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

Cover Page

Principle Investigator (PI):	Damon Smith
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Phone:	608-286-9706
Fiscal Year:	2020
USDA-ARS Agreement ID:	59-0206-0-189
USDA-ARS Agreement Title:	Refining IPM for FHB and DON in SRWW in Wisconsin
FY20 USDA-ARS Award Amount:	$ 19,785
Recipient Organization:	University of Wisconsin - Madison Office of Research & Sponsored Programs 21 N. Park Street, Suite 6401 Madison, WI 53715-1218
DUNS Number:	161202122
EIN:	39-6006492
Recipient Identifying Number or Account Number:	MSN240122
Project/Grant Reporting Period:	6/6/20 - 6/5/21
Reporting Period End Date:	6/5/2021

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Refining IPM for FHB and DON in SRWW in Wisconsin	$ 19,785
	FY20 Total ARS Award Amount	**$ 19,785**

8/27/2021

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: *Refining IPM for FHB and DON in SRWW in Wisconsin*

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

Overall Project Goal: Develop integrated management strategies for FHB and mycotoxins specific to Wisconsin soft red winter wheat production.

Objectives:

1) Conduct the standard multi-state MGMT-CP Integrated management protocol involving new chemistries applied to various varieties;
2) Conduct a uniform fungicide trial in Wisconsin with a focus on Miravis Ace®;
3) Validate action thresholds for spraying fungicide based on the FHB Prediction center, for Wisconsin's unique climate.

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?

The IM-CP standard protocols were followed and implemented in Wisconsin on soft red winter wheat (SRWW). This included conducting the integrated management (IM) protocol, treating resistant and susceptible varieties with various fungicides at different application timings. We also conducted the uniform fungicide trial (UFT) to bolster multi-state recommendations for efficacious fungicides. Finally, we conducted the coordinated scab prediction validation protocol using a susceptible variety in Wisconsin.

b) What were the significant results?

Results from the IM protocol revealed that the most significant reduction in FHB and DON is a result of planting a resistant variety (Harpoon). FHB could further be reduced by using fungicide. However, DON levels are usually very low on the resistant variety, thus, separation of treatments is often hard to see if we are just dealing with FHB and DON. However, in years where foliar disease are of concern, there is utility in applying fungicide at anthesis for both FHB and foliar disease control. We continue to see the best reductions in DON when Miravis Ace is applied 5 days after anthesis. This latter result is consistent with findings using Prosaro® or Caramba®. Results from the uniform fungicide trials also indicate that application of Miravis Ace at half-head emergence is just two early. Reductions in DON levels were much better when this product was applied at anthesis, or 5-days after anthesis, with the last application timing giving us the best reductions. This is also a great time to apply this fungicide to control foliar diseases that tend to come in during grain fill. These results have been consistent in Wisconsin now for several seasons. Prosaro and Caramba continue to perform well in

Wisconsin for reducing FHB and DON, as long as these products are applied at anthesis or 5 days after anthesis, with the higher rate of Prosaro performing quite well.

The scab prediction tool continues to fall short on accuracy in Wisconsin. We have experienced two years of heavy FHB in winter wheat. In 2019 the model never recommended a fungicide application on susceptible varieties in Wisconsin, with significant damage noted in the validation trials. In 2020, the model called for an application of fungicide, however pressure was low. We tend to have more years where the model is not accurate than when it is accurate. More work needs to be done to refine the scab advisor tool for unique environments like Wisconsin.

c) List key outcomes or other achievements.

Key outcomes of this work have been improved recommendations for FHB management in Wisconsin. Prior to this work, we were recommending that farmers apply just the fungicides Prosaro and Caramba at Anthesis. Now we know that Miravis Ace is a viable option and can be applied at full head emergence or as late as 5 days after the start of anthesis. Combined with moderately resistant varieties, this strategy has proven to be an excellent recommendation for limiting DON accumulation in finished grain harvested in Wisconsin. Prosaro and Caramba continue to be proven fungicide options and our foray into using these options in two-spray programs has also demonstrated excellent reductions in DON. These results are encouraging farmers to revisit wheat in their rotations in Wisconsin, which improves overall pest and disease control.

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.

Yes, due to new limits on DON testing at the University of Minnesota, we had to grind and send samples to a private lab for DON analyses on certain aspects of this project. This led to increased expenditures that had to be leveraged from flexible funds.

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

While this project did not directly train a graduate student, several graduate students were involved in assisting technicians in implementing the trials. These graduate students obtained experience in experimental design and disease management strategies in wheat.

