

**U.S. Wheat and Barley Scab Initiative
 FY00 Final Performance Report (approx. May 00 – April 01)
 July 30, 2001**

Cover Page

PI:	Shahryar Kianian
Institution:	North Dakota State University
Address:	Dept. of Plant Sciences 470G Loftsgard Hall Fargo, ND 58105
Email:	S_Kianian@ndsu.nodak.edu
Phone:	701-231-7574
Fax:	701-231-8474
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Grant Number:	59-0790-9-048
Grant Title:	Fusarium Head Blight Research
2000 ARS Award Amount:	\$43,902

Project

Program Area	Project Title	Requested Amount
Biotechnology	Development of markers linked to FHB resistance in durum and hexaploid wheat.	\$52,400.00
	Requested Total	\$52,400.00¹

Principal Investigator

Date

¹ Note: The Requested Total and the Award Amount are not equal.

Project 1: Development of markers linked to FHB resistance in durum and hexaploid wheat.

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

The ultimate goal of this project is to develop "breeder friendly" markers for FHB resistance in durum and hexaploid wheat to help accelerate the process of germplasm development and time to variety release. Specific objectives of the project are to 1) identify markers closely linked to FHB resistance loci; 2) develop a PCR-based marker system for screening large populations segregating for FHB; and 3) demonstrate the utility of these markers in populations developed by various breeding programs.

2. What were the most significant accomplishments?

Objective 1) we have employed two sets of populations segregating for FHB resistance to answer this objective. First is a durum population, Langdon-dicoccoides recombinant inbred chromosome line for chromosome 3A. The work on this population is completed. The QTL analysis of this population indicates a major region on this chromosome with the nearest marker explaining over 37% of the phenotypic variation. Environmental influence on the phenotypic measurements were large (considering that the experiment was performed under controlled greenhouse conditions). Using heritability estimates as a measure of genetic variation in this population, this QTL locus accounts for over 50% of the genetic variation. Second set of populations are lines derived by the ND-HRS wheat breeding program carrying Sumai#3 derived FHB resistance and their susceptible parental and sister lines. Analysis of these lines for presence of markers coming from Sumai#3 indicates two significant regions. First a region on 3B, previously identified by Waldron et al.1999 in a RI population, was present in 15 out of the 19 resistant ND derived lines. The probability of this happening by random chance is less than 3×10^{-15} , a highly unlikely event. Second a region located on chromosome 7B and is present in 10 of the 19 derived lines. The probability of this occurring by random chance is 5×10^{-7} , a highly unlikely event. Other markers spread through out the genome did not show the same association. A large recombinant inbred population derived from Wangshuibai, as a source for FHB resistance, has been screened for disease reaction as well as the markers indicated above. This population contains individuals that are more resistant than any derived from Sumai#3. Preliminary molecular marker analysis indicates that the QTLs identified in Sumai#3 are not responsible for the resistance in this population. Therefore, this population could provide additional, possibly more potent, FHB resistance QTLs for breeding resistant varieties.

Objectives 2 &3) the durum marker is being converted to a locus specific primer at the present time. We have cloned the microsatellite fragment associated with the resistance and have the sequence data available. Currently we are in the process of designing locus specific primers. This marker has already been used in selection of doubled haploid lines of durum developed by the NDSU breeding program. Thus, the utility of the above results in applied breeding is currently being tested. The hexaploid wheat markers are useful in selecting future lines developed by various breeding programs utilizing Sumai#3 as the source of resistance.

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.

1. C.D. Otto, S.F. Kianian, E.M. Elisa, R.W. Stack and L.R. Joppa., 1999. Molecular mapping for FHB resistance in a RICL population of tetraploid wheat. p. 159. *In* 1999 Agronomy abstracts. ASA, Madison, WI.
2. I.A. Del Blanco, R.C. Frohberg, R.W. Stack, S.F. Kianian and W.A. Berzonsky., 2000. Detection of QTLs linked to FHB resistance in Sumai-3 derived lines. p.184. *In* 2000 Agronomy abstracts. ASA, Madison, WI.
3. C.D. Otto, S.F. Kianian, E.M. Elias, R.W. Stack, L.R. Joppa, and E.T. Doehler., 2000. Molecular Mapping for *Fusarium* Head Blight in a RICL Population of Tetraploid Wheat p.183. *In* 2000 Agronomy abstracts. ASA, Madison, WI.
4. C.D. Otto, S.F. Kianian, E.M. Elias, R.W. Stack, and L.R. Joppa. 2001. Molecular Mapping of *Fusarium* Head Blight in a RICL Population of Tetraploid Wheat. Plant Molecular Biology (submitted).