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Plant Pathology Fact Sheet

# Pre- and Post-Emergence Damping-Off of Soybean

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## IMPORTANCE

The push to maximize soybean yields, as well as recent research proving the benefits of early planting, has prompted many soybean producers to considering planting their full season soybean crops earlier than they did a decade ago. Early planting can give a crop many advantages, which often lead to higher yields, as long as a good stand is achieved and attention is paid to pest management. See the University of Kentucky publication "Soybean Planting in Kentucky" (AGR-130) for more information on agronomic considerations.

Optimal soil temperature for germination of soybean is 77° F. However, according to University of Kentucky agronomists, soybean can be successfully planted when soil is at least 50° F and suitable for planting (i.e., not too wet). Planting soybean when soil is cooler than 50° F will greatly increase the chances that crops will be damaged by one or more seed or soil-borne disease. The risk of disease is greatly enhanced by the added stress that cold, wet soils places on germinating seed and young seedling. For example, stand establishment can take weeks when soybean is planted into cold soils. Pre- and post-emergence damping-off reduce yields by lowering plant populations in all or portions of fields (FIGURE 1). Stand loss can be so great as to require replanting.

FIGURE 1. DAMPING-OFF RESULTS IN STAND LOSSES.

Damping-off is a generalized name for diseases caused by a variety of seed- and soil-borne pathogens which result in seed rot or death of seedlings prior to emergence (pre-emergence damping-off), or death of seedlings following emergence (post-emergence damping-off).

## *Pythium* SPECIES

*Pythium* species are widespread in Kentucky's agricultural soils. The most prolific and damaging species is *P. ultimum*. Damage is greatest when

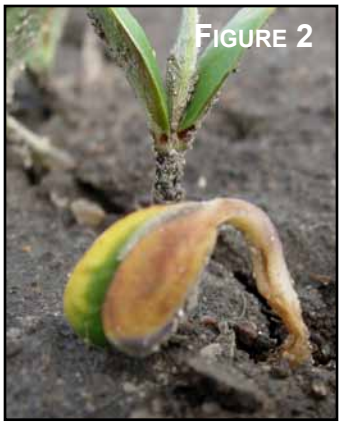




**FIGURE 2.** SYMPTOMS CHARACTERISTIC OF POST-EMERGENCE DAMPING-OFF DUE TO VARIOUS *Pythium* SPP. **FIGURE 3**. *Phytophthora sojae* CAN CAUSE SOYBEAN PLANTS TO WILT AND DIE AT ANY AGE. **FIGURE 4.** A GLOSSY BROWN DISCOLORATION EXTENDS UP THE STEM OF OLDER PLANTS INFECTED WITH *P. sojae*.

soils become saturated soon after planting in mid-April to early-May. Diseased plants are usually distributed in small circular patches, frequently where water has stood. Much larger areas may be affected during extremely rainy weather, especially in fields with poor interior or surface water drainage. *Pythium* species may cause a seed rot or death of young seedlings may occur during or soon after emergence (FIGURE 2). Affected seedlings will exhibit a soft watery rot, wilt, turn brown, and die.

## *Phytophthora sojae*

The fungus-like organism *Phytophthora sojae* is widespread in Kentucky, but the disease caused by this pathogen is much less common than *Pythium* due to the very strict moisture and temperature conditions required for the disease to occur. In addition, *P. sojae* occurs as many different races, but soybean varieties grown in Kentucky are commonly highly resistant to the races most prevalent in the state. As with *Pythium*, seedlings may be attacked before, during, or after emergence. The moisture requirement is greater for *P. sojae* than it is for *Pythium*, which likely is the reason for the more infrequent appearance of the former disease. Unlike *Pythium*, which generally stops being a problem as the seedlings become established, *Phytophthora* can cause plants to wilt and die at any age (FIGURE 3). Generally, a dark brown root rot can be found on older plants and a glossy brown discoloration will be seen extending up the stem into the lower nodes (FIGURE 4).

## *Rhizoctonia solani*

*Rhizoctonia solani* is present in every soybean field in Kentucky. However, the fungus mainly causes post-emergence damping-off when the crop is stressed. Herbicide damage is a factor commonly associated with *Rhizoctonia*. Although this fungus is less dependent on water than either *Pythium* or *Phytophthora*, damage is nonetheless usually most severe in heavy, poorly drained areas, especially following the occurrence of warm, wet conditions. Infected plants may die or look unthrifty because of a firm, dry, brown to reddish-brown decay of the roots and stem below or near the soil line (FIGURE 5). In many cases, plants will not be killed by *R. solani,* but will outgrow the problem and appear to be normal the remainder of the season.


**FIGURE 5**. SOYBEAN PLANTS INFECTED WITH *Rhizoctonia solani* TYPICALLY HAVE STEM LESIONS NEAR THE SOIL LINE THAT ARE REDDISH-BROWN IN APPEARANCE.

## *Phomopsis* / Pod & Stem Blight Seed & Seedling Rot

Seed and seedling decay caused by the fungal complex *Phomopsis longicolla* and *Diaporthe phaseolorum* var *sojae* is very common in Kentucky and is related to the planting of low quality (i.e., *Phomopsis/Diaporthe*-infected) seed, especially into cool wet soil. The causal fungi are seed-borne, with initial infections occurring the previous growing season, prior to harvest. Severely infected seed will be shriveled, elongated, cracked, and often has a white and chalky appearance (Figure 6). If infected seeds do germinate, they give rise to diseased, malformed seedlings with many brown stem and seed-leaf lesions. Severely diseased seedlings usually die prior to becoming established.


**Figure 6**. Seed decay caused by *Phomopsis*/*Diaporthe* fungi (left) compared to healthy soybean seed (right).

## Miscellaneous Fungi

Numerous other fungi can attack soybean seed and seedlings, causing pre- or post-emergence damping off, or both. Fungi, such as *Cercospora sojina* (frogeye leaf spot) and *Cercospora kikuchii* (Cercospora leaf blight), *Fusarium* species, *Macrophomina phaseolina* (Charcoal rot), and others have the potential to cause occasional stand losses in Kentucky.

## Disease Management

- Plant certified seed, which will be of uniform quality and a high germination rate.
- Avoid planting into cold, wet soils, especially during no-till operations.
- Use a broad-spectrum seed treatment fungicide if seed quality is marginal and/or if seeds must be planted into soil of less-than-optimal conditions.
- Maintain proper soil fertility throughout the growing season.
- Avoid damage to developing seedlings from herbicides, insects, or other physical factors.

## Additional Resources

The following University of Kentucky publications are available at County Extension offices, as well as on the Internet.

- Kentucky Integrated Crop Management Manual for Field Crops: Soybeans, IPM-3 (2009) http://www.uky.edu/Ag/IPM/manuals/ipm3soy.pdf
- Phytophthora Root and Stem Rot of Soybean, PPFS-AG-S-04 (2012) http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/ppfsags4.pdf
- Seed Treatment Fungicides for Soybeans: Issues to Consider, PPFS-AG-S-12 (2011) http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/ppfsags12.pdf
- Soybean: Early Planting and Disease, PPFS-AG-S-22 (2004) http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/ppfsags22.pdf
- Soybean Planting in Kentucky, AGR-130 (2011) http://www.ca.uky.edu/agc/pubs/agr/agr130/agr130.pdf

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*Photos: Daren Mueller, Iowa State University, Bugwood.org (Fig. 1); Martin Chilvers, Michigan State University (Fig. 2); and Donald Hershman, University of Kentucky (Figs. 3 to 6)*