normally gains 0.25 lb/bu per percent of moisture removed, but drought-stressed corn normally does not experience as much, if any, test weight gain.

Be selective about what corn is placed in storage versus moved at harvest. Low test weight corn should not be put in temporary storages or outdoor piles. It is also not wise to mix corn of different crop years in the same storage bin; the mix is generally much less stable than each year's crop stored separately.

Extreme drought creates susceptibility to aflatoxin in corn. Aflatoxin is produced by the fungus *Aspergillus flavus* that invades stress-weakened corn in the field. If nighttime low temperatures in August remain above 75 °F for several days, the fungus is more likely to produce toxin. The earliest harvested, most stressed corn is at the highest risk. It is recommended to spot check 2005 corn in severely dry areas before feeding or marketing. Consult with your veterinarian if you suspect a problem.

Aflatoxin testing by the United States Department of Agriculture is required for all corn exports. Elevators serving river and rail export markets will undoubtedly check corn they receive. Likewise, feed markets serving dairy herds should check because of the potential for pass through into fluid milk. The tolerance for aflatoxin in fluid milk is 0.5 ppb compared to 20 ppb in whole corn. Dry and wet grind ethanol plants must be especially careful because the distillers' grains and corn gluten feed are often used in dairy rations. Processing in these plants concentrates aflatoxin or any other feed toxin about 4:1 in the feed products after starch is fermented or removed.

If corn is dried uniformly, aflatoxin is not likely to increase in storage; storage conditions of 18 percent moisture and above 60 °F are needed to support the *Aspergillus flavus* in storage, and even then, this fungus is often crowded out by more aggressive storage fungi that do not produce toxins.

The Iowa Grain Quality Initiative Web site has additional information about aflatoxin and aflatoxin testing. See **http://www.extension.iastate.edu/grain/resources/specialtopics/aflatoxin/aflatoxin.htm**.

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Plant Diseases

Risk of aflatoxin contamination increases with hot and dry growing conditions

by Alison Robertson, Department of Plant Pathology

Aspergillus ear rot in corn fields has been reported by Iowa State University Extension field crop specialists in southeast and south central Iowa. The concern with this disease is the production of aflatoxins, which are extremely toxic chemicals produced by two molds *Aspergillus parasiticus* and *Aspergillus flavus*. Aflatoxin accumulation is usually associated with poor storage conditions. However, hot, dry conditions during grain fill increase the risk of *Aspergillus* infection and aflatoxin contamination in the field.

Yellow-green powdery growth of *Aspergillus flavus* on a corn rootworm-damaged ear. *(Alison Robertson)*

Disease cycle and aflatoxin formation

Aspergillus fungi survive in plant residues. Numerous spores are produced in hot, humid conditions and carried by wind throughout the field. Infection occurs through corn silks, when they are yellow-brown and still moist, or in association with insect or bird damage to the developing kernels. High temperatures (80–100 °F)

and high relative humidity (85%) favor the growth of *Aspergillus* in the field. Ear rot symptoms on corn ears can be recognized as gray-green or yellow-green powdery mold growth on and between the corn kernels (see photo).

Although the presence of Aspergillus mold does not necessarily indicate aflatoxin contamination, there is certainly an increased risk. Aflatoxins are produced under certain conditions, which include temperatures from 55–104 °F (optimum 81–86 °F), and 17–18 percent and higher moisture content. In addition, aflatoxin contamination does not occur uniformly from kernel to kernel.

The U.S. Food and Drug Administration regulates aflatoxin levels in food and livestock feed. An "action level" of 20 parts per billion (ppb) for aflatoxins in corn has been established for interstate commerce. Since this appears to be a high risk year in southeast and south central Iowa for aflatoxin contamination, it is likely that aflatoxin screening will be done at local elevators.

Management recommendations

There is little that can be done this late in the season to reduce the risk of *Aspergillus* preharvest aflatoxin contamination. However, postharvest aflatoxin contamination can be reduced. Corn in high risk areas should be scouted at, or just prior to, black layer (physiological maturity), and again two weeks prior to harvest. If greater than 10 to 15 percent of the ears show extensive mold growth, a sample should be collected for aflatoxin analysis.

Contaminated fields should be harvested as soon as possible after the field matures. Adjust the combine to reduce kernel damage and reduce the amount of lightweight infested grain being harvested. Ensure storage bins are clean of debris from the previous season. Shelled corn should be dried to 15 percent moisture or less within 24 to 48 hours of harvest, and cooled to 35–40 °F for the duration of winter to reduce fungal growth and aflatoxin production.

Uses for aflatoxin-contaminated grain

Corn that is contaminated with aflatoxin at levels greater than 20 ppb may not be sold for interstate commerce, but it does have uses. Since aflatoxin levels are usually highest in damaged kernels, cleaning the grain using a rotary screen or gravity table may reduce their levels. However, this is expensive and not always successful since aflatoxin levels also can be high in undamaged kernels.

Contaminated grain may be used for feed using the guidelines in Table 1. This is probably the best use of contaminated grain available. Obviously, it is vital that a good estimate of aflatoxin concentration is obtained so that an educated decision can be made.

Table 1. FDA guidelines for acceptable aflatoxin levels in corn based on intended use

Intended Use	Aflatoxin Level (ppb)
Milk	None detected
Corn of unknown destination	< 20
Corn for young animals	< 20
Corn for dairy cattle	< 20
Corn for breeding meat cattle, swine, mature poultry	< 100
Corn for finishing swine	< 200
Corn for finishing cattle	< 300

Source: PM 1800, *Aflatoxins in Corn*

Blending aflatoxin-contaminated corn is not legal except for on-farm use. Ensiling will not reduce aflatoxin concentrations, although if the silage is properly managed, concentrations will not increase. Ethanol production is an option for aflatoxin-contaminated grain; however, accumulation of the aflatoxin in the distiller's dried grains with solubles (DDGS) will occur. If the grain is to be used on-farm, anhydrous ammonia can be used to reduce aflatoxin contaminations.

Fusarium ear rot and fumonisin contamination

In addition to Aspergillus ear rot, there also have been reports of Fusarium ear rot. The pathogen that causes this disease, *Fusarium verticilliodes,* produces the mycotoxin fumonisin, to which swine are particularly susceptible. Similar to Aspergillus, the *Fusarium* fungus infects kernels via the corn silk or in association with insect damage. Symptoms of Fusarium ear rot are a white-to-pink mold on scattered kernels about the ear.

Much of this information and more on aflatoxins and fumonisins in corn can be found in the ISU Extension publications, PM 1800, *Aflatoxins in Corn* (**http://www.extension.iastate.edu/Publications/PM1800.pdf**), and PM 1698, *Corn Ear Rots, Storage Molds, Mycotoxins, and Animal Health,* and also the University of Kentucky publication, ID-59 *Aflatoxins in Corn* (**http://www.ca.uky.edu/agc/pubs/id/id59/id59.pdf**).

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