Minnesota Wheat Research and Promotion Council
FULL RESEARCH PROPOSAL
For Crop Years 2026 and 2027 (01/01/2026 to 12/31/2027)

(Maximum Two Pages, Plus Itemized Budget)

Project Title: Evaluating the Economic Impact of Bacterial Leaf Streak on Hard Red Spring Wheat in Minnesota: A Two-Year Yield Loss Study

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Project Period: January 1, 2026 – December 31, 2027

Estimated cost: $34,453 for 2 years (2026: $16,987, 2027: $17,466)

Abstract

Bacterial Leaf Streak (BLS), caused by *Xanthomonas translucens* pv. *undulosa*, is widespread in Minnesota wheat fields, yet the true economic toll on yield remains a critical knowledge gap for researchers and producers. This two-year project will quantify the yield losses associated with BLS across ten diverse hard red spring wheat varieties grown in Minnesota. Additionally, we will collaborate with the Bacterial Leaf Streak Research Initiative working group that is organizing similar yield-loss trials across the US and Canada to create a robust dataset representing multiple environments.

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

In Minnesota, the prevalence of bacterial leaf streak (BLS) in wheat has been continually noted. Primarily a foliar pathogen, the lesions that develop into chlorotic and necrotic tissue lead to decreased grain fill due to decreased photosynthetic capacity. The severity of the economic damage that BLS causes is currently not well documented. Friskop et al. (2023) estimated yield losses up to 60% based on data from surveys of naturally infected field plots across North Dakota in 2019 and 2020. Shane et al. (1987) performed yield loss plot experiments in Minnesota using seed from previously infested fields. The result was non-uniform disease development which made it challenging to estimate losses. Overall, there are few studies documenting yield losses associated with BLS and specifically a dearth of studies utilizing inoculated plots to clearly document the impact of BLS on grain yield and quality. This lack of quantitative yield loss data is a hurdle for producers in assessing the risk of BLS infection. Producers need to know potential yield reductions because of BLS infections in order to weigh the return in prioritizing the selection of resistant wheat varieties over other traits and to invest in the development of additional control methods.

Research methods:

This two-year yield loss study will be conducted at the University of Minnesota's agricultural experimental station in St. Paul. We will use 10 hard red spring wheat varieties, consisting of commercial varieties including resistant and susceptible checks. The design will employ three replications for each variety/inoculation combination; a total of 60 plots per year (10 varieties x 2 treatments (inoculated/control) x 3 replications). Plot size will be 8 x 5 ft; the standard yield plot size used at the St. Paul location. The bacterial strain CIX40 will be used to inoculate the treatment plots at the flag leaf stage with a gas-powered backpack sprayer. Control plots will remain uninoculated. The field plots will be mist-irrigated as necessary to ensure proper plant growth and conditions for disease development. Disease assessments will be collected at two- and three-weeks post

inoculation, to track disease severity using whole plot scores on a 1-9 scale. Plots will be harvested, and grain yield, test weight, and kernel characteristics will be recorded and statistically analyzed to determine the quantified yield loss (in bu/acre and percent loss).

Outline the timeline for completion:
The project will be completed over a 24-month period across two growing seasons. Year 1 (2026) will include planting preparation phase (January–March) focused on finalizing wheat variety selection, purchasing supplies, preparing field books and data collection files, and setting up seed for planting. The field season (April–August) involves plot planting, inoculum preparation, inoculation, disease rating, and harvest. The remainder of the year (September–December) will be used for post-harvest analysis, initial statistical processing, and submission of the Year 1 report. In Year 2, we will review the Year 1 data to make any minor methodological adjustments deemed necessary. The field work in 2027 will repeat the cycle of planting, inoculation, rating, harvest and post-harvest activities. The project will conclude at the end of 2027 with a comprehensive statistical analysis of the pooled two-year data, finalizing conclusions, drafting a manuscript for peer-review, and submitting the final project report.

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:
The results of this study will be disseminated to reach Minnesota wheat producers, stakeholders and other research groups through multiple channels. We will engage and present at various field crops days and conferences, including the annual Bacterial Leaf Streak Meeting. Additionally, the data from this study will funnel into the BLS Research Initiatives' working group that is focused on yield-loss studies across the US and Canada. Thus, the results of this project will contribute to a understanding the economic impact of BLS internationally. Finally, we will prepare a peer-reviewed manuscript for a high-impact journal (e.g. Phytopathology or Plant Disease) with the potential of incorporating pooled data from the national BLS Research Initiative working group.

List potential collaborators or co-investigators you may consider inviting to participate:
The Bacterial Leaf Streak Research Initiative has developed a working group of collaborating investigators across US and Canada who are coordinating yield loss trials for BLS in wheat and barley. We will work with this group to adhere to similar protocols and data collection so that our results can be synthesized with the larger data set that will be collected through this initiative. The result will be a strong data set that provides a clear picture of the economic impact of BLS on small grains in North America.

Budget requirements:
Total estimated budget: $34,453 for two years
Salary: Agronomy Research Technician (5% effort) $3,189 (2026), $3,285 (2027); Pathology Research Scientist (10% effort) $8,615 (2026), $8,873 (2027).
Combined fringe benefits for personnel: $4,813 (2026), $4,308 (2027).
Field plot rental: $250 per year
Lab and field supplies: $750 per year

References:
Friskop, A., Green, A., Ransom, J., Liu, Z., Knodel, J., Hansen, B., Halvorson, J., and Lux, L. 2023. Increase of bacterial leaf streak in hard red spring wheat in North Dakota and yield loss considerations. Phytopathology 113:2103-2109.
Shane, W. W., Baumer, J. S., and Teng, P. S. 1987. Crop losses caused by *Xanthomonas* streak on spring wheat and barley. Plant Dis. 71:927-930.