

## Pythium stalk rot

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*Pythium aphanidermatum*, *Pythium* spp.

*Pythium* species cause stalk rots, seed rots, and seedling blights. The disease is present in some hot and humid tropical and subtropical zones and in temperate regions.

Usually the basal internodes become soft, water-soaked, and dark, causing lodging. Damaged internodes commonly twist before the plants lodge. Diseased plants can remain alive until all vascular bundles become affected (Photo 42).

Isolations in culture media are necessary to differentiate *Pythium* from *Erwinia* stalk rots.

Plants can be affected prior to flowering.

## Fusarium and gibberella stalk rots

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

*Gibberella zeae* (Anamorph: *Fusarium graminearum*)

These two species of *Fusarium* are responsible for stalk rots in maize:

*Fusarium moniliforme* is most common in dry, warm areas. It is particularly severe if it begins just before tasseling (Photo 43).

*Gibberella zeae* is prevalent in cool regions. It is one of the most potentially damaging stalk-rotting agents (Photo 44).

Symptoms produced by these pathogens resemble those caused by *Stenocarpella* or *Cephalosporium*, and cannot be differentiated until spore-producing structures are observed. Wilted plants remain standing when dry, and small, dark-brown lesions develop in the lowest internodes. When infected stalks are split, the phloem appears dark brown, and there is a general conspicuous browning of tissues.

In the final stages of infection, pith is shredded and surrounding tissues become discolored.



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# Head smut

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*Sphacelotheca reiliana*

Head smut can cause significant economic damage in dry, hot maize growing areas, as well as in midhill zones and under temperate conditions.

The infection is systemic: the fungus penetrates the seedlings and grows inside the plant without showing symptoms, until the tasseling and silking stages.

The most conspicuous symptoms are (a) abnormal development of the tassels, which become malformed and overgrown (Photo 45); (b) black masses of spores that develop inside individual male florets; and (c) masses of black spores in place of the normal ear, leaving the vascular bundles exposed and shredded (Photo 46).

# False head smut

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*Ustilaginoidea virens*

False head smut occurs very rarely in hot, dry or humid areas. The fungus commonly infects rice flowers more than maize.

Symptoms differ from those of other smuts of maize. False head smut produces neither tassel malformation nor ear infection, as does true head smut (*Sphacelotheca reiliana*); only a few isolated male florets in the tassel show dark-green masses of spores (sori; Photo 47). False head smut also differs from common smut (*Ustilago maydis*) in that no galls are produced.



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## **Black bundle disease and late wilt**

*Acremonium strictum*

(syn. *Cephalosporium acremonium*) and *C. maydis*

Black bundle disease is caused by *Cephalosporium acremonium* and is widely distributed. The late wilt disease, caused by *C. maydis*, has been reported only in Egypt and India. Both diseases kill the plants near flowering time (Photo 48). They are most common in humid, heavy soils in hot areas. The pathogens are soil- and seed-borne.

Infected plants do not show symptoms until they reach tasseling stage and start wilting, generally beginning from the top leaves. Diseased plants produce only nubbins or ears with underdeveloped, shrunken kernels. When split, diseased stalks show brown vascular bundles starting in the underground portion of the roots (Photo 49). Similar symptoms may be observed in plants damaged by *Fusarium moniliforme*.

## Anthracnose stalk rot

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Anamorph: *Colletotrichum graminicola*  
(Teleomorph: *Glomerella graminicola*)

The fungus *Colletotrichum graminicola* causes both a stalk rot and a leaf blight. The stalk rot is found mostly in warm, humid areas throughout the world. Infection symptoms are clearly evident as narrow, elongated dark lesions (initially brown; turning later to black) along the stem surface beginning when plants approach flowering (Photo 50). In infected plants, there is premature wilting due to the complete destruction of pith tissue, with shredded vascular bundles turning dark brown (Photo 51). Because this and other fungi overwinter in infected maize tissues, conservation agriculture practices involving mulches reportedly increase the incidence of the disease.

(Photo courtesy of Dr. R. Carvalho)



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## Charcoal stalk rot

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*Macrophomina phaseolina*

Charcoal stalk rot is most common in hot, dry environments. Incidence increases rapidly when drought and high temperatures prevail near tasseling stage.

The pathogen invades seedling roots. After flowering, initial symptoms are the abnormal drying of upper leaf tissue. When plants approach maturity, the internal parts of stems show a black discoloration and vascular bundles shred (Photo 52), mainly in lower stalk internodes. Careful examination of rind and vascular bundles reveals small, black, fungal structures known as sclerotia (Photo 53) that can overwinter and infect the next crop. The fungus may also infect kernels, blackening them completely.

Many crops can serve as hosts for this pathogen.

## **Botryodiplodia stalk rot**

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*Botryodiplodia theobromae*

The disease was first reported in India, but has been found in several other countries in Asia, Africa, and the Americas. It develops in hot, humid environments.

Diseased plants dry prematurely. Splitting stalks open will show some shredding of the pith and a dark gray to black discoloration of the vascular bundles.

Abundant grayish mycelia are conspicuous in the rotten areas, confined mostly to the lower internodes above ground (Photo 54).

Unlike charcoal rot, *Botryodiplodia* stalk rot does not produce black pinhead-like sclerotia in the rotten areas, but it does produce abundant, gray-blackish, cottony mycelium in cavities formed in the pith of affected internodes.



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## Stenocarpella stalk rot

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

Stalk rot is caused by *S. maydis* in cool, humid temperate areas, and by *S. macrospora* in warm, humid zones. In susceptible cultivars it causes browning of the pith of basal internodes (Photos 55, 56). Stalks are weakened and break easily during strong winds and rains. Late in the season, the most conspicuous symptom is the abundant formation of spore structures known as pycnidia on the surface of internodes where rotting has occurred.



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