



Scouting for Phytophthora Root and Stem Rot in Soybean

Description

Phytophthora root and stem rot is a common soilborne disease caused by a water mold, *Phytophthora sojae*. In poorly drained soils, *Phytophthora* can have a severe economic impact. The most common symptom is areas of the field with no stand from early season damping off and on older plants, a dark brown lesion on the lower stem that extends from the root into the upper portions of the plant. During the early stages of soybean development, when pre- and post-emergence damping off occur, symptoms are indistinguishable from *Pythium*, another water mold. Later in the growing season, symptoms on more mature plants include chlorosis of leaves and wilting, stunting, and death. Mid- to late season symptoms may be confused with *Diaporthe* stem canker or white mold.



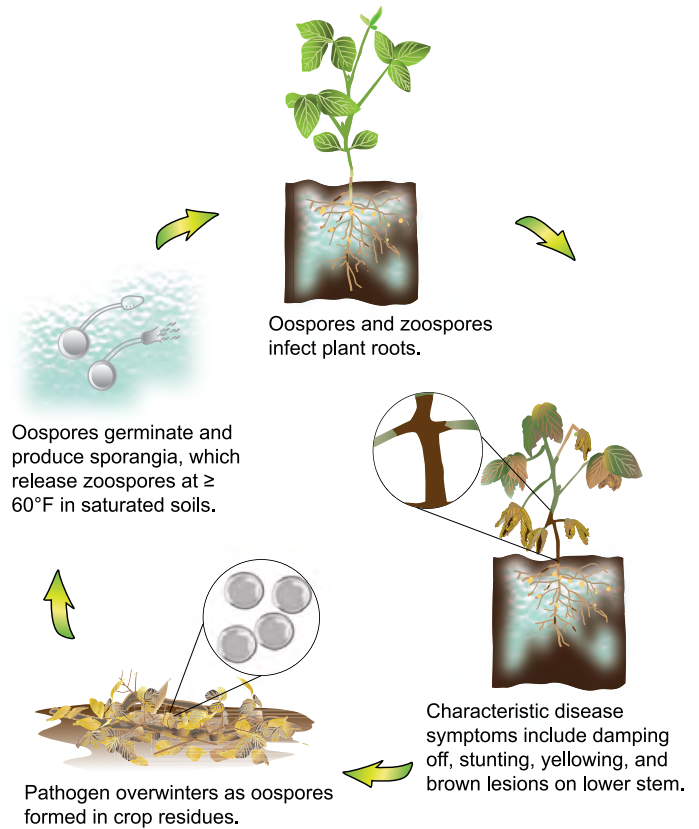
Phytophthora root and stem rot: Brown lesions extend from root.

Diaporthe stem canker: Brown lesions occur at lower nodes and unlike the *Phytophthora* lesion are rarely observed at base of the plant.

White mold: Light brown lesions; white fluffy growths may be present.

Risk

Planting into saturated, warm (>60°F) soils with a history of *Phytophthora* root and stem rot poses the greatest risk for disease. Disease is most common in low-lying areas that are poorly drained and prone to saturation or flooding. Planting into soils that are no till also poses a risk for disease development due to increased water retention and higher inoculum density in the top 2 to 3 inches.



Disease cycle

Scouting

Phytophthora sojae can infect the plant at any growth stage from seedling through maturity. Scouting for *Phytophthora* root and stem rot should be done following prolonged periods of rain when soil temperatures exceed 60°F. Finding patches of diseased plants in low-lying, poorly drained portions of fields is common.

While scouting for *Phytophthora* root and stem rot, it is important to note that there are other diseases that have similar symptoms, such as stem canker and white mold. The key difference between the three diseases is that the brown stem lesion characteristic of *Phytophthora* will develop from the base of the stem upward and plants have rotten roots. With the other diseases, brown lesions develop at a node and rarely progress down stem to the soil line.



Phytophthora root rot usually occurs in patches in low-lying areas of field.

Diversity of *Phytophthora sojae*

P. sojae is classified into pathotypes (which used to be referred to as races) based on its ability to cause disease on soybean lines that contain single *Rps* resistance genes. Within a single soybean field, the population of *P. sojae* is made up of hundreds of individuals called isolates. From two to as many as 50 different pathotypes have been classified from isolates recovered from soybean plants from a single field.

During a 2012–2013 survey of 208 fields in the Midwest, more than 870 isolates of *P. sojae* were recovered from either soil through a baiting procedure or diseased plants. More than 200 pathotypes were identified in the region based on the few isolates that were evaluated from each field. Among these isolates, more than two thirds were able to cause disease on two or more *Rps* genes. Soybean lines with *Rps1a*, *Rps1c*, and *Rps1k* were susceptible to 43 to 68% of the isolates, while 15% or less of the isolates caused disease on *Rps3a*, *Rps6*, and *Rps8*.

Management

The best management tool for *P. sojae* is the use of resistant varieties. There are two forms of resistance: race-specific genes (*Rps* genes) and partial resistance. *Rps* genes will provide complete resistance to certain *P. sojae* populations. The most common *Rps* genes are *Rps1a*, *Rps1c*, *Rps1k*, *Rps3a*, and *Rps6*. Partial resistance offers some resistance to all populations of *P. sojae*. However, partial resistance is not expressed until the first true leaves have developed, so emerging seedlings are still vulnerable to infection by *P. sojae* early.

Other disease management options include some form of tillage and/or tiling to improve drainage and seed treatments with active ingredients mefenoxam, metalaxyl, or ethaboxam.

Acknowledgments

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Photographs

All photos were provided by and are the property of the authors and reviewers except white mold symptoms image courtesy Craig Grau, University of Wisconsin. Disease cycle illustration by Renée Tesdall.

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