Progress Report for 2021-2022 Minnesota Soybean Research and Promotion Council Production Action Team

- **Project Title:** : **Assessing Management Options and Inputs for Significant Soybean Diseases in Minnesota: Phase 2**

- **Principle Investigator:** Dean Malvick

- **Department/Organization**: Department of Plant Pathology, University of Minnesota, St. Paul, MN

- **Dates of Reporting**: May 1 – December 1, 2021

A summary of activity and progress for each objective are shown below for this reporting period. Please let me know if you would like additional information about this project and the results. Thank you.

Project Objectives:
1. Evaluate inputs and tactics to manage SDS and BSR of soybean
2. Determine distribution of Frogeye Leaf Spot in Minnesota and evaluate fungicide efficacy against Minnesota isolates of the causal pathogen
3. Conduct extension education and diagnostic activities that address important and unusual soybean disease problems in Minnesota.
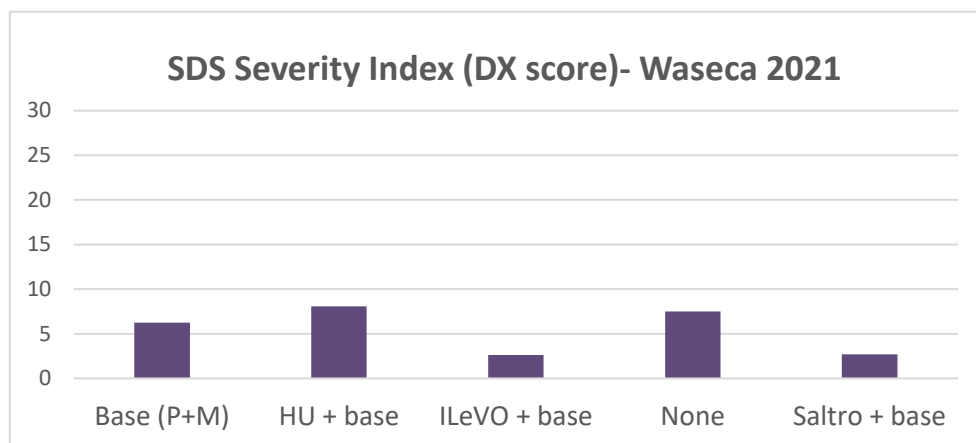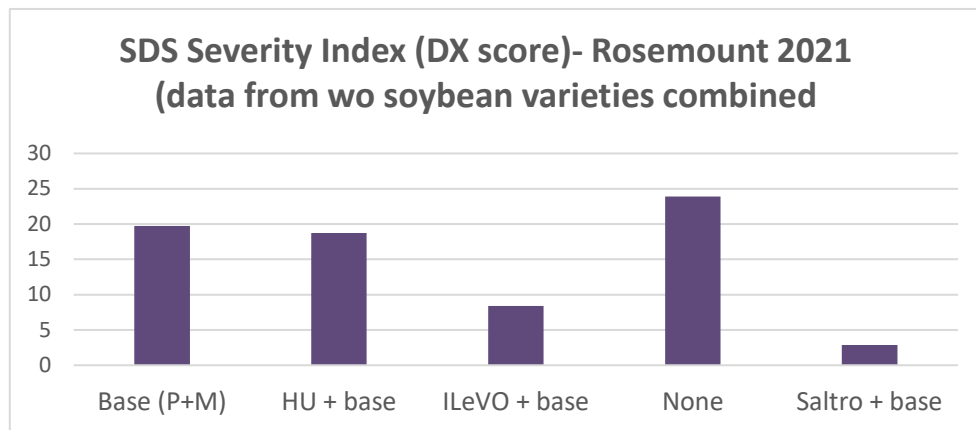
Progress Report by Objective

1. Evaluate inputs and tactics to manage SDS and BSR of soybean.

Background. SDS and BSR are among the top 10 soybean diseases in the NC Region, and are likely among the top five most important diseases in Minnesota.   Previous work by my research team suggest that some seed treatments can be effective for managing SDS. Additional field studies are required to validate these results and assess the situations where they are most likely to pay-off. Varietal resistance is used to manage BSR. However, resistance needs to be evaluated in available public varieties and Minnesota breeding lines.

