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

Cover Page

Principle Investigator (PI):	Patrick Hayes
Institution:	Oregon State University
E-mail:	patrick.m.hayes@oregonstate.edu
Phone:	541-737-5878
Fiscal Year:	2020
USDA-ARS Agreement ID:	59-0206-0-165
USDA-ARS Agreement Title:	Production of Double Haploid for FHB Resistance
FY20 USDA-ARS Award Amount:	$ 85,204
Recipient Organization:	Office for Sponsored Research and Award Administration Oregon State University A312 Kerr Administration Building Corvallis, OR 97331-2140
DUNS Number:	053599908
EIN:	61-1730890
Recipient Identifying Number or Account Number:	R08160
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
BAR-CP	Barley Doubled Haploid Production for Resistance to FHB and DON Accumulation	$ 85,204
	FY20 Total ARS Award Amount	**$ 85,204**

8/17/2021

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: *Barley Doubled Haploid Production for Resistance to FHB and DON Accumulation*

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

Our overall project goal is to continue to assist researchers in increasing the efficiency with which researchers they identify and deploy genes and QTLs that contribute to reduction in the losses caused by Fusarium head blight (FHB). This can be achieved by developing doubled haploid (DH) germplasm from the F1s of cross combinations identified by collaborating breeders. DH's - being complete homozygotes – are immortal reference genetic stocks (IGSs) that provide unequivocal genotyping and phenotyping data. We will also implement speed breeding as an alternative path for achieving a rapid approach to homozygosity, when germplasm is recalcitrant in the DH production process and/or when marker-assisted selection will be useful in segregating generations.

Our project objectives were to:

1. Produce ~ 2,000 plantlets from the F1 donor plants.
2. Based on past experience, ~2,000 plantlets will produce ~ 1,000 DH plants.
3. Submit lyophilized tissue from these DH to the USDA-ARS Western Regional Small Grains Genotyping Laboratory (USDA-ARS WRSGGL) at Pullman, WA for genotyping.
4. Produce seed from the DH and ship seed to cooperators, who will then be empowered by accessing DH-IGSs and with real-time genotype data.
5. Pilot development of one speed breeding population of recombinant inbred lines (RILs), via single seed descent, through the F4 generation.

Our plan to accomplish goals was:

1. Receive F1 seed no later than August 1 from the collaborating research group(s) identified by the CP Steering Committee (CPSC) as having the greatest potential to have economic impact and to contribute to the fundamental body of knowledge.
2. Grow F1 donor plants.
3. Produce ~ 2,000 plantlets from the F1 donor plants.
4. Produce ~ 1,000 DHs.
5. Lyophilize leaf tissue from the DHs and send to the USDA-ARS WRSGGL for genotyping.
6. Ship DH and/or seed of RILs to cooperators.

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 following F1s were received and used for DH production:
DH120304/Mateo (C1); Oregon State University

DH142000/Mateo (C2); Oregon State University
DH140963/Mateo (C3); Oregon State University
Francine/B9K62 (C4); University of California, Davis
Somerset/DH141225 (C5); Oregon State University

Number of green plantlets produced per F1 and the number of green plantlets per tiller (in parentheses):
76; (2.62/tiller) DH120304/Mateo
838; (9.10/tiller) DH142000/Mateo
275; (8.59/tiller) DH140963/Mateo
153; (0.86/tiller) Francine/B9K62
939; (7.95/tiller) Somerset/DH141225
Total green plantlets **2,281**

Number of transplants from which tissue was collected for genotyping:
(on-going until 9/2021)
C1: 41
C2: 498
C3: 155
C4: 43
C5: 223
Total tissue samples collected: **960**

b) What were the significant results?
We exceeded the goal of 2,000 plantlets.
Collected tissue from 960 transplants for genotyping at USDA-ARS, WRSGGL.
On target to produce goal of 1,000 DHs.
Produced 219 F5 RILs from a cross that was recalcitrant in DH production.

c) List key outcomes or other achievements.
Expected DH efficiencies for all crosses except Francine/B9K62; alternative generation advance discussed with PI. They chose to take only the available DH and not wait for speed breeding.

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 imposed challenges, but the staff surmounted them.

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

Professional expertise enhanced, but COVID constrained personal interactions.

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

Tissue shipped for genotyping; seed shipped to cooperators.

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? Click to enter number here.

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
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 (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.

Nothing to report.

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

Nothing to report.

Other publications, conference papers and presentations.

Nothing to report.