

**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:	59-0790-9-074
Grant Title:	Fusarium Head Blight Research
FY01 ARS Award Amount:	\$ 338,442

Project

Program Area	Project Title	Requested Amount
HQ	U.S. Wheat and Barley Scab Initiative's Networking & Facilitation Office	\$ 271,066
Biotech	SSR Mapping of Novel FHB Resistance Genes From a Synthetic Hexaploid	\$ 45,900
Variety/Uniform	Development of FHB Resistant Soft White Wheat Varieties for Michigan and similar environments	\$ 104,812
	Total Amount Requested	\$ 421,778

 Principal Investigator

 Date

Project 1: U.S. Wheat and Barley Scab Initiative's Networking & Facilitation Office

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

Scab affects the industries and people involved in virtually every stage of the production, processing, and distribution systems of five market classes of wheat and barley across the U.S. The Networking and Facilitation Office (NFO) was established in 1999 to minimize the barriers to the U.S. Wheat & Barley Scab Initiative's success arising from the administrative burdens and communication challenges that are involved in working with over 83 researchers across 26 states. The NFO is addressing this problem by 1) helping scientists and all interested parties, who in the past may have problems communicating with each other, to learn from each other by facilitating communications and communication system development; 2) identifying and implementing an internet-based communication and collaboration mechanisms; and 3) acting as a center of accountability and a rapid clearing house of scab-related information. The NFO also provides administrative support to the various committees and associated conferences associated with the Initiative, including annual resolution of a comprehensive national research plan and budget.

2. What were the most significant accomplishments?

The eighth, ninth and tenth issues of the "Scab Newsletter" have been published. The call for pre-proposals for the FY2003 research plan has gone out, and final performance reports for the FY2001 projects are being completed by researchers and will be forwarded to ARS in late July. The 5th National Fusarium Head Blight Forum was held in December 2001 in Erlanger, Kentucky. This was the most successful forum to date with 197 participants in attendance. Planning for the 2002 National Scab Forum, which will be held December 7-9 in Erlanger, Kentucky, is well underway. The NFO facilitated adoption of a formal set of policies and procedures for the operating of the USWBSI's committees and the NFO. A policy for drafting annual research area program descriptions and research priorities for the RFP process was developed.

The NFO organized two Steering Committee meetings, and three Executive Committee conference calls. A tour of the transformation labs in Manhattan, Kansas and Lincoln, Nebraska, by researchers from the Biotechnology research area, was facilitated and partially funded with resources from this office. The web-based database has been integrated with the static website. That achievement contributes to the NFO's objective creating a seamless "real-time" network that allows individuals to search all of the Initiative's available information.

Project 2: SSR Mapping of Novel FHB Resistance Genes From a Synthetic Hexaploid

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

The major issues being resolved are as follows: 1) the characterization of a novel source of resistance to FHB, and 2) mapping the QTL(s) responsible for conferring this novel resistance to FHB. To characterize the novel source of resistance a mapping population of 171 dihaploid (DH) lines has been developed from a cross between the FHB susceptible line ‘Flycatcher’ and the resistant line ‘CASS94’. This mapping population is being phenotypically evaluated for resistance to FHB in two locations (Mexico and Michigan State University). To map the QTLs conferring resistance a genetic map is being developed for the A, B and D genomes of the DH population using previously published and unpublished microsatellite loci. After the development of the genetic map, QTL mapping programs are being utilized to conduct single marker, multiple regressions, and composite interval mapping to search for the QTLs conferring resistance.

2. What were the most significant accomplishments?

The most significant accomplishments were: 1) the completion of the 171 dihaploid mapping population, 2) a preliminary phenotypic characterization of a subset of the mapping population in Mexico, 3) the increase and quarantine screening of 171 dihaploid lines at Michigan State University, 4) the identification of 135 polymorphic SSR primer sets that amplify 155 D genome loci, 3) genotypic evaluation of 58+ DH lines for 126 of the 135 polymorphic SSR primer sets.

Project 3: Development of FHB Resistant Soft White Wheat Varieties for Michigan and similar environments

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

(1) Lack of elite resistance germplasm with desired agronomic traits. We have introduced more than 20 (24 or so) improved scab-resistant cultivars/lines newly-developed in China, which have high resistance and much better agronomic performance, such as W14, CJ 9306, CJ 9403.

