

**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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<b>Fiscal Year:</b>	2007
<b>USDA-ARS Agreement ID:</b>	NA
<b>USDA-ARS Agreement Title:</b>	Pyramiding Three Triticum dicoccoides Derived FHB Resistance QTL in Durum Wheat.
<b>FY07 ARS Award Amount:</b>	\$ 18,000

**USWBSI Individual Project(s)**

<b>USWBSI Research Area*</b>	<b>Project Title</b>	<b>ARS Adjusted Award Amount</b>
HGR	Pyramiding Three Triticum dicoccoides Derived FHB Resistance QTL in Durum Wheat.	\$18,000
	<b>Total Award Amount</b>	<b>\$ 18,000</b>

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Principal Investigator

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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:** *Pyramiding Three Triticum dicoccoides Derived FHB Resistance QTL in Durum Wheat.*

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

Fusarium head blight (FHB) is one of the most devastating diseases of wheat. Resistant sources of hexaploid bread wheat have been identified and are currently being employed in breeding programs, but development of resistant tetraploid durum wheat has met with less success. Moderate levels of resistance have been identified in *Triticum dicoccoides*, a wild tetraploid relative, which readily hybridizes with durum wheat. In the *T. dicoccoides* accession 'Israel A', QTLs and associated molecular markers for FHB resistance have been identified on chromosomes 3A and 6B. A different accession of *T. dicoccoides* (PI478742) with moderate levels of FHB resistance was shown to harbor a QTL on chromosome 7A for FHB resistance. Molecular markers linked to these QTL should expedite the pyramiding of *T. dicoccoides*-derived resistance genes into elite durum lines using marker-assisted selection. Combining the FHB resistance genes from *T. dicoccoides* chromosomes 3A, 6B, and 7A along with genes identified by others from different sources should lead to a highly resistant durum cultivar.

**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:**

Initial mapping of the 7A FHB resistance defined the QTL to a 20 cM segment, which is rather large for efficient marker-assisted selection. In this work, we targeted the 7A QTL region with additional PCR-based markers and identified four new markers within the region. The QTL is now delineated to an 8 cM interval by SSR markers, which allow for much more efficient selection of the QTL.

We identified two FHB resistant F<sub>3</sub> plants, designated 57-37 and 56-78, that were homozygous for the 3A and 6B QTLs in the Langdon background. These plants were crossed to LD7A-28, which is a recombinant line homozygous for the 7A QTL. The resulting F<sub>1</sub> plants, which were heterozygous for all three QTL, were then crossed to the durum variety Divide. A total of about 500 plants from these crosses were genotyped with molecular markers for the 3A, 6B, and 7A QTLs and four progeny heterozygous for all three QTL were identified. These plants will be crossed again to Divide to recover more of the Divide background, and the progeny will again be genotyped to retain plants with all three FHB resistance QTL.

**Impact:**

Incorporation of the 7A QTL identified in this research together with the 3A and 6B QTLs will lead to higher levels of FHB resistance in tetraploid wheat. The additional markers associated with the 7A QTL provide valuable tools for breeders and geneticists to use in marker-assisted selection schemes for the development of FHB resistant germplasm and varieties. The pyramiding of the 3A, 6B, and 7A *T. dicoccoides* derived QTLs into the

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Divide background provides the first step toward the development of an FHB resistant durum variety. The molecular markers associated with each QTL make the pyramiding of the QTLs and recovery of the Divide background extremely efficient compared to having to conduct phenotypic evaluations.

**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 new markers identified for the 7A FHB resistance QTL are valuable for breeders and geneticists who wish to introgress the 7A QTL into adapted material. These markers are currently being used by the USDA-ARS genotyping lab in Fargo, ND and by the North Dakota durum breeder. The community now has tetraploid germplasm containing the 3A, 6B, and 7A FHB resistance QTLs in a single background. Only further recovery of the recurrent parent background is needed before an adapted FHB resistant durum germplasm is available.

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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.