

USDA-ARS | U.S. Wheat and Barley Scab Initiative
FY21 FINAL Performance Progress Report

Due date: July 26, 2023

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USDA-ARS Agreement ID:	59-0206-1-205
USDA-ARS Agreement Title:	FHB Germplasm Research, Development, and Preservation in Winter Wheat
Principle Investigator (PI):	Anne McKendry
Institution:	University of Missouri
Institution UEI:	SZPJL5ZRCLF4
Fiscal Year:	2021
FY21 USDA-ARS Award Amount:	\$38,760
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Period of Performance:	6/1/21 - 5/31/23
Reporting Period End Date:	5/31/2023

[USWBSI Individual Project\(s\)](#)

USWBSI Research Category*	Project Title	ARS Award Amount
EC-HQ	Preservation of Soft Red Winter Wheat FHB Germplasm at the University of Missouri	\$38,760
FY21 Total ARS Award Amount		\$38,760

I am submitting this report as a: FINAL Report

I certify to the best of my knowledge and belief that this report is correct and complete for performance of activities for the purposes set forth in the award documents.



July 25, 2023

Principal Investigator Signature

Date Report Submitted

† BAR-CP – Barley Coordinated Project
 DUR-CP – Durum Coordinated Project
 EC-HQ – Executive Committee-Headquarters
 FST-R – Food Safety & Toxicology (Research)
 FST-S – Food Safety & Toxicology (Service)
 GDER – Gene Discovery & Engineering Resistance
 HWW-CP – Hard Winter Wheat Coordinated Project

MGMT – FHB Management
 MGMT-IM – FHB Management – Integrated Management Coordinated Project
 PBG – Pathogen Biology & Genetics
 TSCI – Transformational Science
 VDHR – Variety Development & Uniform Nurseries
 NWW – Northern Soft Winter Wheat Region
 SPR – Spring Wheat Region
 SWW – Southern Soft Red Winter Wheat Region

Project 1: Preservation of Soft Red Winter Wheat FHB Germplasm at the University of Missouri

1. What are the major goals and objectives of the research project?

This project arose as a result of my retirement as wheat breeder at the University of Missouri and the subsequent (hopefully temporary) discontinuation of the wheat breeding program. During my tenure at MU and with the financial support of the USWBSI, I have primarily worked to incorporate, through conventional breeding, “native” resistances into Missouri soft red winter wheat varieties. The unique FHB resistance in most of the Missouri lines builds on the resistances in the Truman/Bess family, Ernie, and the MO 030291 family of lines (that includes MO 080104). These lines and others derived from them have been released from the Missouri Agricultural Experiment station either as public varieties with PVP or as licensed varieties and have been widely grown in Missouri and surrounding states. Several of our lines (Truman, Bess, Ernie) have also served as resistant check varieties in the Northern and Southern Uniform FHB Nurseries. The primary goal of this project was to increase and purify unreleased germplasm carrying FHB resistance and make that germplasm available to interested breeders within the USWBSI’s VDHR working groups for use as parents in their respective breeding programs. Within this overall goal during this period, I proposed to:

- a. Identify, catalogue, increase, and purify superior FHB lines that have shown agronomic performance in the Missouri environment.
- b. Build into the database, Missouri designations, pedigrees, agronomic data, and FHB data where available. We will then share that information with USWBSI breeders to inform their decision as to whether or not to use any of these lines in their breeding programs.

2. What was accomplished under these goals or objectives? (For each major goal/objective, address these three items below.)

a) What were the major activities?

Approximately 160 germplasm lines, selected for FHB response and agronomic performance following preliminary and/or advanced yield testing, were identified for a grow-out under greenhouse conditions. For each line, 20 plants were vernalized and planted in the greenhouse environment. Off-types were identified and removed. Plants were harvested when mature, and hand threshed. Seed from each line were bulked within line and weighed. Lines with more than 100 grams of seed were retained for distribution to USWBSI breeders.

b) What were the significant results?

