USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY20 Annual Performance Progress Report
Due date: July 29, 2021

Cover Page

Principle Investigator (PI):	Carl Bradley
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Fiscal Year:	2020
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:	$ 45,865
Recipient Organization:	University of Kentucky Sponsored Projects Administration 500 S Limestone 109 Kinkead Hall Lexington, KY 40526-0001
DUNS Number:	939017877
EIN:	61-6033693
Recipient Identifying Number or Account Number:	3200003575
Project/Grant Reporting Period:	5/15/20 - 5/14/21
Reporting Period End Date:	5/14/2021

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Integrated Management of Fusarium Head Blight of Small Grain Crops in Kentucky	$ 45,865
	FY20 Total ARS Award Amount	**$ 45,865**

Carl A Bradley

7/28/2021

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: *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 proposed study 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 newly-registered fungicide, Miravis Ace®; 2) compare the efficacy of Miravis Ace when applied at heading or at anthesis to that of standard anthesis application of Prosaro® or Caramba®; 3) evaluate multiple applications for FHB and DON management; 4) generate data to further quantify the economic benefit of FHB/DON management strategies; 5) develop more robust "best-management practices" for FHB and DON; and 6) generate data to validate and advance the development of FHB and DON risk prediction models.

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). 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 are 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 barley "integrated management trial", DON was lower in grain from 'Thoroughbred' compared to 'Secretariat'. All fungicide applications made at Feekes 10.5 and up to 6 days later significantly reduced DON compared to the non-treated control in both varieties.

For the barley "uniform fungicide trial", DON was significantly reduced compared to the non-treated control (5.6 ppm) by all treatments applied from Feekes 10.5 up to 6 days later. When applied at Feekes 10.3, Miravis Ace did not reduce DON compared to the non-treated control.

For the wheat "integrated management trial", DON levels were relatively low for the trial (0.6 – 2.1 ppm). Cultivar had the biggest impact on DON, where harvested grain from plots planted to AgriMaxx 463 had the lowest DON levels compared to grain from 'AgriMaxx 446' and 'Pembroke 16'.

For the wheat "uniform fungicide trial", DON levels ranged from 2.9 to 6.9 ppm. Although no treatments reduced DON levels to below 2 ppm, Prosaro, Caramba, Miravis Ace, and BAS840 applied at Feekes 10.51 up to 6 days later, resulted in the lowest DON levels. Double applications (made at either Feekes 10.3 and then 6 days later or Feekes 10.51 and then 6 days later) did provide any additional benefit in reducing DON compared to single applications at Feekes 10.51 or 4-6 days later.

c) List key outcomes or other achievements.

New information on management of FHB and DON in winter barley in Kentucky was made possible by this research. In general, little information is available in the region for management of FHB and DON in winter barley. Therefore, this research provided some much-needed information for this area.

Kentucky farmers have had questions about the possibility of making double applications of fungicides for improved control of FHB and DON. The results of this research did not show an advantage of making two fungicide applications compared to one application for control of FHB and DON. These results will help farmers improve their profitability by not spending money on a second fungicide application. In addition, it was also important to evaluate the experimental fungicide BAS 840, as it may be registered for use by 2022. As observed in previous studies and confirmed in this research, the greatest reduction in FHB occurs when moderately resistant cultivars are planted and sprayed with an effective fungicide at the correct application timing

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.

A reduction in summer seasonal technical help was applied at the University of Kentucky. In addition, restrictions on the number of people per university vehicle was applied. These changes resulted in longer hours (in some cases overtime being accrued) for support personnel as well as additional expenses on University of Kentucky motor pool vehicles.

4. 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), a M.S. graduate student 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 a graduate student 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.

5. 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.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY20 award period (5/15/20 - 5/14/21). 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 FY20 award period?**
   ☐Yes ☒No
   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 FY20 award period?**
   ☐Yes ☒No
   If yes, how many? Click to enter number here.

3. **Have any post docs who worked for you during the FY20 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**
   ☐Yes ☒No
   If yes, how many? Click to enter number here.

