



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.

Results

We published [Fungicide and Cultivar Effects on Sudden Death Syndrome and Yield of Soybean](#) in the journal *Plant Disease* on the previous two years' evaluation of products. In the last two years' evaluation, ILeVO seed treatment or in-furrow application was superior to manage SDS than other fungicide products.

In 2016, we conducted field experiments in Iowa, Indiana, Michigan, South Dakota, Wisconsin and Ontario, Canada including new fungicide products to compare them with base seed treatment and ILeVO in their ability to reduce SDS. We evaluated eight fungicide products applying on seed and foliage on SDS susceptible and resistant cultivars. Plant population, root rot, foliar SDS incidence and severity, and yield data were recorded using standard protocols. Root samples have been collected and are being processed to quantify *F. virguliforme* in soybean root tissue

using a qPCR assay identified in a NCSRP-funded project. Data collection from participating states and analysis is in process.

We completed a study evaluating planting date and seed treatment effect on SDS development and published a manuscript in [Plant Disease Effect of Planting Date, Seed Treatment, and Cultivar on Plant Population, Sudden Death Syndrome, and Yield of Soybean](#) in the journal *Plant Disease*. The ILeVO seed treatment reduced disease severity and increased yield nearly in all plantings and cultivars, with a maximum yield response up to 21% at the Roland, Iowa location. No clear link between early planting and SDS was observed. Planting earlier than Mid-May did not increase the risk of SDS being developed. Mid-June plantings yielded lower grain up to 19 bu/A compared to early May plantings. In all experiments, early-May plantings resulted in lower or similar FDX as treatments planted in mid-May or early June. We learned from this study that planting should not be delayed for management of SDS.

Field trials investigating planting date and cultivar effects on SDS development and yield were conducted in Wisconsin in 2013 and 2014 (See [Revisiting Planting Date and Cultivar Effects on Soybean Sudden Death Syndrome Development and Yield Loss](#) in *Plant Disease*). Similarly, despite the most symptom development, results of this 2-year study (2013, 2014) suggest that early May planting coupled with appropriate cultivar selection provides maximum yield potential and profitability in Wisconsin.

We completed field experiments on determining how increasing SCN resistance to SCN-resistant cultivars will affect SDS resistance performance. Data analysis is complete and manuscript is near submission to publish in *Plant Disease*. So far, 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 SCN had the highest disease and lowest yield. Fall season SCN population density and SDS were positively correlated.

We established field experiments in Iowa, Indiana, Michigan, and 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. The first year of data on plant population, root rot, foliar SDS, and yield were collected. Soil samples for determining SDS and SCN level on soil will be collected and processed in fall. Data are being gathered and analyzed.

We developed two regional publications through the Crop Protection Network: [Scouting for Sudden Death Syndrome in Soybean](#) and [Soybean Disease Management: Sudden Death Syndrome](#).

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Fluoyram (ILeVO, Bayer CropScience) seed treatment or in-furrow application was found superior to manage SDS than other fungicide products evaluated. We published a manuscript (Plant Disease 100:1339-1350). We continue evaluating fungicides including new products to compare them with base seed treatment and ILeVO in their ability to reduce SDS. In 2016, we conducted field experiments in Iowa, Indiana, Michigan, South Dakota, Wisconsin and Ontario, Canada. We evaluated eight fungicide products applied as seed and foliar applications on SDS susceptible and resistant cultivars. Plant population, root rot, foliar SDS incidence and severity, and yield data were recorded using standard protocols and data analysis has been complete. Root samples were collected to quantify *F. virguliforme* in soybean root tissue. DNA extraction has been complete and DNA samples are being processed for qPCR.

We established field experiments at locations 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. We collected data on plant population, SDS incidence and severity multiple times, and yield. A manuscript has been accepted in Crop Science and an extension publication was written and posted in the CoolBean website. 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.

We completed a study evaluating planting date and seed treatment effect on SDS development and published a manuscript (Plant Disease 100:1735-1743). To summarize, ILeVO seed treatment reduced disease severity and increased yield nearly in all plantings and cultivars, with a maximum yield response up to 21% (Roland Iowa). No clear link between early planting and SDS was observed. Planting earlier than Mid-May did not increase the risk of SDS being developed. Mid-June plantings yielded lower grain up to 19 bu/A compared to early May plantings. In all experiments, early-May plantings resulted in lower or similar FDX as treatments planted in mid-May or early June.

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system. The first year of data on plant population, root rot, foliar SDS, and yield were collected and are being analyzed. Preliminary data analysis showed that SDS was higher in residue not removed treatment than in residue removed for both tilled and no-tilled trials in Iowa. Michigan and Wisconsin did not detect significant difference between treatments in the no-tilled and tilled trials.

We completed field experiments on determining how increasing SCN resistance to SCN-resistant cultivars will affect SDS resistance performance. Manuscript has been accepted for publication and will be published in Plant Disease. 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 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 4 manuscripts and two manuscripts are accepted in peer-reviewed journals. 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 on Soybean* and *Soybean Disease Management: Sudden Death Syndrome*). These are linked to the SR11 site. We also updated SR11 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.