

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY13 Final Performance Report
July 15, 2014**

Cover Page

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Fiscal Year:	FY13
USDA-ARS Agreement ID:	59-0206-9-061
USDA-ARS Agreement Title:	Identify and Develop Durum Wheat Resistant to Fusarium Head Blight.
FY13 USDA-ARS Award Amount:	\$ 129,685

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
DUR-CP	Develop Durum Wheat Resistant to Fusarium Head Blight.	\$ 95,081
DUR-CP	Identify Sources of Resistance to Fusarium Head Blight in Durum Wheat.	\$ 34,604
	FY13 Total ARS Award Amount	\$ 129,685

Principal Investigator

Date

* MGMT – FHB Management

FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain

GDER – Gene Discovery & Engineering Resistance

PBG – Pathogen Biology & Genetics

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: *Develop Durum Wheat Resistant to Fusarium Head Blight.*

1. What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?

Fusarium head blight (FHB) is caused by the fungus *Fusarium graminearum* Schwabe (telomorph *Gibberella zeae* (Schwein.) Petch., which has been seriously attacking durum wheat. Since 1993, it is estimated that FHB has cost over \$3 billion in direct and indirect losses in North Dakota. Although fungicides may reduce FHB, using genetic resistance is the most environmentally safe and economical way to control the disease. The objective of this project is to incorporate identified sources of resistance into the currently susceptible durum wheat germplasm in order to develop resistant cultivars.

2. List the most important accomplishments and their impact (i.e. how are they being used) to minimize the threat of Fusarium Head Blight or to reduce mycotoxins. Complete both sections; repeat sections for each major accomplishment:

Accomplishment:

- 1 lines were evaluated in the Uniform Regional Nursery
- 9 lines were evaluated in the Elite Advanced Yield Trial
- 98 lines were evaluated in the Advanced Yield Trials
- 200 lines were evaluated in the Preliminary Yield Trials
- 48 populations were screened in the field and greenhouses
- 15 new populations were developed

Impact:

The above developed material is the only known improved durum germplasm with Fusarium head blight resistance. This germplasm is vital for the survival of the Midwest durum producers. Since the Midwest produces over 59% of the US durum, this germplasm has a major impact on the pasta industry and the US economy. The new cultivars such as Carpio and Joppa, based on their FHB resistance and yield advantage and the current grown acreage of Divide will generate additional millions of dollars into the economy.

Project 2: *Identify Sources of Resistance to Fusarium Head Blight in Durum Wheat.*

1. What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?

Durum Wheat is very susceptible to Fusarium head blight (FHB) caused by the fungus *Fusarium graminearum* Schwabe (teleomorph *Gibberella Zeae* (Schw.) Petch. Sources of resistance to FHB in durum wheat that are equivalent to the Chinese spring wheat Sumai 3 are not available yet. Our objective is to identify sources of resistance that can be utilized by durum plant breeders to develop FHB resistant cultivars. To date we have screened all the durum wheat accessions in the National small grain Collection, Aberdeen, ID. There are 15,000 durum wheat accessions at the International Center of Agricultural Research in the Dry Areas (ICARDA) and International Maize and Wheat Improvement Center (CIMMYT). We are in the process of evaluating these accessions in field nurseries in China and greenhouses in North Dakota.

2. List the most important accomplishments and their impact (i.e. how are they being used) to minimize the threat of Fusarium Head Blight or to reduce mycotoxins. Complete both sections; repeat sections for each major accomplishment:

Accomplishment:

- To date we have evaluated 4,527 accessions from ICARDA. After several evaluations in the field and greenhouses three accessions maintained disease severity less than 30%. Fifteen populations were developed from crossing the three accessions with adapted germplasm.
- Nine-hundred-ninety five new accessions were sent to China for evaluation.
- Four-hundred-seven selected ICARDA accessions from 2013 were reevaluated in the spring 2014 greenhouse.
- Nine populations were developed from crossing adapted germplasm with Tunisian 7.
- Four F₄ populations were advanced from crossing adapted germplasm with Tunisian 7.
- Two F₄ populations were advanced from crossing adapted germplasm with *Triticum dicoccum*.
- Six F₄ populations were advanced from crossing adapted germplasm with *Triticum dicoccum*.
- Two F₄ populations were advanced from crossing adapted lines to *T. Carthilicum*
- Two F₄ populations were advanced from crossing adapted lines to *T. dicoccoides*
- Four F₃ populations were advanced from crossing adapted lines to ICARDA's world collection accessions.

Impact:

Any resistant germplasm that is identified above could potentially lead to the development of FHB resistant durum cultivars. Resistant durum cultivars will generate millions of dollars

into the farm economy in the Midwest and will insure the stability of the durum industry in the United States.

Include below a list of all germplasm or cultivars released with full or partial support of the USWBSI during the FY13 award period. List the release notice or publication. Briefly describe the level of FHB resistance.

'Carpio' (PI 670039), spring durum wheat (*Triticum turgidum* L. var. *durum* Desf.) was developed by the North Dakota Agricultural Experiment Station in cooperation with USDA-ARS and released on 30 January, 2012. Carpio had numerically lower FHB disease severity in the field compared to all the durum cultivars including Divide, which is known to have some tolerance to the disease.

Include below a list of the publications, presentations, peer-reviewed articles, and non-peer reviewed articles written about your work that resulted from all of the projects included in the FY13 grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

None