4. **Have any post docs who worked for you during the FY20 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
   If yes, how many? Click to enter number here.

FY20 Annual Performance Progress Report
PI: Bradley, Carl
USDA-ARS Agreement #: 59-0206-0-183
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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 (5/15/20 - 5/14/21). 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
Not applicable to this project.	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 (5/15/20 - 5/14/21**) 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:

Z.J. Winn, R. Acharya, J. Lyerly, G. Brown-Guedira, C. Cowger, C. Griffey, J. Fitzgerald, R.E. Mason and J.P. Murphy. 2020. "Mapping of Fusarium Head Blight Resistance in NC13-20076 Soft Red Winter Wheat." In: S. Canty, A. Hoffstetter, and R. Dill-Macky (Eds.), *Proceedings of the 2020 National Fusarium Head Blight Forum (*p. 12.), Virtual; December 7-11. Online: 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.

J.M. Luis, S.J. Ng, G. Bergstrom, K. Bissonnette, K. Bowen, C. Bradley, E. Byamukama, M. Chilvers, A. Collins, C. Cowger, H. Darby, E. DeWolf, R. Dill-Macky, P. Esker, A. Friskop, N. Kleczewski, A. Koehler, D.B. Langston, L. Madden, J. Marshall, H. Mehl, W. Moraes, M. Nagelkirk, N. Rawat, D. Smith, D. Telenko, S. Wegulo, H. Young-Kelly, and P.A. Paul. 2020. "Fusarium head blight management coordinated project: integrated management trials 2018-2020." In: S. Canty, A. Hoffstetter, and R. Dill-Macky (Eds.), *Proceedings of the 2020 National Fusarium Head Blight Forum* (p. 38-43), Virtual; December 7-11. Online: https://scabusa.org/pdfs/NFHBF20_Proceedings.pdf.
Status: Paper published and Poster presented
Acknowledgement of Federal Support: YES

J.M. Luis, S.J. Ng, G. Bergstrom, K. Bissonnette, K. Bowen, C. Bradley, E. Byamukama, M. Chilvers, A. Collins, C. Cowger, H. Darby, E. DeWolf, R. Dill Macky, P. Esker, A. Friskop, N. Kleczewski, A. Koehler, D.B. Langston, L. Madden, J. Marshall, H. Mehl, W. Moraes, M. Nagelkirk, N. Rawat, D. Smith, D. Telenko, S. Wegulo, H. Young-Kelly, and P.A. Paul. 2020. "Fusarium head blight management coordinated project: uniform fungicide trials 2018-2020." In: S. Canty, A. Hoffstetter, and R. Dill-Macky (Eds.), *Proceedings of the 2020 National Fusarium Head Blight Forum* (p. 44-48), Virtual; December 7-11. Online: https://scabusa.org/pdfs/NFHBF20_Proceedings.pdf.

Status: Paper published and Poster presented
Acknowledgement of Federal Support: YES

C. Bradley. 2021. "Putting it all together: integrated management of head scab in wheat." Presentation at the 2021 University of Kentucky Winter Wheat Meeting; Virtual; January 5, 2021. Online: https://wheatscience.ca.uky.edu/videos.

Status: Published
Acknowledgement of Federal Support: YES

C. Bradley. 2021. "Foliar fungicides for disease control in field crops." Presentation at the 2021 Tennessee Grain & Soybean Producers Conference; Virtual; January 2021. Online: https://conference.utcrops.com/foliar-fungicides-for-disease-control-in-field-crops/.

Status: Published
Acknowledgement of Federal Support: YES

C. Bradley. 2021. "Foliar fungicides for disease control in wheat and soybean". Presentation at the Virtual Grain Conference for Carlisle and Fulton Counties, KY; Virtual; March 1, 2021.

Status: Presented
Acknowledgement of Federal Support: YES

C. Bradley. 2021. "Management of Fusarium head blight". Presentation at the 2021 University of Kentucky Wheat Webinar; Virtual; May 11, 2021. Online: https://www.youtube.com/watch?v=WpV1XsQ9pXk.

Status: Presented
Acknowledgement of Federal Support: YES