

USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY19 Final Performance Report
Due date: July 24, 2020

Cover Page

Principle Investigator (PI):	Harold Trick
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Fiscal Year:	2019
USDA-ARS Agreement ID:	59-0206-6-007
USDA-ARS Agreement Title:	A Centralized Wheat Transformation Facility for the Fusarium Community
FY19 USDA-ARS Award Amount:	\$ 67,905
Recipient Organization:	Kansas State University 10 Anderson Hall Manhattan, KS 66506
DUNS Number:	929773554
EIN:	48-0771751
Recipient Identifying Number or Account Number:	AR9854 / GAPP603893
Project/Grant Reporting Period:	5/23/19 - 5/22/20
Reporting Period End Date:	5/22/2020

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
GDER	A Centralized Wheat Transformation Facility for the Fusarium Community	\$ 67,905
FY19 Total ARS Award Amount		\$ 67,905



7/24/2020

Principal Investigator

Date

* MGMT – FHB Management
FST – Food Safety & Toxicology
GDER – Gene Discovery & Engineering Resistance
PBG – Pathogen Biology & Genetics
EC-HQ – Executive Committee-Headquarters
BAR-CP – Barley Coordinated Project
DUR-CP – Durum Coordinated Project
HWW-CP – Hard Winter Wheat Coordinated Project
VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
 SPR – Spring Wheat Region
 NWW – Northern Soft Winter Wheat Region
 SWW – Southern Soft Red Winter Wheat Region

Project 1: *A Centralized Wheat Transformation Facility for the Fusarium Community*

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 plants and provide T1 generation seed stocks to funded Initiative research projects.

2. What was accomplished under these goals or objectives? (For each major goal/objective, address items a-b) 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 T1 generation were and will be harvested and mailed to PIs under the appropriate APHIS movement Permit.

b) What were the significant results?

Transgenic event were supplied for two constructions to Guihua Bai's, Jyoti Shah, and Steven Xu's laboratories. Wheat cultivars used were Bobwhite, Fielder, RB07, and Rollag.

c) List key outcomes or other achievements.

The generation of wheat transgenic lines for collaborators and providing them with seeds representing T1 generation.

3. Was this research impacted by the COVID-19 pandemic (i.e. university shutdowns, reduced or lack of support personnel, etc.)? If yes, please explain how this research was impacted or is continuing to be impacted.

In the middle of March 2020, the university instructed researchers to begin shutting down/reducing research activities to essential research only and to minimize physical presence on campus because of the COVID-19 pandemic. This order caused my lab to reduce plants grown in growth chamber and greenhouse space, minimized the workforce to two personnel working part-time in the lab. Cultures used for starting material for transformations and gene editing were discarded and planned new transformation/gene editing experiments were placed on hold. Experiments that were ongoing were kept as essential experiments and were

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continued to be transferred on a weekly schedule. This was the case at the end of the funding period.

4. 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 PhD students (Monica Navia and Sifan Wu).

5. 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 meeting.

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Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY19 award period (5/23/19 - 5/22/20). The term “support” below includes any level of benefit to the student, ranging from full stipend plus tuition to the situation where the student’s stipend was paid from other funds, but who learned how to rate scab in a misted nursery paid for by the USWBSI, and anything in between.

- 1. Did any graduate students in your research program supported by funding from your USWBSI grant earn their MS degree during the FY19 award period?**

No

If yes, how many?

- 2. Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY19 award period?**

Yes

If yes, how many? 2

- 3. Have any post docs who worked for you during the FY19 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**

No

If yes, how many?

- 4. Have any post docs who worked for you during the FY19 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**

No

If yes, how many?

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Release of Germplasm/Cultivars

Instructions: In the table below, list all germplasm and/or cultivars released with full or partial support through the USWBSI during the FY19 award period. All columns must be completed for each listed germplasm/cultivar. Use the key below the table for Grain Class abbreviations.

NOTE: Leave blank if you have nothing to report or if your grant did NOT include any VDHR-related projects.

Name of Germplasm/Cultivar	Grain Class	FHB Resistance (S, MS, MR, R, where R represents your most resistant check)	FHB Rating (0-9)	Year Released

Add rows if needed.

NOTE: List the associated release notice or publication under the appropriate sub-section in the 'Publications' section of the FPR.

