



UNIVERSITY OF WISCONSIN AGRONOMY, SOYBEAN RESEARCH, UNIVERSITY OF WISCONSIN-EXTENSION

Diagnosing Late Season Soybean Diseases

Paul Esker, John Gaska, Shawn Conley, and Craig Grau

Ext. Plant Pathologist, Senior Outreach Specialist, and Ext. Soybean Specialist, and Plant Pathologist
UW Madison

A lot is happening in the soybean fields we've been visiting recently and it is a good time to learn about several common diseases. If you just drive by your soybean fields this time of year, you could easily mistake maturity and natural plant death for several diseases or possibly early senescence due to drought. Just looking across a field you might notice dead plants that look like Phytophthora root and stem rot (*Phytophthora sojae*) but could easily be plants killed by stem canker (Northern: *Diaporthe phaseolorum* var. *caulivora*; Southern: *Diaporthe phaseolorum* var. *meridionalis*) (Image 1). Plants that are browning from brown stem rot (BSR) (*Phialophora gregata*) could be mistaken for sudden death syndrome (SDS) (*Fusarium virguliforme*) or just natural senescence. Furthermore, even if you think the disease is one of the above four, given our cool and wet conditions in 2008, the wilted plants may just as easily be white mold (*Sclerotinia sclerotiorum*).

Image 1. Dead plants in the soybean canopy. Only close examination will reveal the cause.



Here's a brief comparison of some of these diseases and what you might see by looking closer at your crop.

The weather we experienced this past spring into early summer increased the favorability for Phytophthora root and stem rot. While we have also seen reports about Rhizoctonia root rots, the main other stem diseases that can often be confused with Phytophthora are white mold and stem canker (Images. 2, 3, 4). White mold incidence is higher in 2008 as we remained cool and wet throughout much of the growing season providing good soil moisture and thus maintaining a favorable microclimate in the soybean canopy for infection. There are some key differences between the three when scouting fields:

Phytophthora root rot: (i) infected plants are often easy to pull from the ground due to the root rot during the early infection, (ii) stem lesions are the key diagnostic symptom later in the season and include a brown discoloration that progresses 6 to 12 inches from the soil line, (iii) diseased roots are smaller than healthy plants and the taproot and lower stem are internally discolored, and (iv) this can lead to an open areas of the canopy.

Image 2. Phytophthora root rot in soybean.



Soybean stem canker symptoms: (i) first appear during early reproductive stages as reddish-brown lesions at the base of branches or petioles and are first noted after the petiole has dropped, (ii) as the lesion elongates, it will become dark brown to black forming a canker that is sunken in appearance and the stem often becomes girdled, (iii) foliar symptoms can include an interveinal chlorosis and necrosis due to the production of a toxin, (iv) above and below the site of the canker, the tissue remains green and while the leaves may wither, they will remain attached, and (v) unlike Phytophthora, stem canker does not cause a root rot, and this will also differentiate stem canker from diseases like sudden death syndrome.

Image 3. Soybean stem canker.



Symptoms of white mold usually first occur in the early reproductive stages and are characterized by a white mold found around the lower part of the stem along with sclerotia (black fruiting body) in the pith of the stem and on the stem and branches (Image 4). Severe infections can lead to wilting and death of the upper leaves. Plants that have white mold have differing degrees of pod development, thus reducing yield.

Image 4. White mycelial growth and black sclerotia on stem of soybean infected with sclerotinia white mold.



Variety selection, tillage and row spacing are all very important in protecting against these diseases. Without walking through your fields and examining individual plants, these three diseases could be easily misdiagnosed.

Natural, disease-free senescence of your soybean crop will begin with yellowing of leaves, followed by yellowing of the pods and leaf drop. Careful inspection of these yellowing leaves and examination of

the inner stem tissue can confirm whether BSR or SDS is also present. Based on our observations in 2008, we have seen an increase in BSR symptoms late in the growing season and these have required careful inspection and splitting of stems (see below). BSR and SDS leaf symptoms are very, very similar. Image 5 shows leaf symptoms typical of SDS. Notice the interveinal chlorosis and bright yellowing of the leaves. With BSR, the leaves will exhibit the same chlorosis; however the yellowing may be less intense (Image 6).

Image 5. Leaf symptoms of SDS on soybean. Note the bright yellow coloration. This bright yellow is often seen with SDS, but further examination is needed to rule out BSR.



Cutting open the taproot and lower stem of a plant with SDS will reveal a brown or gray outer stem and center pith that is white. The stem pith of a plant with BSR will be brown, with browning more prevalent at the nodes (Image 7). Careful examination of the stem interior is the one way to confirm which disease is present in the field.

Image 6. Interveinal chlorosis and necrosis in soybean caused by BSR.



Image 7. Internal stem symptoms (brown pith) of soybean infected with BSR.



SDS is a fairly new disease in WI. It was confirmed in 9 counties in 2006 and was seen with increased frequency in 2007. In our current surveys of soybean fields in 2008, the level of SDS has not been nearly as high as in 2007, however, it is still important to not just assume that means you have BSR and split stems to verify if the disease you are seeing is SDS or BSR. Also, we are finding more evidence of a link between SDS and soybean cyst nematode (SCN). In most cases where SDS is found, SCN is present as well. Researchers at Purdue have confirmed earlier studies that showed when SCN and SDS are both present, the foliar and stem symptoms of SDS are more severe than if SDS was the only pathogen present. If you find SDS in the fields you scout, be sure to pull a soil sample for SCN. This is where walking your fields, pulling a few plants, splitting the stems and careful examination of the leaves will help you correctly identify diseases (Image 8).

Image 8. Stem and leaf symptoms of SDS (Top) and BSR (Bottom).



Another symptom you may be seeing as you scout your fields is a purplish discoloration of the upper canopy (Image 9). In recent years, *Cercospora* leaf blight (*Cercospora kikuchii*) has been found in Wisconsin with increasing frequency. Foliar symptoms are most evident during late pod filling stage as plants approach maturity and include a light purple discoloration that are either pinpoint spots to irregular patches up to 1 cm in diameter that can occur on both upper and lower leaf surfaces. As symptoms progress, leaves appear leathery and develop into the typical deep red to purple discoloration. In susceptible cultivars, the entire leaf surface may have this appearance. *Cercospora* leaf blight is often mistaken with sunburn, but keep in mind that with sunburn, symptoms are typically seen on the underneath side of the leaf surface and would not increase over time. The causal organism also causes purple seed stain, however, the link between foliar symptoms of *Cercospora* leaf blight and purple seed stain is still not well known.

Image 9. Foliar symptoms of *Cercospora* leaf blight.



More detailed information on these diseases can be found at:

Phytophthora root and stem rot:

<http://www.plantpath.wisc.edu/soyhealth/prr.htm>

Sudden death syndrome

<http://www.plantpath.wisc.edu/soyhealth/sds.htm>

Brown stem rot

<http://www.plantpath.wisc.edu/soyhealth/bsr/bsr/bsr.htm>

Stem canker

http://www.plantpath.wisc.edu/soyhealth/pdf/stemcanker_06.pdf

White mold

<http://www.plantpath.wisc.edu/soyhealth/cause.htm>