

WHAT IS KILLING MY CORN SEEDLINGS?

Conditions that delay germination and emergence can set the stage for corn seeds and seedling diseases. For disease to occur, environmental conditions must be suitable for infection and growth of the pathogen. In the case of soilborne diseases, this usually involves cool and wet soils (<50°F).

What are the possible diseases that can attack corn seeds and seedlings?¹

Fungi associated with seed and seedling diseases of corn include: *Pythium*, *Fusarium*, *Rhizoctonia*, *Penicillium*, and *Diplodia*.

Pythium species can survive in the soil for many years and are the most common fungi that infect seeds and seedlings. Under wet and cool conditions, overwintering spores germinate and produce spores that move in the soil water. Root exudates attract these spores, and if conditions are conducive, infection can occur. Seeds that are damaged also produce compounds that attract spores, so injury by insects or other pathogens can allow a site for infection. There are many species of *Pythium* and the critical temperature for infection varies with each species. The key factor in *Pythium* infections is excess soil moisture. A seedling that is only moderately infected may be stunted and develop more slowly than a healthy seedling. The mesocotyl will be rotted and slimy and not firm and bright white in color (Figure 1). A severe infection will result in death of the plant, the roots will be off-color, and the outer tissue of the roots will easily slide off, leaving just the inner tissue, often referred to as rat-tailing.

Fusarium species, like *Pythium* spp., can cause disease under a wide range of favorable temperatures. But unlike *Pythium* spp., moisture is not as critical for disease development. *Fusarium* infections also result in discoloration of the mesocotyl.



Figure 1. Discolored mesocotyl caused by infection by *Pythium*.

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Rhizoctonia species can also cause seedling disease. In general, *Rhizoctonia* infections tend to be more common in cool, but drier conditions. A common symptom is reddish-brown discoloration on the roots; in severe cases it can girdle the roots and crown resulting in seedling death.

Penicillium species, unlike these other seed and seedling fungi, cause disease under high temperature conditions. *Penicillium* spp. tend to discolor the mesocotyl and the seminal roots. Occasionally a blue-green fungal growth can be observed, which should not be confused with the green color of the seed treatment.

Aboveground symptoms of this seedling blight include browning of leaf tips, which can occur as late as the V3 to V5 growth stages. Infected plants may turn yellow and die or remain discolored and stunted throughout the growing season. Plants that have not developed a nodal root system are more prone to infection.

Diplodia seed or seedling infections are caused by the same species that causes the *Diplodia* stalk and ear rot. The fungus overwinters on the corn debris and infects the seedling if adequate moisture is available.



Figure 2. *Rhizoctonia* infection on coleoptile, note the reddish-brown discoloration.

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What are the general diagnostic tips that indicate a seed and seedling diseases?²

When the seed is infected it decays very rapidly and may be difficult to find. If the seed is found it is usually soft and easily squeezed. It can be covered with white fungal mycelium. When the pathogen kills the seedling prior to emergence but after germination, the coleoptile and the seminal roots are discolored and slimy in appearance. With postemergence seedling blights, the seedlings emerge through the soil surface before developing symptoms. Seedlings tend to yellow, wilt and die. Lesions can be found on the mesocotyl, which will become soft and have a slimy appearance. The seminal root system is usually stunted, roots are discolored, and the outer surface can slough off very easily.

How can the disease be specifically determined?

As a group, diagnosing which pathogen is responsible for the disease in the field is very difficult and it is recommended to send a sample to a diagnostic laboratory to determine the specific pathogen. Many Land-Grant Universities have diagnostic laboratories that may be able to confirm the pathogen causing the disease. It is not uncommon to have more than one pathogen or species causing the infection.

Your local extension office should be able to provide you with information on sample collection and the laboratory address.

Sources

- ¹ Kleczewski, N. Pythium- an early season pain in corn and soybeans. University of Illinois Extension. <http://cropdisease.cropsciences.illinois.edu/?p=1071>.
- ² Sweets, L. 2014. Seed Decay and Seedling Blights of Corn. University of Missouri Extension. <https://ipm.missouri.edu/ipcm/2014/4/Seed-Decay-and-Seedling-Blights-of-Corn/>.
- ³ Jackson-Ziems, T. Corn Seedling Diseases 2015. University of Nebraska Extension. <https://cropwatch.unl.edu/corn-seedling-diseases-2015>.

What other factors can cause similar symptoms?³

Seed and seedling diseases are not only hard to tell apart in some cases, they can also be confused with other issues such as seed feeding insects, herbicide injury, and stresses caused by the environment. Symptoms that may be caused by seed or seedling pathogens include:

- Decayed seed prior to germination - if the injury is caused by cold shock or cold water stress during imbibition, the seed is often swollen but not decayed.
- Decayed or discolored seedlings after germination prior to emergence, particularly the mesocotyl.
- Damping-off of emerged seedlings.

If the seed has a seed treatment, won't that provide control?³

Fungicide seed treatments can provide control or suppression of many seed or seedling pathogens. However, the fungicides on the seed can be ineffective when conditions slow germination and emergence, and when pathogen abundance is high.

What agronomic practices can be used to reduce the risk of seedling diseases?

The key practice to reduce the risk of seed or seedling disease is to plant when conditions are adequate for germination and emergence. Planting when soils are cold and wet (<50°F) can delay germination and emergence and provide an opportunity for some pathogens to attack the seed or seedling. Improving soil drainage and reducing compaction can also help reduce the risk of seed infection. Crop rotation may be a benefit, but some of the pathogens attack multiple crop species. Tillage may help in two ways: by reducing inoculum overwintering on crop debris by burying it and by helping warm and dry the seedbed prior to planting.

Legal Statements

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.
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