

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY07 Final Performance Report (approx. May 07 – April 08)
July 15, 2008**

Cover Page

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Fiscal Year:	2007
USDA-ARS Agreement ID:	59-0790-4-098
USDA-ARS Agreement Title:	Identify and Develop Durum Wheat Resistant to Fusarium Head blight.
FY07 ARS Award Amount:	\$ 130,732

USWBSI Individual Project(s)

USWBSI Research Area *	Project Title	ARS Adjusted Award Amount
HGR	Identify Sources of Resistance to Fusarium Head Blight in Durum Wheat.	\$38,049
VDUN	Development of Durum Wheat Reistant to Fusarium Head Blight.	\$ 92,683
	Total Award Amount	\$ 130,732

Principal Investigator

Date

* CBCC – Chemical, Biological & Cultural Control
 EEDF – Etiology, Epidemiology & Disease Forecasting
 FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
 GET – Genetic Engineering & Transformation
 HGR – Host Genetics Resources
 HGG – Host Genetics & Genomics
 IIR – Integrated/Interdisciplinary Research
 PGG – Pathogen Genetics & Genomics
 VDUN – Variety Development & Uniform Nurseries

Project 1: *Identify Sources of Resistance to Fusarium Head Blight in Durum Wheat.*

1. What major problem or issue is being resolved 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. There are 7,000 durum wheat accessions at the National small grain Collection, Aberdeen, ID that are available for evaluating for FHB resistance. We are in the process of evaluating these accessions in field nurseries in China and greenhouses in North Dakota. In addition to these we are evaluating germplasm from the International Center of Agricultural Research in the Dry Areas (ICARDA) and International Maize and Wheat Improvement Center (CIMMYT).

**2. List the most important accomplishment and its impact (how is it being used?).
Complete all three sections (repeat sections for each major accomplishment):**

Accomplishment:

- To date we have evaluated 7,000 accessions from the world collection. After several evaluations in the field and greenhouses seven accessions maintained disease severity less than 30%. These accessions will be used as parents in crosses.
- Nine hundred seventy-nine new accessions were evaluated in China. Of these 109 accessions were selected and evaluated for the second time in the greenhouse. Of the 109 accessions 25 were selected for further FHB evaluations in the field and the greenhouse.
- Twenty-seven lines from crosses with Tunisian lines were selected from Preliminary Yield Trials to be evaluated in Advanced Yield Trials.
- The diversity study on the Tunisian lines was completed. Tunisian 7 appears to be significantly different than Tunisian 18, 34, 36, and 108. A study to haplotype these sources of resistance has been initiated.

Impact:

Any resistant germplasm that is identified above could potentially lead into the development of FHB resistant durum cultivars. Resistant durum cultivars will generate million of dollars to the farm economy in the Midwest and will insure the stability of the durum industry in the United States.

As a result of that accomplishment, what does your particular clientele, the scientific community, and agriculture as a whole have now that they didn't have before?:

The five Tunisian lines and the durum accessions that we have identified to have resistance to FHB are being shared with breeders working on developing FHB resistant durum cultivars.

Project 2: *Development of Durum Wheat Resistant to Fusarium Head Blight.*

1. What major problem or issue is being resolved and how are you resolving it?

Fusarium head blight (FHB) caused by the fungus *Fusarium graminearum* Schwabe (telomorph *Gibberella zea* (Schwein.) Petch. 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 accomplishment and its impact (how is it being used?).
Complete all three sections (repeat sections for each major accomplishment):**

Accomplishment:

The cultivar Divide that have some level of resistance to FHB is gaining acreages in North Dakota.

● ***Sumai 3 and Wangshuibai sources of resistance:***

- 6 lines were evaluated in the Uniform Regional Nursery
- 40 lines were evaluated in the Elite Advanced Yield Trials
- 56 lines were evaluated in the Advanced Yield Trials
- 810 lines were evaluated in the Preliminary Yield Trials
- 58 populations were screened in the field and greenhouses

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 75% of the US durum, this germplasm has a major impact on the pasta industry and the US economy. Divide, based on its FHB resistance and yield advantage it could replace up to 30% of the acreage of the current grown cultivars in the Midwest which would generate millions of dollars into the economy.

As a result of that accomplishment, what does your particular clientele, the scientific community, and agriculture as a whole have now that they didn't have before?:

The producers of North Dakota have a durum cultivar (Divide) that has a moderate level of resistance to FHB.

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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 grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

None