

Brown Stem Rot and Sudden Death Syndrome in Soybean

Two soybean diseases that are easy to misdiagnose are brown stem rot (BSR) and sudden death syndrome (SDS). In fact, brown stem rot may have been more of an issue than growers realize during past years. Misdiagnosis no longer has to be a problem by utilizing some easy and helpful identification characteristics.

Identification starts with recognizing the three components of disease:

- Pathogens must be present in the soil or carried to a field as spores.
- The plant (host) growth stage must be susceptible to the pathogen.
- The environmental conditions must be favorable for the pathogen to be active.

These components make up the disease triangle shown below in Figure 1.

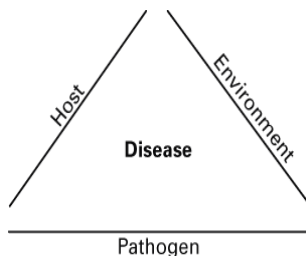


Figure 1. Disease Triangle.

There are many environmental conditions that are similar for both brown stem rot (BSR) and sudden death syndrome (SDS). Both diseases are caused by soil-borne fungi that are present in crop residue. Consequently, both diseases may be more prevalent in reduced or no-till fields. Cool and moist soil conditions also favor both BSR and SDS. Whereas, low moisture and high temperatures can reduce the severity of both diseases. The additional stress caused by the presence of soybean cyst nematode may also increase incidence and severity of BSR and SDS. Finally, foliar symptoms may not be present, for either disease, even when the roots are infected. When present, foliar symptoms can be very similar, consisting of wilting, chlorosis, and browning of the tissue between the veins (Figure 2). These foliar disease symptoms can also be hard to distinguish from early crop maturity and drought stress. The two diseases have many differences which are described next.

Brown Stem Rot (BSR) is caused by *Phialophora gregata*. In late spring the fungus enters the roots, moves to the vascular tissue of the soybean plant and then on to the stems and possibly the leaves. Symptoms of BSR are typically present after pod formation. The most common symptom of BSR is the brown

to reddish-brown discoloring of the stem pith or central portion of the stem (Figure 3). There are two genotypes of the pathogen that causes BSR. Both cause brown stem rot however, only one of the genotypes can cause the foliar symptoms. When foliar symptoms do occur, they tend to be more severe when rain or irrigation follows flowering and in soil with pH levels ranging from 5-7.

Sudden Death Syndrome (SDS) is caused by *Fusarium virguliforme*. SDS is found across all soybean production regions and can be associated with compacted soil. The fungus infects the roots and the base of the stem, sending toxins to the leaves. Unlike BSR, symptoms of SDS may be seen during the vegetative growth stages. However, they are most commonly seen during the early reproductive growth stages through pod fill. Splitting the stem of a soybean plant infected with SDS will reveal a slightly tan to light brown discoloration of the cortex and a normal white to cream colored pith (Figure 4). This distinguishes the two diseases because soybean plants infected with BSR have a reddish-brown discolored pith. Two other symptoms only SDS can cause are root rot and blue masses of spores, which may be present on the tap root under moist conditions (Figure 5).



Figure 2. Foliar symptoms of brown stem rot (top) and sudden death syndrome (bottom) can be very similar. (Pictures courtesy of Dr. Alison Roberston, Iowa State University)

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◀ **Figure 3.** Stem infected with BSR, discoloration of the central portion of the stem or pith (top) and a normal, healthy soybean stem (bottom).



Figure 5.▶ Soybean taproot with blue masses formed by the fungus associated with sudden death syndrome. Initially starts as white spores and then mature to blue or blue-green. (Picture courtesy of Dr. Stephen Koenning, North Carolina State University)



Figure 4.▶ Stem infected with SDS, cortex has a slightly tan to light brown discoloration and a normal white to cream colored pith. (Picture courtesy of Dr. Shaner, Purdue University)



Management for Both Brown Stem Rot and Sudden Death Syndrome

- Plant resistant or highly tolerant cultivars.
- SCN field testing and management is needed due to the possible interaction of SCN with both diseases.
- Tillage can help decompose infected crop residue, improve drainage, reduce compaction and warm soil at planting.
- Plant into warm, dry soils to reduce the risk of infection.
- Maintain optimum soil fertility and pH for soybean production to avoid additional stress.

Management for Brown Stem Rot Only

- Some soybean cyst nematode resistant cultivars may be susceptible to BSR and some are also resistant to BSR.
- Crop rotation to non-host crops, like corn and small grains, can decrease pathogen levels and severity, 2-3 year rotations should be used for severe disease pressure.
- Fields with a history of BSR may benefit from planting soybean cultivars with a shorter relative maturity to help escape the yield reducing effects of BSR due to earlier harvest.

Management for Sudden Death Syndrome Only

- If possible, improve drainage and reduce soil compaction in the field

Sources: Dorrance, A. E., Mills, D. 2008. *Brown Stem Rot of Soybean*. Ohio State University Plant Pathology Department Fact Sheet. Publication AC-35-08; Tabor, G., Leonardo, L., Robertson, A. 2007. *Brown stem rot and sudden death syndrome: Can you tell them apart?* Department of Plant Pathology Iowa State University. *Integrated Crop Management IC-498(3)* March 26, 2007; Westphal, A., Xing, L., Abney, T.S., and Shaner, G. 2006. *Sudden Death Syndrome*. *Diseases of Soybean*. Purdue Extension. Publication BP-58-W; University of Illinois Extension. 1997. *Sudden Death Syndrome of Soybeans*. University of Illinois Department of Crop Sciences Extension. Report of Plant Disease RPD No. 512; Yang, X.B. *Midsummer soybean disease scouting*. Department of Plant Pathology Iowa State University. *Integrated Crop Management IC-496(19)* July 10, 2006.

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