RISK OF SUDDEN DEATH SYNDROME IN WISCONSIN

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Introduction

Sudden death syndrome (SDS) of soybeans, causal agent *Fusarium solani* f. sp. *glycines*, has been observed frequently in soybean fields in the North central states since the early 1990s. Symptoms of SDS had been observed in Wisconsin previously, and the causal agent was confirmed by laboratory analysis in 2006. Nine counties are now confirmed to have positive SDS reports (Figure 1).

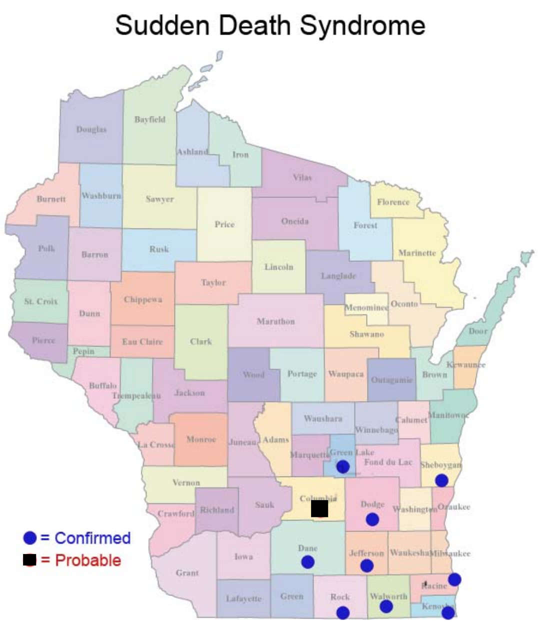

Figure 1. SDS has been confirmed in nine counties in Wisconsin, and likely to be found in at least one more.

Symptoms

The first symptoms of SDS are usually observed on the foliage (Figure 2). Leaves are characterized by interveinal necrosis and chlorosis, indistinguishable from the symptoms of brown stem rot. Despite the similarity of foliar symptoms, SDS symptoms can be separated from those of BSR by observing the timing of symptoms, absence of internal stem discoloration, and degree of root rot. Symptoms of SDS become apparent earlier in the reproductive phase, usually

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R3 or R4, in comparison to R5 or R6 for BSR symptoms. Often, as leaves drop, petioles will remain attached to the stem in soybeans infected by the SDS pathogen. Internal discoloration in the stem is not observed beyond lower nodes with SDS symptoms. Roots may be brown and stunted due to root rot caused by the SDS pathogen and not so for BSR. Often, the location of infected plants may be limited to an area where water had been sitting for sometime, or along a wet portion of the field.

Figure 2. Interveinal necrosis and chlorosis foliar symptoms typical of Sudden death syndrome.

Epidemiology

SDS severity varies from year to year because of the influence of environment, especially soil moisture and temperature. High soil moisture, especially in the early months of growth, increases severity of foliar symptoms (Roy et al., 1989; Rupe et al., 1993; Vick et al., 2001). Studies in controlled temperature facilities showed that disease was more severe at cooler soil temperatures and higher soil moistures, and that each factor affected disease development independent of the other (Vest et al., 2001). Additionally, cooler temperatures during the early reproductive stages are reported to increase disease severity (Roy et al., 1997).

Yield loss due to SDS can be significant, even in the absence of foliar symptoms (Njiti, et al. 1998; Luo, et al. 2000). Yield loss factors include lower seed weight and quantity, especially when symptoms appear before growth stage R5.5. While yield losses may be near 100% in some areas in years of high disease pressure, year to year environmental variability, coupled with field variability may result in sporadic yield loss in a given area (Hartman, 1995). Yield loss caused by SDS in Wisconsin is not known.

Often, symptoms of SDS can serve as an indicator for presence of soybean cyst nematode (SCN). Typically a problem of high yield soybeans, presence of SDS may also indicate presence of soybean cyst nematode (SCN), a serious pest of soybean. Field and greenhouse studies have shown SDS foliar severity is greater in when SCN is present (Xing and Westphal, 2006; Gao et al., 2006). The SDS pathogen has been found to colonize cysts of SCN, which may accounts for common simultaneous occurrences of both pathogens (Roy, et al. 2000).

Management Strategies for SDS

Management of SDS can be achieved by use of resistant or moderately resistant cultivars. SDS resistance varies widely by soybean variety (Figure 3). As prevalence of SDS has increased, companies are including SDS ratings for their product lines. An informal survey of seed company soybean product lines indicated 57% of the listed varieties were characterized for SDS resistance. Individual seed companies reported an SDS rating for 37 to 62% of their product line adapted to Wisconsin. Most of the varieties were given a rating of moderate resistance rather than resistant. It is notable however, that not all seed companies screen for SDS, so it is important for growers and consultants to be aware of the potential risks. Because presence of SCN can alter a cultivar's reaction to the SDS pathogen, it is desirable to utilize a cultivar with SCN resistance to limit yield loss. The majority of the seed companies have data on SCN resistance for their varieties so an effective management strategy may be implemented around variety selection.

Figure 3. SDS susceptible soybean variety surrounded by a variety with resistance. Note the susceptible variety is very chlorotic, shorter and does not have canopy closure.

Cultural practices can be part of an SDS management strategy. Correcting or limiting soil compaction may reduce amount of SDS development. In areas where compaction is problematic, subsoiling can increase porosity, decrease water-holding capacity, and reduce disease severity substantially (Vick et al., 2001). Severity of SDS is reported to increase as sand content in soil increases, but decreased as soil pH was lowered from 7.7 to 5.5 (Sanogo and Yang, 2001). Delayed planting may have some effect on limiting losses due to SDS (Rupe and Gbur, 1995). The effect of planting date may be related to soil temperature. Cooler soil temperatures have been shown to increase severity of SDS. Late planting must be balanced with other potential disease risks, however. Increased soybean aphid pressure and virus incidence are associated with later plantings. Severity of SDS has been found to be greater in no till systems, presumably because of cooler soil temperatures, increased moisture and greater residue reserves that harbor pathogen inoculum. (Von Qualen et al., 1989; Wrather et al., 1990). Crop rotation and crop sequence does not influence SDS severity. (Rupe and Hartman, 1999).

The increased presence of SDS in Wisconsin fields will mandate careful scouting practices. Because there is not one management option that will prevent yield losses, a multi-faceted approach will need to be taken. By careful scouting for SDS and SCN, choice of a resistant soybean variety and utilizing cultural practices that do not favor disease development, growers will be able to effectively manage this new threat.

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