USDA-ARS | U.S. Wheat and Barley Scab Initiative

FY21 Performance Progress Report

Due date: July 26, 2022

Cover Page

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Fiscal Year:	2021
USDA-ARS Agreement ID:	59-0206-0-169
USDA-ARS Agreement Title:	Developing FHB Resistant Wheat Cultivars for Idaho and the Western US
FY20 USDA-ARS Award Amount:	$48,202
Recipient Organization:	University of Idaho Aberdeen Research & Extension Center 1691 S 2700 W, Aberdeen, ID 83210
DUNS Number:	075746271
EIN:	82-6000945
Recipient Identifying Number or Account Number, if any:	AP4785
Project/Grant Period:	5/15/21 - 5/14/23
Reporting Period End Date:	5/14/2022

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR-SPR	Developing FHB Resistant Wheat Cultivars for Idaho and the Western US	$48,202
	FY21 Total ARS Award Amount	$48,202

I am submitting this report as an: ☒ Annual Report ☐ 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.

Jianli Chen

Principal Investigator Signature — July 27, 2022 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: Developing FHB Resistant Wheat Cultivars for Idaho and the Western US

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

We proposed to achieve the below major goals and objectives:

1) To make production of 'UI Cookie', release IDO1805S, and produce breeder seed for two FHB resistant lines IDO2101FHB and IDO2103FHB
2) To stack Fhb1, Fhb2, and Fhb3 genes with native resistance into adapted elite line backgrounds using a combination of traditional breeding, molecular marker assisted selection, and wheat by maize doubled haploid methods
3) To assess FHB resistance in FHB nurseries in Aberdeen, ID, and in Pullman, WA in collaboration with Dr. Deven See
4) To use the unknown resistance gene from synthetic wheat in collaboration with Dr. Steven Xu at the USDA-ARS facility at Fargo, ND
5) To train an under-graduate student on FHB research

2. What was accomplished under these goals or objectives? *(For each major goal/objective, address these three items below.)*

Objective 1. UI Cookie was officially released and licensed to Idaho Wheat Commission in spring 2021, registered seed will be harvested in summer 2022. Breeder seed of IDO2101FHB and IDO2103FHB will be harvested in summer 2022 as well. Because of weak straw strength we declined to release IDO1805S but used as a parental line in objective 2. UI Cookie, IDO2101FHB, and IDO2103FHB have been tested in state variety trials. UI Cookie has showed very good yield performance in summer of 2022.

Objective 2. In spring 2022, we assessed 28 lines in elite spring yield trials (21 soft white, 3 hard white and four hard red out of 120 lines), 122 soft white lines (out of 130) in observation yield trials with FHB1 and FHB3 from W14, NING9016, Faller, Alsen, and IDO1805S plus desirable agronomic traits, end-use quality, and resistance to stripe rust, stem rust, and hessian fly. Some of these lines showed excellent performance and have potential to be released in two to five years. Molecular markers have been used in selecting multiple traits. Doubled haploid lines (34) derived from a resistant line IDO1805S were produced. Additional populations (21 F2, 59 F3, 26 F4) with Fhb1 stacked with quality and other disease resistance are being evaluated in different generations of breeding processes.

Objective 3. We operated a FHB nursery in Aberdeen, ID in summer of 2021 and obtained good infection and DON data for 464 lines tested. Based on the disease data and DON data we advanced 28 lines to an elite nursery for agronomic evaluation in summer 2022. We also contributed 15 lines to Juliet Marshall's FHB nursery and got good infection in 2021. Because of severe drought conditions in summer 2021, Deven See (50 lines) and Steve Xu (50 lines) didn't get sufficient infection to assess disease in summer 2021. We planted a FHB nursery in spring 2022, but failed to do inoculation because a field technician resigned the position.

Objective 4. We have advanced 25 F2 populations that integrated non-FHB1 resistance (16 from synthetic wheat, seven from Fhb7, ten from Fhb2) in elite line backgrounds in 2022.

Objective 5. We hired an undergraduate student Spencer Walton in May then converted him to a field technician in June 2022.

3. **What opportunities for training and professional development has the project provided?**
   Two PhD students received training how to set up FHB disease nursery and assess disease resistance, and breeding for FHB resistance in summer 2021 and 2022.

4. **How have the results been disseminated to communities of interest?**
   We disseminated the results through several fieldday in both 2021 and 2022. We are going to develop a manuscript on breeding of FHB resistant cultivar. We also joined the virtual FHB forum in December 2021.

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 grant 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 FY21 grant 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 FY21 grant award

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

Idaho Farm Bureau Federation News. 'UI Cookie' licensing to Idaho Wheat Commission: https://www.idahofb.org/News-Media/2021/06/u-of-i-wheat-commission. June 7, 2021.