Soybean Sudden Death Syndrome Overview

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Among the top four loss causing diseases of soybean [Glycine max (L.) Merrill.], worldwide were the root rot and leaf scorch called Sudden Death Syndrome (SDS; Wrather et al. 1996; 2003). Over a five year period 1999-2004 average losses around 1% or 0.9 million Mg per harvest, worth $190 million a year, were reported. The syndrome was accurately predicted to intensify and spread over the next 20 years over the whole north central region (Scherm and Yang, 1996). SDS starts in field as hotspots associated with low areas and over 3-5 years become established throughout the field. There is no means to stop its spread. Agronomic solutions are costly and often ineffective (late planting, deep tilling etc). Therefore, improved genetic resistance in germplasm releases will be key to containing soybean losses to SDS (Gibson et al. 1994; Kazi et al, 2008). SDS was shown to be caused by the blue-pigmented soil borne fungus Fusarium virguliforme (Aoki et al. 2003; ex. Fusarium solani (Mart.) Sacc. f. sp. glycines; Fsg; Roy 1997). F. virguliforme is a member of an evolutionary group known as the “F. solani complex” that colonize a wide variety of habitats and hosts (Gray et al. 1999; O'Donnell, 2000). They are serious pathogens of many crops. Analysis in North America showed that only F. virguliforme prompted the symptoms of SDS on soybean but in South America two separate species, F. tucumaniae and F. virguliforme, were both responsible for SDS (Aoki et al. 2003; Covert et al. 2007). The genetics of resistance to SDS is complex. Stephens et al. (1993) reported that a single dominant gene, Rfs controls SDS resistance in ‘Ripley’ soybean in greenhouse conditions. In contrast, the ‘Essex’ by ‘Forrest’ (ExF) population (Hnetkovsky et al. 1996; Chang et al. 1996; Kassem et al. 2006) showed that the SDS resistance was conditioned by several quantitative trait loci (QTL). By 2007, more than twenty detections of QTL for resistance to SDS have been reported among eight different recombinant inbred line (RIL) populations. Soybean [Glycine max (L.) Merr.] cultivars show differences in their resistance to both the leaf scorch and root rot of sudden death syndrome (SDS). Root susceptibility combined with reduced leaf scorch resistance has been associated with resistance to H. glycines HG Type 1.3.6.7 (race 14) of the soybean cyst nematode (SCN). In contrast, the rhg1 locus underlying resistance to Hg Type 0 was found clustered with three loci for resistance to SDS leaf scorch and one for root infection. Interactions with SCN are currently a topic of intense research.

Bibliography


