

FY21 Performance Progress Report

Due date: July 26, 2022

Cover Page

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Fiscal Year:	2021
USDA-ARS Agreement ID:	59-0206-0-129
USDA-ARS Agreement Title:	Development of Montana Adapted FHB Resistant Winter Wheat Varieties
FY20 USDA-ARS Award Amount:	\$36,880
Recipient Organization:	Montana State University Plant Sciences & Plant Pathology PO Box 173150, 407 Leon Johnson Hall Bozeman, MT 59717
DUNS Number:	625447982
EIN:	81-6010045
Recipient Identifying Number or Account Number, if any:	RJW8546
Project/Grant Period:	5/6/21 - 5/5/23
Reporting Period End Date:	5/5/2022

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
HWW-CP	Development of Montana Adapted FHB Resistant Winter Wheat Varieties	\$36,880
FY21 Total ARS Award Amount		\$36,880

I am submitting this report as an: Annual Report 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.



Principal Investigator Signature

7/25/2022

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: Development of Montana Adapted FHB Resistant Winter Wheat Varieties

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

- 1.) Integrate FHB resistance genes from FHB resistant winter and spring wheat germplasm into MSU's winter wheat breeding program using both conventional breeding and marker assisted backcrossing (MAB) to increase FHB resistant allele frequencies in the Montana winter wheat breeding program.
- 2.) Phenotype Montana adapted winter wheat experimental lines for FHB resistance during the 2021 field seasons. Experimental lines found to have FHB resistance will be used in our crossing block and advanced for possible public release.

Deployment of FHB resistant winter wheat varieties adapted to Montana will help protect Montana's winter wheat grain producers and end-users from FHB infections and unacceptable deoxynivalenol (DON) levels that would prevent the sale of FHB infected winter wheat.

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?

Major activities included using MAB to integrate known FHB resistance genes into Montana adapted winter wheat germplasm. Secondly, crosses were made between FHB resistant winter wheat lines and susceptible Montana adapted winter wheat germplasm for conventional breeding. Lastly, experimental lines were phenotyped in FHB screening nurseries for FHB resistance.

b) What were the significant results?

During the 2021 growing season, Montana experienced a severe drought. Because of the drought, our mist irrigated FHB screening nursery located at the Southern Ag Research Center (SARC) had reduced incidence of the disease than in past years. The nursery contained 36 lines. Means across all lines for FHB Severity was 9.7% (5.4 – 17.8), FHB Incidence was 57.8% (36.8 – 86.8), and FHB Index was 9.7% (5.4 – 17.8). Mean DON levels were 5.0 ppm and ranged from 0.27 ppm to 17.4 ppm. The lines were significantly different for all traits, however all lines but two did not have significantly different DON levels. Emerson, our resistant check variety, had a severity rating of 7.0% and a DON level of 2.9 ppm. Our susceptible check variety, Yellowstone, had a severity rating of 9.2% and a 10.4 ppm DON level. Confidence in identifying experimental lines with improved FHB resistance in this study is low.

Fifteen MT experimental lines were submitted to the 2021 FHB hard red winter wheat uniform screening nursery. The Kansas screening nursery had excellent incidence of FHB, however we have not received DON data. MT20164 had the lowest FHB Index at

the Kansas nursery, and it was the most resistant line in the SARC nursery. We will continue testing MT20164, because it is a possible candidate for variety release that has moderate FHB resistance.

Lastly, our longtime winter wheat breeder, Dr. Phil Bruckner, retired in March 2021, and Sue Mondal has taken over the breeding program. Dr. Mondal will take over this USWBSI project.

c) List key outcomes or other achievements.

Key outcomes from our breeding efforts include acquiring FHB resistance information on Montana adapted experimental lines that carry Fhb1 and native resistance from Emerson. Experimental lines with moderate FHB resistance were advanced in the breeding pipeline for additional testing in the 2022 yield trials. An additional set of lines derived from FHB resistance sources are being evaluated in yield trials located in Huntley, MT, and Bozeman, MT during the 2022 growing season. Lines developed using MAB that carry Fhb1 and Fhb5A have been planted for field evaluation in 2022.

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

None

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

We now have enough FHB data where we can provide FHB resistance ratings to Montana adapted varieties. Ratings and our work with the USWBSI have been communicated to Montana wheat producers and stakeholders through the use of periodicals, field days and social media. Our efforts to develop Montana adapted FHB resistant winter wheat varieties has received positive responses from the Montana wheat growing community.

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 grant 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).

Books or other non-periodical, one-time publications as a result of FY21 grant 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).

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

Identify any other publications, conference papers and/or presentations not reported above. Specify the status of the publication.