

Brown Stem Rot of Soybean

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Soybeans with symptoms of brown stem rot have not been common in Ohio in the past few years. But this does not mean that it cannot happen. When this disease does develop it tends to be in fields that have been in continuous soybeans, short rotations, reduced tillage, or no-till. When disease is severe, yield reductions from 10 to 38% have been reported. The fungus, *Phialophora gregata*, only infects soybeans and is also residue borne.

Symptoms

The most common symptom of brown stem rot is the brown to reddish brown discoloration of the stem pith. When disease is severe, the discoloration is continuous throughout the stem from the base of the plant upwards, and the outside base of the stems have a “greasy” appearance. But this does not always occur; more often the discoloration is only present at nodes with healthy appearing pith tissue both above and below the reddish brown color. Foliar symptoms, when present, consist of wilting,

chlorosis, and browning of the tissue between the veins. These foliar symptoms are very similar to another soybean disease, sudden-death syndrome. With brown stem rot, the leaves will wilt and eventually die. Foliar symptoms are influenced by many factors, including the soybean cultivar, temperature, plant age, soil moisture, and variation in the pathogen. There are two types of the brown stem rot fungus. Strain A (also called pathotype 1) causes foliar symptoms and greater yield losses in susceptible soybean cultivars than Strain B (also called pathotype 2), which only causes internal browning in the pith. In addition, foliar symptoms may fail to develop if seasonal precipitation is below normal. When rain or irrigation follows flowering, foliar symptoms tend to be more severe in infected plants. Above normal air temperatures are reported to be suppressive to development of foliar symptoms.

Recent studies from the University of Wisconsin have demonstrated that soil pH can also have a large effect on the development of foliar symptoms. Expression of foliar



Brown stem rot brown discoloration of stem pith.
Photo by OSU Plant Pathology.



Brown stem rot symptom on leaves showing necrotic areas between leaves.
Photo by OSU Plant Pathology.

symptoms is greater in soils with pH levels of 5 up to 7, while foliar symptom severity is greatly reduced at soil pH of 7 and higher.

One of the best ways to identify brown stem rot of soybean is to split the lower stem of affected plants to check for brown discoloration. Healthy plants will have white pith. Leaf symptoms of brown stem rot are quite characteristic; however, they do not always occur. Brown interveinal tissue surrounded by yellow to green along the veins are typical symptoms on the leaves. Symptoms can be readily confused with sudden death syndrome and there are occasions where both diseases have been present in the same field in Ohio.

Disease Cycle

The fungus *Phialophora gregata* survives mainly on crop residue left on the soil surface. Conidia (spores) are produced in late spring, then the fungus invades roots and subsequently the vascular system. After pod formation, symptoms of brown stem rot can be found in affected plants. Low soil moisture reduces the severity of stem and foliage symptoms produced by this pathogen.

Disease Management

Tillage, rotation, and soybean cultivar all affect the severity of brown stem rot.

1. Crop rotation with non-host plants like corn and small grains will prevent build-up of the brown stem rot fungus to levels that cause economic losses. Continuous planting of soybeans will result in the build-up of inoculum on crop debris, which results in more disease and greater severity in seasons with environmental conditions favoring disease development. A minimum of two years between soybean crops in fields with a history of brown stem rot is recommended.
2. Cultivars with resistance to brown stem rot have been developed; 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, such as crop rotation to limit the build-up of *Phialophora gregata*, in production fields. One new finding from the team

at University of Wisconsin and University of Illinois is that soybean varieties developed from the SCN resistant source, PI88788, are also resistant to *P. gregata*. This is a bit of serendipity as the genes that confer resistance to each of these soybean pathogens are different. Resistance to *P. gregata* is complex requiring at least 2 genes to be effective. In addition, the resistance is not complete, but does allow some colonization and under high disease pressure, some foliar symptoms do develop albeit limited.

3. Severity of brown stem rot was 30% greater and yields were 15% lower in no-till than in conventional tillage in a study completed in Wisconsin. When severe disease occurs, deep plowing of infested crop debris may reduce the survival of the fungus, but this practice should be used in combination with sufficiently long rotation sequence.
4. Additional disease management strategies for fields with a history of brown stem rot may include planting soybean cultivars with shorter relative maturity. These 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. It should be noted that planting soybeans in narrow rows does not influence the incidence of brown stem rot.
5. Maintain optimum soil fertility and pH for soybean production. The optimum fertility will help to maximize yields but also the pH may contribute to reducing disease severity if *P. gregata* is present in a particular production field.

Links to other useful sources of information on managing brown stem rot:

Ohio Field Crop Disease

<http://www.oardc.ohio-state.edu/ohiofieldcropdisease/soybeans/bsr.htm>

Soybean Plant Health Initiative

http://www.planthealth.info/bsr_mgmnt.htm

University of Wisconsin

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

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