U.S. Wheat and Barley Scab Initiative
FY01 Final Performance Report (approx. May 01 – April 02)
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Cover Page

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Grant Number:	**59-0790-9-048**
Grant Title:	**Fusarium Head Blight Research**
FY01 ARS Award Amount:	**$ 52,567**

Project

Program Area	Project Title	Requested Amount
Biotech	Development of markers linked to FHB resistance in durum and hexaploid wheat	$ 53,970
	Total Amount Requested	**$ 53,970**

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Principal Investigator Date

(Form – FPR01)

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 is completed indicating one significant region. A region on 3B, previously identified by Waldron et al.1999 in a RI population, was identified by two markers, one present in 15 out of the 19 resistant ND derived lines ($p \leq 3 \times 10^{-15}$) and another present in 10 of the 19 derived lines ($p \leq 5 \times 10^{-7}$). 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 has been converted to a locus specific primer. We have cloned the microsatellite fragment associated with the resistance, sequenced the cloned and developed primers that are specific to this locus. This marker is beening 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 also are being used to select a large durum population (3200 individuals) derived from Sumai#3. To date data clearly indicates the strong value of this marker in a marker assisted selection program. We plan to test this results further by analysis of maker selected vs. phenotypic population.

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. I.A. del Blanco, R.C. Frohberg, R.W. Stack, W.A. Berzonsky, and S.F. Kianian. 2002. Detection of QTL linked to Fusarium head blight resistance in Sumai-3 derived North Dakota bread wheat lines. TAG (submitted).
2. C.D. Otto, S.F. Kianian, E.M. Elias, R.W. Stack, and L.R. Joppa. 2002. Molecular dissection of a major Fusarium Head Blight QTL in tetraploid Wheat. Plant Molecular Biology 48: 625-632.
3. K. Hartel, W. Berzonsky and S. Kianian. 2002. Development of synthetic hexaploids with Fusarium head blight resistance from *Triticum turgidum* L. Var. *dicoccoides*. International Plant, Animal and Microbe Genome X. San Diego, CA. (http://www.intl-pag.org/).
4. E. Elias, R. Stack, F. Manthey and S. Kianian. 2001. Development of durum wheat resistant to Fusarium head blight. P. 232 In 2001 National Fusarium Head Blight Forum Proceedings.
5. 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.
6. 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.