

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

Due date: July 26, 2023

Cover Page

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| USDA-ARS Agreement ID: | 59-0206-0-169 |
| USDA-ARS Agreement Title: | Developing FHB Resistant Wheat Cultivars for Idaho and the Western US |
| Principle Investigator (PI): | Jianli Chen |
| Institution: | University of Idaho |
| Institution UEI: | QWYKRJH5NNJ3 |
| Fiscal Year: | 2021 |
| FY21 USDA-ARS Award Amount: | \$48,202 |
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| Period of Performance: | 5/15/21 - 5/14/23 |
| Reporting Period End Date: | 5/14/2023 |

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 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.

Jianli Chen

Principal Investigator Signature

05/24/2023

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

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

The objectives of the proposed study are: 1) To release ‘IDO1805S’ and make production of ‘UI Cookie’; 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.)

a) What were the major activities?

UI Cookie, FHB-tolerant soft white spring wheat has been grown in Idaho, Washington, and Oregon since its released in 2021.

IDO1805S hard red spring wheat line has very good FHB resistance. UI Cookie, IDO1805S, IDO2101Fhb, and IDO2103Fhb were used as recurrent parents and stacked with *Fhb1*, *Fhb2*, and *Fhb3*, as well as FHB resistant synthetic wheat. Around 103 populations (F2 to F4) are advanced targeting FHB resistance.

In 2021, four hundred lines, 1120 headrows were planted and inoculated with conidial suspension in a misted FHB nursery in Aberdeen, ID. Fifty elite lines were assessed simultaneously for FHB resistance in nurseries in ND and WA under collaboration with Dr. Steve Xu and Dr. Deven See in summer 2021. A total of 500 DON samples were tested in winter 2021. In 2022 summer, fifty lines were evaluated for FHB resistance in Pullman, WA FHB nursery and NDSU FHB nurseries under collaborative effort although we lost our FHB nursery in summer 2022 because of field stress and poor standing.

More than 1500 lines were screened with molecular markers associated with *Fhb1* and *Fhb7* as well as markers for Hessian Fly, stem rust, and end-use quality.

Around 300 elite lines were simultaneously planted in yield trials and assessed for agronomic performance. The selected lines were tested for baking quality.

b) What were the significant results?

Fhb1 resistance gene from W14, Ning9016, Futai8944, and Rollag was introgressed in adapted spring wheat backgrounds. Out of 40 elites evaluated, fourteen showed very good FHB resistance. These elite lines with *Fhb1* showed promising agronomic performance. New FHB gene *Fhb7* and new synthetic wheat were backcrossed in these elite lines to stack multiple FHB genes. Molecular markers for *Fhb1* and *Fhb7* have facilitated the breeding effort. Few elite lines were entered into State Variety Trials in 2023.

c) List key outcomes or other achievements.

UI Cookie has been performing very good in the production in SE Idaho, East Washington, and West Oregon, especially in summer 2022. UI Cookie also have very good FHB resistance/tolerance to help growers when FHB epidemic occurs. Adapted spring wheat with *Fhb1* resistance gene are available to use as parental lines and shared with other breeding programs. Breeder seed from few spring wheat lines were harvested.

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

Nothing to report in this period.

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

FHB resistant lines were demonstrated at grower field day events.

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).

Nothing to report.

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).

Nothing to report.

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.

Nothing to report.