Part A. OBJECTIVES : Determine the benefits of four seed treatments (ILeVO®, Saltro®, base treatment, and Heads-Up®) and resistant soybean varieties for management of SDS in different field environments. Field studies were conducted at inoculated and irrigated fields in Rosemount and Waseca, MN in 2021. The studies include two soybean varieties with different levels of resistance to SDS and five seed treatments (untreated, Acceleron base, ILeVO®+base, Saltro®+base, and Heads-Up®+base). The studies were planted and inoculated in May, and were irrigated weekly as needed so the plots received at least 1.5" of rain and irrigation combined to increase SDS. The studies progressed as planned, and SDS developed in all studies, although it was at relatively low levels in 2021. We rated disease development at R5.5 and R6 growth stages and plots were harvested for

yield in both years, although summarized yield data from 2021 was not available in time for this report.

Results summary. In 2021, foliar disease index (DX) DX scores were below 8 for all treatments at Waseca (this on a 100 pt scale and thus is very low), and between 4 and 24 at Rosemount. The more SDS-resistant soybean variety generally had lower levels of SDS than the more susceptible variety under SDS pressure, as expected. The ILeVO and Saltro seed treatments both consistently reduced SDS relative to the untreated controls in both locations. The Heads-Up treatment had inconsistent effects on SDS and yield. The results demonstrate the relative efficacy of the three seed treatments with SDS activity and variety resistance on management of SDS. Preliminary data summaries are shown below.

SDS Severity Index (DX score)- Rosemount 2021 (data from wo soybean varieties combined

	Base (P+M)	HU + base	ILeVO + base	None	Saltro + base
DX	~20	~19	~8.5	~24	~3

SDS Severity Index (DX score)- Waseca 2021

	Base (P+M)	HU + base	ILeVO + base	None	Saltro + base
DX	~6.5	~8	~2.5	~7.5	~2.5

Part B. OBJECTIVE: Evaluate available public varieties and soybean breeding lines for resistance to BSR. This work must be conducted in the greenhouse in the fall and winter, and thus has not yet been completed. Selected public varieties and advanced breeding lines from the U of MN soybean-breeding program, as well as selected common commercial soybean varieties, will be evaluated this winter for resistance to BSR. This work will be conducted in cooperation with Dr. Aaron Lorenz. This research will take place in a greenhouse under controlled conditions. Plants at the VC/V1 growth stage will be inoculated in replicated studies with two types (A and B) of the BSR pathogen. BSR severity will be measured at the R6 growth stage.

2. **Determine distribution of Frogeye Leaf Spot *in* Minnesota and evaluate fungicide activity against Minnesota isolates of the causal pathogen**

<u>Background</u>: Frogeye leaf spot (FLS) has been a significant disease of soybean across the southern half of the U.S. for many years, and in the past few years has been increasing in distribution and severity in Minnesota. Additional information on its distribution and its sensitivity to fungicides in Minnesota is needed
.
Part A. OBJECTIVE: Determine the distribution of frogeye leaf spot in MN. Soybean leaf samples with symptoms typical of Frogeye leaf spot were collected from scattered fields in southern, central and northern Minnesota. This disease was less common than in recent years due to the dry conditions in 2021. Regardless, is was found in multiple fields, and leaf samples with symptoms of FLS were collected from fields and taken to my laboratory in St. Paul for analysis where we were able to isolate and confirm the pathogen.

Part B. OBJECTIVE.   Evaluate efficacy of fungicides against the FLS pathogen (*Cercospora*) from soybean leaves in Minnesota. The FLS pathogen from all leaves collected in MN with FLS symptoms were sent to a cooperating laboratory (Dr. Carl Bradley's lab) at the University of Kentucky and tested for sensitivity to fungicides (with a focus on the QoI fungicides). All isolates of the pathogen from southern, central, and northern MN were resistant to the QoI fungicides, providing further data to suggest that the FLS pathogen is resistant to this class of fungicides across Minnesota from south to north.

3. Conduct extension education and diagnostic activities that address important and unusual soybean disease problems in Minnesota.

<u>*Background*</u>: There is an ongoing need to develop and deliver disease management information and new research results for soybean diseases across Minnesota. In addition, unusual disease outbreaks occur in soybean fields across Minnesota each year for which specialized diagnosis and focused efforts are needed to help famers understand the problems and to identify and develop response and management strategies.

We disseminated information, and taught and organized specialized meetings and workshops to address soybean disease information needs for soybean producers. For example, one of these was a field day conducted at Rosemount, MN in early September 2021. Specialized diagnosis was focused on frogeye leaf spot, a significant root/stem disease outbreak near Waseca following heavy rains in July, as well as suspected charcoal rot, pod and stem blight, and BSR samples.

Information Dissemination of data/information from this research during this reporting period. This is noted above under objective #3