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Risk of Mycotoxins Associated with Hail Damaged Corn

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Abstract
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Risk of Mycotoxins Associated with Hail Damaged Corn

By Alison Robertson and Gary Munkvold, Department of Plant Pathology

Hail storms that occurred recently across the state have caused considerable damage to corn crops that will likely result in reduced yields. Bruises on stalks and ear husks may allow pathogen entrance that could result in stalk and ear rots, and consequently stalk and grain quality issues. In particular, there may be increased risk of mycotoxin contamination on grain.

Unfortunately there is little information available to quantify the increased risk of mycotoxin contamination of corn as a result of hail injury. However we do know that injury to the ear does favor certain rots, namely Fusarium ear rot (Figure 1) and Aspergillus ear rot (Figure 2). The fungi associated with these ear rot diseases can produce mycotoxins that are harmful to livestock. Other fungi that do not produce mycotoxins may also colonize damaged kernels and reduce their feed value.

Figure 1. White mold characteristic of Fusarium ear rot associated with wounds caused by hail. *Photo G. Cummins*.

Figure 2. Powdery olive green mold characteristic of Aspergillus ear rot associated with insect damage. *Photo A. Robertson*

It is important to be able to recognize the toxin-producing ear rot diseases because their potential impact is very dependent on the particular fungus involved. Once the corn is harvested, it can be more difficult to recognize the symptoms, but if there is a major problem, it will be evident in the grain.

Fusarium ear rot is caused by several species of *Fusarium*. Symptoms of Fusarium ear rots are a white to pink- or salmon-colored mold, beginning anywhere on the ear or scattered throughout. Often the decay begins where kernels have been damaged. Infected kernels are often tan or brown, or have white streaks. These fungi can produce mycotoxins known as fumonisins.

Aspergillus ear rot is caused by *Aspergillus flavus*. This olive-green, powdery mold is usually associated with damaged kernels. In Iowa, *Aspergillus* is much more common in hot, dry years, but it can grow extensively in damaged kernels under a wider range of weather conditions. Aflatoxins can be produced when *A. flavus* colonizes corn.

Another ear rot to look out for, since mycotoxins are also associated with it, is Gibberella ear rot (Figure 3), which is caused by the fungus *Gibberella zeae*, also known as *Fusarium graminearum*. This ear rot is not typically associated with damaged kernels. Instead, it usually infects through the silks, so it begins at the tip of the ear and appears red or pink, or occasionally white. Gibberella sometimes rots the entire ear. Infections occur more commonly in cool, wet weather after silking and through the late summer. Gibberella can produce vomitoxin and zearalenone.

Figure 3. A pink mold that starts at the ear tip is characteristic of Gibberella ear rot. ***Photo A. Robertson***

When evaluating an ear rot problem, remember that certain ear rots are a warning sign to suspect toxins, but ear rots do not always lead to toxin problems. If hail-damaged fields are still intended for grain harvest, ears should be inspected before harvesting. If more than 10 percent of ears in a field have a significant amount of mold (25 percent of the ear or more), these fields should be harvested and the corn dried as soon as possible. The combine will remove some of the moldiest kernels.

Options for using corn at risk of mycotoxins

The best option for moldy grain is to feed it or sell it instead of storing it. However, it should be tested for toxins before feeding. Mycotoxin testing is available through the ISU Veterinary Diagnostic Laboratory. Testing for mycotoxins can be done before putting the grain in storage. The best sampling method is to take a composite sample of at least 10 pounds from a moving grain stream, or to take multiple probes in a grain cart or truck for a composite 10-pound sample. If toxins are present, it is possible that it can be fed to a less sensitive livestock species, such as beef cattle (depending on the specific toxin and its concentration). A veterinarian or extension specialist can help with these decisions. If the grain is sold, there may be a reduced price due to mold damage.

Hail-damaged fields that are to be salvaged for silage may have mycotoxin risks originating from both the grain and the stalks. Stalks can be colonized by mycotoxin-producing fungi, especially following hail damage. If silage is taken at standard moisture content, and properly ensiled, usually these fungi can no longer develop, but any mycotoxins produced in the field will still be there. Also if the silage is not well-packed, there can be too much air exposure and some additional mycotoxin development. There are a few other fungi, such as some species of *Penicillium*, that produce less well-known toxins such as PR toxin in silage. There are good sources of information on molds and mycotoxins in silage from UW Madison, and Pennsylvania State University.

Once fungal colonization begins, it can continue as long as temperatures are favorable and the plant moisture content is high enough. As long as grain moisture remains above about 21 percent, any of the mycotoxin-producing fungi can continue to grow and produce mycotoxins. *Aspergillus flavus* can continue to do so down to about 16 percent. Silage remains wet enough to sustain fungal growth, but the anaerobic conditions and low pH in fermenting silage will arrest the development of aerobic, mycotoxin-producing fungi. So

reducing mycotoxin risk in hail-damaged corn can be achieved by chopping early and ensiling, if the moisture content is low enough for proper ensiling (see articles on the Hail Damage page of the ISU Extension Disaster Recovery website). Fields that can be held for grain should be considered for early harvest and artificial drying. Mold inhibitors can be used in grain or silage, but they will not repair decay that has already occurred nor reduce existing mycotoxin levels.

The only way to determine mycotoxin levels with certainty is to have samples tested for specific mycotoxins. The most accurate samples will be chopped silage, sampled just before ensiling, or harvested grain as already described. Silage samples are more time-consuming to process because of the lack of accurate quick tests for mycotoxins in silage. Grain can be sampled pre-harvest, by collecting ears at random from throughout the field; at least 25 ears should be sampled; larger samples tend to provide a better estimate of whole-field mycotoxin levels.

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