

FY22 Performance Progress Report

Due date: July 26, 2023

Cover Page

USDA-ARS Agreement ID:	59-0206-2-152
USDA-ARS Agreement Title:	Developing Fusarium Head Blight (FHB) Resistant Wheat lines for the Midsouth
Principle Investigator (PI):	Ehsan Shakiba
Institution:	University of Arkansas
Institution UEI:	WJNTJ7LBL823
Fiscal Year:	2022
FY22 USDA-ARS Award Amount:	\$40,116
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Period of Performance:	May 1, 2022 – April 30, 2026
Reporting Period End Date:	April 30, 2023

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR-SWW	Evaluation and Development of FHB-Resistant Wheat Varieties for the Midsouth	\$40,116
FY22 Total ARS Award Amount		\$40,116

I am submitting this report as an: Annual 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.

Ehsan Shakiba
Principal Investigator Signature

6/14/2023
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: Evaluation and Development of FHB-Resistant Wheat Varieties 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.

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

a) What were the major activities?

A total of 1046 entries, including Arkansas Advanced line (389 lines, 1 rep) and the SunGrain consortium lines including GWAN (58 lines, two reps), Sunpre (222, 1 rep), SunWheat (78 two reps), , Eastern Nursery region; (65, two reps), Uniform Southern Nursery region USSN (59, 1 rep), and checks including pat and CG514W (17 from each line) were tested in two locations of Newport and Fayetteville. The inoculum was prepared, added to corn, and applied to the field on March 29 (Fayetteville) and April 2 (Newport). The misting system was set up in both locations to increase the chance of inoculation. The phenotypic data were collected on April 11, 18, and 24 (Fayetteville) and April 11 and 24 in Newport. We rated each line from 0 (high tolerance) to 9 very susceptible.

b) What were the significant results?

The results on Arkansas lines showed various reactions, from susceptibility to high tolerance to FHB disease. Of 755 Sungrain Entries, 299 lines showed high tolerance to the disease. The mean for the Sungrain lines was 0.5712387, Standard Deviation of 1.33327. The mean and STD DV for each group are as follows
 The rating system is based on 0 (resistance) to 9 (tolerance). Thus, a smaller mean represents higher tolerance to FHB. The Standard deviation value from each group is greater than their mean value. As a result, the value of CV% is high, which indicates that many tested wheat cultivars showed high tolerance to FHB (Table 1)

Table 1 Analysis of variance of SunGrain populations

Level	Number	Mean	Std Dev	Std Err Mean	LSD (0.05)	Cv%	Student T-test
C0	17	0.1535294	0.1484479	0.0360039	0.3065	219.35601	C
C1	17	4.4841176	1.9483585	0.4725463	0.2206	250.008359	A
GAWN	115	0.6065217	1.3304418	0.1240643	0.2632	276.188646	B
SP	222	0.5132432	1.2831509	0.0861195	0.2883	214.537705	B
SW	156	0.1142308	0.3154925	0.0252596	0.3026	192.103413	C
UE	130	0.5960769	1.2788097	0.112159			B
USSN	118	0.7192373	1.3816794	0.1271939			B

Abbreviations: C0, tolerance check; C1, susceptible check, Sp, Sunpre; SW, Sunwheat; UE, Eastern Nursery region; USS, Uniform Southern Nursery region

ANOVA showed no significant differences between GAWN, SP, UE, and USSN groups. Student t-test revealed that Sunpre (SP) contains more FHB tolerance lines than other groups (Table 1).

c) List key outcomes or other achievements.

No immunity or full resistance to FHB. We identified several lines that showed high tolerance to FHB. This information can be added to the package release of potentially released cultivars, or the lines can be used as parental lines for developing new high-yield lines.

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

We introduced the project to our new employees and taught them how to set up the misting system, harvesting techniques, etc. We will train them how to evaluate FDK after harvesting and collecting seeds.

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

FHB is an important disease in our state. Presently I plan to submit our results in our local journal that farmers in Arkansas can view. Moreover, the information from this study will be shared with other wheat breeders in the SunGrain consortium.

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 FY22 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 May 1, 2022 – April 30, 2023?

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

Journal publications as a result of FY22 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 FY22 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 FY22 award

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