USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY05 Final Performance Report (approx. May 05 – April 06)
July 14, 2006

Cover Page

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Fiscal Year:	**2005**
FY05 ARS Agreement ID:	**NA**
Agreement Title:	**Evaluation of Tetraploid Wheat Germplasm for Resistance to Fusarium Head Blight.**
FY05 ARS Award Amount:	**$ 25,000**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
GIE	Evaluation of Tetraploid Wheat Germplasm for Resistance to Fusarium Head Blight.	$ 25,000
	Total Award Amount	**$ 25,000**

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Principal Investigator Date

* BIO – Biotechnology
CBC – Chemical & Biological Control
EDM – Epidemiology & Disease Management
FSTU – Food Safety, Toxicology, & Utilization
GIE – Germplasm Introduction & Enhancement
VDUN – Variety Development & Uniform Nurseries

FY05 (approx. May 05 – April 06) FY05 Final Performance Report
PI: Xu, Steven S.
ARS Agreement #: NA

Project 1: *Evaluation of Tetraploid Wheat Germplasm for Resistance to Fusarium Head Blight.*

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

Fusarium head blight (FHB) currently is one of the most destructive fungal diseases of tetraploid durum wheat (*Triticum turgidum* L. subsp. *durum*) and hexaploid common wheat (*T. aestivum* L). Resistant sources of common wheat have been identified and successfully used in hexaploid wheat breeding. However, high levels of resistance in durum wheat have not been discovered and attempts to transfer resistance from hexaploid wheat and relative species have met with limited success. Thus, almost all the current commercial durum cultivars in the U.S. are susceptible to FHB. There is urgent need to discover novel resistance sources within the primary gene pool of durum wheat. To identify useful sources of FHB resistance for durum wheat breeding, we evaluated 426 accessions belonging to five cultivated *T. turgidum* subspecies, including Persian wheat (*T. t. carthlicum*), cultivated emmer wheat (*T. t. dicoccum*), Polish wheat (*T. t. polonicum*), oriental wheat (*T. t. turanicum*), and poulard wheat (*T. t. turgidum*) in greenhouse and field nurseries. In the first season of greenhouse evaluation, accessions were evaluated using a non-replicated design. Accessions exhibiting less than 30% FHB severity were evaluated in one or two additional seasons using a randomized complete block design with three replicates. Inoculation in the greenhouse was performed using the single-spikelet inoculation method. One hundred and sixteen accessions with putative Type II resistance were evaluated using the grain spawn inoculation method in mist-irrigated field nurseries at two locations (Fargo and Langdon, ND) in the summer of 2005.

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: Except for the accessions that had a poor growth, 376 accessions belonging to five cultivated *T. turgidum* subspecies have been successfully evaluated in greenhouse and 90 accessions exhibited consistent Type II resistance in two or three greenhouse seasons. Field evaluation data showed that 19 accessions of cultivated emmer and Persian wheat consistently exhibited medium or high level of resistance to FHB.

Impact: This is the first time that tetraploid wheat subspecies other than durum and wild emmer in primary gene pool of durum wheat were systematically evaluated for reaction to FHB. The 19 resistant accessions of cultivated emmer and Persian wheat are a potential novel source of FHB resistance and could be utilized directly in breeding programs to enhance FHB resistance in durum wheat.

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 research results were presented in the 2005 National Fusarium Head Blight Forum and durum wheat breeders in the U.S. and France showed strong interest to use the resistant tetraploid wheat accessions in their breeding programs. In collaboration with the ND durum wheat breeder, we are currently transferring the FHB resistance from cultivated emmer and Persian wheat to three major ND durum cultivars.

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.

Oliver, R.E., X. Cai, R.W. Stack, T.L. Friesen, S. Halley, and S.S. Xu. 2005. Fusarium head blight resistance in tetraploid wheat. *In*: Proceedings of 2005 National Fusarium Head Blight Forum, December 11-13, 2005. Milwaukee, WI. pp79.

Cai, X., S.S. Xu, R.E. Oliver, and R.W. Stack. 2005. The alien gene could be one of the 'fighters' against Fusarium head blight in wheat. *In*: Proceedings of 2005 National Fusarium Head Blight Forum, December 11-13, 2005. Milwaukee, WI. pp21.