MSR&PC Production Action Team Final Report 2019-2020

- **MSR&PC Award Number:** 10-15-44-19-160-7527
- **Principle Investigator:** Dean Malvick
- **Department/Organization**: Department of Plant Pathology, University of Minnesota, St. Paul, MN
- **Project Title: Improving Management of White Mold, SDS, and Root Disease in Minnesota**
- **Dates of Reporting**: **May 2020**

Activity and updates for this project are shown below for each objective. Please let me know if you would like additional information beyond what is included here. Thank you.

Project Objectives

1. Optimize Management of White Mold

Goal A. Determine the efficacy of genetic resistance, fungicides, and plant population reduction for management of white mold

Soybean white mold field studies were planted and established as planned in 2019 at Rosemount, MN. Plots were established with a high population of 180,000 seeds/acre with 15" row spacing and applied fungicides and other treatments in July. We did everything possible to establish and increase white mold in the studies. We planted a susceptible variety in early May, inoculated the plants twice to increase the odds of establishment of white mold, and irrigated twice per week in July and August. Plants were tall (chest high) and very dense in mid-August. We scouted and rated disease in the plots throughout August and early September. Plots were harvested for yield at maturity.

In spite of the effort, expense, and time we put into these studies to establish and increase white mold, only very low incidence levels (<1%) of white mold developed in some of the plots. This is the lowest level of white mold that has developed in our studies over the past 10 years of white mold research. Thus, there was insufficient white mold in the study to detect fungicide treatment effects on white mold incidence and severity. There were no clear and significant yield increases with fungicide applications. However, at growth stage R6.5, there was an effect of the fungicides on greening, with % greening ranging from 48% to 73% for fungicide treatments, but again as noted, this did not translate into yield.

Table 1. Effect of fungicide treatments on white mold incidence, leaf greening at growth stage R6.5, and yield in field study at Rosemount, MN 2019.

Treatment	White mold incidence	Greening %	Yield (Bu/Ac)
Endura R1	0	55	72
Aproach R1/R3	0	65	76
Endura R1, Revytek R3	0	70	71
Maravis Neo 13.7 oz R1/R3	0	73	72
Proline R1	0	55	69
Untreated	0	48	68
Grand Total	**0**	**61**	**71**

Goal B. Determine the value of Contans® for white mold management in on-farm trials.

Contans® s a biological fungicide that has been proven to kill sclerotia of the white mold fungus (*Sclerotinia sclerotiorum*), but few efficacy studies have been done with soybean. Plans were in place to apply Contans® in spring 2019 in three studies in three different soybean fields in western MN that have a strong history of white mold. However, due to various factors, the trials were not established by the cooperators as planned, partially due to long periods of wet weather in the spring. Two of the field trials were not established at all due to weather and other factors occurring on the farms.

One trial was established near Boyd, MN in a field that had heavy white mold pressure in 2017. Contans® was applied in 6 strips, each 100 ft wide across a field. Between each treated strip was a check strip 100 ft wide that was left untreated. However, the Contans was not applied until the first week of June, much later than planned, due to frequent rains that slowed field work. White mold developed in the field at moderate levels, however, there was no measurable effect of the Contans on yield, and white mold incidence and severity ratings were not able to be collected. I believe the Contans® was applied too late to allow enough time for the product to kill the white mold pathogen structures (sclerotia) in the soil, and thus had no measurable effect on white mold or yield in the field.

2. Improve management and risk analysis for SDS.

Goal A. Determine the effects of pathogen population size in soil and other common root pathogens on development and management of SDS.

We focused our work on this objective on the effects of other soilborne fungal pathogens on the development of SDS. The results as summarized below support the idea that the presence of other pathogens in the soil can influence development of SDS, which has implications for assessing risk of SDS and for managing this disease, i.e. multiple fungicides with different modes of action may be beneficial.

Due to the very wet conditions in spring 2019, we were not able to establish field studies to further determine the effects of soil populations of the SDS soil pathogen (*Fusarium virguliforme*) on SDS development.

Four experiments to determine the effects of common soybean root pathogens on SDS were completed in a greenhouse. The results show that different fungi that commonly infect soybean roots in MN can alter the amount of SDS that develops in soybean plants. Some of the fungi can increase SDS and some can decrease severity of SDS. The results indicate that these other fungi (primarily other *Fusarium* spp.) should be considered when managing SDS.

