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# Grain Storage Management to Minimize Mold and Mycotoxins

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## Grain Quality Concerns

As most dryland corn producers are aware, the dry and hot growing season in 2012 resulted in reduced corn yields with moderately lower test weights. Along with the reduced test weights are concerns about potential mycotoxin contamination in the drought-stressed grain.

The only way to know for sure if there are mycotoxins in your grain and which specific mycotoxins are present is to collect representative grain samples and have them tested by a certified laboratory.

Many species of fungi can cause ear rot diseases and molding of grain. Most of these fungi become associated with the grain in the field, but may continue to grow and reproduce if grain is stored under favorable conditions of moisture and temperature in the bin.

Harvested corn is NOT necessarily safer in the bin than in the field with regard to maintaining grain quality. If there was a problem with ear rot diseases in the corn in the field, there will likely be grain mold problems in the bin. Even under the best storage conditions, grain mold fungi are likely to continue to grow in the bin, where some can also produce mycotoxins. Under these conditions, it is important to cool and dry harvested corn as quickly as possible – preferably within 48 hours of harvest. It is NOT recommended to store infected grain, particularly for extended periods of time. In addition, grain that is damaged during or after harvest, such as during handling or storage by insects or other mechanical means, is much more prone to fungal infection by grain molds. Ear rot diseases and grain molds can lead to substantial reductions in grain quality that can ultimately cost producers who may be penalized at elevators or by loss of feed quality.

## Grain Moisture

Wet grain (greater than 16 percent moisture) loses quality grade three times faster when it is not being aerated to reduce the heat created by microbial respiration. Grain should be dried as quickly as possible by running the fan(s) continuously (rain or shine) until grain is below 17% moisture to slow mold growth in the grain. When grain is below 17% moisture, run fans even if foggy or raining to carry away heat buildup in the bin at least every 3 days until the moisture content throughout the entire bin is below 15% moisture. When grain is below 15% moisture, you may begin to run aeration fans intermittently when the equilibrium moisture content table indicates additional drying is possible.

If it is likely that fungi that produce mycotoxins are present in the corn, dry the grain to 14% moisture if it will be held for one month and if grain will be stored for over a month, dry the grain down to <13% moisture. If the corn is found to have any level of mycotoxin contamination it is recommended to partially fill the bin(s) initially, such as 1/4 of the capacity of the bin, so the fan(s) will produce higher airflow rates (cfm/bu) and therefore dry the grain quicker and reduce mold growth and mycotoxin production and contamination of the grain.

If the bin was equipped with a stirring system, run a couple of rounds each time four or more feet of corn is added to the bin. Stirring will help to equalize the moisture content in the grain and to prevent over-drying the bottom of the bin. However, be careful to not over stir, as the down augers can damage the kernels and small cracks in the seedcoat allow fungal infection of the kernels.

## Grain Temperature

In addition to getting the corn dry, you need to cool the grain whenever ambient air temperature allows. This will slow the growth rate of the fungal organisms and will prolong the shelf life of the grain. Run the fans whenever the air temperature is 10 degrees below the grain temperature in the bin to cool the grain. This advice holds even in years when we are not expecting mycotoxin contamination. Continue running fans until the grain is 30 degrees F. Reducing the grain temperature down to near freezing will stop mold growth. Nevertheless, check bins at least once a month for any signs of heating.

If your bin is not equipped with a grain temperature monitoring system, you should consider purchasing a grain thermometer *that* can be pushed into the grain. I recommend you buy a grain thermometer that can be pushed at least four feet into the grain. Some suppliers sell the thermometer head without an extension rod, but they have a threaded female socket that accepts a 3/8 inch threaded rod (ready-rod).

When measuring grain temperature, always allow at least five minutes for the thermometer to equalize with the grain before taking each reading. Take readings about every 20 feet around the perimeter of the bin, but maintaining a distance of at least two feet from the bin wall. Then check several places in the center of the bin. If you find a difference of eight degrees or more between the warmest and coldest spot in the bin, run the aeration fan(s) to equalize the grain temperature in the bin. If you detect a musty smell when you turn on the fan or if you see

condensation on the inside of the bin roof on a cold day, you might have a hot spot developing in the grain in the bin. Most often, these hot spots develop in the center of the bin directly under the loading auger where the majority of the fines collect. If you detect any of these warning signs you should consider unloading some grain and observe the grain coming out of the auger for signs of heating or spoilage.

If there are confirmed mycotoxins in the grain at harvest, it is safer to avoid storage of the affected grain. It is not recommended to hold the grain in the bin after temperatures begin to warm again in the early spring, Mold spores in the bin will survive harsh winter conditions and continue to grow again once temperatures exceed 40 degrees F. In addition, mycotoxins are temperature stable and their concentrations will not decline in storage, but likely only increase.

### **Disinfesting Bins**

It is important to thoroughly clean out the bin once it is empty, including all grain and grain dust that could still contain pathogens and insect pests. When moldy grain has been removed from the bin, you can use a spray disinfectant on all inside surfaces in the empty bin to kill mold spores.

For example, you may use 1 gallon of 5.25% household laundry bleach to 20 gallons water. Then rinse the bleach off with water a few days later to ensure the bleach does not cause corrosion on the galvanized metal.

**Chlorine fumes are dangerous. You will need a lot of ventilation while working in the bin. NEVER** mix bleach with ammonia or vinegar!

### **For More Information**

For more information, see the 2013 Crop Production Clinic article and presentation entitled, "Corn Disease Update" in these Proceedings. Additional information on these and other diseases can also be found at the website Plant Disease Central at <http://pdc.unl.edu/> or in the following UNL Extension publications:

#### **Sampling and Analyzing Feed for Fungal (Mold) Toxins (Mycotoxins)**

<http://www.ianrpubs.unl.edu/epublic/live/g1515/build/g1515.pdf>

#### **Understanding Fungal (Mold) Toxins (Mycotoxins)**

<http://www.ianrpubs.unl.edu/epublic/live/g1513/build/g1513.pdf>

#### **Use of Feed Contaminated with Fungal (Mold) Toxins (Mycotoxins)**

<http://www.ianrpubs.unl.edu/epublic/live/g1514/build/g1514.pdf>

#### **Corn Disease Profile III: Ear Rot Diseases and Grain Molds**

<http://www.ianrpubs.unl.edu/epublic/live/ec1901/build/ec1901.pdf>