During the greenhouse grow-out, lines that appeared to be segregating or were an ad hoc mixture were removed from further processing. 130 pure lines had sufficient seed for distribution. Thousand kernel weights averaged 36.1 g and total amounts of seed produced averaged 175 g / line. In addition to Missouri lines, 20 lines identified under Missouri field conditions from 80 lines provided by Dr. Fed Kolb (retired) at the University of Illinois were

included in this grow-out. Of these 20 lines, 15 had sufficient seed for distribution. The lines Dr. Kolb shared with me were from his recurrent selection program funded over a number of years by the USWBSI.

As the project progressed, I determined that rather than communicating with breeders in the Northern Coordinated Project individually, a more efficient way to distribute these lines to the widest group of breeders would be through the US Northern FHB nursery system. Because Missouri is in a transition zone, we've found that our lines are indeed adapted in some of the southern states and so, distributing them through the nursery system will enable more breeders to actually observe the lines prior to making the decision to cross with them. This should maximize the use of Missouri lines throughout the US Soft Red Winter Wheat region. I have communicated with Clay Sneller who believes there is interest in Missouri FHB germplasm and has agreed to take these lines, test them for FHB in Ohio and do a small field increase for distribution. Depending on the productivity of each line, 50–150 grams of seed were sent to Dr. Sneller for inclusion in the nursery while an equal amount (50-150 g) were retained in cold storage at Missouri awaiting the hiring of a new breeder which may occur in the next year or two. This work will appear in Dr. Sneller's LOI for the next grant cycle.

(c) List key outcomes or other achievements.

One hundred and forty-five lines (130 Missouri lines and 15 lines from an FHB recurrent selection program conducted under the direction of Fred Kolb at Illinois) have been sent to Dr. Clay Sneller at The Ohio State University for distribution to breeders within the USWBSI through the Northern Scab Nursery System. In addition to seed, a complete list of lines, their Missouri designations and pedigrees as well as FHB data collected in Missouri, will be sent to Clay and copied to the USWBSI NFO for their records.

3. What opportunities for training and professional development has the project provided?

None. This project is taking place as a result of my retirement. I have had a full-time staff member working on the project with funding from the USWBSI supplemented with royalty funding that remains within the soft red winter wheat breeding program at the University of Missouri. No student labor was needed to complete the work.

4. How have the results been disseminated to communities of interest?

Seed of 130 Missouri lines plus 15 lines we had in the program that Fred Kolb shared with me from his recurrent selection breeding program for FHB (funded through the USWBSI) have been sent to Clay Sneller for inclusion in the Scab Nursery as noted above. A list of all lines, their Missouri designations and pedigrees along with FHB data collected at Missouri will be sent to Dr. Sneller. Clay will screen lines in the Ohio environment for FHB and the best lines will be included in the uniform scab nursery for observation and utilization by interested breeders. Lines can be freely used in crossing with no restrictions. A list of lines provided to the USWBSI from the Missouri breeding program will be sent to the USWBSI NFO for future reference.

Publications, Conference Papers, and Presentations

Please include a listing of all your publications/presentations about your FHB work that were a result of funding from your FY21 grant award. Only citations for publications published (submitted or accepted) or presentations presented during the **award period** should be included.

Did you publish/submit or present anything during this award period?

- Yes, I've included the citation reference in listing(s) below.
 No, I have nothing to report.

Journal publications as a result of FY21 award

List peer-reviewed articles or papers appearing in scientific, technical, or professional journals. Include any peer-reviewed publication in the periodically published proceedings of a scientific society, a conference, or the like.

Identify for each publication: Author(s); title; journal; volume; year; page numbers; status of publication (published [include DOI#]; accepted, awaiting publication; submitted, under review; other); acknowledgement of federal support (yes/no).

Nothing to report.

Books or other non-periodical, one-time publications as a result of FY21 award

Report any book, monograph, dissertation, abstract, or the like published as or in a separate publication, rather than a periodical or series. Include any significant publication in the proceedings of a one-time conference or in the report of a one-time study, commission, or the like.

Identify for each one-time publication: Author(s); title; editor; title of collection, if applicable; bibliographic information; year; type of publication (book, thesis, or dissertation, other); status of publication (published; accepted, awaiting publication; submitted, under review; other); acknowledgement of federal support (yes/no).

Nothing to report.

Other publications, conference papers and presentations as a result of FY21 award

Nothing to report.