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

FY22 Performance Progress Report

Due date: July 26, 2023

Cover Page

USDA-ARS Agreement ID:	59-0206-2-161
USDA-ARS Agreement Title:	USWBSI Wheat Transformation/Gene Editing Facility
Principle Investigator (PI):	Harold Trick
Institution:	Kansas State University
Institution UEI:	CFMMM5JM7HJ9
Fiscal Year:	2022
FY22 USDA-ARS Award Amount:	$86,085
PI Mailing Address:	Kansas State University, Dept of Plant Pathology 1712 Claflin Rd, 4024 Throckmorton Manhattan, KS 66506
PI E-mail:	hnt@ksu.edu
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Period of Performance:	May 1, 2022 – April 30, 2026
Reporting Period End Date:	April 30, 2023

USWBSI Individual Project(s)

USWBSI Research Category[‡]	Project Title	ARS Award Amount
GDER	A Centralized Wheat Transformation and Gene Editing Facility for the FHB Community	$86,085
	FY22 Total ARS Award Amount	$86,085

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.

Principal Investigator Signature — 7/24/2023 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: A Centralized Wheat Transformation and Gene Editing Facility for the FHB Community

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1. **What are the major goals and objectives of the research project?**
   The major goal of this project was to maintain a wheat plant transformation facility for U.S. Wheat and Barley Scab Initiative. The main objective was to generate transgenic and/or gene –edited plants and provide T_1 generation seed stocks to funded Initiative research projects.

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 transformation facility has setup protocols to provide transformation services year-round. Cultivars are planted weekly or biweekly to ensure constant supply of immature embryos used as targets for genetic transformations. On a weekly basis several experiments are simultaneously going. After transformation the cultures go through the transformation selection, plant regeneration process, followed by molecular confirmation genetic transformation. Approximately five-six months after initiating transformation seeds representing the T_1 generation were and will be harvested and mailed to PIs under the appropriate APHIS movement Permit.

   b) **What were the significant results?**
   Transgenic events were supplied for six plasmid constructions to Guihua Bai's program, two constructions to Jyoti Shah's program, and two constructions to Nidhi Rawat's program. Wheat cultivars used were Bobwhite, RB07 and Rollag. During the funding period 390 liberty positive plants were produced for Dr. Bai, and 5 for Dr. Shah. T1 transgenic seeds were shipped to Dr. Bai. Additional events for each of these constructions are pending as 32 bombardment experiments are still in the selection and regeneration.

   c) **List key outcomes or other achievements.**
   The generation of wheat transgenic lines for collaborators and providing them with seeds representing T_1 generation.

3. **What opportunities for training and professional development has the project provided?**
   This project, in part, has provided tissue culture and transformation of wheat cultures training for two M.S. students (Sophie Filbert and Giovanna Moreria)

4. **How have the results been disseminated to communities of interest?**
   Individuals providing vectors were updated periodically of progress on their requests and at the annual NFHBF and GDER mid-year meetings. A general call for plasmid submission was also published in the spring newsletter and placed on the Forum's website.

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).

Hao G, Naumann TA, Chen H, Bai G, McCormick S, Kim H, Tian B, **Trick HN**, Naldrett MJ, Proctor R. Fusarium graminearum effector FgNls1 targets plant nuclei to induce wheat head blight. *Molecular Plant-Microbe Interactions : Mpmi*. PMID 36853197 DOI: 10.1094/MPMI-12-22-0254-R
Acknowledged federal support: yes

Hui Chen, Zhenqi Su, Bin Tian, Guixia Hao, Harold N. Trick, Guihua Bai. 2022. *TaHRC* suppresses the calcium-mediated immune response and triggers wheat Fusarium head blight susceptibility. *Plant Physiology* Volume 190, Issue 3, November 2022, Pages 1566–1569, https://doi.org/10.1093/plphys/kiac352.
Acknowledged federal support: yes

Hui Chen, Zhenqi Su, Bin Tian, Yang Liu, Yuhui Pang, Volodymyr Kavetskyi, Harold N. Trick and Guihua Bai. **2022.** Development and optimization of a *Barley stripe mosaic virus* (BSMV)-mediated gene editing system to improve Fusarium head blight (FHB) resistance in wheat. *Plant Biotechnology Journal* Jun; 20(6):1018-1020. doi: 10.1111/pbi.13819. Epub 2022 Apr 8.
Acknowledged federal support: yes

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.