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Brown Stem Rot of Soybean

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Brown stem rot has increased steadily in incidence and severity since the introduction of soybean in the Midwest. Brown stem rot was observed first in 1944 in central Illinois and now is prevalent in the North Central states and Canada. Currently brown stem rot is ranked as the third most important disease of soybean in Wisconsin.

Pathogen

Brown stem rot of soybean is caused by the fungus *Phialophora gregata*. The brown stem rot pathogen does not form specialized survival structures, thus the pathogen declines in numbers when soybean is absent from a field. The pathogen is composed of two strains, one is aggressive and causes both foliar and stem symptoms, and the second is a mild strain that causes only stem symptoms.

Symptoms and Losses

The symptoms associated with brown stem rot are characterized as a browning of the vascular and pith tissues of the stem and root, which may be accompanied by a sudden interveinal chlorosis and necrosis, wilting and defoliation of the leaves. The progression of symptoms is related to plant growth and development in addition to soil and climatic conditions. Internal stem symptoms intensify as the plant progresses into reproductive stages. There is no external evidence of the disease in the early reproductive stage and signs of early infection generally go unnoticed unless the stems are cut open and examined or only the mild strain of the pathogen is present. The onset of foliar symptoms typically occurs at growth stages R4 and R5 and foliar symptoms peak at R7. The disease is rarely observed until late July and early August when plants reach the R4 to R5 growth stage. Yield losses of 10-30% are common for susceptible soybean varieties grown in management systems conducive for brown stem rot development. Brown stem rot may not be recognized as a problem because symptoms develop late in the growing season, are not always apparent, and may be confused with normal maturation and senescence of the soybean plant.

Disease Cycle and Epidemiology

The brown stem rot pathogen survives in soybean residue previously colonized during the pathogen's parasitic phase. Infection occurs through roots by growth stage V3 and progressively colonizes stems. Soybean is the only known host grown in Wisconsin thus, extended periods of cropping to nonhosts such as corn or small grains effectively lowers inoculum of *P. gregata*. The rate of inoculum decline is directly related to rate of soybean residue decomposition. The incidence and severity of brown stem rot is modified by ambient and soil environments, and crop management systems. Stem and foliar symptoms are most severe when air temperatures range between 60° and 80° F during growth stages R4 to R6. Air temperatures in the 90° F range will suppress foliar symptom development. Brown stem rot is most severe when optimal soil moisture is present at R1 to R2 followed by dry soil conditions at R5 to R6. The severity of brown stem rot is greater if soils are low in phosphorus and potassium and soil pH is below 6.5. *Phialophora gregata* and *Heterodera glycines*, the soybean cyst nematode, frequently occur together and there is evidence that the severity of brown stem rot is greater in the presence of SCN.

Management

Successful control of BSR has been obtained through crop rotation, especially if 2 to 3 years of nonhost crops are spaced between soybean. If this rotation scheme is not used, other approaches to management are needed such as variety selection and tillage. Also, the incidence and severity of brown stem rot is greater in no-till systems versus tilled systems. The trend for less soil tillage delays decomposition of infested soybean residue and increases the potential for brown stem rot. Maintaining soil pH closer to pH 7.0 reduces the risk of brown stem rot.

Commercial soybean varieties have been improved dramatically for resistance to brown stem rot. There is evidence that much of the greater yield potential realized this past decade is linked to greater brown stem rot resistance. However, susceptible varieties remain on the market, thus, variety selection is important for fields with greater risk of brown stem rot. Current forms of resistance appear effective against all strains of the brown stem rot pathogen, but this situation is being monitored. Most soybean cultivars with SCN resistance tracing to PI 88788 have various degrees of resistance to brown stem rot. However, caution is advised for varieties with SCN resistance derived from Peking or Hartwig, the source of CystX technology, as these two varieties are susceptible to brown stem rot.



Internal stem discoloration caused by the BSR pathogen.



Classic interveinal chlorosis symptoms associated with the more virulent form of BSR



Interveinal chlorosis and necrosis of leaves in the soybean canopy. A BSR resistant variety is planted on the left and a susceptible variety is on the right.

More information on soybean diseases and production can be found at:

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

<http://soybean.uwex.edu>

Pest Management in WI Field Crops-2006

<http://cecommerce.uwex.edu>

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