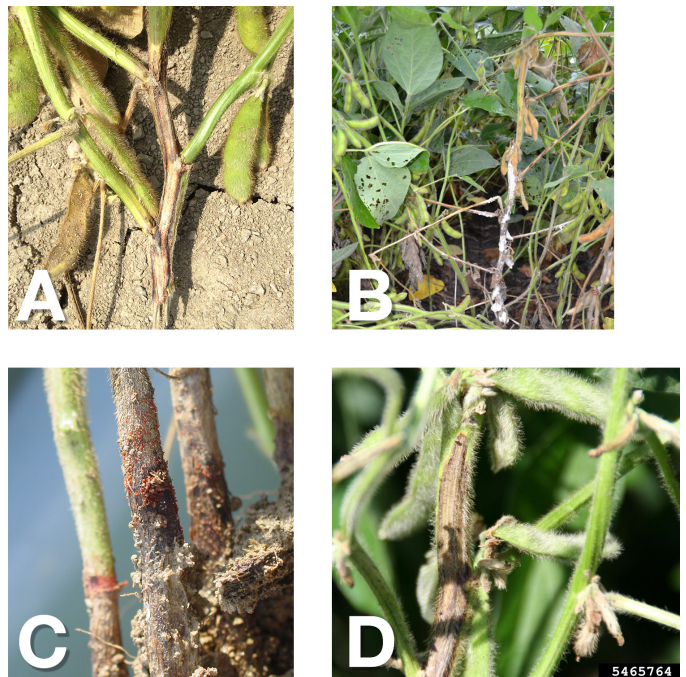


## Phytophthora Root and Stem Rot of Soybean

Phytophthora root and stem rot (PRSR) is caused by *Phytophthora sojae* and *Phytophthora sansomeana*, which belong to a group of fungal-like organisms referred to as the water molds. While soybeans are the only known host of *P. sojae*, *P. sansomeana* can infect corn and some weed species. Several other species of *Phytophthora* have been found in association with soybean.<sup>1</sup> Additionally, there are hundreds of known pathotypes (races) of *Phytophthora sojae*. In a survey of 208 Midwest fields, over 200 pathotypes were identified from 870 isolates.<sup>2</sup>

### Description<sup>3</sup>

Infection can occur at any growth stage, from VE to R6. PRSR is common throughout the soybean producing areas of the United States. It is associated with poorly drained soils and can have a critical economic impact. Field symptoms usually occur after extended periods of rainfall when soil temperatures exceed 60°F. Infection occurs through roots and moves up the stem. Early-season symptoms are areas in the field devoid of plants. The stand is reduced by damping-off and roots become brown and rotted (soft) or are missing. The symptoms of PRSR cannot be distinguished from those caused by *Pythium* without laboratory analysis. Symptoms of infection in older plants include yellowing of leaves, wilting, stunting, and death of the whole plant. Root rot and stem rot occur on susceptible cultivars. Stem rot lesions are a chocolate-brown color. Other diseases that can be confused with PRSR at this stage of infection include *Sclerotinia* stem rot or white mold (for more information on managing white mold in-season, please read the article, In-season White Mold Management), *Diaporthe* stem canker, and red crown rot. White mold lesions usually occur at the site of a blossom and are light brown in color with white, fluffy mycelium. *Diaporthe* stem canker lesions occur lower on the plant and are dark brown in color, and rarely occur at the soil line. Red crown rot lesions are gray-brown to red-brown and occur near the soil line with red structures forming on the stem surface.



**Figure 1. (from top left to bottom right)**

- A) *Phytophthora* root and stem rot: Brown lesions on stem extending to the soil line.**
- B) White mold: Lesions usually occur initially at the site of a blossom and are covered with white mycelium.**
- C) Red crown rot: Stem lesions can be gray-brown to red-brown near the soil line with red structures forming on the stem surface.**
- D) *Diaporthe* stem canker: Brown lesions at lower nodes, rarely occurring to the soil line, with black structures (pycnidia) arranged in rows.**

*Photo courtesy of Daren Mueller, Iowa State University, Bugwood.org*

# Phytophthora Root and Stem Rot of Soybean

## Management<sup>2,3</sup>

Management tactics include the use of resistant varieties, fungicide seed treatments, improving drainage, and tillage. The resistance to *P. sojae* can be race specific, meaning that certain race-specific genes (that are designated Resistant phytophthora sojae or Rps) provide complete resistance to certain pathotypes of PRSR; the most common of these genes being *Rps1a*, *Rps1c*, *Rps1k*, *Rps3a*, and *Rps6*. However, because of the large number of pathotypes, this resistance can be overcome. In a survey of 208 Midwest fields, soybean cultivars that contained *Rps1a*, *Rps1c*, and *Rps1k* were susceptible to 43 to 68% of the isolates; however, 15% or fewer of the isolates caused disease in plants containing *Rps3a*, *Rps6*, and *Rps8*.<sup>2</sup> The second type of resistance is often referred to as field tolerance or partial resistance, but this type of resistance is not expressed until the first true leaves have emerged.

Management strategies to consider include the improvement of field drainage, crop rotation, the use of seed treatments containing mefenoxam, metalaxyl, or ethaboxam, and in fields where PRSR has been consistent, the use of a resistant cultivar. If specific resistance has been overridden, consider a cultivar with field tolerance.

## Sources:

- <sup>1</sup>Phibbs, A. 2016. Phytophthora root rot survey. Wisconsin Department of Agriculture, Trade and Consumer Protection. Plant Industry Laboratory. <https://datcpservices.wisconsin.gov/pb/pdf/12-08-16.pdf>
- <sup>2</sup>Kandel, Y., Robertson, A., Dorrance, A., Zaworski, E., Chilvers, M., and Bestor, N. 2015. Scouting for Phytophthora root and stem rot in soybean. Crop Protection Network. <https://crop-protection-network.s3.amazonaws.com/publications/cpn-1014b-scouting-for-phytophthora-root-and-stem-rot-in-soybean.pdf>
- <sup>3</sup>Malvick, D. 2018. Phytophthora root and stem rot on soybean. University of Minnesota Extension. <https://extension.umn.edu/pest-management/phytophthora-root-and-stem-rot-soybean>

## Additional Sources

- Dorrance, A.E., Mills, D., Robertson, A.E., Draper, M.A., Giesler, L., and Tenuta, A. 2007. Phytophthora root and stem rot of soybean. The Plant Health Instructor. <https://www.apsnet.org/edcenter/disandpath/oomycete/pdlessons/Pages/PhytophthoraSojae.aspx>

## 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. ©2020 Bayer Group. All rights reserved. 5003\_S3