

USDA-ARS | U.S. Wheat and Barley Scab Initiative
FY21 FINAL Performance Progress Report

Due date: July 26, 2023

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USDA-ARS Agreement ID:	59-0206-0-189
USDA-ARS Agreement Title:	Refining IPM for FHB and DON in SRWW in Wisconsin
Principle Investigator (PI):	Damon Smith
Institution:	University of Wisconsin
Institution UEI:	LCLSJAGTNZQ7
Fiscal Year:	2021
FY21 USDA-ARS Award Amount:	\$21,349
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Period of Performance:	6/6/21 - 6/5/23
Reporting Period End Date:	6/5/2023

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT-IM	Refining IPM for FHB and DON in SRWW in Wisconsin	\$21,349
FY21 Total ARS Award Amount		\$21,349

I am submitting this report as a: 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.



7/5/2023

Principal Investigator Signature

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: 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 had very little FHB in 2021 and 2022 and the prediction tool functioned okay. However, in

previous years under heavy pressure the tool tends to under-predict. More work needs to be done on understanding how to use this tool in 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. What opportunities for training and professional development has the project provided?

While this project did not directly train a graduate student, a graduate student focused on FHB management in organic winter wheat production was involved in assisting technicians in implementing these trials. The grad student obtained experience in experimental design and disease management strategies in wheat.

4. 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.

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).

N/A

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).

N/A

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.

Peer-reviewed technical reports

Mueller, B. and Smith, D.L. 2022. Evaluation of foliar fungicides for control of Fusarium head blight of 'Kaskaskia' wheat in Wisconsin, 2021. Plant Disease Management Reports 16:CF062.

Status: Published Acknowledgement of Federal Support: N/A

Mueller, B. and Smith, D.L. 2022. Evaluation of foliar fungicides for control of Fusarium head blight of 'Harpoon' wheat in Wisconsin, 2021. Plant Disease Management Reports 16:CF063.

Status: Published Acknowledgement of Federal Support: N/A

Published Abstracts

Debbink, K., Da Silva, C.R., Mueller, B., Silva, E., Telenko, D.E.P., and Smith, D.L. 2022. Integrated management of Fusarium head blight and deoxynivalenol in organic winter wheat systems. Phytopathology 112:S3.5.

Newsletters and Blog Articles

Smith, D.L. 2022. Wisconsin winter wheat disease update-June 1, 2022. Badger Crop Doc Blog, June 1. <https://badgercropdoc.com/2022/06/01/wisconsin-winter-wheat-disease-update-june-1-2022/>

Smith, D.L. 2022. Wisconsin winter wheat disease update-May 24, 2022. Badger Crop Doc Blog, May 24. <https://badgercropdoc.com/2022/05/24/wisconsin-winter-wheat-disease-update-may-24-2022/>

Videos

Smith, D.L. and Smith, D. 2022. Bumper Crops: Early season pest management in winter wheat. University of Wisconsin-Madison, Division of Extension. <https://youtu.be/IQeWM83QG0U>