USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY20 Annual Performance Progress Report
Due date: August 31, 2021

Cover Page

Principle Investigator (PI):	Paul Esker
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Fiscal Year:	2020
USDA-ARS Agreement ID:	59-0206-0-140
USDA-ARS Agreement Title:	Integrated Management of Fusarium Head Blight in Wheat in Pennsylvania
FY20 USDA-ARS Award Amount:	$ 26,132
Recipient Organization:	The Pennsylvania State University Research Accounting 227 W Beaver Ave, Ste 401 State College, PA 16801-4819
DUNS Number:	00-340-3953
EIN:	24-6000376
Recipient Identifying Number or Account Number:	138890
Project/Grant Reporting Period:	6/1/20 - 5/31/21
Reporting Period End Date:	5/31/2021

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Integrated Management of Fusarium Head Blight in Wheat in Pennsylvania	$ 26,132
	FY20 Total ARS Award Amount	**$ 26,132**

Paul Esker

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Date: 2021.08.29 14:30:43 -04'00'

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 in Wheat in Pennsylvania*

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

The goals of this project are to: (1) validate the integrated management strategies with next generation of wheat and barley varieties in multiple production environments; (2) develop economic analyses of effective integrated management strategies used alone and in combination (i.e. fungicide, biological control, cultivar, residue management); (3) evaluate flexibility of fungicide application timing within the context of the integrated management strategies; (4) Continue to update and enhance the content of the ScabSmart web site; (5) Make commentaries from the FHB forecasting site available USWBSI blog website and sent to users via mobile devices; and (6) develop tools that will help growers assess and understand the value of adopting scab management practices.

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?

During FY20, the major activities included the establishment of four field trials, two each for the uniform fungicide testing program, and two for the integrated management coordinated project. Trials were established at the Russell E. Larson Agricultural Research Center (RELARC) and the Southeast Agricultural Research and Extension (SEAREC). These are in Centre/Huntington Counties and Lancaster County, respectively. Trials were established following the recommended protocols. All trials were inoculated as per the protocol, given that we were able to resume more intensive lab work at the timing of inoculations. Trials have been harvested but the data are still being processed. Data will be shared with the CP as soon as they are finalized.

Furthermore, information from this trial, along with previous trials have been used in various talks about Fusarium head blight management. Also, risk information has been shared through our channels like the *Field Crop News* from Penn State Extension and Twitter to help guide stakeholders through the decision-making process during flowering periods.

b) What were the significant results?

Data are still be analyzed from field trials conducted during FY20. General observations noted that the inoculation was effective, although scab conditions were not as favorable for natural infection compared to previous years. Reports from around Pennsylvania indicated that scab was variable and that the scab model was maybe not as effective as in previous years. One other major observation and result

from the FY20 trials has been the increase in wheat leaf rust. Anecdotally we saw large differences between treated and nontreated plots. This is providing novel information for our team to develop the next generation of trials for Pennsylvania whereby we focus on increasing our understanding of the overall disease complex late in the growing season.

c) List key outcomes or other achievements.

Two key outcomes from our project was (1) the development of virtual talk on FHB management, which was delivered at seven programs being received by an audience of 400 and (2) the successful establishment and harvest of the FY20 trial in spite of COVID-19 and also a change in personnel as part of the soybean and small grains variety testing program. We collaborate closely with this group for planting and harvesting of trials. Additionally, we were able to successfully conduct the trial as per our original protocol, which included the use of inoculation. The results look promising, including for other foliar diseases of wheat like wheat leaf rust, which will become a key component of our new trials (i.e., mixed infections).

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.

COVID-19 impacted the study initially in that we had reduced support personnel for things like crop establishment. Nonetheless, the ability to get approval for personnel deemed as mission critical did enable us to focus our efforts on making sure field trials were established, maintained, inoculated, and harvested. Currently, we do not have restrictions but continue to monitor the situation regarding the Delta variant of COVID-19 as this could impact some of our fall efforts.

COVID-19 did affect how we conducted extension meetings until relatively recently. All programming was virtual, so we did not conduct our normal schedule of activities. Despite this, we were able to create a virtual presentation, which was used at seven meetings, being seen by 400 people. Right now, we do not have restrictions for meetings, although the impact of COVID-19 has changed how we may run some programs going forward.

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

Training of a new graduate student was accomplished as part of the FY20 trials. This student will take the lead on field projects to be planted in Fall 2021.

