, there is little that can be done to eliminate them. There are commercially available feed additives that bind aflatoxin; however, the additives do not bind other mycotoxins. Addition of mold inhibitors to harvested feeds (e.g., dry or high-moisture grain, silage, earlage, or forage) may prevent future mold growth but will not eliminate the mycotoxins that are already present. Furthermore, treatment of grains with mold inhibitors will eliminate the possibility of future sale of that grain on the commodity market. Silage inoculants may be beneficial when harvesting wet feeds; however, silage inoculants will only affect the fermentation process. Successful fermentation will produce acids that will prevent spoilage; however, as with the mold inhibitors, the acids will not eliminate mycotoxins that are already present.

FEEDING GRAIN SCREENINGS

Mold and associated mycotoxins are often separated from the corn grain during the handling process. Consequently, grain screenings from mold-affected grains are likely very high in mycotoxins. Grain screenings should be thoroughly blended and analyzed for mycotoxin concentrations prior to feeding.

GRAZING CORN STALKS

Mycotoxins can be found in different concentrations in different parts of the plant. For example, concentrations of deoxynivalenol and fumonisin may be 5 to 10 times greater in the cob and husk than in the grain. Risk factors for high mycotoxin concentrations in the crop residue include moldy ears, stalk rot, insect damage, and lodging. Unfortunately, accurate sampling of crop residue can be challenging. As such, the decision on whether or not to graze a field should be based upon the mycotoxin analysis of the grain, along with assessment of the other risk factors

mentioned. If the grain contains ≤ 1ppm deoxynivalenol or zearelenone or ≤ 3 ppm fumonisin, it is likely safe to graze. However, if the grain contains concentrations above these, it is recommended to harvest the crop residue in bales. The bales can then be core sampled, analyzed for mycotoxin concentrations, and fed accordingly.

SUMMARY

Moldy corn is not an uncommon occurrence and does not preclude the grain from being harvested as livestock feed. However, identification of the mold and analysis for any associated mycotoxins is essential to formulating diets that are safe for all classes of beef cattle.

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