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

Results obtained were disseminated to stakeholders using cooperative extension outlets. The University of Wisconsin Field Crops Pathology program maintains a website(s) (https://badgercropdoc.com) for data distribution. All pertinent results from these trials were posted in online portals. In addition, data were delivered to growers via annual cooperative extension Pest Management Update Meetings and Winter Agronomy meetings. All data were also supplied to the IM-CP manager to be included in the multi-state analysis.

Training of Next Generation Scientists

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

FY20 Annual Performance Progress Report
PI: Smith, Damon
USDA-ARS Agreement #: 59-0206-0-189
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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 (6/6/20 - 6/5/21). 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
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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

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 (6/6/20 - 6/5/21**) 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.

N/A

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

A Farmer's Guide to Wheat Diseases. 2020. Damon Smith, Kiersten Wise, Anna Freije, Adam Sisson, Albert Tenuta, Andrew Friskop, Emmanuel Byamukama, Juliet Marshall, Mary Burrows, and Daren Mueller (eds.). APS Press, St. Paul, MN. 149 pgs.
Status: Book Published
Acknowledgement of Federal Support: Yes USWBSI logo printed in book

Other publications, conference papers and presentations.

Peer-reviewed Technical Report:

Mueller, B. and **Smith, D.L.** 2020. Evaluation of foliar fungicides for control of Fusarium head blight of wheat in Wisconsin, 2019. Plant Disease Management Reports 14:CF007.
Status: Published
Acknowledgement of Federal Support: N/A

Extension Fact sheets:

Zegler, C., Smith, D.H., Broeske, M., Gaska, J., Werle, R., Conley, S.P., **Smith, D.L.**, Jensen, B., and Laboski, C. 2020. Small grains in Wisconsin. University of Wisconsin-Madison, Nutrient and Pest Management Program Publication. https://ipcm.wisc.edu/download/pubsGuides/SmallGrainsWI_final.pdf.
Status: Published
Acknowledgement of Federal Support: N/A

Kleczewski, N., Kaur, N., Bergstrom, G., Bradley, C., Chilvers, M., Collins, A., Cowger, C., DeWolf, E., Friskop, A., Koehler, A., Mehl, H., Paul, P., Salgado, J., Sisson, A., **Smith, D.L.**, Wise, K., and Young-Kelly, H. 2020. Stagnospora nordorum leaf and glume blotch. Crop Protection Network Fact Sheet: CPN-3003.
Status: Published
Acknowledgement of Federal Support: N/A

Kleczewski, N., Bissonnette, K., Bradley, C., Chilvers, M., Collins, A., DeWolf, E., Friskop, A., Koehler, A., Mehl, H., Paul, P., Salgado, D., **Smith, D.L.,** Wise, K., Young-Kelly, H. 2020. Stripe Rust of Wheat. Crop Protection Network Fact Sheet: CPN-3004.
Status: Published
Acknowledgement of Federal Support: N/A

Conley, S., Roth, A, Gaska, J., Mueller, B., **Smith, D**. **2020**. *Wisconsin Winter Wheat Performance Tests*, University of Wisconsin-Madison, Cooperative Extension (A3868).
Status: Published
Acknowledgement of Federal Support: N/A

Newsletter Articles:

Smith, D.L. and Mueller, B. 2020. Wisconsin winter wheat disease update – June 2, 2020. Wisconsin Crop Manager, https://ipcm.wisc.edu/blog/2020/06/wisconsin-winter-wheat-disease-update-june-2-2020/.
Status: Published
Acknowledgement of Federal Support: N/A

Smith, D.L. and Mueller, B. 2020. Wisconsin winter wheat disease update – May 27, 2020. Wisconsin Crop Manager, https://ipcm.wisc.edu/blog/2020/05/wisconsin-winter-wheat-disease-update-may-27-2020/.
Status: Published
Acknowledgement of Federal Support: N/A

Smith, D.L. 2020. Timely wheat disease management videos and wheat fungicide information. Wisconsin Crop Manager, https://ipcm.wisc.edu/blog/2020/05/timely-wheat-disease-management-videos-and-wheat-fungicide-information/.
Status: Published
Acknowledgement of Federal Support: N/A

Smith, D.L. and Mueller, B. 2020. Early season scouting wheat in Wisconsin. Wisconsin Crop Manager, https://ipcm.wisc.edu/blog/2020/05/13498/.
Status: Published
Acknowledgement of Federal Support: N/A

Forum Proceedings:

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, Dec. 7-11). Fusarium head blight management coordinated project: Integrated management trials 2018-2020 (pp. 38-43). 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: 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, Dec. 7-11). Fusarium head blight management coordinated project: Uniform fungicide trials 2018-2020 (pp. 44-48). 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.
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