

**Minnesota Wheat Research and Promotion Council**  
**FULL RESEARCH PROPOSAL TEMPLATE**  
**For Crop Year 2025**

(Maximum Two Pages, Plus Itemized Budget)

Please Note: To speed up and streamline the granting process, we now require full proposals be submitted by 1:00 PM CST on November 22, 2024. You will need to include an itemized budget with your proposal that has been approved by your organization's accounting and/or sponsored programs department.

Project Title: **Accelerated Breeding for Fusarium Head Blight Resistance in Spring Wheat**

Principle Investigator: **Karl D. Glover – Professor / Spring Wheat Breeder**

Organization: **South Dakota State University**

Email address and Primary phone number: [Karl.Glover@sdstate.edu](mailto:Karl.Glover@sdstate.edu) – 605-688-4769

Project Period: **January 1, 2025 – December 31, 2027**

Estimated cost: **\$18,000 / year \* 3 years = \$54,000**

Abstract

Complete resistance to Fusarium head blight (FHB) of wheat is presently not attainable. Host plant resistance is therefore the most economical and environmentally benign means of disease control. This proposed work aims to increase FHB resistance levels in regionally adapted hard red spring wheat breeding lines and cultivars through traditional plant breeding methods.

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

Efforts to increase FHB resistance levels began prior to inception of the US Wheat & Barley Scab Initiative (USWBSI) within this program. Specifically, it began very shortly after the 1993 epidemic in the upper-Midwest spring wheat production area. The original three-party agreement included the Minnesota Wheat Research and Promotion Council (MWRPC), South Dakota Wheat Commission (SDWC), and the South Dakota Ag Experiment Station (SDAES). Annual allotments of \$17,000 from each group were used to establish field and greenhouse screening capabilities and provide labor for their operation. Capacity of the disease screening nursery increased, along with the number of entries examined, once additional funds became available through the USWBSI in 1995 or 1996. Due to budget constraints, the SDAES ceased contributions to this endeavor in about 2008. Since 2002, however, funds received from MWRPC have continually been utilized along with those provided for similar use by SDWC (~\$20,000 / yr) and USWBSI (~\$25,000 / yr) for operations devoted to FHB resistance breeding and variety development. At its core, this work centers on screening inoculated plants and examining seed after harvest. New segregating populations are created each year and progeny must be screened for resistance to find worthwhile lines for advancement within the program. As these cycles continue, screening observation data is accumulated to the point where experimental lines under consideration for release are usually considered at least moderately resistant to FHB and other diseases. Ensuring that moderately resistant materials are the ones to eventually release helps maintain profitability to growers in Minnesota and elsewhere by lessening the impact of severe FHB epidemics. For the foreseeable future, these practices will be the most practical means to help alleviate potentially large losses when growing conditions are optimal for FHB development.

Research methods:

The FHB screening and germplasm development component within this program is fashioned so that FHB screening procedures begin with F<sub>2</sub> populations that have been selected as desirable from the standpoint of agronomic potential. Each fall approximately 100 of these F<sub>2:3</sub> populations are screened in the greenhouse which is equipped with a mist-irrigation system. Ten hills of each population are screened in each greenhouse cycle. In

the following spring greenhouse cycle, F<sub>3:4</sub> lines are derived from plants within the top twenty to thirty percent of the hills based on their resistance phenotype. For the summer season, F<sub>4:5</sub> lines are derived from each of the hills within the spring greenhouse to confirm their resistance and are sown as rows in our mist-irrigated field nursery. In both the greenhouse and field settings, infested corn kernels and a conidial suspension of several *Fusarium* isolates serve as inoculum sources.

Along with screening early-generation breeding materials in greenhouse and field nurseries, more advanced experimental breeding lines are also evaluated at several stages along the road to potential release so that multiple observations can be considered prior to large-scale seed advancement. As a portion of the summer field screening cycle, we also evaluate experimental entries submitted to the Uniform Regional Spring Wheat Nursery (URN), the Uniform Regional Scab Nursery for Spring Wheat Parents (URSN), and Crop Performance Testing trials comprised of commercially available cultivars.

