

FY21 Performance Progress Report

Due date: July 26, 2022

Cover Page

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Fiscal Year:	2021
USDA-ARS Agreement ID:	59-0206-0-183
USDA-ARS Agreement Title:	Integrated management of Fusarium head blight of small grain crops in Kentucky
FY20 USDA-ARS Award Amount:	\$47,428
Recipient Organization:	University of Kentucky Department of Plant Pathology 1205 Hopkinsville Street, Princeton, KY 42445
DUNS Number:	939017877
EIN:	61-6033693
Recipient Identifying Number or Account Number, if any:	3200003575
Project/Grant Period:	5/15/21 - 5/14/23
Reporting Period End Date:	5/14/2022

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT-IM	Integrated Management of Fusarium Head Blight of Small Grain Crops in Kentucky	\$47,428
FY21 Total ARS Award Amount		\$47,428

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: Integrated Management of Fusarium Head Blight of Small Grain Crops in Kentucky

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

The overall project goal is to improve management of FHB and DON. The specific objectives of the project are: 1) evaluate the integrated effects of fungicide treatment and genetic resistance on FHB and DON in all major grain classes, with emphasis on a new fungicide, Miravis Ace; and 2) compare the efficacy of Miravis Ace when applied at early heading or at anthesis (heading in barley) to that of standard anthesis (heading in barley) application of Prosaro or Caramba fungicides.

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?

Two trials each were conducted in soft red winter wheat and in winter barley (4 trials in total) for the 2020-21 growing season. Within wheat and barley, there were “integrated management trials” and “uniform fungicide trials”. These trials were conducted at the University of Kentucky Research & Education Center at Princeton, KY. Research trials were established, managed, sprayed with the fungicide treatments, rated for disease severity, and harvested for yield and for grain samples to be evaluated for DON. Since these projects are part of an overall coordinated project, the data were sent to Dr. Pierce Paul’s research program (Ohio State University), where the multi-state data are analyzed. Results from the research trials also are presented at scientific and extension meetings.

b) What were the significant results?

For the wheat “integrated management trial”, mean DON values ranged from 0.3 to 2.4 ppm. Cultivar had a large impact on DON, where DON values were below 0.7 ppm for all treatments (including the non-treated control) on the most resistant cultivar (AgriMaxx 463). For the other two cultivars (AgriMaxx 446 and Pembroke 16), the non-treated controls had DON values greater than 2 ppm, but most fungicide treatments reduced DON values to below 2 ppm. The new fungicides Miravis Ace and BAS8400F (now known as “Sphaerex”) were effective in reducing DON similar to other standard fungicide treatments in the trial.

For the wheat “uniform fungicide trial”, mean DON values ranged from 1.1 to 4.6 ppm, where the non-treated control had a mean DON value of 3.3 ppm. Treatments that reduced DON to below 2 ppm were Prosaro applied at Feekes 10.51, Miravis Ace applied at 4 days after Feekes 10.51, sequential applications of Miravis Ace at Feekes 10.51 followed by Caramba 4 days later, and sequential applications of Miravis Ace at Feekes 10.3 followed by Caramba 4 days after Feekes 10.51.

For the barley “integrated management trial”, mean DON values were relatively low and ranged from 0.2 to 1.3 ppm. DON values tended to be greatest for the cultivar ‘Secretariat’ compared to the cultivar ‘Thoroughbred’. For ‘Secretariat’, all fungicide

treatments significantly ($P \leq 0.05$) reduced DON compared to the non-treated control except for Prosaro applied at Feekes 10.5. Due to the overall low DON values for 'Thoroughbred', no treatments had significantly lower DON values than the non-treated control for that cultivar.

For the barley "uniform fungicide trial", mean DON values were relatively low and ranged from 0.2 to 0.9 ppm. All treatments except Prosaro @ 6.5 fl oz/A @ Feekes 10.5 and Folicur @ 4 fl oz/A @ Feekes 10.5 significantly reduced DON values compared to the non-treated control, which had a DON value of 0.9 ppm.

c) List key outcomes or other achievements.

For both "integrated management trials" in wheat and barley, the importance of planting the most resistant cultivars available were highlighted as being an important step towards managing FHB and DON. In addition, very little information on management of FHB and DON in winter barley in Kentucky has been available until very recently. This research provided some much-needed information on management of this important disease of winter barley in Kentucky and the surrounding region.

This research also showed that the new fungicides Miravis Top and BAS8400F (now known as "Sphaerex") were effective in managing FHB and DON. These non-biased results provided information that will help farmers make better-informed fungicide choices for their wheat and barley crops for Kentucky and the nearby region. In addition, Kentucky farmers have had questions about the possibility of making sequential applications of fungicide for improved control of FHB and DON. The results of this research did not necessarily show an advantage of making two sequential fungicide applications compared to one application of an effective fungicide for control of FHB and DON. These results will help farmers improve their profitability by not spending money on a second fungicide application.

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

Conducting this research allowed two undergraduate students (from Murray State University and Western Kentucky University), an M.S. and a Ph.D. graduate students from the University of Kentucky, a postdoctoral scholar from the University of Kentucky, a research analyst from the University of Kentucky, and an extension associate from the University of Kentucky to gain hands-on learning about the Fusarium head blight disease cycle, impacts of this disease, and management options. In addition, the project has allowed the PI and two graduate students to attend the virtual National Fusarium Head Blight Forum, which has provided an opportunity to learn about other research being conducted. Results from this project are presented to farmers, crop consultants, and others, which presents opportunities for their professional development and learning.

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

Results of the Coordinated Management Trials have been disseminated to the scientific community through proceedings presented at the National Fusarium Head blight Forum. Results also have been disseminated to stakeholders (i.e. farmers, Extension personnel, crop consultants, industry representatives, and commodity representatives) through presentations at virtual Extension meetings and field days, and articles written in on-line Extension newsletters.

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).

None

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).

None

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.

J.A. Cinderella, K. Anderson, G.C. Bergstrom, W.W. Bockus, C.A. Bradley, M. Breunig, E. Byamukama, M.I. Chilvers, C. Cowger, T.R. Faske, A.J. Friskop, J. Kelly, N.M. Kleczewski, S. Mideros, P.A. Paul, T. Price, N. Rawat, J. Rupp, S. Shim, J. Stevens, D. Telenko, and A.M. Koehler. 2021. Baseline fungicide sensitivity to pydiflumetofen in *Fusarium graminearum* isolated from wheat across 16 states. *Proceedings of the 2021 National Fusarium Head Blight Forum*, Virtual; December 6-7. Retrieved from: <https://scabusa.org/forum/2021/2021NFHBForumProceedings.pdf>.

C. Bradley. 2022. "Blights and Spots: Wheat and Soybean Disease Management." Presentation at the 2022 Illinois Crop Management Conference, Mt. Vernon, IL; January 19, 2022.

Status: Presented

Acknowledgement of Federal Support: YES

C. Bradley. 2022. "Blights and Blotches: Wheat Disease Management Update." Presentation at the 2022 University of Kentucky Winter Wheat Meeting, Hopkinsville, KY; February 8, 2022. Status:

Presented

Acknowledgement of Federal Support: YES

C. Bradley. 2022. "Blights and Spots: Wheat and Soybean Disease Management." Presentation at the 2022 Kentucky-Tennessee Grain Day, Russellville, KY; February 23, 2022.

Status: Presented

Acknowledgement of Federal Support: YES

(Form – PPR21)