Abbreviations for Grain Classes

- Barley - BAR
- Durum - DUR
- Hard Red Winter - HRW
- Hard White Winter - HWW
- Hard Red Spring - HRS
- Soft Red Winter - SRW
- Soft White Winter - SWW

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Publications, Conference Papers, and Presentations

Instructions: Refer to the FY19-FPR_Instructions for detailed more instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY19 grant award. Only citations for publications published (submitted or accepted) or presentations presented during the **award period (5/23/19 - 5/22/20)** should be included. If you did not publish/submit or present anything, state ‘Nothing to Report’ directly above the Journal publications section.

NOTE: Directly below each citation, you **must** indicate the Status (i.e. published, submitted, etc.) and whether acknowledgement of Federal support was indicated in the publication/presentation.

Journal publications.

Zhenqi Su, Amy Bernardo, Bin Tian, Shan Wang, Hongxiang Ma, Shibin Cai, Dongtao Liu, Dadong Zhang, Tao Li, Harold Trick, Paul St Amand, Jianming Yu, Guihua Bai. 2019. A deletion mutation in *TaHRC* confers *Fhb1* resistance to Fusarium head blight in wheat. *Nature Genetics* 51: 1099-1105 (**KAES no. 16-129-J**) **Impact Factor 27.1**

Status: Abstract Published and Invited talk Presented

Acknowledgement of Federal Support: YES (presentation), Yes (abstract)

Sujon Sarowar, Syeda Alam, Ragiba Makandar, Hyeonju Lee, Harold N. Trick, Yanhong Dong, and Jyoti Shah. 2019. Targeting the pattern-triggered immunity pathway for enhancing resistance to *Fusarium graminearum* *Molecular Plant Pathology Molecular Plant Pathology* 20(5) 626-640; (DOI: 10.1111/mpp.12781).

Status: Abstract Published and Invited talk Presented

Acknowledgement of Federal Support: YES (presentation), Yes (abstract)

Books or other non-periodical, one-time publications.

None

Other publications, conference papers and presentations.

John E. McLaughlin, Neerja Tyagi, Harold N. Trick, Susan McCormick, Ruth Dill-Macky and Nilgun E. Tumer. 2019. “Non-specific Lipid Transfer Proteins (nsLTPs) have Antifungal and Anti-ROS Properties that Enhance Resistance of Wheat to *Fusarium graminearum* Infection and Deoxynivalenol Exposure.” In: S. Canty, A. Hoffstetter, H. Campbell and R. Dill-Macky (Eds.), *Proceedings of the 2019 National Fusarium Head Blight Forum* (p. 54), Milwaukee, WI; December 8-10. University of Kentucky, Lexington, KY.

Status: Abstract Published and Invited talk Presented

Acknowledgement of Federal Support: YES (presentation), Yes (abstract)

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Jyoti Shah, Syeda T. Alam, Vijee Mohan, Elena Shulaev, Athulya Nagarajan, Jaspreet Gill, Neerja Tyagi, Hyeonju Lee and Harold N. Trick. 2019. "Targeting Fungal Virulence Genes via Host-Induced Gene Silencing (HIGS) for Enhancing Plant Resistance to *Fusarium graminearum*." In: S. Canty, A. Hoffstetter, H. Campbell and R. Dill-Macky (Eds.), *Proceedings of the 2019 National Fusarium Head Blight Forum* (p. 55), Milwaukee, WI; December 8-10. University of Kentucky, Lexington, KY.

Status: Abstract Published and Invited talk Presented

Acknowledgement of Federal Support: YES (presentation), Yes (abstract)

Jyoti Shah, Syeda Alam, Bhavit Chhabra, Vijee Mohan, Elena Shulaev, Athulya Nagarajan, Jaspreet Gill, Nidhi Rawat, Neerja Tyagi, Hyeonju Lee and Harold N. Trick. 2019. "Targeting Pathogenicity Mechanisms to Promote FHB-Resistance in Wheat." In: S. Canty, A. Hoffstetter, H. Campbell and R. Dill-Macky (Eds.), *Proceedings of the 2019 National Fusarium Head Blight Forum* (p. 56), Milwaukee, WI; December 8-10. University of Kentucky, Lexington, KY.

Status: Abstract Published and Invited talk Presented

Acknowledgement of Federal Support: YES (presentation), Yes (abstract)