USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY15 Final Performance Report
Due date: July 15, 2016

Cover Page

Principle Investigator (PI):	Yang Yen
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Fiscal Year:	2015
USDA-ARS Agreement ID:	59-0206-4-039
USDA-ARS Agreement Title:	Improving FHB resistance in Hard Winter Wheat by Molecular Breeding/Manipulation.
FY15 USDA-ARS Award Amount:	$ 19,907
Recipient Organization:	South Dakota State University SAD 133, Box 2201 Brookings, SD 57007
DUNS Number:	929929743
EIN:	46-6000364
Recipient Identifying Number or Account Number:	3F4679
Project/Grant Reporting Period:	06/01/15-05/31/16
Reporting Period End Date:	05/31/16

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
HWW-CP	Improving FHB resistance in Hard Winter Wheat by Molecular Breeding/Manipulation.	$ 19,907
	FY15 Total ARS Award Amount	**$ 19,907**

July 5, 2016

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: *Improving FHB resistance in Hard Winter Wheat by Molecular Breeding/Manipulation.*

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

The major goal:
Testing our working hypothesis for this proposed research that not every *Fhb1*-introgressing HWW line we have created gets the functional genic component of this QTL.

2. What was accomplished under these goals?

1) major activities:
- We have screened 11 *Fhb1* introgressing HWW lines with gene-specific marker *WFhb1_c1* to see if an FHB-resistant copy of *WFhb1_c1* does exist in them.
- We have conducted Real-time quantitative PCR assay of the 11 lines for expression of *WFhb1_c1*
- We conducted bisulfite conversion assay to study DNA methylationin the WFhb1_c1 regulatory sequence.
- We are cloning polymorphic sequence fragments of *WFhb1_c1* from the HWW lines for their comparison.

2) specific objectives

Objective 1: Understanding how *WFhb1_c1* is expressed in *Fhb1*-introgressing HWW lines
- Our marker investigation indicates that the sequence polymorphisms addressed by either *Xumn10* or *XFhb1* are not universal in all wheat lines. More universal marker needs to be developed.
- Our RT-qPCR assay revealed that WFhb1_c1 expression varied among the 11 winter wheat *Qfhb1* introgression lines, which has agreed the results of the marker assay.

Objective 2: Elucidating the regulatory component of the native *WFhb1_c1* in HWW that makes it FHB-susceptible.
- Our Bisulfite conversion assay indicated that *WFhb1_c1* is differentially methylated between the resistant and susceptible wheat genotype.

3) significant results and key outcomes or other achievements
- Neither *Xumn10* nor *XFhb1* marker can precisely indicating the existence of *Qfhb1*
- Differential expression of WFhb1_c1 might be due to the differential methylation between the resistant and the susceptible alleles of this gene

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

Provided lab-based research opportunities for postdoc, graduate students and undergraduate students.

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

SDSU made a news release (https://www.sdstate.edu/news/articles/biochemical-pathways-may-be-key-to-scab-resistance.cfm) about our research achievement that was partially supported by the USWBSI. This news release was quickly picked up by many scientific or farmer networks, such as Science Daily (https://www.sciencedaily.com/releases/2014/03/140319093832.htm), Phys.org

(http://phys.org/news/2014-02-biochemical-pathways-key-scab-resistance.html), and eScience News (http://esciencenews.com/sources/physorg/2014/02/26/biochemical.pathways.may.be.key.scab.resistance), but also by farmers' networks, such as USAgNet (http://www.usagnet.com/state_headlines/state_story.php?tble=SD2014&ID=198).

Posters:
Zhuang, Y., A. Galla, Y. Qiu, & Y. Yen. 2014. Identifying microRNAs responsive to *Fusarium graminearum* infection in wheat spike. At Edgar S. McFadden Symposium, September 23-24, 2014, Brookings, SD.

Galla, A., Y. Zhuang, Y. Qiu, S. Ali, & Y. Yen. 2014. Silencing RNA *fg-siR34* plays a key role in pathogenicity of *Fusarium graminearum*. At Edgar S. McFadden Symposium, September 23-24, 2014, Brookings, SD.

GenBank Deposit:
Yang Yen, Yongbin Zhuang and Yinjie Qiu, 2015. *WFhb1-1* cDNA sequence, GenBank Access Number KU304333.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY15 award period. 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 FY15 award period?**
   Yes
   If yes, how many?
   One

2. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY15 award period?**
   No
   If yes, how many?

3. **Have any post docs who worked for you during the FY15 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**
   None.
   If yes, how many?

4. **Have any post docs who worked for you during the FY15 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**
   None.
   If yes, how many?

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 FY15 award period. All columns must be completed for each listed germplasm/cultivar. Use the key below the table for Grain Class abbreviations. *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

Publications, Conference Papers, and Presentations

Refer to the FY15-FPR_Instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY15 grant. If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

Journal publications.

None.

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

GenBank Deposit:
Yang Yen, Yongbin Zhuang and Yinjie Qiu, 2015. *WFhb1-1* cDNA sequence, GenBank Access Number KU304333.
Status: Submitted
Acknowledgement of Federal Support: No This usually is done in the accompanied publication, which we are to write.

Other publications, conference papers and presentations.

SDSU Newsletter "Biochemical pathways may be key to scab resistance" (https://www.sdstate.edu/news/articles/biochemical-pathways-may-be-key-to-scab-resistance.cfm)
Status: Released to the public
Acknowledgement of Federal Support: Yes.

Poster Abstracts:

Zhuang, Y., A. Galla, Y. Qiu, & Y. Yen. 2014. Identifying microRNAs responsive to *Fusarium graminearum* infection in wheat spike. At Edgar S. McFadden Symposium, September 23-24, 2014, Brookings, SD.
Status: Presented
Acknowledgement of Federal Support: Yes

Galla, A., Y. Zhuang, Y. Qiu, S. Ali, & Y. Yen. 2014. Silencing RNA *fg-siR34* plays a key role in pathogenicity of *Fusarium graminearum*. At Edgar S. McFadden Symposium, September 23-24, 2014, Brookings, SD.
Status: Presented
Acknowledgement of Federal Support: Yes.