

**FY22 Performance Progress Report****Due date:** July 26, 2023**Cover Page**

<b>USDA-ARS Agreement ID:</b>	59-0206-2-152
<b>USDA-ARS Agreement Title:</b>	Developing Fusarium Head Blight (FHB) Resistant Wheat lines for the Midsouth
<b>Principle Investigator (PI):</b>	Ehsan Shakiba
<b>Institution:</b>	University of Arkansas
<b>Institution UEI:</b>	WJNTJ7LBL823
<b>Fiscal Year:</b>	2022
<b>FY22 USDA-ARS Award Amount:</b>	\$40,116
<b>PI Mailing Address:</b>	University of Arkansas, Rice and Research Extension Ctr 2900 HWY 130 E, Stuttgart, AR 72160
<b>PI E-mail:</b>	eshakiba@uark.edu
<b>PI Phone:</b>	807-673-2661
<b>Period of Performance:</b>	May 1, 2022 – April 30, 2026
<b>Reporting Period End Date:</b>	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
<b>FY22 Total ARS Award Amount</b>		<b>\$40,116</b>

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.