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

Data from FY20 trials will be shared back to the coordinated project. We have used primarily a virtual approach to disseminating results to the broader community. We also wrote six articles during the growing season about scab risk. These articles as shared as part of Penn State Extension's *Field Crop News*, which is received by over 10,000 currently signed up to receive information Penn State Extension.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY20 award period (6/1/20 - 5/31/21). 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 FY19 award period?**
   ☐Yes ☒No ☐ Not Applicable
   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 FY19 award period?**
   ☒Yes ☐No ☐ Not Applicable
   If yes, how many? 1

3. **Have any post docs who worked for you during the FY19 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**
   ☐Yes ☒No ☐ Not Applicable
   If yes, how many? Click to enter number here.

4. **Have any post docs who worked for you during the FY19 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 ☐ Not Applicable
   If yes, how many? Click to enter number here.

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 (6/1/20 - 5/31/21). 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
N/A	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
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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 (6/1/20 - 5/31/21**) 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:

> Winn, Z.J., Acharya, R., Lyerly, J., Brown-Guedira, G., Cowger, C., Griffey, C., Fitzgerald, J., Mason R.E., and Murphy, J.P. (2020, Dec 7-11). Mapping of Fusarium Head Blight Resistance in NC13-20076 Soft Red Winter Wheat (p. 12). In: Canty, S., Hoffstetter, A. and Dill-Macky, R. (Eds.), *Proceedings of the 2020 National Fusarium Head Blight Forum*. https://scabusa.org/pdfs/NFHBF20_Proceedings.pdf.
> Status: Abstract Published and Poster Presented
> Acknowledgement of Federal Support: YES (Abstract and Poster)

Journal publications.

Rodrigues Duffeck, M., Del Ponte, E.M., and Esker, P. 2021. Multifaceted insights of Fusarium head blight in small grains in Pennsylvania. Plant Health Progress, https://doi.org/10.1094/PHP-03-21-0067-SYN.
Status: Published
Acknowledge of Federal Support: Yes

Duffeck, M., Bandara, A., Weerasooriya, D, Collins, A., Jensen, P., Kuldau, G., Del Ponte, E., and Esker, P. 2021. Fusarium head blight of small grains in Pennsylvania: Unravelling species diversity, toxin types, growth, and triazole sensitivity (in review).
Status: Accepted
Acknowledge of Federal Support: Yes

Books or other non-periodical, one-time publications.

Nothing to report.

Other publications, conference papers and presentations.

P. Esker, A. Collins, A. Murillo-Williams, H. Reed, and B. Clark. 2021. The home stretch: Evaluating your small grain crop. Field Crop News – Penn State Extension. https://extension.psu.edu/the-home-stretch-evaluating-your-small-grain-crops.
Status: Published
Acknowledge of Federal Support: No

P. Esker, and A. Collins. 2021. Low risk for Fusarium head blight in wheat. Field Crop News – Penn State Extension. https://extension.psu.edu/low-risk-for-fusarium-head-blight-in-wheat.
Status: Published
Acknowledge of Federal Support: No

P. Esker, A. Collins, and A. Murillo-Williams. 2021. 2021 Wheat fungicide ratings available. Field Crop News – Penn State Extension. https://extension.psu.edu/2021-wheat-fungicide-ratings-available.
Status: Published
Acknowledge of Federal Support: No

Luis, J.M., Ng, S.J., Bergstrom, G., Bissonnette, K., Bowen, K., Bradley, C., Byamukama, E., Chilvers, M., Collins, A., Cowger, C., Darby, H., DeWolf, E., Dill-Macky, R., Esker, P., Friskop, A., Kleczewski, N., Koehler, A., Madden, L., Marshall, J., Mehl, H., Moraes, W., Nagelkirk, M., Rawat, N., Smith, D., Telenko, D., Wegulo, S., Young-Kelly, H., and Paul, P.A. (2020). Fusarium head blight management coordinated project: Integrated management trials 2018-2020. In: *Proceedings of the 2020 National Fusarium Head Blight Forum*. Online: December 7-11, 2020, pp. 38-43.
Status: Published
Acknowledgement of Federal Support: Yes

Luis, J.M., Ng, S.J., Bergstrom, G., Bissonnette, K., Bowen, K., Bradley, C., Byamukama, E., Chilvers, M., Collins, A., Cowger, C., Darby, H., DeWolf, E., Dill-Macky, R., Esker, P., Friskop, A., Kleczewski, N., Koehler, A., Madden, L., Marshall, J., Mehl, H., Moraes, W., Nagelkirk, M., Rawat, N., Smith, D., Telenko, D., Wegulo, S., Young-Kelly, H., and Paul, P.A. (2020). Fusarium head blight management coordinated project: Uniform fungicide trials 2018-2020. In: *Proceedings of the 2020 National Fusarium Head Blight Forum*. Online: December 7-11, 2020, pp. 44-48.
Status: Published
Acknowledgement of Federal Support: Yes