COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

Brown Stem Rot of Soybean

Amilcar Vargas, M.S. student, Department of Plant Pathology, The Ohio State University.

Dana Martin, Research Associate, Department of Plant Pathology, The Ohio State University.

Anne E. Dorrance, Professor, Department of Plant Pathology, The Ohio State University.

Brown stem rot (BSR) is not commonly found in Ohio. When it does occur it is most commonly found in fields that have a low pH, that have been in continuous soybeans, have short crop rotations, and have reduced tillage or no tillage. Under high disease severity, yield reductions from 10 to 38% have been reported.

Causal Agent

Brown stem rot is caused by a residue-borne fungal pathogen, *Cadophora gregata* formerly known as *Phialophora gregata.* The fungus infects through the roots then travels upward to colonize primarily in the vascular system and pith, then possibly spreads to the leaves. Leaf infection depends on which genotype of the fungus is present. Genotype A will cause symptoms on leaves such as chlorosis and necrosis, while genotype B only causes browning of pith and vascular system. Both genotypes can be effectively managed using the strategies outlined in this fact sheet.

Figure 1. *One of the best ways to identify brown stem rot of the soybean is to split the lower stem of affected plants to check for the brown pith region. Healthy plants will have a white pith as will those with sudden death syndrome.*

Symptoms and Signs

The most common symptom of brown stem rot is the brown to reddish-brown discoloration of the soybean stem pith (Figure 1). This internal stem browning is the diagnostic characteristic of this disease, but the discoloration may only occur in sections of the stem. When disease is severe, the discoloration is continuous throughout the stem from the base of the plant upwards, and the outside base of the stem may have a “greasy” appearance. Foliar symptoms may be absent, but when present consist of wilting, chlorosis, and necrotic tissue between the veins (Figure 2). These foliar symptoms are very similar to another soybean disease, sudden-death syndrome (SDS). The primary difference between these two diseases is the discoloration of the pith. BSR will have a brown to red pith, while in SDS it will remain white (Figure 1).

Figure 2. *Leaf symptoms of brown stem rot are quite characteristic, however, they do not always occur. Brown interveinal tissue with yellow to green veins are typical symptoms on the leaves.*

As disease progresses, it is possible that leaves will wilt and eventually die. Foliar symptoms are influenced by many factors including; the soybean cultivar, temperatures, plant age, soil moisture and variation in the pathogen. There are two pathotypes of *C. gregata;* genotype 1 causes foliar symptoms and greater yield losses in susceptible soybean cultivars than genotype 2, which only causes internal browning in the pith. In addition, foliar

***Figure 3**. A healthy soybean stem (left) and one infected with BSR, showing severe brown discoloration (right).*

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.

Disease Cycle

The fungus, *Cadophora gregata,* survives mainly on crop residue left on the soil surface. Conidia (spores) are produced in late spring, favored by cool temperatures, then the fungus invades roots and subsequently the vascular system. The fungus will colonize in the pith and vascular system, eventually moving to the leaves, if genotype A. Symptoms most commonly appear after pod formation.

Disease Management

Choosing soybean variety with resistance to BSR as well as time to maturation, and using certain cultural practices such as tillage and crop rotation are all important strategies to consider when implementing a management program for brown stem rot.

Host Resistance: Brown stem rot resistant varieties have been developed and are very effective.

Monitor SCN levels: High levels of soybean cyst nematode have also been shown to influence disease development. Keep SCN levels low through crop rotation to mitigate secondary damage.

Cultural Practices: Continuous planting of soybeans will result in the build-up of inoculum on crop debris, which results in more disease and greater severity when environmental conditions are favorable. Rotating 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. A minimum of two years between soybeans crops in fields with a history of brown stem rot is recommended.

In no –till cropping, severity of brown stem rot was 30% greater and yields were 15% lower than in conventional tillage, according to a study completed in Wisconsin. When severe disease occurs, deep plowing of infested crop debris may reduce the survival of the fungus. This practice should be used in combination with sufficiently long rotation sequence for the best results.

Early-Maturing Varieties: 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 row does not influence the incidence of brown stem rot.

Soil pH: Brown stem rot severity is higher when pH decreases. Therefore, modifying soil pH to close to 7.0 will reduce the risk of Brown stem rot.

Useful References

Crop Protection Network– Scouting for Soybean Stem Diseases
http://cropprotectionnetwork.org/soybean/scouting-soybean-stem-diseases/

C.O.R.N. Newsletter– OSU Agronomic Crops Network

https://agcrops.osu.edu/newsletter/corn-newsletter/