

Penicillium ear rots

Penicillium spp.

Damage is most frequently caused by *Penicillium oxalicum*, but other species may occasionally be involved. In many instances infection follows ear damage by insects.

A conspicuous, light blue-green powder grows between kernels and on the cob surface (Photos 57, 58). Kernels with fungal growth normally become bleached and streaked.

Aspergillus ear rots

Aspergillus flavus, *Aspergillus* spp.

The disease may be a serious problem when infected ears are stored at high moisture contents. Several species of *Aspergillus* can infect maize in the field. *Aspergillus niger* is the most common; it produces black, powdery masses of spores that cover both kernels and cob. In contrast, *A. glaucus*, *A. flavus* (Photo 59), and *A. ochraceus* normally form yellow-green masses of spores. *Aspergillus parasiticus* is ivy green and less common in maize.

Aspergillus flavus and *A. parasiticus* produce mycotoxins known as aflatoxins that are harmful to birds and mammals.





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Fusarium and gibberella ear rots

Fusarium graminearum (syn. *F. roseum*)
(Teleomorph: *Gibberella zeae*)

Fusarium moniliforme, syn. *F. verticillioides*
(Teleomorph: *Gibberella fujikuroi*)

In maize, these two species of fungi cause ear rots, stalk rots, and seedling blights. *Gibberella zeae*, the sexual stage of the pathogen, is most common in cool and humid areas. Ear infection begins as white mycelium moving down from the tip, which later turns reddish-pink, in infected kernels (Photo 60). The fungus produces mycotoxins—known as deoxynivalenol, zearalenone, and zearalenol—which are noxious to several animal species.

Fusarium moniliforme ear rot is likely the most common pathogen of maize ears throughout the world. In contrast to damage from *G. zeae*, that from *F. moniliforme* occurs mainly on individual kernels or on limited areas of the ear (Photos 61, 62). Infected kernels develop a cottony growth or may develop white streaks on the pericarp and germinate on the cob. Ears infested by earworms are usually infected with *F. moniliforme*. The fungus produces mycotoxins known as fumonisins, which are harmful to several animal species.

Ergot, horse's tooth

Claviceps gigantea

This disease (anamorph *Sphacelia* sp.) is endemic to certain high, cool, humid areas of the central plateau of Mexico. Infected kernels grow into large fungal structures known as sclerotia along with normal healthy kernels (Photo 63). In early stages of infection, sclerotia are pale colored, soft and slimy, finally hardening toward harvest time. These sclerotia do not produce the black powder characteristic of common smut. When sclerotia are dropped on the ground, they germinate and develop many head-like structures (stromata) that release new spores when the maize plants silk the following season (Photo 64).

The pathogen is closely related to the fungus that causes ergot of rye, and also produces toxic alkaloids.

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Charcoal ear rot

Macrophomina phaseolina

Like charcoal stalk rot (see page 57), the disease can be found in hot, humid areas with dry periods, mainly during flowering time. At harvest kernels are pale yellow with black streaking below the pericarp, and the ear is loose and chaffy. Kernels are easily removed from the cob, and they show small, round, black, pinhead-like sclerotia on the surface (Photos 65-67).

Plants affected by charcoal stalk rot do not necessarily develop ear rot from the same pathogen.

Nigrospora ear rot

Anamorph: *Nigrospora oryzae*
(Teleomorph: *Khuskia oryzae*)

The disease is widely distributed, and the causal fungus normally overwinters on plant residues.

Infected ears are chaffy and lightweight. Kernels are discolored and easily removed from the cob. Under close examination, cob tissues and kernel tips show small black masses of spores (Photos 68, 69).

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Gray ear rot

Physalospora zeae (syn. *Botryosphaeria zeae*)
(Anamorph: *Macrophoma zeae*)

Hot, humid weather for several weeks after flowering favors development of this ear rot. Early symptoms are very similar to those caused by stenocarpella ear rot, where a white-gray mycelium develops between kernels and husks, which become bleached and glued together. In the later stages of infection, the two fungi can be readily identified:

- (a) Gray ear rot. Ears have a distinct black color; the mycelium is also dark and develops small sclerotia (specks) scattered throughout the cob (Photo 70, courtesy Dr. A. J. Ullstrup).
- (b) Stenocarpella ear rot (see page 83). The ear is gray-brown and the mycelium is white, with small black pycnidia on the cob and kernels.

Common smut

Ustilago maydis

Common smut occurs throughout most maize growing regions, but can be more severe in humid, temperate environments than in hot, humid, tropical lowlands.

The fungus attacks ears, stalks, leaves, and tassels (Photos 71-73). Conspicuous closed white galls replace individual kernels. In time the galls break down and release black masses of spores that will infect maize plants the following season. The disease is most severe in young, actively growing plants and may stunt or kill them.

This is easily distinguished from head smut by the lack of host vascular bundles that appear as fibers in smut-infected ears.

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Botryodiplodia or black kernel rot

Botryodiplodia theobromae

The disease has been reported in India, Nigeria, Pakistan, and Thailand, and to a lesser extent in the Americas. The same fungus can produce stalk rot with a conspicuous black discoloration in moist, hot environments (see page 58).

Affected ears develop deep black, shiny kernels (Photos 74, 75), and husk leaves can also turn black and be shredded.

There are no reports of economic losses from this disease.

Cephalosporium kernel rot

Acremonium strictum

(syn. *Cephalosporium acremonium*)

This disease is common in hot, lowland tropical and subtropical areas. Infected kernels show white streaks in the pericarp (Photo 76). The symptoms are similar to those of kernels infected by *Fusarium moniliforme*.

Hormodendrum ear rot

Hormodendrum cladosporoides

(syn. *Cladosporium cladosporoides*), *C. herbarum*

There are no reports of economic losses from this disease.

Dark brown-green streaks on kernels start at the kernel and cob bases. When damage is complete, ears look dark and lightweight (Photo 77). In some instances, fungal penetration results from physical injury to kernel tips.

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Stenocarpella ear rot

Stenocarpella maydis, syn. *Diplodia maydis*, *S. macrospora*, syn. *D. macrospora*

Stenocarpella ear rots are commonly found in hot, humid maize-growing areas.

Maize ears show characteristic development of irregular bleached areas on husks. These areas enlarge until the husks become completely dried, although the plant is still green. If husks are removed, ears appear chaffy and bleached, with a white, cottony growth between the kernels (Photo 78). Late in the season, many small, black pycnidia form on kernels and cob tissues (Photo 79). These pycnidia serve as sources of inoculum for the following season's crop. Microscopic observation of the spores is the only way to identify which pathogen is present.

Severely infected ears are very light. Infection more frequently occurs through the shank and moves from the cob to the kernels. Stem borer injury in the ear often increases incidence of this disease. *Stenocarpella maydis* produces the mycotoxin diplodiatoxin and *S. macrospora* produces diplodiol, both harmful to birds.