Outline the timeline for completion:

Materials progress through the program in the following cyclical manner. The Year 1 cohort of 2025 will become Year 2 cohort in 2026 and Year 3 in 2027. Meanwhile, Year 1 group of 2026 will be the Year 2 group of 2027, and so on.

Year	Setting	Generation	Actions
Year 1 (fall)	Greenhouse	F <sub>2:3</sub> Hills	Screen FHB / select top 20-30% / collect heads
Year 1 (Spring)	Greenhouse	F <sub>3:4</sub> Hills	Screen FHB / select top 20-30% / collect heads
Year 1 (Summer)	Field	F <sub>4:5</sub> Rows	Screen FHB / select top 20% / collect heads
Year 2 (Winter)	Field (NZ or AZ)	F <sub>5:6</sub> Rows	Increase seed
Year 2 (Summer)	Field	F <sub>5:7</sub> Plots	Screen FHB / Yield trials / select / collect heads
Year 3 (Winter)	Field (NZ or AZ)	F <sub>7:8</sub> Rows	Increase seed
Year 3 (Summer)	Field	F <sub>7:9</sub> Plots	Screen FHB / Yield trials / select / bulk plot seed
Year 4 - Release	Field	F <sub>7:x</sub> Plots	Screen FHB / Yield trials / continue evaluation

What methods, if any, will be used to disseminate your research findings out to the greater public, beyond the final report due to Minnesota Wheat Research and Promotion Council:

Along with the annual report to MWRPC, growers / breeders / agronomists / pathologists etc. are made aware of FHB resistance levels as well as other performance metrics for released varieties through Extension publications and field days. Furthermore, information pertaining to materials evaluated in Uniform Regional Nurseries is made available to other wheat breeders and researchers.

List potential collaborators or co-investigators you may consider inviting to participate:

Screening germplasm for FHB resistance is a routine activity in the breeding program. If difficulties arise, Dr. Gazala Ameen, the SDSU Small Grains Pathologist, can be approached for assistance and/or troubleshooting.

Estimate the budget requirements:

Through the years, MWRPC has provided \$17,000 to this project annually through the proposal, submitted every third year, has always been for \$51,000. This request is for \$54,000 (\$18,000 / year). The proposed budget will include contractual costs (i.e., greenhouse rental, field space rental, supplies, etc) along with hourly labor.

List sources and amounts of additional funding for this project, and indicate if they have committed to provide funding or if you have requested funding:

Funds from MWRPC, SDWC, and USWBSI will be jointly utilized to complete proposed tasks. Funding from SDWC is proposed annually and USWBSI funding is proposed every fourth year. Each agency has contributed since before I began at SDSU in 2002.

Submit full proposal (max. 2 pages) and itemized budget to [bsorenson@mnwheat.com](mailto:bsorenson@mnwheat.com) by 1:00 PM, 11/22/24

# Minnesota Wheat Research and Promotion Council

## RESEARCH PROJECT PROPOSAL BUDGET

<b>Project Title:</b> Accelerated Breeding for Fusarium Head Blight Resistance in Spring Wheat			
<b>Principal Investigator(s) / Project Director(s)</b>  Karl D Glover	<div>Funds Requested For</div> <div> <div>Year 1</div> <div>Year 2</div> <div>Year 3</div> </div> <div> <div>(2025)</div> <div>(2026)</div> <div>(2027)</div> </div>		
A. Salaries and Wages	\$6,060	\$6,242	\$6,429
1. Co-principal Investigator(s)			
2. Senior Associates			
3. Research Associates – Post Doctorate			
4. Other Professionals			
5. Graduate Students			
6. Prebaccalaureate Students	6,000	6,180	6,365
7. Secretarial - Clerical			
8. Technical, Shop and Other			
B. Fringe Benefits	60	62	64
C. Consulting and Professional Services			
D. Supplies and Services	11,940	11,758	11,571
E. Travel			
F. Sub-Contracts			
G. Repairs & Maintenance			
H. Rentals & Lease			
I. Other Expenses			
<b>TOTAL AMOUNT OF THIS REQUEST (per year)</b>	<b>\$ 18,000</b>	<b>\$ 18,000</b>	<b>\$ 18,000</b>