TEXAS A&M AGRILIFE EXTENSION

PLANT PATHOLOGY & MICROBIOLOGY

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BEST MANAGEMENT PRACTICES TO PREVENT OR REDUCE MYCOTOXIN CONTAMINATION OF CORN IN TEXAS

In general, whatever you do in managing your crop to get the best yields possible can be considered a "best management practice" to minimize mycotoxin contamination. There is no trade-off in steps taken to manage mycotoxins and optimizing yield. Unfortunately, under Texas growing conditions, the best-managed crop from a standpoint of yield may still have mycotoxin contamination. However, we have seen that poor management (e.g. the use of poorly-adapted corn hybrids) can result in an even greater level of mycotoxin contamination.

HYBRID SELECTION

Aflatoxin

Plant hybrids that have adaptation for southern U.S. growing conditions. There are no hybrids that are resistant to aflatoxin contamination, but there are differences among hybrids in their degree of susceptibility. The differences are primarily associated with traits that make the corn more tolerant of environmental stresses. These traits include a general adaptation to high temperatures and drought, as well as resistance to both ear-feeding and root-feeding insects. The desirable traits of adapted hybrids are tight husks that cover the ear tip and a hard endosperm that maintains kernel integrity.

Hybrids that are prone to loss of kernel integrity should not be planted. Under conditions of heat and moisture stress, some hybrids are more prone to splitting of the seed coat. The splitting can be longitudinal and lateral and is known as "silk cut" (Fig. 1). This naturally-occurring wounding increases the risk of contamination.

Fig. 1. "Silk cut" on corn kernel: loss of kernel integrity.

Transgenic hybrids with insect resistance will help reduce contamination, but can not totally prevent it, since the fungus can get into the ear without insect wounds.

There has been no recent, systematic evaluation of hybrid susceptibility to aflatoxin in Texas. Such work has identified hybrids that are highly susceptible to contamination. Optimally, evaluations are made over two years, in different locations, because the response will vary because of different environments.

Fumonisin

Differences in fumonisin accumulation have been identified in hybrids in the midwestern U.S., but there is no information for hybrids planted in Texas. Resistance to Fusarium ear rot is correlated with lower fumonisin levels, but fumonisin contamination can occur in the absence of visible ear rot. Husk cover is one trait thought to be associated with fumonisin resistance. In other growing areas, insect resistance, including that in transgenic hybrids, is associated with lower levels of fumonisin, but there is no information for Texas growing conditions. Fumonisin contamination can occur without previous insect damage to ears.

PLANTING CONDITIONS

Break hardpans in the field before planting. Minimize tillage operations before planting to conserve moisture.

Plant during the time window known to provide the best yields for your growing area. Late-planted corn is at higher risk for contamination because of a greater chance of moisture stress during flowering and grain filling growth periods.

CROP MANAGEMENT

Atoxigenic Strains

Apply between V10-V12 and R1 (silking). It may not work effectively if applied at later growth stages. Research has yet to determine if an earlier application will also be effective. The field should be treated uniformly with the material. The effectiveness may be limited by the absence of moisture needed to promote sporulation (Fig. 2).

Additionally, after application to the field, several days are required for the atoxigenic strain to sporulate on the grain.

Fig. 2. Abundant sporulation of atoxigenic strain of *Aspergillus flavus* on a barley grain.

Pest

Control insects and weeds. Weed control reduces water usage and reduces moisture stress.

Moisture

Optimize irrigation. Avoid moisture stress between flowering and grain fill. With high plant populations, extra care must be taken to avoid moisture stress.

Fertility

Maintain optimal nitrogen fertility, especially with high plant populations.

HARVEST

Field Segregation

Corn from fields or portions of fields showing moisture stress should not be mixed with corn from other fields.

Combine Setting

Adjust combine ground speed and cylinder speed to minimize trash and broken kernels in hopper. This involves operating at a slow speed, using a lower gear than normal, and then gradually increasing speed up to the point that trash and broken kernels enter the hopper. Increase fan speed to blow out immature and broken kernels.

Grain Moisture

This is not usually done in Texas, but corn can be harvested at higher than usual moisture contents and then artificially dried. A quick drying reduces mycotoxin accumulation that could occur in the field as the corn is drying. For example, harvest corn at 24% kernel moisture, then it dry down to 15% within 24 hours.

Transport

If corn is harvested at high moisture with the intention of drying it later, store and transport it as quickly as possible.

POST-HARVEST

Ensure that grain bins are properly ventilated, to minimize temperature differences. These differences lead to air movement, resulting in condensation of moisture at the top of the bin. This moisture will allow the growth of mycotoxigenic fungi, resulting in post-harvest increase in mycotoxins. Ensure that the top of the grain pile is flat.

BALING CORN IN DROUGHT YEARS

In an attempt to salvage some yield from drought-stricken corn fields, many growers have baled dried corn plants for use as hay. Whenever the hay contains ears with kernels, there is a risk of aflatoxin contamination. Sometimes the ears have visible growth of *Aspergillus flavus* (Fig. 3), the fungus that produces aflatoxin. However, high levels of aflatoxin can be present, even if no fungal growth can be seen.

Fig. 3. Visible *Aspergillus flavus* on an ear of corn.

Text and photos by Dr. Thomas Isakeit, Professor and Extension Plant Pathologist. Jan., 2010: Feb. 2011 REVISION