



North Central Soybean Research Program

Improving our understanding of stem canker and how to manage it in soybean across the Midwest

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Progress report October 2016 - April 2017

The overall goal of this research is to unravel the fungal species complex that cause stem canker and related diseases and identify soybean stressors that can influence stem canker in order to develop more effective and economical management strategies.

Project Objectives

1. Increase understanding and importance of diseases caused by *Diaporthe* species. Determine the prevalence of *Diaporthe* species causing stem canker among the soybean producing states.
2. Determine which *Diaporthe* species cause the most damage on soybean.
3. Comparison of inoculation methods to study the aggressiveness of *Diaporthe* isolates by species.
4. Soybean seed treatments and in-furrow treatments for control of *Diaporthe* spp
5. Communicate research results with farmers, agribusinesses and other soybean stakeholders.

Research Accomplishments

October 2016

In Wisconsin, a total of 5 fields were sampled in late 2015. Among all locations the primary species obtained was *Diaporthe caulivora*, which is the causal agent of northern stem canker. In addition, at one location we also recovered *Diaporthe longicolla*, which is the casual agent of pod and stem blight. At this location both *Diaporthe* species were present in the field.

In Wisconsin a fungicide management trial was also implemented in a field with a history of stem canker/pod and stem blight in 2015. Stem disease was observed in the field. At harvest, yield was determined and sub-samples of seed were obtained. Seed were then examined for damage, and all organisms causing seed damage were isolated. Out of those plots 9 isolates of *Diaporthe* spp. were confirmed. Five

of the isolates were *D. longicolla*, while four isolates were confirmed to be *D. caulivora*.

In 2016, Stem canker and pod and stem blight have had very limited occurrence in Wisconsin. Several fields suspected to be damaged by *Diaporthe* spp. were sampled in 2016 in Wisconsin. Isolates were obtained from those samples and are currently being identified using genetic markers. In Wisconsin, sampling thus far has indicated a mix of *D. longicolla* and *D. caulivora* on soybean stems and seed.

In South Dakota, 52 fields across 9 counties were surveyed for soybean stem canker. The soybean fields were selected arbitrarily, with no fields being closer than 5 km from a previously selected field. In each field, one to two transects (rows) were randomly selected. In each transect in a field, five plants exhibiting reddish brown lesions and cankers on the soybean stems were arbitrarily selected until the end of the transect was reached.

In the 52 fields sampled and based on isolation, *Diaporthe* spp. was prevalent in 45 fields and the percentage of isolation was 36%. In addition to *Diaporthe* spp., *Fusarium* spp. (78%), and *Macrophomina phaseolina* (16%) were also recovered. Isolates for DNA sequencing was selected based on similarity of their cultural characteristics on PDA. In total, 39 representative isolates were sequenced and these were confirmed to be *Diaporthe longicolla* based on DNA sequencing. In South Dakota, *D. longicolla* appears to be the primary *Diaporthe* species in soybean fields.

In Indiana in 2016, 10 fields were sampled for soybean plants with symptoms indicative of stem canker. These samples have been sent to cooperators in South Dakota for isolation and identification of fungi. In Iowa one field was observed with stem canker in 2016. Samples will be collected during harvest if other fields are identified. Stem canker and pod and stem blight were not a major diseases in Iowa in 2016. Sampling will continue into 2017.

Three outreach publications were developed and distributed:

[Scouting for Soybean Stem Diseases](#)

[Scouting for Soybean Stem Diseases - trifold version](#)

[Pod and stem blight and Phomopsis seed decay](#)

April 2017

Objectives 1 is ongoing in this project and we continue to sample symptomatic soybean plants in all states, as disease is observed. In Indiana, sampling of symptomatic soybean plants was conducted in 7 fields during the 2016 field season. These sample were sent to co-PI Mathew and identified to species. *Diaporthe caulivora* was present in two counties, and *D. longicolla* was present in the other 5 counties. This trend of mixed ratios of species continues to persist among all locations where sampling is taking place. In Wisconsin and Iowa stem canker was not a common disease in 2016, thus no samples were collected in that year. In South Dakota, species identification of a large isolate collection that was made in

2015 is ongoing.

Progress on objective 2 was made in Indiana and Wisconsin. In Indiana, Stem canker was discussed at 3 late-season field talks and Crop Protection Network materials related to stem canker and pod and stem blight were promoted at those events. In Wisconsin, talks on stem canker and pod and stem blight were presented at 7 fall farmer and consultant meetings. Crop Protection Network materials were also distributed on these diseases, at these meetings.

Progress on the objective 3 (new objective) has been the current focus of the project. Much of the work on this objective is directed by Co-PI Mathew. First, comparison of inoculation methods to study the aggressiveness of *Diaporthe* isolates by species– *Diaporthe aspalathi*, *Diaporthe longicolla* and *Diaporthe caulivora* was just started this spring. This project is on-going and results should be available soon and will be presented at the annual meeting of the American Phytopathological Society.

Interaction between *Diaporthe longicolla* and soybean aphid was tested through controlled experimentation in the greenhouse. Results of these initial experiments suggest that there is no interaction between soybean aphid and infection by *Diaporthe longicolla*. However, further experiments need to be conducted. Initial experiments to test the interaction between *Diaporthe longicolla* and soybean cyst nematode were also conducted. Initial results suggest that there is no interaction between these two species. However, this will be investigated further and additional *Diaporthe* spp. by SCN interactions will be tested in the coming months.

Plans to address soybean seed treatments and in-furrow treatments (Objective 4; new objective) for control of *Diaporthe* spp. are being developed for the 2017 field season. At least two locations (Iowa and South Dakota) will test seed treatments and control of *Diaporthe*-induced disease. In two locations (Wisconsin and Iowa) in-furrow application of fungicide will be conducted to investigate control of *Diaporthe*-diseases. These results will be tabulated across location and initial return on investment (ROI) results (Objective 5; new objective) will be presented at fall grower and consultant meetings.