BROWN STEM ROT

Soybean Diseases




Overview

Brown Stem Rot (BSR) is a major disease of soybeans and is widely distributed in soybean fields throughout the North Central region and Ontario, Canada, particularly in areas roughly north of Interstate 70. The increase in the incidence of BSR is thought to be a result of shorter rotations between soybean and corn, which encourages a build-up of the BSR pathogen. BSR is caused by the soilborne fungus, *Cadophora gregata* (formerly *Phialophora gregata*). The fungus survives mainly in the soil and on crop residue. In the spring, the fungus infects soybean roots and eventually moves up into the stem during vegetative and early reproductive growth stages. The fungus impedes the movement of water and nutrients needed for growth. About the time of full pod development, internal browning of the stem (see photo) becomes visible and is diagnostic for brown stem rot.

Scouting

Recognizing BSR is not easy. Symptoms are usually not evident until late in the growing season and are often confused with early crop maturity, the effect of dry soils, or other soybean diseases with similar symptoms.

Begin scouting at the full pod stage of development (growth stages R4 – R5). Cut stems lengthwise in several places and check for a chocolate-brown discoloration in the pith,

especially at and between nodes near the soil line. Initially, the discoloration may only be found at the nodes, but it becomes continuous through the stem as the plant ages and temperatures become cooler.

It can frequently be mistaken for sudden death syndrome (SDS) or stem canker, because these diseases cause similar leaf symptoms. However, root and stem symptoms can be used to differentiate among the three diseases. In the southern range of the disease, feeding damage from *Dectes* stem borer will also cause a browning of the internal stem.

Two types of *C. gregata* are common in the U.S. Type A produces both internal browning and foliar yellowing and browning. Type B typically produces only stem browning. A laboratory test can be used to distinguish the two types. Type A typically results in greater yield loss. Type B is often found in “resistant” soybean varieties.

Table 1. Comparison of the signs and symptoms of brown stem rot, sudden death syndrome, stem canker.

Plant Part	**BSR**	**Stem Canker**	**SDS**
Roots	Healthy	Healthy	Rotted roots
Exterior stem	Healthy	Dark, reddish-brown, sunken cankers at the lower nodes	Healthy
Interior stem	Brown pith (center)	Slight browning at the nodes to stems that are completely turned brown	The internal stem is white and healthy
Leaves	No symptoms or a yellowing between the veins	A general yellowing of leaves, sometimes between the veins. A *“shepherd’s crook”* may form at the top of the plant.	Yellowing and eventually browning between the veins like BSR

Adapted from: *Agronomy Guide for Field Crops (Soybeans: Brown Stem Rot, Stem Canker and SDS)*, Ontario Ministry of Food and Agriculture.

Risk Assessment

Seasonal Risk Factors for BSR

- Continuous soybeans
- Susceptible soybean varieties

- Late maturing varieties
- Short rotations
- Low soil pH (< 6.8)
- History of BSR
- Type A pathogen present
- SCN present
- Rain or irrigation following flowering
- Cool air temperatures (< 80°F)

Long-term risk factors for BSR

- Reduced or no-till cropping systems
- Slow residue decomposition
- Soil movement from field-to-field

Management

Brown stem rot can be effectively managed with crop rotation, selection of resistant varieties, and residue management.

Crop rotation
A minimum of two years between soybean crops in fields with a history of brown stem rot will effectively reduce pathogen populations and the risk of BSR. Corn, small grains and forage legumes are all good rotation crop choices. Soybean is the only host for the brown stem rot pathogen.

Use resistant soybean varieties and rotate among resistant varieties
Soybean varieties with some resistance to BSR are commercially available. However, the genetic source of brown stem rot resistance is limited. It is not recommended that growers rely only on resistant varieties, but use a combination of management practices to reduce the incidence and severity of this disease. Rotate soybean varieties to preserve the effectiveness of resistance genes. Early-maturing varieties may escape the yield reducing effects of brown stem rot in comparison to cultivars with later maturity or planting later in the season.

Residue management
Because the brown stem rot fungus survives mainly on crop residue left on the soil surface, decomposition of the residue is believed to be an important factor in managing this pathogen. In no-till or reduced tillage systems, longer crop rotations and shredding soybean straw with a combine-mounted shredder are effective practices to reduce pathogen populations.

Chemical Control
Foliar fungicides have no effect on brown stem rot. Likewise, seed treatment fungicides will have no effect, since protecting the seedling will not be enough to prevent infection after the materials lose their efficacy.

Distribution

Brown Stem Rot, *Crop Protection Network*

Brown Stem Rot, University of Wisconsin, 2013

Brown Stem Rot of Soybean, Purdue University, 2006

Brown Stem Rot of Soybean – Webinar, *Plant Management Network – Focus on Soybean*

Brown Stem Rot Scouting – Video, University of Wisconsin, 2014

Scouting for Soybean Stem Diseases, *Crop Protection Network*, CPN 1002, 2015

Soybean Sudden Death and Brown Stem Rot: How to Tell the Difference, PennState Extension, 2018

Resources

Brown Stem Rot Scouting Video
University of Wisconsin, 2014
https://www.youtube.com/watch?v=-KWu9dPCDXY

Brown Stem Rot
University of Wisconsin, 2013
https://soybeanresearchinfo.com/wp-content/uploads/2019/02/BSR-XGT1012.pdf

Brown Stem Rot
Crop Protection Network
https://cropprotectionnetwork.org/resources/articles/diseases/brown-stem-rot-of-soybean

Brown Stem Rot of Soybean
Purdue University, 2006
https://soybeanresearchinfo.com/wp-content/uploads/2019/02/BrownStemRot_BP41W.pdf

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Scouting for Soybean Stem Diseases
Crop Protection Network CPN 1002, 2015
https://soybeanresearchinfo.com/wp-content/uploads/2019/03/CPN1002_ScoutingSoybeanStemDiseases051515.pdf

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Iowa State University, 2018
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