

Minimizing Aflatoxin in Corn

Aflatoxin is a naturally occurring toxic chemical by-product from the growth of the fungus *Aspergillus flavus* on corn and other crops such as peanuts and cottonseed. Grain containing aflatoxin is toxic to animals, especially young animals and poultry; therefore, facilities that handle grain routinely test loads before accepting delivery.

Aflatoxin problems are more likely in Mississippi than in the Corn Belt, because the state's hot, humid climate is ideal for fungal growth. Also, little hybrid resistance exists and few if any decontamination methods have proven successful and been granted federal approval.

Stressful Conditions

The Midsouth's climatic conditions dictate that aflatoxin potential will continue to threaten corn producers until control measures are identified. Aflatoxin problems have historically developed during years with severe high-temperature stress, particularly when coupled with water deficiency and insect ear and stalk damage. In 1977 and 1998, Mississippi had severe problems with aflatoxin-contaminated corn.

You can minimize the likelihood of developing a problem by using sound agronomic practices, properly storing and drying grain, maintaining grain quality, and sanitizing grain-handling equipment.

Aflatoxin can infect corn by airborne spores in the field during grain filling or during storage and handling. Kernel infection may occur through the silk, cob, or direct contact. Fungus spores over-

winter on plant residue on the soil. However, management practices intending to reduce the inoculum level have little impact on aflatoxin development in subsequent years, because the fungus is abundant in the Midsouth nearly every year.

Management Practices

Aflatoxin develops in the field when corn is exposed to severe environmental conditions known to stress kernel development and promote fungal infection within the ear. Management practices that improve plant health strongly discourage aflatoxin development.

Timely planting, adequate fertility, good weed and insect control, supplemental irrigation, suitable plant population, and hybrid selection should help reduce aflatoxin potential. Although hybrid evaluations conducted in Mississippi in 1998 indicated little aflatoxin resistance in commercially available hybrids, hybrids that perform well in drought conditions generally have lower aflatoxin concentration than hybrids that yield poorly in drought conditions.

Harvest Timing

Producers may reduce the likelihood of aflatoxin buildup in the field by harvesting corn before it reaches the industry standard of 15.5 percent moisture. This system reduces duration when ears may be exposed to unfavorable drying conditions that promote aflatoxin development in the field. Corn reaches physiological maturity at about 30 percent moisture and can be harvested any time thereafter.

Mississippi research indicates corn will normally lose around 0.6 percent moisture per day during the dry-down period. This rate is not influenced much by hybrid maturity. Thus, you can reduce field exposure by at least 1 to 2 1/2 weeks by harvesting corn at 20 to 25 percent moisture, compared to letting the corn dry in the field to 15 percent moisture.

The disadvantage of early harvest is that wet, warm grain is an ideal environment for rapid aflatoxin escalation if it is not handled properly. Dry your high-moisture grain (16-30 percent) to below 15 percent moisture within 24 hours after harvest or immediately haul the grain to an elevator (that will dry the grain).

Storage

Do not store grain in trucks, combines, bins, or any nonaerated site for more than 4 to 6 hours. These conditions quickly escalate aflatoxin levels and deteriorate grain quality, because fungal growth and grain respiration will rise quickly in high-moisture grain, particularly with normal Mississippi August and early September air temperatures.

Conversely, aflatoxin approaches dormant levels when grain moisture drops to about 12 percent, especially when air temperatures decline to around 55 °F. If you plan to dry the grain yourself, do not harvest more corn than you can dry within these constraints.

Aflatoxin problems often develop in grain bins being used to dry corn. You must minimize grain

depth (commonly 3-6 feet deep) to quickly dry high-moisture corn using in-bin drying system. Stirring devices may assist drying but cannot overcome aeration problems that limit the drying rate in deep-layered grain. Other drying systems, such as continuous flow and portable batch driers, normally dry grain within these constraints, if harvest capacity does not exceed volume of the drying system.

Harvest and Handling Practices

You may improve grain quality by altering harvest and handling procedures. Fungi readily invade kernels with cracked or damaged seed coats. If you suspect a problem, keep obviously stressed, stunted, or damaged areas and field edges from healthy corn.

Increasing fan speed, opening sieves, and reducing ground speed help enhance grain quality collected by a combine. Postharvest screen cleaners and gravity separators help reduce moderate aflatoxin levels (50 to 100 ppb) below the FDA standard (20 ppb).

Daily clean out corn and debris left in combines, trucks, pits, grain carts, and augers; clean bins before use because these are potential

contamination sources. Spores from fungi on infected grain may readily disperse during handling, contaminating subsequent grain. A chlorine cleaning solution (3/4 cup bleach/gallon of water) kills fungal growth on handling facilities.

Detection

Methods historically used for aflatoxin detection range from visual observations to complex lab analyses. A “black light” test uses long-wave ultraviolet light to illuminate a bright yellow-green fluorescence indicative of a fungal metabolism product that often precludes aflatoxin. This product is called Kojic acid and should not be confused with aflatoxin. The “black light” test has limited use; use only as a preliminary test to a more accurate chemical analysis.

Elevators or grain markets should use chemical analyses to determine aflatoxin content. You may also submit samples for analysis to the State Chemical Lab or buy an aflatoxin test kit from chemical supply companies.

Sampling and Testing

Substantial aflatoxin testing variability is common because few kernels are normally contaminated with aflatoxin (less than 0.1 per-

cent), but concentration in individual kernels is often very high.

You may improve sampling by increasing the sample size and using proper sampling techniques. Chemical extraction of aflatoxin requires grinding the grain sample.

Testers should grind the original sample before a subsample is removed. This improves distribution of contaminated particles to the subsample. Testers may also grind particles finer, increase the size of the subsample, and increase number of analyses per sample to reduce variability. The latter two recommendations, however, will increase the time and expense involved with the analytical procedure and may be impractical in some situations.

Action Levels

The United States Food and Drug Administration action levels for corn contaminated with aflatoxin establish guidelines for specific uses. Research indicates that aflatoxin-contaminated corn within these action levels will not injure the health of specific animals listed or humans consuming foods derived from these animals.

FDA action levels for aflatoxin-contaminated corn include the following:

Maximum level	Use
20 ppb:	Human food, feed for immature animals (including poultry) or dairy animals, or unknown destination
100 ppb:	Feed for breeding cattle, breeding swine, or poultry
200 ppb:	Feed for finishing swine of greater than 100 pounds
300 ppb:	Feed for finishing beef cattle

www.ext.msstate.edu

By **Dr. Erick Larson**, Extension Corn Specialist

Mississippi State University does not discriminate on the basis of race, color, religion, national origin, sex, age, disability, or veteran status.

Information Sheet 1563

Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. RONALD A. BROWN, Director (rev-1M-3-00)