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Phytophthora and other soil-borne diseases of soybean

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There have been several studies in the past decade that have raised awareness of the diversity of species that contribute to soybean stand loss as well as the diversity within species that can impact management. In addition to *Phytophthora sojae* and a few *Pythium* spp., more than 40 species of *Pythium*, *Phytophthora sansomeana*, and *Fusarium graminearum* and other *Fusarium* spp. are now recognized as pathogens of soybean. Host resistance continues to be the primary disease management strategy for the numerous root, stem, and foliar pathogens of soybean. Over the past 2 decades numerous sources of resistance have been identified, characterization of the genetic loci and mechanisms that contribute to resistance are being realized. More than 20 *Rps* genes have been identified for resistance to *P. sojae* which has a gene-for-gene relationship with its soybean host. Numerous QTL have been mapped that are associated with resistance to *Phytophthora sojae*, several *Pythium* spp., *F. graminearum*, and *F. virguliforme*. The majority of the QTL are minor and contribute to less than 10% of the phenotypic variation, while a few have been identified for both *P. sojae* and *F. graminearum* that contribute 20% or more. Within a recombinant inbred line (RIL) population that was segregating for resistance to more than one pathogen, different loci were associated with resistance to *P. sojae* compared to *Pythium* or *F. graminearum*. In addition, QTL-isolate specificity was identified for *P. sojae*. Perfect markers, which are developed from the genes that contribute to a trait of interest, will be required to improve the success of marker assisted selection. With quantitative resistance, high levels of disease or when resistance is not expressed at the right time, additional disease management approaches maybe required. Fungicide seed treatments for water molds or foliar applications at flowering for *Sclerotinia sclerotiorum* combined with resistance have proven beneficial.