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

FY21 Performance Progress Report

Due date: July 26, 2022

Cover Page

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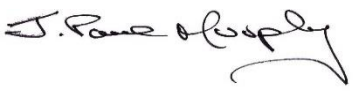
Phone:	919-610-0100
Fiscal Year:	2021
USDA-ARS Agreement ID:	59-0206-7-009
USDA-ARS Agreement Title:	Genotyping Breeding Lines for FHB Resistance
FY20 USDA-ARS Award Amount:	$84,278
Recipient Organization:	North Carolina State University Department of Crop Science Box 7629, 840 Method Rd, Unit 3 Raleigh, NC 27695
DUNS Number:	04-209-2123
EIN:	56-6000757
Recipient Identifying Number or Account Number, if any:	572204
Project/Grant Period:	6/1/19-05/31/22
Reporting Period End Date:	5/31/2022

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR-NWW	Genotyping FHB Nurseries - Northern	$59,569
VDHR-SWW	Genotyping FHB Nurseries- Southern	$24,709
	FY21 Total ARS Award Amount	$84,278

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.



Principal Investigator Signature — July 22, 2022 — Date Report Submitted

ǂ 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: Genotyping FHB Nurseries - Northern

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

The overall goal of the project is to provide genotyping data to cooperating breeding programs for identification of genomic regions involved in disease resistance and develop GS models.

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?

This project was an extension of the 2019-2020 project.

Activities during the current period were targeted to Objective 3 - to use next generation sequencing (NGS) analysis to genotype SRWW to identify QTL associated with FHB resistance and perform genomic selection (GS). Specifically, work was done to evaluate the single primer extension technology (SPET) as a sequencing based genotyping platform to replace reduced representation genotyping by sequencing (GBS). A preliminary test was completed that targeted 2500 single nucleotide polymorphisms scattered throughout the genome identified from exome capture sequencing of eastern winter wheat.

b) What were the significant results?

Our first SPET design recovered useful data for 85% of targets with very little missing data. These results are the basis of a new design that is being tested on samples from the FHB nursery to evaluate its use in the genomic selection.

c) List key outcomes or other achievements.

Our results indicate that the SPET platform could provide a flexible, cost-effective genotyping alternative to GBS.

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

Joy Horowitz was hired as a technician in the NCSU Department of Crop and Soil Sciences funded by this project. While providing valuable lab assistance, Joy is enrolled in classes as at NCSU with the goal of obtaining skills in data science and a certificate in computer science. She is given opportunities to use this new training as part of this research.

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

Updates are provided to collaborating breeding programs in regular Zoom meetings to jointly plan genomic selection efforts. Data are being prepared for publication in peer reviewed journal article.

Project 2: Genotyping FHB Nurseries- Southern

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

The overall goal of the project is to provide genotyping data to cooperating breeding programs for identification of genomic regions involved in disease resistance and develop GS models.

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?

This project was an extension of the 2019-2020 project.

Activities during the current period were targeted to Objective 3 - to use next generation sequencing (NGS) analysis to genotype SRWW to identify QTL associated with FHB resistance and perform genomic selection (GS). Specifically, work was done to evaluate the single primer extension technology (SPET) as a sequencing based genotyping platform to replace reduced representation genotyping by sequencing (GBS). A preliminary test was completed that targeted 2500 single nucleotide polymorphisms scattered throughout the genome identified from exome capture sequencing of eastern winter wheat.

a) What were the significant results?

Our first SPET design recovered useful data for 85% of targets with very little missing data. These results are the basis of a new design that is being tested on samples from the FHB nursery to evaluate its use in the genomic selection.

b) List key outcomes or other achievements.

Our results indicate that the SPET platform could provide a flexible, cost-effective genotyping alternative to GBS.

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

Joy Horowitz was hired as a technician in the NCSU Department of Crop and Soil Sciences funded by this project. While providing valuable lab assistance, Joy is enrolled in classes as at NCSU with the goal of obtaining skills in data science and a certificate in computer science. She is given opportunities to use this new training as part of this research

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

Updates are provided to collaborating breeding programs in regular Zoom meetings to jointly plan genomic selection efforts. Data are being prepared for publication in peer reviewed journal article.

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.