NebGuide

University of Nebraska–Lincoln Extension, Institute of Agriculture and Natural Resources

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Sudden Death Syndrome of Soybean

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This NebGuide addresses symptoms and management of Sudden Death Syndrome of soybean and includes photos to aid in disease identification.

Sudden Death Syndrome (SDS) of soybeans is a soilborne fungal disease caused by *Fusarium virguliforme*. First found in Arkansas in 1971, the pathogen has spread throughout soybean-producing states. It was identified in Nebraska in 2004. This fungus overwinters in soybean residue and in the soil as chlamydospores. Chlamydospores are survival structures that can withstand freezing and a variety of environmental conditions for many years. When soil temperatures begin to increase in the spring, chlamydospores germinate and infect soybean roots. Foliar symptoms are caused by one or more toxins produced by the fungus and translocated to the foliage.

Symptoms

Though the fungus infects the plant early in the growing season, foliar symptoms of SDS typically do not appear prior to soybean flowering. Early symptoms at the R3 (beginning pod) and later growth stages consist of the presence of chlorotic (yellow) spots on the leaves between veins. As the symptoms advance, the yellow spots may coalesce, but stay between the veins at the leaf margin (*Figure 1*). Eventually the yellow areas between the veins become brown (necrotic) as the tissue dies (*Figure 2*). While causing foliar symptoms, the fungus cannot be found in the leaves and rarely moves more than a few inches above the crown.

Figure 1. Yellow (chlorotic) spots between veins are typical early stage symptoms of sudden death syndrome of soybean.

Roots will exhibit an obvious root rot, typically on the tap root. The discoloration of the vascular tissue is restricted to the outer stem area (xylem vessels) and can extend up the stem from the soil line (*Figures 3* and *4*). The pith remains white (*Figure 3*) with discoloration under stem tissues. This is a key symptom to differentiate SDS from brown stem rot. (Brown stem rot will cause the pith to be discolored starting at the crown and moving up the stem.) Pods may be aborted and plants may defoliate early. Defoliated

Figure 2. Late-stage SDS foliar symptoms (Albert Tenuta, Ontario Ministry of Agriculture, Food and Rural Affairs)

Figure 3. White pith of SDS-infected plant

Figure 4. Internal taproot discoloration caused by sudden death syndrome of soybeans

Figure 5. Cobalt blue fungal growth on roots

plants will retain their petioles (leaf stems). Retention of the petioles is a symptom frequently associated with SDS.

Symptoms on the root system are difficult to distinguish from other soybean root rots. When roots are removed from soil, the fungus can be visible on the outer root surface as masses of cobalt blue growths (*Figure 5*) if there is adequate moisture. Symptoms are often more severe in the upper canopy (*Figure 6*). Since the SDS pathogen is soilborne, it will show up in the same areas each season and spread with soil movement.

Favorable Environmental Conditions

Sudden Death Syndrome is favored in high-yield environments. The disease is more prevalent during cool, wet growing seasons and is favored by early planting in cool soils. Hot, dry weather appears to slow disease development, but depending on the growth stage and infections which may have occurred prior to dry weather, it can become severe under these conditions. Heavy rains around flowering promote foliar symptom development. During these wet periods, toxins produced in the roots are translocated to the leaves causing interveinal discoloration and leaf drop. If

Figure 6. SDS of soybeans. Note leaf symptoms are more severe in upper canopy than in the lower canopy.

environmental conditions are not favorable for the fungus, damage from SDS will be limited.

Management

Genetic Resistance: Varieties with resistance or tolerance to SDS should be considered in fields known to be infested with the SDS pathogen.

Cultural Management: Avoid early planting in fields known to be severely affected by SDS. Soil temperatures below 60°F can favor SDS infection. Reducing compaction and improving soil drainage will reduce the risk of SDS.

Rotation: Due to long-lasting spores, the fungus can survive in soil without a host for many years and crop rotation does not appear to significantly reduce SDS.

Chemical Control: Seed treatment fungicides have not been shown to be effective in controlling this disease.

Soybean Cyst Nematode (SCN) Control: SCN pressure can increase SDS levels, as SCN weakens plants and creates wounds favorable to invasion by other pathogens. Selecting SCN-resistant soybean varieties can reduce the impact of SDS.

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