Ear and Kernel Rots of Corn

By Laura Sweets

Corn harvest is beginning or rapidly approaching in many parts of the state. So far we have received very few samples with ear and kernel rots. However, preliminary surveys suggest that a variety of ear and kernel rots of corn could be problems this season. Usually Diplodia ear rot, Gibb ear rot, Penicillium ear rot and *Aspergillus* species other than *Aspergillus flavus* are associated with wet conditions, especially wet falls and harvests that are delayed by wet conditions. Although much of the state was unusually dry from July on, there have already been fields in which these ear and kernel rots are present. In some cases the ears showing molds had been damaged by insects or hail and the molds had come in around the damaged areas. But in other cases Penicillium and Fusarium are showing up on the tips of the ears. And then in areas in which hot, dry conditions occurred at or just after pollination, *Aspergillus flavus* and aflatoxin could be problems. See article by Dr. Allen Wrather in the August 15, 2011 issue of the *Integrated Pest and Crop Management Newsletter* for more information on aflatoxin.

Diplodia ear rot, Penicillium ear rot and Gibb ear rot are common problems year in and year out but the severity varies with weather conditions at pollination or close to harvest. The Penicillium ear rot and Gibb ear rot are particularly evident on the exposed tips of ears, around insect tunnels and on ears that have remained upright. If there are periods of wet weather before corn is harvested, some of the corn plants that died prematurely may show the black discoloration caused by secondary fungi coming in on the senescing plant tissues. Many corn fields in the state were stressed by hot, dry conditions during silking and pollination and were exposed to extended periods of hot, dry weather either during or after pollination. Therefore, there is a potential for *Aspergillus flavus* and aflatoxin in corn throughout the state.

Both *Diplodia maydis* and *Diplodia macrospora* can cause **Diplodia ear rot** of corn. The ear leaf and husks on the ear may appear prematurely bleached or straw-colored. When the husk is peeled back, dense white to grayish-white mold growth will be matted between the kernels and between the ear and the husks. Small, black fungal fruiting bodies may be scattered on husks or embedded in cob tissues and kernels. The entire ear may be grayish-brown, shrunken, very lightweight and completely rotted. Diplodia ear rot is favored by wet weather just after silking and is more severe when corn is planted following corn.

Penicillium rot is usually evident as discrete tufts or clumps of a blue-green or gray-green mold erupting through the pericarp of individual kernels or on broken kernels. Penicillium appears as small, discrete colonies of mold growth with a dusty or powdery appearance. The fungus may actually invade the kernel giving the embryo a blue discoloration. Blue-eye is the term used for this blue discoloration of the embryo.

Gibb ear rot (caused by *Gibberella zeae*) usually begins as a reddish mold at the tip of the ear. Early infected ears may rot completely with husks adhering tightly to the ear and a pinkish to reddish mold growing between husks and ears. Although mold growth usually has a pinkish to reddish color, it can appear yellow to yellow-orange or yellow-red. Gibb ear rot typically begins at the tip of the ear but under favorable conditions it can move down the ear causing extensive damage. It may also develop around injuries from hail, birds or insects.

Aspergillus niger is also common on exposed ear tips. This fungus will be evident as black, powdery masses of spores on the tip of the ear or around insect tunnels.

Black corn occurs when any of a number of saprophytic or weakly parasitic fungi grow on corn plants in the field.

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Alternaria, Cladosporium, Aureobasidium and other species are frequently found on these discolored or black plants. Since the affected plants may have a sooty appearance these fungi are sometimes called sooty molds. These sooty molds or secondary fungi tend to develop on plants when wet or humid weather occurs as the crop is maturing or if harvest is delayed because of wet weather. Typically these fungi come in on plants that are shaded, undersized, weakened or prematurely ripened and on senescing foliage. Plants that are lodged or that have been stressed by nutrient deficiencies, plant diseases or environmental conditions may be more severely affected. Although many of these fungi produce dark or black mold growth, the color of the mold growth can range for dark or black to olive green or even pink to white.

These secondary fungi tend to develop on senescing plant tissues, primarily leaf, stalk and husk tissue, but under favorable conditions can cause infection of the kernels. Infected kernels might show a black discoloration.

It is possible that these sooty molds or secondary fungi could contribute to stalk deterioration or stalk rot. Lodging could become a problem in these fields, especially if there are high winds or strong storms before harvest.

Grain from fields with high levels of sooty molds should be treated with care if it is stored. Grain should be thoroughly cleaned to remove lightweight, damaged or broken and moldy kernels. Grain should be stored at the proper moisture content and temperature and checked on a regular basis during storage.

Aspergillus flavus is evident as greenish-yellow to mustard yellow, felt-like growth on or between kernels, especially adjacent to or in insect damaged kernels. *Aspergillus flavus* is favored by high temperatures and dry conditions, so Aspergillus ear rot is typically associated with drought stress. The fungus survives in plant residues and in the soil and spores are spread by wind or insects to corn silks where the spores initiate infection.

An additional concern with ear and kernel rots of corn is the possibility of mycotoxin production. Mycotoxins are naturally produced chemicals that in small amounts may be deleterious to animal or human health. *Aspergillus* and *Gibberella* are most frequently involved in cases of mycotoxin contamination in Missouri corn. The presence of molds or their spores does not necessarily mean that mycotoxins will be produced. Circumstances that favor mold growth may allow production of mycotoxins in some situations, but frequently mold growth occurs with little or no mycotoxin production. Once formed, mycotoxins are stable and may remain in grain long after the fungus has died. In general, swine and poultry are more susceptible than ruminants to mycotoxin-induced health problems. In cases where mycotoxin problems are suspected, a sample should be submitted to a qualified laboratory for mycotoxin analysis. Table 1 below gives the acceptable levels of aflatoxin in corn intended for various uses as established by the United States Food and Drug Administration.

Table 1. Present acceptable levels of aflatoxin in corn used for food and feed as established by the United States Food and Drug Administration (FDA) are as follows:

1. Corn containing no more than 20 ppb of aflatoxin when destined for food use by humans, for feed use by immature animals (including immature poultry) and by dairy animals, or when the intended use is unknown.
2. Corn containing no more than 100 ppb aflatoxin when destined for breeding beef cattle, breeding swine or mature poultry (e.g. laying hens).
3. Corn containing no more than 200 ppb aflatoxin when destined for finishing swine (e.g. 100 lbs. or greater).
4. Corn containing no more than 300 ppb aflatoxin when destined for finishing (i.e. feedlot) beef cattle.

Little can be done to prevent or reduce the invasion of corn by fungi in the field. These ear and kernel rots tend to be more severe on ears with insect, bird, hail or other physical damage. Ears well covered by husks and maturing in a downward position usually have less rot than ears with open husks or ears maturing in an upright position. However, if ear and kernel rots developed in the field, it is important to harvest the field in a timely manner and to store the grain under the best possible conditions. Both *Penicillium* and *Aspergillus* can continue to develop on corn in storage if the grain is not stored at proper moisture content and temperatures. These two fungi can cause serious storage mold problems.

Adjust harvest equipment for minimum kernel damage and maximum cleaning. Before storing grain, clean bins thoroughly to remove dirt, dust and any grain left in or around bins. Thoroughly clean grain going into storage to remove chaff, other foreign material and cracked or broken kernels. Dry grain to 15% moisture as quickly as possible and monitor grain on a regular basis throughout storage life to insure moisture and temperature are maintained at correct levels. Protect grain from insects.

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