

FY22 Performance Progress Report

Due date: July 26, 2023

Cover Page

USDA-ARS Agreement ID:	N/A
USDA-ARS Agreement Title:	Barley FHB Resistance for the Intermountain West
Principle Investigator (PI):	Kathy Esvelt Klos
Institution:	USDA-Agricultural Research Service
Institution UEI:	N/A
Fiscal Year:	2022
FY22 USDA-ARS Award Amount:	\$17,892
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Period of Performance:	May 1, 2022 - April 30, 2023
Reporting Period End Date:	April 30, 2023

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
BAR-CP	Identification, Characterization, and Development of FHB-resistant Germplasm	\$17,892
FY22 Total ARS Award Amount		\$17,892

I am submitting this report as an: Annual 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.

KATHY ESVELT KLOS

Digitally signed by KATHY ESVELT KLOS
Date: 2023.06.05 12:39:47 -06'00'

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: Identification, Characterization, and Development of FHB-resistant Germplasm

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

Major Project Goals: Identification and confirmation of FHB resistance (particularly expressed as lower DON) in USDA-ARS Aberdeen, Idaho breeding lines.

Project Objectives:

- 1) Characterize FHB resistance in Elite barley germplasm.
- 2) Incorporate a genomic selection approach to improve elite germplasm for FHB resistance.
- 3) Characterize QTL contributing to FHB resistance and lower DON.

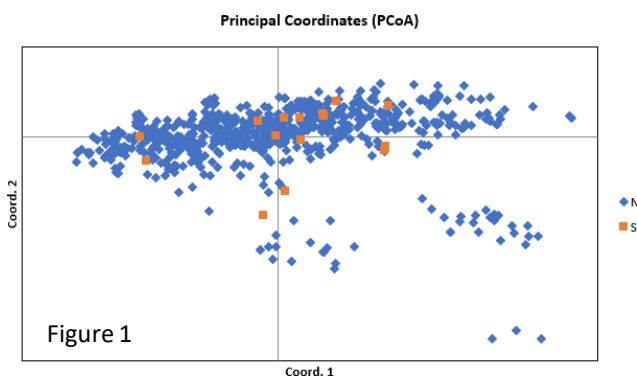
2. What was accomplished under these goals or objectives?

a) What were the major activities?

- 1) Characterized more than 170 elite lines at Aberdeen and Kimberly nurseries in Idaho. DON data was obtained for grain samples taken at the Kimberly nursery. Collaborated with North Dakota State University and University of Minnesota for FHB screening in their nurseries. Obtained DON data from collaborators for 100 lines each. Selected FHB resistance germplasm for use as parents in crosses.
- 2) Used Genotype and phenotype data taken on a spring barley training population (N=250) to predict FHB resistance in elite breeding lines of the spring barley breeding program (N=681). 15 lines were selected for use as parents.
- 3) Three spring barley bi-parental populations were phenotyped for FHB response in Kimberley, ID, Fargo, ND and Langdon, ND.

b) What were the significant results?

- 1) From selections made in FHB nurseries, made over 30 crosses using at least one FHB resistant (low DON) parent. Fewer than normal F1 seed was obtained from FY22 crosses due to problems with the greenhouse temperature control system. The DON results from 2022 indicated that our potential malting barley line 16ARS067-13 is likely MR or MS to FHB.
- 2) In Figure 1, the 15 lines selected through phenotypic prediction are shown (in orange) in relation to the genetic diversity structure of the Aberdeen spring barley breeding program. Each parent line was successfully combined with at least two other lines.



- 3) The FHB severity and DON concentration of spring barley bi-parental populations are shown in Figure 2. The 2022 data will be combined with the previous phenotyping data and with genotyping data for mapping the genes/QTLs contributing to FHB resistance.

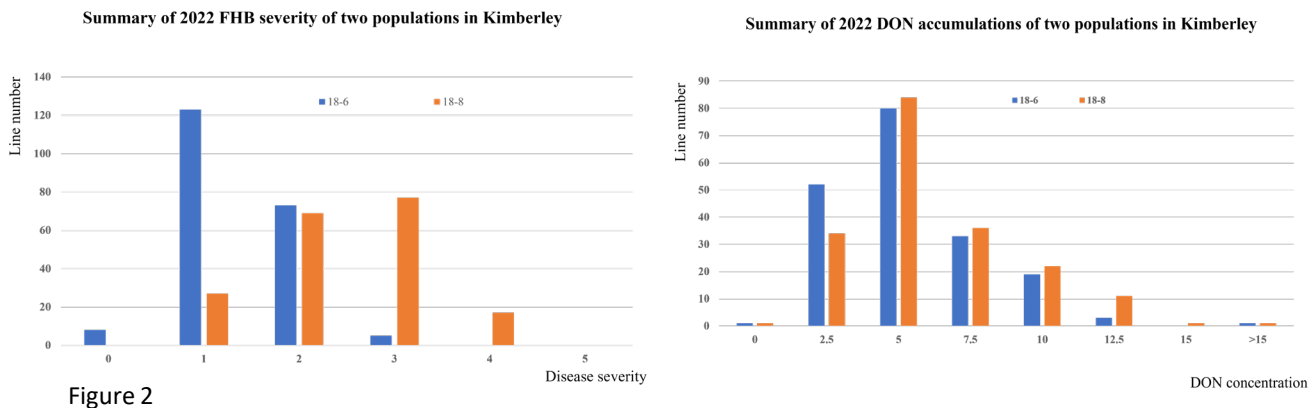


Figure 2

c) List key outcomes or other achievements.

The DON results from 2022 indicated that our potential malting barley line 16ARS067-13 is likely MR or MS to FHB.

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

This project provided the opportunity for training and career development for one postdoc at ARS, and one undergraduate student at Idaho State University. Additionally, the project also trained one student from the local high school.

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

The barley materials developed by our group have been shared with several barley scientists in the US. The FHB testing results are being used to prepare scientific manuscripts or conference abstracts. Results have been reported to the Idaho Barley Commission and the American Malting Barley Association.

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 FY22 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 May 1, 2022 – April 30, 2023?

Yes, I've included the citation reference in listing(s) below.

No, I have nothing to report.

Journal publications as a result of FY22 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).

Books or other non-periodical, one-time publications as a result of FY22 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).

Other publications, conference papers and presentations as a result of FY22 award

Identify any other publications, conference papers and/or presentations not reported above. Specify the status of the publication.

1. Gao, D., Abdullah, S., Baldwin, T., Caspersen, A.M., Fox-Fogle, E.G., Carlson, A., Collier, R., Petersen, M., Williams, E., Hu, G., Bregitzer, P., Esvelt Klos, K.L. (2022). Preliminary study on RNAi-mediated resistance to Fusarium head blight in barley (*Hordeum vulgare*). Proceedings of the National Fusarium Head Blight Forum: Tampa, FL. December 4-6, 2022. Retrieved from: <https://scabusa.org/forum/2022/2022NFHBForumProceedings.pdf>
2. Abdullah, S., Baldwin, T., Esvelt Klos, K. (2022). Adday validation through DIP inoculation of Fusarium Head Blight in spring barley training population. Proceedings of the National Fusarium Head Blight Forum: Tampa, FL. December 4-6, 2022. Retrieved from: <https://scabusa.org/forum/2022/2022NFHBForumProceedings.pdf>