USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY20 Annual Performance Progress Report
Due date: August 31, 2021

Cover Page

Principle Investigator (PI):	Jason Kelley (former PI Esten Mason now at Colorado State Univ)
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Fiscal Year:	2020
USDA-ARS Agreement ID:	59-0206-0-167
USDA-ARS Agreement Title:	Development of FHB-Resistant Wheat Cultivars for the Midsouth
FY20 USDA-ARS Award Amount:	$ 133,957
Recipient Organization:	University of Arkansas 305 Administration Bldg. Fayettevlle, AR 72701
DUNS Number:	191429745
EIN:	71-6003252
Recipient Identifying Number or Account Number:	AWD-100370
Project/Grant Reporting Period:	6/1/20 - 5/31/21
Reporting Period End Date:	5/31/2021

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR-SWW	Development of FHB-Resistant Wheat Cultivars for the Midsouth	$ 120,155
VDHR-SWW	Double Haploids to Expedite Development of FHB Resistant Soft Winter Wheat Varieties	$ 13,802
	FY20 Total ARS Award Amount	**$ 133,957**

Jason Kelley

August 31, 2021

Principal Investigator Date

* MGMT – FHB Management
FST – Food Safety & Toxicology
R- Research
S – Service (DON Testing Labs)
GDER – Gene Discovery & Engineering Resistance
PBG – Pathogen Biology & Genetics
EC-HQ – Executive Committee-Headquarters
BAR-CP – Barley Coordinated Project
DUR-CP – Durum Coordinated Project
HWW-CP – Hard Winter Wheat Coordinated Project
VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
SPR – Spring Wheat Region
NWW – Northern Soft Winter Wheat Region
SWW – Southern Soft Red Winter Wheat Region

Project 1: *Development of FHB Resistant Wheat Cultivars for the Midsouth*

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

1) Develop and release high yielding, FHB resistant cultivars.
2) Increase breeding efficiency through collaborative phenotyping, marker development and introgression of new genes using marker-assisted (MAS) and genomic selection (GS).
3) Screen and report the reactions of breeding lines and currently grown commercial cultivars to FHB using misted inoculated nurseries.

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

a. Objective 1: Develop and release high yielding, FHB resistant cultivars adapted to Arkansas and the mid-south.

a) What were the major activities?

The major activities on a yearly cycle for this objective include developing new breeding populations, advancement of breeding populations and lines using phenotypic, molecular marker and genomic prediction data and release of breeding lines as varieties.

b) What were the significant results?

1. 383 crosses made; the majority expected to contain moderate FHB resistance.
2. 693 breeding lines and varieties and 899 double haploid lines screened for FHB resistance.

c) List key outcomes or other achievements.

Breeding lines with potential for increased levels of FHB resistance and high grain yield were field-tested.

- **Objective 2: Increase breeding efficiency through collaborative phenotyping, marker development and introgression of new genes using marker-assisted (MAS) and genomic selection (GS).**

a) What were the major activities?
Due to the loss of the original P.I., Esten Mason, no collaborative phenotyping, marker development work was done in FY20.

b) What were the significant results? Nothing to report.

c) List key outcomes or other achievements. Nothing to report.

- **Objective 3: Screen and report the reactions of breeding lines and currently grown commercial cultivars to FHB using misted inoculated nurseries.**

a) What were the major activities?

Evaluating multiple SunGrains, USDA and commercial nurseries for reaction to FHB in misted and inoculated nurseries.

b) What were the significant results?

1. 93 entries in the Official Variety Trial were screened for FHB.
2. Other cooperative nurseries screened included GAWN, SUNWHEAT, SUNPRE, UESSRWWN, and USSRWWN.

c) List key outcomes or other achievements.

Results of the University of Arkansas Official Wheat Variety Trials were published in print and online (https://aaes.uada.edu/variety-testing/) and are accessible through ScabSmart. Data for the USDA nurseries was published by the nursery organizers.

3. Was this research impacted by the COVID-19 pandemic (i.e. university shutdowns and/or restrictions, reduced or lack of support personnel, etc.)? If yes, please explain how this research was impacted or is continuing to be impacted.

This research was not impacted by COVID-19.

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

No training or professional development occurred in FY20.

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

During FY20, research results were shared with stakeholders, including the Sungrains cooperative breeders and USDA. Material was also available online through the University of Arkansas Variety Testing website (https://aaes.uada.edu/variety-testing/) which is easily accessible to researchers, seedsmen and others.

Project 2: *Developing Doubled Haploids to Expedite Variety Development in Soft Red Winter Wheat*

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

   The goal of this proposal is use double haploid technology to combine favorable loci for more rapid improvement of FHB resistance. This is done in a collaborative manner with exchange of DH lines.

