Monitoring and Managing Aflatoxin in Corn

- Aflatoxin can infect corn grain across the Midwest and the South, particularly when corn is stressed.
- Aflatoxin is highly toxic to many animals and can be fatal to livestock when too much is ingested.
- Proper identification of the fungus that produces aflatoxin, testing, and management of contaminated grain can help reduce further contamination and help target grain for an appropriate end use.

Aflatoxin Development

Aflatoxin can be produced by two fungi, Aspergillus flavus and Aspergillus parasiticus and can infect corn kernels in the field and during storage. The fungi can be recognized by yellow-green (A. flavus) or green-gray (A. parasiticus) mold on the corn kernels (Figure 1).1 The fungi overwinter on plant residues from which they can produce abundant spores if conditions are favorable. One requirement for sporulation is moisture. Through wind dispersal, the spores land on silks and kernels and under favorable conditions, begin growing. Wounds from insect feeding create ideal growth sites.

Hot, dry days and warm nights coupled with moisture content levels of 17 to 30%, are favorable for Aspergillus development. Under stress, the fungi can initiate aflatoxin production on infected kernels of susceptible products. The most common stresses leading to aflatoxin production in the field include excessive heat and drought conditions. In the South, higher insect populations and temperatures make Aspergillus infection and aflatoxin production a regular concern. Drought conditions coupled with high humidity or high nighttime temperatures can also lead to sporadic outbreaks. Post-harvest Aspergillus infection and aflatoxin production on infected kernels can be caused when there is poor grain conditioning and storage conditions, insufficient drying and storage.

Sampling and Testing Procedures

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 potential aflatoxin accumulation in a sample. Table 1 lists the Food and Drug Administration’s (FDA) guidelines for acceptable aflatoxin levels based on intended use of grain.2 A black light test can be used only to detect the presence of Aspergillus, not aflatoxin itself.2 Since not all Aspergillus strains produce aflatoxins, black light test results should not be accepted as grounds for rejection of corn.

Management

Corn product selection is an important step in managing aflatoxin production. Products with larger, tighter fitting husks, insect resistance traits, and drought tolerance can help reduce the potential production of aflatoxin. Other factors that may have an effect on aflatoxin production are: maturity, flowering time, and days to maturity.

Management Tips

- Corn products that are well-adapted to the environment in which they are grown should be selected.
- Ear-damaging insects may be controlled by planting a corn product with protection against insects. Reducing insect damage may reduce the potential for Aspergillus infection.
- Corn ears should be scouted for insect damage. Scout fields for Aspergillus infection at black layer and two weeks prior to harvest.
- A plan to test grain for aflatoxin contamination should be developed, and grain with high infection levels should be segregated from non-contaminated grain.
- Fields showing signs of ear rot or insect damage should be harvested as soon as possible. The longer infected ears stay drying in the fields, the greater the opportunity for aflatoxin accumulation.
- Harvesting early can reduce the risk of aflatoxin contamination by reducing the time corn is exposed to environmental stress. However, nitrate levels of drought-stressed corn can be high and should be monitored.
- Combines should be adjusted according to the owner’s manual to reduce kernel damage. Opening sieves and increasing fan speed may help remove damaged or light in weight kernels.
- Wet corn should be dried immediately to moisture content levels of 12% to 13%. The grain should then be cooled quickly. Drying equipment should be set to minimize kernel cracking and other damage.
- Bins should be routinely monitored 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, grain should not be harvested at rates that exceed drying capacity.
Handling Contaminated Grain

Farmers with contaminated grain have some options; however, contaminated grain cannot cross state lines and discounted prices are likely. As an alternative, grain that is contaminated with aflatoxin at levels below 300 ppb (parts per billion) can be fed to local beef cattle. Another alternative for contaminated grain may be ethanol production. Aflatoxin does not accumulate in the ethanol, but can be concentrated in the byproduct 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>
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</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>
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Sources