



North Central Soybean Research Program

Developing an integrated management and communication plan for soybean SDS

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The foundational management strategy for sudden death syndrome (SDS) is using resistant cultivars. However, in years such as 2010 when environmental conditions are favorable for disease development, resistance alone does not provide adequate control or reduce farmer risk sufficiently. Also, SDS continues to move into new areas. The main goal of this project is to investigate management options that will help ensure resistant cultivars will be as effective as possible even in unusually conducive SDS conditions.

Project Objectives

1. Evaluate if soybean root health can be improved to reduce SDS or be used as an indicator of SDS risk;
2. Determine how shifts in soybean production practices affect the risk of SDS development; and
3. Communicate research results with farmers, agribusinesses and other soybean stakeholders.

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In our previous regional evaluations, fluoyram (ILeVO, Bayer CropScience) seed treatment or in-furrow application was found superior to manage SDS than other fungicide products evaluated. A manuscript was published in *Plant Disease* ([Fungicide and Cultivar Effects on Sudden Death Syndrome and Yield of Soybean](#), *Plant Disease* 100: 1339-1350). We continue evaluating new products including biological fungicides to compare them with base seed treatment and ILeVO in their ability to reduce SDS. In 2017, we performed field experiments in Iowa, Indiana, Michigan, South Dakota, Wisconsin and Ontario, Canada. We evaluated 9 fungicide products applied as seed and foliar applications on SDS susceptible and resistant cultivars. Plant population, root rot, root dry weight, foliar SDS incidence and severity, and yield data were recorded using standard protocols and data are being collected and analyzed.

We completed field experiments in Iowa, Indiana, Michigan, Wisconsin and Ontario

for a study coordinated by Dr. Shawn Conley to investigate the economic risk and profitability of seed treatments on soybeans planted at different populations. The three seed treatments consisted of untreated control (UTC), a commercial base treatment (CB), and CB treatment + ILeVO were compared at different plant populations. Soybean yield was evaluated in fields with and without a history of SDS. A manuscript has been published in Crop Science (Crop Sci. 56:2251-2262) and an extension publication was posted in the CoolBean website - see [Response of Broad Spectrum and Target Specific Seed Treatments and Seeding Rate on Soybean Seed Yield, Profitability and Economic Risk](#). Economic risk and profitability of seed treatments and seeding rate for each seed treatment was also estimated using different soybean prices. The CB and ILeVO seed treatments increased profit at each grain sale price and across all seeding rates compared to the UTC.

A manuscript evaluating planting date and seed treatment effect on SDS development has been published in the journal Plant Disease ([Plant Disease Effect of Planting Date, Seed Treatment, and Cultivar on Plant Population, Sudden Death Syndrome, and Yield of Soybean](#) , Plant Disease 100:1735-1743).

In 2017, we continued field experiments in Iowa, Indiana, Michigan, Wisconsin and Ontario to investigate the effect of corn residue on SDS development. We compared two levels of residue removals and two tillage systems in corn and soybean rotation system. We collected plant population, root rot, foliar SDS, and yield data and they are being analyzed.

We completed field experiments on determining how increasing SCN resistance to SCN-resistant cultivars will affect SDS resistance performance. A manuscript has been posted online in Plant Disease. In summary, we found PI88788 resistance source has been broken by nematode population in all tested sites except in Rodney, Ontario. SCN resistance played a critical role on SDS development. Cultivars with no resistance to SCN had the highest disease and lowest yield. Even though, the PI 88788 type resistance was not holding up, any type of SCN resistance led to greater yields, lower SDS, and lower SCN reproduction than the cultivars with resistance. Fall season SCN population density and SDS were positively correlated.

We identified fields with long-term fertility experiments in collaboration with Dr. Antonio Malarino, Professor of Nutrient Management Research and Extension, ISU, at the Northeast Research Farm in Nashua and the Southeast Research Farm in Crawfordsville, to determine how soil potassium levels affect SDS. We collected SDS incidence and severity and yield data in 2017. Data are being analyzed. We are working on establishing protocols for greenhouse studies.

In 2017, we tagged plants with different visual ratings of SDS from low to high. Root samples were collected to quantify *F. virguliforme*. DNA extraction is in process. Next step will be to quantify the pathogen in root tissue and determine the correlation with visual ratings.

To determine the soil sampling protocol for determining SDS pathogen level in soil, we identified fields with low and high risk of SDS based on previous years SDS severity and collected samples in different time and from different soil zones. DNA extraction has been completed and DNA samples are being processed for qPCR.

We presented our research reports at professional meetings, on Plant Management Network, many state or province level talks, seminars, media interviews, talk in field days and conferences for farmers and also published in state newsletter articles, several media releases etc. To communicate with researchers, we published 6 manuscripts in peer-reviewed journals, including [*Revisiting Planting Date and Cultivar Effects on Soybean Sudden Death Syndrome Development and Yield Loss in Plant Disease*](#).

We also had several press releases, including some jointly with NCSRP, based on results from this project. We developed two regional publications through the Crop Protection Network [Scouting for Sudden Death Syndrome in Soybean](#) and [Soybean Disease Management: Sudden Death Syndrome](#) . We updated SRII with information from this proposal.

The result from this study will have directly benefited soybean farmers in the North Central region and also establish foundation to address future research and management questions.