

AGRONOMIC Spotlight



Corn Ear Rots and Kernel Sprouting

Corn is susceptible to a number of ear- and kernel-rotting fungi that can reduce yield potential, grain quality, and feed value. Damage is greatest when above average rainfall, and/or kernel damage from insects or birds, occurs during silking to harvest. *Aspergillus*, *Diplodia*, *Fusarium*, *Gibberella*, *Penicillium*, and *Trichoderma* are some common ear and kernel rots. Kernel sprouting can also occur under certain conditions. In 2009, wet harvest conditions coupled with an early frost that damaged corn prior to black layer led to the development of a less frequently seen black mold, *Cladosporium*.

Diplodia. *Diplodia* ear mold occurs most frequently in reduced tillage fields and continuous corn. It is recognized by a white to gray mold that usually begins at the base of the ear and develops toward the tip, growing between kernels (Figure 1). With severe infection, the entire ear turns gray-brown and completely rots, a symptom known as mummification. *Diplodia* is favored by wet weather within the first 21 days after silking. Hybrids vary in the level of susceptibility to *Diplodia*, but because of the erratic nature of the disease most hybrids are not well-characterized and any hybrid can be infected given the right conditions. **Concerns:** Although *Diplodia* is not known to produce any mycotoxins that can harm humans or livestock, it is important to dry



Figure 1. White to gray mold of *Diplodia* progressing from the base to the tip.



Figure 2. *Gibberella* progressing from the tip to the base.

and store infected grain properly as kernel damage can continue to spread if grain moisture is over 20%.

Gibberella. *Gibberella* is a mold that usually begins at the ear tip and progresses toward the base (Figure 2). It varies in color from red to white, but is often bright pink. Infection is favored by cool and wet weather after silking, through late summer. **Concerns:** *Gibberella* can produce vomitoxin and zearalenone, which are harmful to livestock.

Aspergillus. *Aspergillus* appears as a gray-green, powdery mold, starting at the tip and spreading along damage from insects (Figure 3 - left). Infection occurs from silking on, through silks or insect or hail damage. It is common in drought years. It can grow on ears with grain moistures down to 15%. **Concerns:** *Aspergillus* ear mold can cause aflatoxin, which is toxic to humans and livestock. Grain elevators can reject loads with aflatoxin levels above the limits set by the FDA (20 ppb in animal feedstuffs).



Figure 3. *Aspergillus* (on left) and *Penicillium* (on right).

Penicillium. This blue-green mold grows on and between kernels (Figure 3—right). Infection is more likely on ears damaged by earworms, corn borers, or from mechanical injury. **Concerns:** High moisture stored corn may develop “blue eye” as a result of this mold.



Figure 4. Ears infected with *Trichoderma*.

Trichoderma. *Trichoderma* produces mold that is green and grows on and between husks and kernels (Figure 4). *Trichoderma* usually enters the plant through bird or insect damage to the ear. **Concerns:** The effect of *Trichoderma* is generally minor and it is not typically produce mycotoxins, but being able to differentiate it from other ear rots that cause mycotoxins, such as *Aspergillus*, is beneficial.

to pg. 2 ▶

from previous page

Corn Ear Rots and Kernel Sprouting

Fusarium. Kernels infected with *Fusarium* have white streaks in a starburst pattern, scattered over the ear (Figure 5). The mold is white to pink. Infection points include kernel growth cracks and ear damage from insects such as earworm or corn borer. Hot, humid weather favors development. **Concerns:** *Fusarium* can produce a mycotoxin, fumonisin, that is toxic to livestock, particularly horses.

Cladosporium. *Cladosporium* often infects kernels damaged by insects, hail, or frost (Figure 6). When grain with high moisture content is frosted, micro-fractures can occur in the pericarp. Starch oozes out from these openings and serves as the food source for *Cladosporium*. The colors of the mold are directly related to its stage of growth. *Cladosporium* can be powdery white in the early stages, to black in later stages and all colors of green in the stages in between. If you rub the surface of the kernels where this mold is located, the discoloration can be completely removed. **Concerns:** This disease can be fairly common but usually does not cause extensive damage to the ears, and does not cause any feeding toxicity.

Kernel Sprout. Kernel sprouting can occur when moisture becomes trapped in the husk, allowing kernels to absorb it and sprout (Figure 7). Hybrids having an upright ear at maturity, with an open husk may be more susceptible. Significant and continuous rainfall at harvest favors kernel sprout.

Management. Since many ear rot pathogens remain viable in the soil for several years, carefully scout fields with a history of ear rot, even if management practices are employed to decrease pressure. Some options to help decrease the risk of ear rot infection include crop rotation, heavy tillage, planting hybrids with insect protection traits,



Figure 5. Scattered kernels infected with *Fusarium* (bottom). Starburst pattern characteristic of *Fusarium* (top).



Figure 6. Various views of ears and kernels infected with *Cladosporium*.



Figure 7. Sprouted kernels

and good fertilization. Planting a package of hybrids with different maturities and growing degree unit (GDU) requirements to flowering, as well as rotating germplasm planted in the same field from year to year, are also good practices to help reduce the effect of ear rots. To accelerate breakdown of crop residues, consider management tools such as chopping stalks, applying 20 pounds of nitrogen to enhance microbial activity, deep tillage, and planting cover crops such as winter wheat on highly erodible soils.

Proper grain drying and storage are important when these diseases are evident. Here are some tips for harvesting and storing grain from fields with prevalent ear rot infection:

- Allow corn to mature in the field to 22 to 25% moisture. If lodging concerns exist, consider harvesting early since down corn is more likely to rot.
- Combine should be adjusted to minimize kernel damage and maximize cleaning.
- Corn should be dried to 13 to 14% moisture prior to storage.
- Grain should be stored at cool temperatures (36°F to 44°F) after drying.
- Grain should be checked periodically for temperature, wet spots, and insects.
- Consider applying antifungal treatments to grain.

Source: *Corn ear and kernel rots.* Univ. of Illinois Extension. RPD No. 205. November 1991.

Corn disease management in Ohio: ear and kernel rots. Ohio State Univ. Extension. Bulletin 802.

Robertson. 2004. *Corn Ear Rots.* IA State University Ext. Integrated Crop Management Newsletter.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

Technology Development by Monsanto and Design(SM) is a servicemark of Monsanto Technology LLC. ©2010 Monsanto Company. 031610EJP