



## CORN DISEASE MANAGEMENT

# Using Atoxigenics to Manage Aflatoxin

*Aspergillus* ear rot (caused by the fungus *Aspergillus flavus*) is one of the most economically important corn ear rots in the southern United States (Figure 1). The fungus produces aflatoxin, which is a dangerous mycotoxin. Most governments regulate aflatoxin in food and feed, because it is harmful to humans and livestock.



Figure 1. *Aspergillus flavus* (the fungus that causes Aspergillus ear rot) on corn.

One approach to managing aflatoxin involves using atoxigenics as a biocontrol strategy. This publication describes how atoxigenics work and provides recommendations on when to use them.

## How Atoxigenics Manage Aflatoxin

Biological control strategies to manage aflatoxin accumulation in corn utilize atoxigenic strains of *A. flavus*. Atoxigenics are naturally occurring strains of *A. flavus* that, as the name suggests, do not produce mycotoxins.

Atoxigenics can help reduce aflatoxin accumulation in corn and other at-risk crops, including peanuts, cottonseed, and pistachios. For corn, there are two atoxigenic strains of *A. flavus* labeled for use in the United States to prevent aflatoxin accumulation. They are sold under the trade names AF36 Prevail® and Afla-Guard®.

When applied to the crop, these atoxigenic strains are dormant and are carried on nonviable grain (either sterilized wheat or barley) (Figure 2). The atoxigenic fungus activates with moisture and begins to produce spores, relying on the grain-carrier as food. The spores, which are dispersed by the wind eventually blow upward and colonize the kernels of the developing ear.



Figure 2. An atoxigenic strain of *A. flavus* on carrier grain.

Atoxigenics may result in ear mold, but they have a minimal effect on kernel quality. The spores from the atoxigenic strains will outnumber the spores of native, toxin-producing *A. flavus* strains, and they will out-compete the native strains for the limited number of sites in the kernels where they can grow. This decreases the overall aflatoxin contamination of the crop.

Under some circumstances, applying atoxigenics increases the incidence of Aspergillus ear rot, usually at the tips of the ears (Figure 3). However, this damage is greatly offset by the reduction in aflatoxin.



Figure 3. These corn ears are infected with atoxigenic strains of *A. flavus*. Although the atoxigenic fungus looks similar to the toxic strain, the atoxigenic strain will not produce aflatoxin.

## Potential Pitfalls

Applying atoxigenics is not without risks. Before using these products, always consider these factors.

### Timing

It will take several days for the fungi in these products to activate and produce spores. It's important to apply these products **before** the native, aflatoxin-producing strains infect corn. If you apply the atoxigenic strains too late, you will not reduce aflatoxin concentrations. Ideally, you want the atoxigenic strain to begin producing spores during silking (R1).

### Too Little Moisture

Atoxigenics are living organisms and need a small amount of moisture to activate and produce spores to colonize ears. If you apply the atoxigenics under dry conditions, they may not produce many spores and, therefore, not be very effective.

### Too Much Moisture

Conversely, if there is a heavy rain after you apply atoxigenics, it may bury much of the material in the soil, which renders it ineffective.

### Storage

Do not carry over unused atoxigenics for the next season. Remember that these are living organisms, so storage conditions may decrease their viability. However, you can test the viability of these products by placing grains on a moist paper towel and sealing it in plastic bag. Viable atoxigenics will produce olive-green, moldy growth after three or four days (Figure 4).



Figure 4. Spores of *A. flavus* developing on grain during a viability test.

## Who Should Use Atoxigenics?

Atoxigenic products add costs to corn production, so it is important to carefully weigh the efficacy and economic benefits of using these products before applying them. If you live in areas where aflatoxin contamination is an annual threat, you should consider using atoxigenic products to reduce aflatoxin concentrations in your finished grain. Be aware that unless conditions are favorable for aflatoxin production (hot and dry conditions during grain fill, or extended periods of wet weather that delay harvest beyond physiological maturity), atoxigenic products may not provide an economic advantage.

If *Aspergillus* ear rot and aflatoxin are rarely a problem where you live, it is unlikely that you will need atoxigenic products.

## Application Timing:

In the United States, AF36 Prevail® can be applied between V7 and silking (Figure 5); Afla-Guard® can be applied between V10-V11 and silking.



Figure 5. Corn at silking is the latest growth stage at which atoxigenic products can be applied in the United States.

Always read and follow manufacturer labels when applying one of these products. These products may not be available in all regions. Contact your local Extension specialist to determine the availability, price, and recommended rates for atoxigenics in your area.

## Find Out More

The Crop Protection Network (CPN) is a multi-state and international collaboration of university and provincial Extension specialists, and public and private professionals that provide unbiased, research-based information to farmers and agricultural personnel. Our goal is to communicate relevant information that will help in the identification and management of field crop diseases.

Find crop disease resources at [CropProtectionNetwork.org](http://CropProtectionNetwork.org).

### Authors

Tom Isakeit, Texas A&M University; Tom Allen, Mississippi State University; Martin Chilvers, Michigan State University; Travis Faske, University of Arkansas; Anna Freije, Purdue University; Daren Mueller, Iowa State University; Trey Price, LSU AgCenter; Damon Smith, University of Wisconsin; Albert Tenuta, OMAFRA; Kiersten Wise, Purdue University and Charles Woloshuk, Purdue University

### Reviewers

Doug Jardine, Kansas State University; Hillary Mehl, Virginia Tech University; Alison Robertson, Iowa State University and Adam Sisson, Iowa State University

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