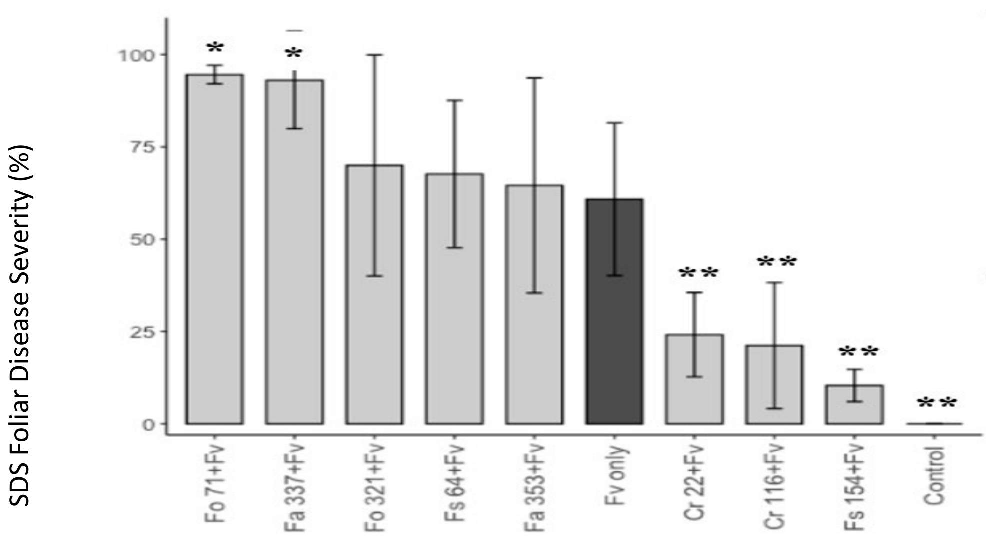

Figure 1. Foliar disease severity (FDS) of soybean plants coinoculated with *Fusarium virguliforme* (*Fv*) and one isolate of the soilborne fungal species *F. acuminatum* (*Fa*), *F. oxysporum* (*Fo*), *F. solani* (*Fs*), and *Clonostachys rosae* (*Cr*) under growth chamber conditions. Values represent the means ± SD of four replications. FDS was scored on a scale of 0 – 100 based on percentage of chlorotic and necrotic leaf area. Treatments that are significantly different from the *Fv*-only treatment are indicated (α=0.10 * and α=0.05 **).

3. Technical transfer of disease management information via extension education programs, and support of soybean disease diagnostic needs that address important soybean disease problems in Minnesota.

Goal A**:** Disseminate technical disease management information, and teach and organize specialized events to improve soybean disease understanding and management.

My focus has been on answering questions and addressing concerns from producers and crop consultants at Extension events across Minnesota, see below for more details.

Goal B: Support and conduct specialized diagnosis of unusual soybean disease problems and address problem fields when special disease situations occur.

This work resulted in some novel and significant information on frogeye leaf spot in Minnesota. Frogeye leaf spot was rarely reported in Minnesota soybean fields prior to 2018, and appears to have increased greatly in incidence and severity in 2018 and 2019. We diagnosed samples in 2019 and confirmed that frogeye leaf spot developed to significant levels in a number of fields across southern and into central Minnesota. We also confirmed with collaborators at the University of Kentucky (Dr. Carly Bradley and staff) that the frogeye leaf spot fungal pathogen (*Cercospora sojina*) collected in three counties in Minnesota (Dakota, Faribault, and Watonwan) is resistant to the QoI (strobilurin) class of fungicides. We suspect that this fungicide resistance is widespread in Minnesota, which has consequences for which fungicides will be effective for managing this disease in Minnesota.

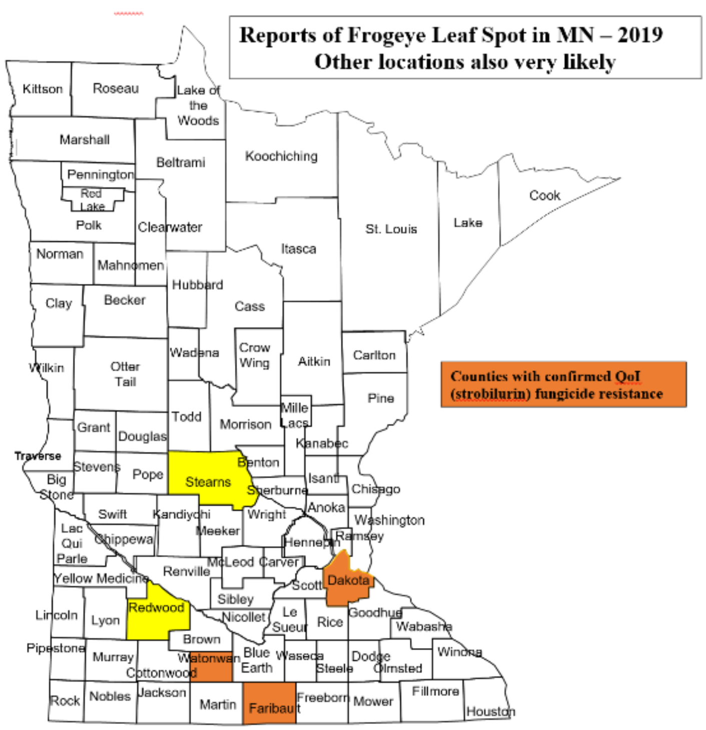

Figure X. Counties in Minnesota with confirmed frogeye leaf spot and confirmed resistance to the QoI (strobilurin) class of fungicides. This represents only samples received from problematic fields. It does not represent results from a systematic survey or all counties where frogeye leaf spot may have been present. (Map developed by and with data collected by D. Malvick).

Specific project achievements during this reporting period. Experiments and studies were established and are proceeding as planned. Achievements to date have been described above.

Challenges encountered. These are noted above.

Specific request for assistance from the Production AT on any challenges listed above. None

Information Dissemination of data/information from this research during this reporting period.

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I presented information from this project at these events: (attendance in parentheses)

- Crop Management Input Seminar, Wilmar, MN Dec 2019 (70)
- Crop Pest Management Short Course, Minneapolis. Dec. 2019. (75)
- Research Update Conference in Waseca, MN. January 2020. (45)
- Research Update Conference in Rochester, MN. January 2020. (65)
- Research Update Conference in Lamberton, MN. January 2020. (40)
- Research Update Conference in Willmar, MN. January 2020. (55)
- Research Update Conference in Morris, MN. January 2020. (40)
- Presentation to commercial applicators. St. Cloud. January 2020. (50)

- Best of the Best Crop Production meeting in Grand Forks. Feb 2020. (130)
- Best of the Best Crop Production meeting in Moorhead. Feb. (120)
- County Crops Day in Faribault. February 2020. (12)