



# Agronomic Spotlight

## Seedling Diseases of Corn

- Stress from wet, cool soil conditions can predispose corn seeds and seedlings to disease.
- Field diagnosis of seedling diseases can be difficult because multiple pathogens are often involved and symptoms can appear similar.
- Planting when soil conditions are favorable for germination and using a broad-spectrum fungicide seed treatment can minimize the risk of seedling diseases and root rots.

### Favorable Environment

Wet and cool soil temperatures (less than 50° to 55° F) can delay seed germination and emergence and predispose corn seedlings to disease. Seedlings become more vulnerable to infection the longer a seed is in the ground before emergence and the more stress germinating corn endures.

### Symptomology and Identification

Typical below-ground seedling disease symptoms include rotted seed that is soft and brown, rotted roots that may have a wet and slimy appearance, and a mesocotyl (region between the seed and permanent root system) with brown lesions or soft and water-soaked tissue. Above-ground symptoms include damping-off after emergence and seedlings that turn yellow, wilt, and die.

Identification of specific seedling blights and root rots based on symptomology can be difficult because different pathogens often cause similar symptoms. Damage to seeds and seedlings from nematodes, root-feeding insects, environmental stresses, and herbicide injury can also cause similar symptoms and complicate diagnosis. Often, multiple species of fungi can be isolated from a single plant sample. In addition to the most common seedling-rot fungi listed below, fungi such as *Aspergillus*, *Nigrospora*, and *Trichoderma* may also cause seedling diseases in corn.<sup>1</sup> Microscopic examination at a plant diagnosis clinic is the most reliable way to confirm one of these specific fungal pathogens.

### Common Pathogens

Several common soilborne fungi such as *Fusarium*, *Pythium*, *Penicillium*, and *Rhizoctonia* are often isolated from infected seedlings and roots.

**Fusarium.** At least six *Fusarium* species have been identified that cause seedling diseases and root rots in corn.<sup>2</sup> Infected plants can have tan to reddish brown lesions and the root or mesocotyl may shrivel (Figure 1). Root symptoms range from very slight brown discoloration to dark black, completely rotted roots. This disease often occurs after the seedling stage and under a wide range of temperature and moisture conditions. Plant susceptibility to root rot increases when plants are under stress or injured by herbicide applications. *Fusarium* root rot can move into the base of the corn plant, resulting in crown and stalk rot at later growth stages.



Figure 1. Symptoms caused by *Fusarium* including rotted mesocotyl (indicated by arrow).

**Pythium.** This is one of the most common fungi associated with seed rot and seedling blight of corn. Several species of *Pythium* are associated with seed rot prior to germination or infection of young seedlings before or after emergence (Figure 2). Symptoms include dark, slimy lesions that cause the root or mesocotyl to shrivel. The outer cortex of the root may be rotted while the inner part, the stele, remains white and intact (Figure 3). This fungus is favored by high moisture and low temperatures and requires wet soils to produce infecting spores. *Pythium* can infect anytime between planting and midseason, but is primarily a seedling problem (Figure 4).



Figure 2. Darkening of the mesocotyl due to infection by *Pythium*.



Figure 3. *Pythium* root rot with stele intact. Courtesy of Don White, University of Illinois.

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Figure 4. Pythium infection at different growth stages.

**Penicillium.** The roots and mesocotyl of plants infected with *Penicillium* may be discolored and rotted. Sometimes a blue-green fungal growth can be seen on infected seeds. Above-ground symptoms of this seedling blight include browning of leaf tips. Infected plants may turn yellow and die, or remain discolored and stunted the remainder of the growing season (Figure 5). *Penicillium* tends to infect plants that have yet to develop nodal root systems. This fungus generally is favored by higher temperatures than the other seedling blight and early-season root rot fungi.



Figure 5. Corn seedling with symptoms of seedling blight caused by *Penicillium*. Courtesy of William M. Brown Jr., Bugwood.org.

**Rhizoctonia.** Initial symptoms are brown lesions on the mesocotyl and roots of seedlings and young plants. Plants may be stunted or chlorotic, but often there are no above-ground symptoms. The most distinctive symptoms are reddish brown sunken cankers, which form on the roots, crown, and brace roots of large plants. In older plants, infection can cause crown rot and brace root rot and plants may lodge due to a poor root system. *Rhizoctonia* can infect corn roots between 46° to 82° F. This disease tends to be more severe in irrigated corn.

## Disease Management

**Cultural Practices.** Management options are generally the same for all corn seedling diseases. Plant high quality seed at the appropriate planting depth and soil conditions to promote rapid germination and emergence. Fields that have good drainage and dark soils, which tend to warm quickly, should be targeted for earlier planting. Fields that have a tendency to stay wet or have a history of seedling disease should be planted slightly later in the season when soil temperatures are more favorable for germination. Avoid mechanical injury to the seed and herbicide injury, as these may influence the occurrence of seedling diseases.<sup>3</sup>

**Seed Treatments.** Most corn seed is treated with a fungicide seed treatment that contains multiple active ingredients in order to provide protection against the variety of fungi that attack seeds and seedlings. Seed treatments can provide a level of protection against multiple seedling blight pathogens, but may not eliminate all threats under severe environmental conditions that favor infection. All seed treatments have a limited period of activity, which usually lasts for about a month after planting. Broad-spectrum seed treatments can help minimize the risk of developing corn seedling diseases.

## Sources

- <sup>1</sup> Robertson, A. and Munkvold, G. 2009. Check general root and mesocotyl health when assessing corn stands. Iowa State University Extension. [www.extension.iastate.edu](http://www.extension.iastate.edu).
- <sup>2</sup> Jackson-Ziems, T. and Korus, K. 2013. Seedling diseases appearing in corn. University of Nebraska. <http://cropwatch.unl.edu>.
- <sup>3</sup> Sweets, L. and Wright, S. 2008. Corn diseases. University of Missouri. <http://ipm.missouri.edu>. Compendium of Corn Diseases. 1999. APS Press. Web sources verified 2/6/15. 140313060656

For additional agronomic information, please contact your local seed representative.

**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.

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