The pathogen overwinters on plant residues from which it can produce abundant spores, if conditions are favorable. One requirement for sporulation is moisture. The spores are carried by the wind to infect silks and kernels, usually through insect wounds.

Hot, dry days and warm nights coupled with corn moisture levels of 17 to 30%, are favorable for *Aspergillus* development on the kernels. Under stress, the pathogen can initiate aflatoxin production on infected kernels of susceptible hybrids. The most common stresses leading to aflatoxin production in the field include excessive heat and drought conditions. In the Midwest, drought conditions coupled with high humidity or high night time temperatures can also lead to sporadic outbreaks. However typically in the Midwest, by the time corn reaches the proper moisture levels, night time temperatures are already cool. Poor conditioning and storage conditions, such as insufficient drying and improper storage of wet grains, can also lead to post-harvest *Aspergillus* infection and aflatoxin accumulation on infected kernels.

**Management**

Hybrid selection is an important step in managing aflatoxin production in corn. Currently, much of the corn germplasm available is susceptible to aflatoxin contamination. No hybrids have been identified with complete resistance. Studies conducted by Texas Agrilife Extension reports that some lines are less susceptible to aflatoxin contamination. In addition, Texas Agrilife has started a breeding effort, using traditional and genomic breeding, to create aflatoxin resistant hybrid lines. However, until resistant lines are created, Texas Agrilife Extension recommends selecting hybrids with characteristics that will reduce stress such as: larger, tight fitting husks, kernel hardness, ear nod (droop), insect resistance and drought tolerance. Other factors that may have an effect on aflatoxin production are: maturity, flowering time, and days to maturity.

A quick list of management tips follows:

- Select hybrids that are adapted to the environment in which they are grown and may reduce stress.
- Control ear damaging insects by planting Genuity® SmartStax™ corn, which may reduce infection with *Aspergillus*.
- Scout corn fields for insect damage to ears and *Aspergillus* infection at black layer and two weeks prior to harvest.
- Formulate a plan to test grain for aflatoxin contamination and segregate grain, with high infection levels, from non-contaminated grain.
- Fields showing ear rot or insect damage should be harvested as soon as possible. The longer infected ears stay drying in the fields, the higher the opportunity for aflatoxin to be accumulated.

_Aflatoxin accumulation on grain can be a concern for corn growers in the southern and mid-western states. Aflatoxin is produced by two fungi, *Aspergillus flavus* and *Aspergillus parasiticus* and can be produced on infected corn kernels in the field and during storage. Aflatoxin is one of the most potent carcinogens found in nature. Chronic consumption of aflatoxin contaminated foods can lead to serious illnesses such as liver cancer, the fifth most common cancer world wide. Aflatoxin is highly toxic to many animal species and is sometimes fatal to livestock. The pathogen that causes aflatoxin can be recognized by yellow-green (*A. flavus*) or green-gray (*A. parasiticus*) mold on the corn kernels (Figure 1)._
Understanding and Managing Aflatoxin in Corn

- Harvesting early can reduce the risk of aflatoxin contamination by reducing the time corn is exposed to environmental pressure. However, nitrate levels of drought stressed corn can be high and should be monitored.
- To minimize kernel damage combines may need to be adjusted. The owner’s manual will provide specific details. To help remove damaged or light kernels, opening sieves and increasing fan speed may be a possibility.
- Dry wet corn immediately to moisture levels below 15% and cool the grain quickly. Set drying equipment to minimize kernel cracking and other damage.
- Routinely monitor bins for storage problems such as crusts, hot spots, and mold.
- Bins and handling equipment should be thoroughly cleaned to help prevent contamination. The owner’s manual will provide specific guidelines.
- Because wet, hot corn spoils quickly, do not harvest grain at rates that exceed drying capacity.

Sampling and Testing

Aflatoxin does not occur uniformly in bulk corn, so be sure to sample in several areas of a load or bin. Contact your grain testing laboratory for specific sampling and handling instructions.

A chemical test can be performed at a certified laboratory to detect and quantify aflatoxin accumulated in a sample. Table 1 lists the Food and Drug Administration’s (FDA) guidelines for acceptable aflatoxin levels based on intended use. A black light test can be used only to detect the presence of Aspergillus, not aflatoxin itself. Since not all Aspergillus strains produce aflatoxins, do not accept the results of a black light test as grounds for rejection of your corn.

Contaminated Grain

A grower with contaminated grain does have some options; however, contaminated grain will not be able to cross state lines. As an alternative, grain that is contaminated with aflatoxin at levels below 300 ppb can be fed to local beef cattle, even though it is likely there will be a discounted price for the grain. Another alternative for contaminated grain may be ethanol production. Aflatoxin does not accumulate in the ethanol but can be concentrated in the dried distiller’s grains (DDGs). Therefore, some ethanol plants may not want contaminated grain because they would not be able to sell the DDGs as animal feed.

If cleaning the grain sounds more appealing than an alternate use, it can be done with a screen or gravity table. Finally, feed additives, such as beta-glucans, may reduce the toxicity of mycotoxins, such as aflatoxin, by reducing absorption in the animal. Reduced intestinal absorption results in less exposure to the animal and less transfer to milk in ruminants.


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

<table>
<thead>
<tr>
<th>Use</th>
<th>Aflatoxin level (ppb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn of unknown destination</td>
<td>&lt; 20</td>
</tr>
<tr>
<td>Corn for Young Animals</td>
<td>&lt; 20</td>
</tr>
<tr>
<td>Corn for Dairy Cattle</td>
<td>&lt; 20</td>
</tr>
<tr>
<td>Corn for Breeding Beef, Cattle, Swine, and Mature Poultry</td>
<td>&lt; 100</td>
</tr>
<tr>
<td>Corn for Finishing Swine</td>
<td>&lt; 200</td>
</tr>
<tr>
<td>Corn for Finishing Cattle</td>
<td>&lt; 300</td>
</tr>
</tbody>
</table>

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

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Understanding and Managing Aflatoxin in Corn

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, including applicable refuge requirements for insect resistance management (IRM) for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.