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?**
   383 new double haploids were evaluated in misted and inoculated nurseries with a select number harvested for future evaluation. There were 1282 total double haploids (including USWBSI and other sources) tested in the program.

   b) W**hat were the significant results?**
   - Data from the misted and inoculated nurseries were shared with other breeders who had received the same lines for testing.
   - 264 selected double haploid lines were sent to other breeders for cooperative testing.
   - Eight lines with the FBH1 gene were tested in the 2020-2021 Arkansas OVT wheat performance trials.

   c) List key outcomes or other achievements.

   Double haploid lines with a high level of resistance were identified and advanced.

3. **Was this research impacted by the COVID-19 pandemic (i.e. university shutdowns and/or restrictions, reduced or lack of support personnel, etc.)? If yes, please explain how this research was impacted or is continuing to be impacted.**

   This research was not impacted by COVID-19.

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

   No opportunities for training and professional development were provided in FY20.

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

During FY20, research results were published in scientific journals, extension publications and presented at meetings where target audience and stakeholders were present, including the annual United States Wheat and Barley Scab Initiative Meeting. Material was also available online through the University of Arkansas Wheat Variety Testing program website (https://aaes.uada.edu/variety-testing/) which is easily accessible to researchers, seedsmen and others. Specific outputs are listed in the Publications, Conference Papers, and Presentations section of this report.

A University of Arkansas Extension publication (Wheat Update) was developed to assist wheat growers on variety selection and provided FHB resistance ratings on commercially available wheat varieties that had been tested in the Official Wheat Variety Testing trials during the 2019-2020 season (published in September 2020). An updated version was also published in August 2021from 2020-2021 growing season data (https://www.uaex.uada.edu/farm-ranch/crops-commercial-horticulture/wheat/)

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY20 award period (6/1/20 - 5/31/21). The term "support" below includes any level of benefit to the student, ranging from full stipend plus tuition to the situation where the student's stipend was paid from other funds, but who learned how to rate scab in a misted nursery paid for by the USWBSI, and anything in between.

1. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their MS degree during the FY19 award period?**
   ☐Yes ☒No ☐ Not Applicable
   If yes, how many? Click to enter number here.

2. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY19 award period?**
   ☐Yes ☒No ☐ Not Applicable
   If yes, how many? Click to enter number here.

3. **Have any post docs who worked for you during the FY19 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**
   ☐Yes ☒No ☐ Not Applicable
   If yes, how many? Click to enter number here.

4. **Have any post docs who worked for you during the FY19 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**
   ☐Yes ☒No ☐ Not Applicable
   If yes, how many? Click to enter number here.

Release of Germplasm/Cultivars

Instructions: In the table below, list all germplasm and/or cultivars released with full or partial support through the USWBSI during the FY20 award period (6/1/20 - 5/31/21). All columns must be completed for each listed germplasm/cultivar. Use the key below the table for Grain Class abbreviations.

NOTE: Leave blank if you have nothing to report or if your grant did NOT include any VDHR-related projects.

Name of Germplasm/Cultivar	Grain Class	FHB Resistance	FHB Rating (0-9)	Year Released
Nothing to report.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year
Click here to enter text.	Select Grain Class	Select what represents your most resistant check	Enter as text 0-9 rating	Select Year

NOTE: List the associated release notice or publication under the appropriate sub-section in the 'Publications' section of the FPR.

Publications, Conference Papers, and Presentations

Instructions: Refer to the PR_Instructions for detailed more instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY20 grant award. Only citations for publications published (submitted or accepted) or presentations presented during the **award period (6/1/20 - 5/31/21**) should be included. If you did not publish/submit or present anything, state 'Nothing to Report' directly above the Journal publications section.

NOTE: Directly below each citation, you **must** indicate the Status (i.e. published, submitted, etc.) and whether acknowledgement of Federal support was indicated in the publication/ presentation. See example below for a poster presentation with an abstract:

> Winn, Z.J., Acharya, R., Lyerly, J., Brown-Guedira, G., Cowger, C., Griffey, C., Fitzgerald, J., Mason R.E., and Murphy, J.P. (2020, Dec 7-11). Mapping of Fusarium Head Blight Resistance in NC13-20076 Soft Red Winter Wheat (p. 12). In: Canty, S., Hoffstetter, A. and Dill-Macky, R. (Eds.), *Proceedings of the 2020 National Fusarium Head Blight Forum*. https://scabusa.org/pdfs/NFHBF20_Proceedings.pdf.
> Status: Abstract Published and Poster Presented
> Acknowledgement of Federal Support: YES (Abstract and Poster)

Journal publications.

Nothing to report.

Books or other non-periodical, one-time publications.

Nothing to report.

Other publications, conference papers and presentations.

A University of Arkansas Extension publication (Wheat Update) was developed to assist wheat growers on variety selection and provided FHB resistance ratings on commercially available wheat varieties that had been tested in the Official Wheat Variety Testing trials during the 2019-2020 season (published in September 2020). An updated version was also published in August 2021from 2020-2021 growing season data (https://www.uaex.uada.edu/farm-ranch/crops-commercial-horticulture/wheat/)
Status: Published
Acknowledgement of Federal Support: No