SUDDEN DEATH SYNDROME OF SOYBEANS

Edward J. Sikora, Professor and Extension Specialist, Department of Entomology and Plant Pathology
Dennis Delaney, Extension Specialist, Department of Agronomy and Soils

Sudden Death Syndrome (SDS) of soybeans, caused by the soil inhabiting fungus *Fusarium solani f. sp. glycine*, was observed in fields in north and west Alabama, and in north Louisiana in July, 2004. Periodically, the disease has been a problem in the mid-south and mid-west since the 1980’s. In most years, the disease is of minor importance. In years when disease symptoms are widespread and apparently severe, soybeans yields are generally excellent.

The disease can be a particular problem when wet, relatively cool conditions prevail during the early flowering period. Losses rarely exceed 15%; however, losses of up to 70% have been reported. The name “Sudden Death Syndrome” is somewhat misleading since the disease may take up to 14 days to fully develop. The name stems from the fact that in wet years, foliar symptoms seem to spread rapidly through a field at or after the pod filling stage.

SDS can vary greatly in appearance and severity from year to year. The disease is favored by cool, wet weather through the first half of the growing season. Hot and dry conditions limit the development of the disease but will not totally eliminate it from an area. Early planted beans tend to be more heavily damaged than later planting because of more favorable conditions for infection by the Fusarium fungus early in the season. Thus, delaying planting until after soils are warm and dry can help reduce the impact of the disease.

**Epidemiology.** *Fusarium solani* can survive in root tissues, as mycelium, as spores in the soil, and/or on crop debris, but SDS is not known to be transmitted through seed. This pathogen can also colonize corn and some other crops grown in Alabama. Since the primary inoculum occurs in the soil, movement of soil or infected plant debris could transfer the disease. Fusarium commonly invades roots through wounds caused by insects, nematodes or from mechanical injury. Conditions favoring infection by *Fusarium solani* are saturated soils and temperatures of 55 to 65 degrees with maximum infectivity at the lower end of this range. Like many other soil-born diseases, SDS losses are greatly dependent on environment, variety, time of infection, and the general vigor of the soybean crop.

After colonization, it is believed that the fungus produces a toxin which is translocated to the upper leaves, causing the characteristic spotting, interveinal necrosis and other symptoms. However, the similarities of SDS foliar symptoms to several other soybean diseases that affect the vascular system suggest that symptom expression is probably a response of the plant to stress at pod fill.
Stress, especially that affecting root development, may increase losses due to SDS. The soybean cyst nematode (SCN), in particular, predisposes plants to infection by producing feeding wounds in the roots as well as affecting plant vigor. Research has shown that SDS is far more likely to occur in a field with a moderate to high population of SCN. Research in Mississippi has shown that *Fusarium solani* can be isolated both externally and internally from SCN. Management of SCN will not eliminate SDS but can significantly reduce losses.

Tillage does not seem to have a direct effect on SDS levels. However, reduced tillage produces additional residues which may not decay during the winter and cause slower warming and drying of the soil in the spring, allowing for conditions that are favorable for Fusarium.

**Symptoms.** Foliar symptoms of SDS typically do not appear prior to flowering. Early symptoms at the R3 and later growth stages, if present, appear as yellow spots on the upper leaves between the veins. These spots gradually enlarge and develop a brown necrotic (dead) center. They continue to enlarge until all of the interveinal tissues are killed, leaving a green vein pattern on the leaf. The time involved for this symptom to develop is dependent on the weather and the variety of soybean in the field. Defoliation follows the development of interveinal necrosis. Petioles remain firmly attached to the plant after defoliation. This may occur late in the season and be mistaken for early maturity. Flower and pod abortion is common with SDS. Infected plants generally set some pods on the lower stem area and abort the majority of their flowers. Lower pods may or may not fully ripen depending on the time of infection.

A diagnostic feature of SDS is found by splitting the stem lengthwise and examining the pith. The central pith should be white with no discoloration or decay. A slight browning of the vascular system just outside the pith area is often seen on the lower stem and root. The discoloration of the vascular system will not extend more than an inch or two above the soil line. SDS foliar symptoms can be confused with symptoms caused by other soybean diseases such as stem canker, brown stem rot, charcoal rot, red crown rot and southern blight (white mold). Roots may also exhibit some decay and discoloration and can easily be pulled from the soil. Nodulation is often sparse on SDS-infected plants. However, these symptoms are commonly seen with many other root rotting pathogens and cannot be considered diagnostic.

**Control:**

1. Varieties resistant to SDS are available. Growers are advised to check literature provided by their seed supplier for information on disease resistance. Many new varieties, and especially varieties in later maturity groups, have not been evaluated for resistance to the disease.

2. Grow well-adapted, high yielding varieties in a warm, well drained, fertile soil. Maintain balanced soil fertility based on soil test information.

3. Where feasible, improve drainage in the field and reduce soil compaction. Reduction of soil compaction will help internal drainage and improve root growth and development, factors that can affect SDS development.

4. Control other diseases, insect pests and weeds to help reduce stress on the crop.

5. Monitor and control SCN populations. Use soil sampling, SCN-resistant varieties and crop rotation to reduce SCN levels.

6. Although SDS is not seed transmitted, seeds from infected plants are small in size and tend to produce less vigorous seedlings than those from healthy plants. Therefore, do not save seed from SDS-infected areas.
7. Crop rotation, although not consistent in significantly reducing levels of Fusarium, is beneficial in reducing the buildup of other pathogens, especially nematodes that may weaken and stress the plant. SDS has been found in fields with continuous soybeans, in fields in soybeans following one or two years of corn or cotton, as well as in fields that have been out of soybeans for many years.

8. SDS tends to be more severe in fields under reduced tillage regimes. Late planting, as occurs with double cropping small grains and soybean, or the use of early maturing varieties may also suppress disease development.

9. Sanitation (e.g., cleaning tires, combines and other equipment of soil and crop debris), although time consuming, will help reduce the spread of the SDS fungus, as well as SCN and other soybean diseases.