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

Cover Page

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Fiscal Year:	2015
USDA-ARS Agreement ID:	N/A
USDA-ARS Agreement Title:	Single Kernel Sorting Technology for Enhancing Scab Resistance and Grain Quality.
FY15 USDA-ARS Award Amount:	$ 19,200

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
HWW-CP	Using Single Kernel NIR Sorting Technology to Enhance Quality of Breeding Lines.	$ 19,200
	FY15 Total ARS Award Amount	**$ 19,200**

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: *Using Single Kernel NIR Sorting Technology to Enhance Quality of Breeding Lines.*

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

(1) Use automated NIR spectroscopy instrumentation to sort scab-damaged kernels from asymptomatic kernels, (2) sort kernels with no measurable DON from this with high DON levels, and (3) sort hard from soft kernels in lines where breeders are attempting to introduce scab resistant traits from soft wheat into hard wheat.

2. What was accomplished under these goals?

1) major activities

We have developed several FHB and DON NIRS prediction models under the USWBSI funding. We suspected that one source of error in our prediction models was the influence of moisture content on the NIR spectra. Thus, we investigated this issue and documented that sample moisture content (MC) considerably affected accuracy of the current NIR DON calibration.

2) specific objectives

Improve our NIR calibration to quantify DON levels in single kernels by incorporating kernel moisture content and other variables in classification models.

3) significant results

DON in single kernels was most accurately estimated at a MC of 13-14% MC. These results show that absorption regions associated with water are often close to absorption regions associated with fusarium damage.

4) key outcomes or other achievements

We showed that care must be taken to develop DON calibrations that are independent of grain MC. This information will be useful to instrumentation developers, wheat breeders, and other users utilizing NIR technology to measure FHB and DON in grain.

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

A post doc has been trained in near-infrared and mid-infrared spectroscopy techniques. In addition, many graduate and undergraduate students have become familiar with the technology and its application to crop breeding.

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

Through publications and presentations as listed later.

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?** 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 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?** No.

   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?** No.

   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**
None				

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.

K. H. S. Peiris, Y. Dong, W. W. Bockus and F. E. Dowel. Moisture effects on the prediction performance of a single kernel near-infrared deoxynivalenol calibration. Cereal Chem.
Status: Publication pending minor revisions as of June 2016.
Acknowledgement of Federal Support: YES

Books or other non-periodical, one-time publications.
'Nothing to Report'

Other publications, conference papers and presentations.

K. H. S. Peiris, Y. Dong, W. W. Bockus, and F. E. Dowell (2015) Moisture content of grain samples affects the performance of near infrared spectroscopic calibration for estimation of DON levels in wheat. Poster presented at the USWBSI conference, St. Louis, MO.
Status: Abstract Published and poster presented
Acknowledgement of Federal Support: YES

P. R. Armstrong, K. H. S. Peiris and F. E. Dowell (2016) Instrumentation development for quantification of single-seed traits used for quality measurement and seed phenotyping. Poster Presentation. 15th International Cereal and Bread Congress. April 18-21, 2016, Istanbul, Turkey.
Status: Abstract Published and poster presented
Acknowledgement of Federal Support: YES