USDA-ARS | U.S. Wheat and Barley Scab Initiative

FY21 Performance Progress Report

Due date: July 26, 2023

Cover Page

USDA-ARS Agreement ID:	59-0206-0-153
USDA-ARS Agreement Title:	Integrated Strategies for Improved Management of FHB and DON in Soft Red Winter Wheat in Alabama
Principle Investigator (PI):	Kira Bowen
Institution:	Auburn University
Institution UEI:	DMQNDJDHTDG4
Fiscal Year:	2021
FY21 USDA-ARS Award Amount:	$18,419
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Period of Performance:	5/23/21 - 5/22/23
Reporting Period End Date:	5/22/2024

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT-IM	Integrated Strategies for Improved Management of FHB and DON in Soft Red Winter Wheat in Alabama	$18,419
	FY21 Total ARS Award Amount	$18,419

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.

Kira L. Bowen

Principal Investigator Signature

25 July 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: Integrated Strategies for Improved Management of FHB and DON in Soft Red Winter Wheat in Alabama

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

Major goals of this project are:

1. To develop integrated management strategies for FHB and mycotoxins that are robust to conditions experienced in production fields of wheat.
2. Help develop and validate the next generation of management and mitigation tools for FHB and mycotoxin control.

Objectives are:

1. To evaluate the integrated effects of fungicide and genetic resistance on FHB and DON in soft red winter wheat (SRWW) grown in AL and
2. To evaluate the efficacy of Miravis Ace, applied at varying times, to standard Prosaro® and Caramba® treatments for FHB and DON management.

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?

i. During summer and fall 2021, yield data were collected and analyzed, and harvest samples were tested for DON from winter wheat field studies planted in the fall of 2020.

ii. In 2022, field research was done at two locations—planted in fall 2021 with disease and yield assessment done in spring and through summer. Fungicides were applied to plots of soft red winter wheat according to IM-MGMT guidelines. At PBU (= east central AL, 32.4993, -85.8915) and GC (= south AL, 30.542, -87.882), three and two wheat varieties, respectively, were included. The focus of these studies was to compare recently introduced fungicides, Sphaerex and ProsaroPro, to established products, particularly MiravisAce. Disease was rated at all locations, and head samples were collected for determining the scab index. Combine samples were evaluated for proportion of Fusarium damaged kernels (% FHK), then ground and sent off for DON testing.

iii. A field evaluation was planted in Fall 2022 at GC with a factorial set of treatments for two cultivars and nine fungicide treatments. During Spring 2023, disease ratings were done and head samples collected for determination of the average scab severity per head (=index). Harvest samples have been received and are being evaluated for % FHK. Subsamples will be ground for DON analysis.

b) What were the significant results?

i. At the southern location (GC), 2021 SRWW harvest, all fungicide treatments reduced FDK % and DON compared to non-treated controls; greatest reductions in DON were noted with the two-fungicide application programs, delayed application of

MiravisAce, and the Sphaerex treatment (40 to 70% lower than in controls). Test weights and yield were also improved with all fungicide programs at GC, and greatest yield gains were seen with two-application programs as well the MiravisAce at anthesis and the delayed MiravisAce application.

ii. At the central location (PBU) in spring 2021, the MR variety (AGS 3030) had somewhat lower DON than the S variety (SS 5550); an experimental variety from UGA (GA 09129) had even lower DON. No other measured variables differed among varieties. MiravisAce treatments reduced scab index but not FDK %, and only a two-fungicide application program reduced DON compared to controls at PBU.

iii. In 2022 at GC, severe lodging prevented field ratings of disease; however, heads were collected for determination of scab indices. No differences were noted between the two cultivars (AGS 3030, MR, and Pioneer P26R94, MS). Scab index was lower with MiravisAce fb Sphaerex and the Sphaerex only treatments than the non-treated control and the MiravisAce only treatments. Test weights, yield, and % FDK did not differ among treatments or cultivars. DON content was significantly reduced with each of the fungicide treatments; greatest reductions ($\geq$ 50%) were noted with MiravisAce fb ProsaroPro, Miravis fb Sphaerex, and Caramba treatments.

iv. In 2022 at PBU, AGS 3030 had higher field ratings for scab than the two experimental cultivars, GAE23F and GA18LE43F. Each of the fungicide treatments significantly reduced field ratings of scab compared to the inoculated control and numerically reduced the scab index compared to the non-treated control.

v. Spring 2023, GC. Preliminary results of field ratings indicate no disease differences.

c) List key outcomes or other achievements.

Sphaerex continues to show good efficacy for managing scab and DON contamination.

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

Graduate students have been trained to recognize and rate disease levels in wheat.

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

A summary report is provided to station personnel and results from all locations at which work was done is shared with growers at a commodity group meeting. Results are also discussed with extension specialists on campus.

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).

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).

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

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

Bowen, K. (2022). Fusarium head blight management in Alabama: Observations from 2021 and 2022 spring seasons. Proceedings of the 2022 National Fusarium Head Blight Forum; Tampa, FL. December 4-6, 2022. Retrieved from: https://scabusa.org/forum/2022/2022NFHBForumProceedings.pdf.

Ghimire, B.*, Bahri, B., Martinez-Espinoza, A. D., Mergoum, M., Glenn, A. E., Bowen, K. L., and Buck, J. W. 2022. Genetic diversity, mycotoxin profiling, and population structure of *Fusarium* spp. recovered from wheat and corn fields in GA. Abstr. Phytopathology 112:S3.181. [abstract, published]

Bowen, K. L. 2022. Fusarium head blight management in Alabama in 2021. So. Div APS. Phytopathology 112:S2.14. [abstract, published]

Ghimire, B., M. Mergoum, A. E. Glenn, K. L. Bowen, A. D. Martinez-Espinoza, and J. W. Buck. (2021). Population diversity of Fusarium species causing Fusarium Head Blight in wheat and greenhouse pathogenicity tests of F. poae isolated from Georgia. Proceedings of the 2021 National Fusarium Head Blight Forum; Virtual. December 6-7, 2021. Retrieved from: https://scabusa.org/forum/2021/2021NFHBForumProceedings.pdf