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DISEASES OF CORN

Fusarium Ear Rot

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Fusarium ear rot is an insidious disease of corn caused by the fungus *Fusarium verticillioides.* The fungus can infect corn seedlings and developing kernels, and grow for a time in the ear without producing disease symptoms. Once symptoms appear, the plants have a stalk rot and/or ear and kernel rot.

The impact of Fusarium ear rot on yield is usually minimal, however, corn producers should be concerned about the risk of fumonisin contamination. Fumonisins are a group of mycotoxins that affect both human and livestock health. Although visible symptoms of Fusarium ear rot can indicate fumonisin contamination, the amount of fumonisin in the grain often does not correspond to the severity of disease.

This publication focuses on the Fusarium ear rot disease, which can be widespread in Indiana when conditions are favorable. This publication describes:

1. How to identify the disease
2. Its danger to livestock
3. How to minimize losses
4. How to manage the disease

Identifying the Disease

Ear symptoms of Fusarium ear rot vary from other ear rots. With Fusarium, diseased kernels are isolated or in patches on the ear, especially on kernels damaged by insects such as European corn borer and earworms. Fusarium-affected kernels can appear tan or brown (Figure 1). In cases where fungal growth is visible on the ear, infected kernels will appear white to pink or salmon-colored (Figure 2). In some cases, the kernels will have white streaks. This is called the "star burst" symptom and is caused by the pathogen growing under the kernel pericarp (seed coat) (Figure 3).

Figure 1. Brown kernels are symptomatic of Fusarium ear rot.

Figure 2. Fungal growth on Fusarium-affected ears can appear white, gray, or pink.

Figure 3. White streaks or "starbursts" visible around kernels are symptomatic of Fusarium ear rot.

F. verticillioides is the primary fungus species that causes Fusarium ear rot in Indiana, but two other Fusarium species (*F. proliferatum* and *F. subglutanins*) also infect corn and cause the ear rot disease. In all three species, the disease symptoms are similar, but only *F. verticillioides* and *F. proliferatum* produce fumonisins. The disease symptoms caused by all three fungi are indistinguishable from one another, so laboratory confirmation is necessary to determine the causal fungus. If you suspect any Fusarium contamination, test your grain for fumonisins (see Mycotoxin Testing, page 3).

All three fungi can infect corn under a wide range of environmental conditions. Therefore, the disease can be widespread across the state in a given year. The most severe disease outbreaks occur in warm regions and in fields with extensive insect damage to the ears. Fumonisin levels in affected fields often increase when wet and warm weather conditions persist just prior to harvest.

Danger to Livestock

Fumonisin poisoning is associated with a number of toxic effects. Equine and swine are the most sensitive livestock. Fumonisins can cause equine leukoencephalomalacia (ELEM, also called blind staggers) and porcine pulmonary edema. In humans, several studies have associated fumonisins with cancer and birth defects.

Because of these risks, the U.S. Food and Drug Administration (FDA) has published guidelines for the maximum amounts of fumonisin allowed in food and feed (Tables 1 and 2).

Table 1. U.S. FDA guidelines for fumonisins in animal feed.

Animal	Maximum Fumonisins in Feed Diet (ppm)
Horse	1
Swine	10
Ruminants[1]	30
Poultry	50
Young & reproductive[2]	15
Pets	5

[1] Animals older than 3 months, fed for slaughter.
[2] Includes laying hens, roosters, lactating dairy cows, and bulls.

Table 2. U.S. FDA guidelines for fumonisins in human food.

Product	Maximum Total Fumonisins (ppm)
Degermed dry-milled corn products	2
Whole dry-milled corn products	4
Dry-milled corn bran	4
Cleaned corn for masa production	4
Cleaned corn for popcorn	2

Minimizing Economic Losses

Scout fields at kernel maturity (growth stage R6) to determine the presence and severity of Fusarium ear rot. If significant ear rot or insect damage is present, the field should be one of the first to be harvested. Leaving affected grain in the field will increase the risk of increased fumonisin contamination when late-season rains interrupt harvest. F. verticillioides requires relatively high moisture to grow. Once corn reaches 17 percent grain moisture, fungal growth and fumonisin production should cease.

For safe storage, dry harvested grain to below 15 percent. Under these conditions, the fungus should not spread and fumonisin levels should not increase.

More information about grain is available from the Purdue Post Harvest Grain Quality website, www.grainquality.org.

Resources are available for measuring fumonisin levels in corn (see Mycotoxin Testing, page 3). When collecting a sample for testing, it is important to remember that fumonisin-contaminated kernels will not be dispersed evenly in the sampled grain. The best strategy for obtaining a good sample is to collect several small samples from the grain and combine these into one composite sample for testing.

Romer Labs, one of the commercial companies that develops mycotoxin analysis tools, has a webpage that describes strategies for collecting samples from different grain structures and carriers: www.romerlabs.com/us/knowledge/sampling-for-mycotoxins.

Mycotoxin Testing

Only a chemical analysis can verify the presence and amount of fumonisin in infected grain.

A variety of commercial laboratories and quick-test kits exist for mycotoxin analysis.

Romer Labs (www.romerlabs.com) and Neogen (www.neogen.com) sell test strips for fumonisin analysis. Purdue Botany and Plant Pathology maintains information about fumonisins and links to other commercial test kit suppliers (www.btny.purdue.edu/NC1183).

To find inspectors that analyze grain and fumonisin in Indiana, contact your Purdue Extension county office extension.purdue.edu/Pages/countyoffices.aspx or (888) EXT-INFO.

Managing the Disease

Research has demonstrated that reducing insect damage to ears will significantly reduce the impact of Fusarium ear rot disease. Corn hybrids with *Bt* traits to control earworms and European corn borer usually have less Fusarium ear rot and fumonisin contamination.

There are few foliar fungicides labeled for Fusarium ear rot control, and their efficacy has yet to be demonstrated for use in managing the disease. Planting hybrids less susceptible to the disease will also reduce the risk of fumonisin contamination. Several commercial seed companies now provide a Fusarium ear rot resistance rating for their hybrids.

Reference to products in this publication is not intended to be an endorsement to the exclusion of others that may be similar. Individuals using such products assume responsibility for their use in accordance with current directions of the manufacturer.

Find Out More

Find more publications in the *Diseases of Corn* series by visiting the Purdue Extension Education Store edustore.purdue.edu

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