USDA-ARS / USWBSI
FY04 Final Performance Report
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Cover Page

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Year:	**FY2004**
FY04 ARS Agreement ID:	**NA**
FY04 ARS Agreement Title:	**Molecular Mapping of Fusarium Head Blight Resistance Genes in Tetraploid Wheat.**
FY04 ARS Award Amount:	**$ 35,122**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
BIO	Molecular Mapping of Fusarium Head Blight Resistance Genes in Tetraploid Wheat.	$ 35,122
	Total ARS Award Amount	**$ 35,122**

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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

Project 1: ***Molecular Mapping of Fusarium Head Blight Resistance Genes in Tetraploid 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. A moderately resistant accession of *T. dicoccoides* was used to create disomic chromosome substitution lines in the Langdon durum background. Screening of the substitution lines for FHB resistance indicated that chromosome 7A contained factors that contribute to resistance. Using Langdon and the 7A (LDN-DIC 7A) substitution line as parents, recombinant inbred chromosome line (RICL) mapping populations will be produced. The populations will be subjected to FHB inoculations and a genetic map of chromosome 7A will be generated using molecular markers. Quantitative trait loci (QTL) analysis will be performed to identify genomic regions associated with resistance. Putative QTLs will be further targeted to identify markers tightly linked to them. The most informative markers will be converted to user-friendly PCR-based markers and freely distributed to interested breeders and geneticists. The diagnostic markers should expedite the introgression of *T. dicoccoides*-derived resistance genes into elite durum lines using marker-assisted selection. Combining the FHB resistance genes identified from this project along with genes identified by others from different sources should lead to a highly resistant durum cultivar.

2. What were the most significant accomplishments?

Accomplishment: A genetic linkage map of chromosome 7A consisting of 20 markers spanning 173 cM (marker density = 8.6 cM) was developed in the LDN x LDN-DIC 7A RICL population. The entire population was screened for reaction to FHB in two greenhouse experiments consisting of four replications each. QTL analysis revealed a single QTL on the long arm of chromosome 7A, which explained 11% of the phenotypic variation for resistance in this population. The QTL was delineated to a four cM interval flanked by microsatellite markers. Therefore, these markers should be suitable for marker-assisted selection to combine this QTL with others in the development of FHB resistant durum wheat.
Impact: The identification of sources of FHB resistant tetraploid wheat is very limited. Furthermore, the identification of tetraploid wheat-derived resistance QTLs is limited to those identified on chromosomes 3A and 6B derived from an accession of *T. dicoccoides* different from the one used in this study. Incorporation of the 7A QTL identified in this research together with the 3A and 6B QTLs identified in other research will lead to higher levels of FHB resistance in tetraploid wheat. The 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.

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

Kumar, S., Friesen, T. L., Stack, R. W., and Faris, J. D. 2005. Identification of a Fusarium head blight resistance QTL on chromosome 7A in tetraploid wheat. (manuscript in preparation).