(2) Combination of scab resistance with adaptability, high-yielding and good quality. Using newly-developed resistant germplasm resources with higher combining ability and desired agronomic traits from China, we are employing back-crossing, three-way crossing and SSD in order to transfer the resistance genes into local superior cultivars. At the same, we implementing implement marker-assisted selection. Identification of the molecular markers associated with scab resistance is in progress.

(3) Accumulation or pyramiding of resistance alleles and further enhancement of resistance. We are using several resistant cultivars with different origins and local cultivars to make multiple-crosses and SSD and marker-assisted selection in order to create new germplasm with enhanced resistance and improved agronomic traits.

2. What were the most significant accomplishments?

Substantial improvements were made to our greenhouse facilities during this year. Installation of a water treatment system at our main field facility increases our capacity to screen lines in the field. Improved parent stocks are evident from the 2001-2002 greenhouse and field data. MSU advanced lines E0009 and E0010 both exhibit moderate levels of type II resistance in addition to excellent soft white wheat quality and average agronomic performance. E0010 also exhibits higher levels of pre-harvest sprouting than that found in current cultivars. E0009 and E0010 have exhibited improved reaction to FHB for two years. F0008, a soft white line tested for the first time this year exhibited moderately high levels of Type II resistance to scab as well as superior yield and test weight in multi-location yield tests. Each of the three lines mentioned above derives its scab resistance from US sources. F2-F4 generation materials with Chinese resistance genes are being advanced in the field and greenhouse. D6234 is a soft white winter wheat which has a moderate level of Type II resistance, high test weight, acceptable milling/baking qualities, and competitive yields. D6234 is scheduled for formal release this fall. 121 single-crosses, back-crosses, three-way crosses and double-crossing combinations were made employing locally adapted parents in combination with strong sources of resistance to scab. Throughput for SSR based marker assisted selection has been greatly enhanced. FHB reaction data were included again with the annual Michigan State Wheat Variety Performance test results.

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.

Sayler, Tracy, S. Canty, and R. Ward. Spring 2002. Scab News. U.S. Wheat & Barley Scab Initiative. Volume 4, Issue 2.

Sayler, Tracy, S. Canty, and R. Ward. Winter 2002. Scab News. U.S. Wheat & Barley Scab Initiative. Volume 4, Issue 1.

Shi, JianRong, R. Ward, and D. Wang. 2001. Application of a High Throughput, Low Cost, Non-Denaturing Polyacrylamide Gel System for Wheat Micro Satellite Mapping. Proceedings from the 2001 National Fusarium Head Blight Forum, Erlanger, Kentucky. , pp. 25-30.

Song, Qijian, JR Shi, S. Singh, E.W. Fickus, R. Fernalld, B.S. Gill, P.B. Cregan, and R.W. Ward. 2001. Development and Mapping of Microsatellite (SSR) Markers in Wheat. Proceedings from the 2001 National Fusarium Head Blight Forum, Erlanger, Kentucky. pp. 31-33.

Sukhwinder-Singh, Q. Song, JR. Shi, G.L. Brown-Guedira, B.S. Gill, P.B. Cregan, and R.W. Ward. 2001. Physical Mapping of Microsatellite Markers on Wheat Chromosomes. Poster presented at the 2001 National Fusarium Head Blight Forum, Erlanger, Kentucky, and abstract included in the Forum Proceedings, pp. 35-36.

Canty, Susan, R. Ward, J. Lewis, and L. Siler. 2001. Proceedings from the 2001 National Fusarium Head Blight Forum, Erlanger, Kentucky. Michigan State University, East Lansing, MI.

Sayler, Tracy, S. Canty, and R. Ward. Fall 2001. Scab News. U.S. Wheat & Barley Scab Initiative. Volume 3, Issue 2.

Ward, Richard, L. Siler, J. Lewis and L.P. Hart. 2001. Michigan State Wheat Variety Trial: 2001. Michigan State University, East Lansing, MI.

Guo-Liang Jiang, Lee Siler, Janet Lewis and Richard Ward. 2001. Greenhouse evaluation for resistance to Fusarium head blight in wheat. Proceedings from the 2001 National Fusarium Head Blight Forum, Erlanger, Kentucky. pp. 245-250.