



# Minnesota Wheat Research and Promotion Council

## RESEARCH PROJECT PROPOSAL

### (2-pages maximum)

#### Abstract

Wheat Stem Sawfly (*Cephus cinctus* Norton) is not new to the region, but rather a species that is endemic to the northern plains of the United States and Canada, including the Red River Valley. It is unclear why WSS is becoming an economic pest at this time. Over the past six years, the area affected by WSS in Minnesota has steadily grown larger and now reaches from Wilkin to Kittson counties. Evaluation of current, adapted HRSW in the past three seasons has shown differences among the varieties in the number of infected stems. The objective of this proposal is to continue evaluation of current, adapted HRSW varieties for resistance to stem cutting by WSS by seeding a duplicate of the HRSW variety performance evaluation trial on the Northwest Research & Outreach Center near Crookston, MN and counting the number of infected stems at the harvest ripe stage.

#### Describe the background for your proposed project and the importance of this project to the profitability of wheat production in MN

Wheat stem sawfly (WSS) is an insect pest that has caused concern in recent years, especially in NW MN where populations have had a considerable impact on some fields. While yield losses and quality losses as a result of the WSS infestations are rare, harvest challenges and losses as a result of the lodged grain are observed and reported. In most instances, these problems are restricted to the first 120 ft. of the affected field's edges as WSS migrate into the current season's wheat from nearby previous season's wheat fields. Over the past six years, the area affected by WSS in Minnesota has steadily grown larger and now reaches from Wilkin to Kittson counties. The only known approach to combat this insect is the use of WSS resistant varieties. Knowing which varieties show fewer WSS infections in combination with checking for absence or presence of stem pith at Feekes 6, whether partial or complete, is the most predictive method to identify WSS resistant varieties.

#### Research methods

A duplicate of the HRSW variety performance evaluation trial will be seeded on the Northwest Research & Outreach Center near Crookston, MN. The standard check varieties (Marshall, Glenn, and Knudson) are replaced with WSS check varieties that differ in stem solidness (WB Gunnison, SY Tyra, and Duclair). The field in which the trial will be located will have been continuous wheat for the past three years. Wheat Stem Sawfly emergence will be monitored in the trial using soil emergence traps (BugDorm Model BT2003, BioQuip Products, CA 90220). The collection bottle will be filled with approximately 50 ml of pre-diluted automotive antifreeze/coolant solution (SuperTech Extended Life Antifreeze/Coolant, WalMart, AR 72716).

The number of adult male or female WSS will be counted every Monday, Wednesday and Friday for six weeks starting in late May, 2022. To aid identification and counting of WSS male and female specimens, the collection bottle will be removed from individual emergence traps and the contents will be emptied on a piece of white cheesecloth held over a 200 ml glass beaker with a sink strainer. The collected antifreeze solution will be recycled and poured back into the sample collection bottle. Additional antifreeze solution will be added to the bottles when necessary and before sample collection bottles are placed back in the emergence traps. The insects caught on the cheesecloth are separated and individual WSS are identified and counted.

Stem solidness will be scored on twenty randomly selected stems at Feekes 6 by determining the presence of a pith using a transverse cut in the middle of the first and second above-ground node. Stem clipping will be scored just prior to the trial being harvest ripe. All stems from three linear feet of row will be harvested by hand and fifty randomly selected stems from each hand-harvested sample will be dissected longitudinally to determine presence of frass on or near the bottom of the first and second above ground nodes to evaluate whether WSS oviposition was successful. The incidence of parasitism by *Bracon cephi* (Gahan) and other parasitoids will be scored by determining the percentage of WSS-infested stems that had an emergence hole in the stem or a parasitized WSS cocoon.

Finally, the project will work with the USDA-ARS's North Central Small Grains Genotyping Lab in Fargo, ND to determine the absence/presence of the Q<sub>ss</sub>.msub-3BL.c QTL associated with the WSS resistance expressed in WB Gunnison as the timing of the determination of presence of a pith at the 6 to 7 leaf stage of spring wheat is precarious. Unfortunately, we will likely not be able to screen many of the privately developed HRSW varieties, including some with very low WSS infestation rates, because of intellectual property rights limitations. This limitation also means that the screening nursery will need to be continued as well.

#### Timeline for completion

The trial will be seeded as early as possible at the Northwest Research & Outreach Center as previous years trials has shown that this ensures synchronization of the crop development and emergence of WSS adults. The trials will be managed the same as the other yield HRSW performance evaluation trials at the Northwest Research & Outreach Center. The trial will, weather permitting, be harvested for grain yield and quality in late July or the first half of August. Success of ovipositioning and parasitism will be scored from the field samples collected during the growing season in late November, after sample processing for grain quality of the season's trials and fall field activities have been completed.

#### Outreach plan

The collected data and interpretations are disseminated to the greater public through the Minnesota Field Crop Trials bulletin and extension talks and presentations.

#### List other current or pending funding sources for this project:

Dr. Andrew Green, NDSU spring wheat breeder, used the screening nursery in 2021 as a local site to have greenhouse raised novel sources of WSS resistance in cone-tainers get infested with WSS.

#### Research group (other collaborators not listed as PIs):

J.J. Wiersma, J.A. Anderson, and H. Lindell

#### Relationship to past projects and research conducted by you or others in the region:

This project is the continuation of the WSS screening over the past three growing seasons.

# Minnesota Wheat Research and Promotion Council

## RESEARCH PROJECT PROPOSAL BUDGET

<b>Project Title:</b> Wheat Stem Sawfly Resistance Screening			
<b>Principal Investigator(s) / Project Director(s)</b> J.J. Wiersma and J.A. Anderson	<u>Funds Requested For</u>		
	Year 1 (2022)	Year 2 (2023)	Year 3 (2024)
A. Salaries and Wages	\$	\$	\$
1. Co-principal Investigator(s)			
2. Senior Associates			
3. Research Associates – Post Doctorate			
4. Other Professionals			
5. Graduate Students			
6. Prebaccalaureate Students/Temp/Casual (320 hrs @ 15.00/hr)	\$ 4,860.-		
7. Secretarial - Clerical			
8. Technical, Shop and Other			
B. Fringe Benefits	\$ 300.-		
C. Consulting and Professional Services			
D. Supplies and Services	\$ 590.-		
E. Travel			
F. Sub-Contracts			
G. Repairs & Maintenance			
H. Rentals & Lease (plot charges)	\$ 500.-		
I. Other Expenses			
<b>TOTAL AMOUNT OF THIS REQUEST (per year)</b>	<b>\$ 6,250.-</b>	<b>\$</b>	<b>\$</b>