USDA-ARS / USWBSI
FY04 Final Performance Report
July 15, 2005

Cover Page

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Year:	**FY2004** (approx. May 04 – April 05)
FY04 ARS Agreement ID:	**59-0790-4-128**
FY04 ARS Agreement Title:	**Conventional Breeding Information Technologies to Control FHB in Wheat and Barely.**
FY04 ARS Award Amount:	**$ 303,099**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
EC/HQ	U.S. Wheat & Barley Scab Initiative's Networking and Facilitation Office.	$ 199,358
GIE	Mapping of FHB resistance QTL carried by 'CJ 9306'.	$ 19,512
VDUN	Development of FHB Resistant Soft White Wheat Varieties for Michigan and Similar Environments.	$ 84,229
	Total ARS Award Amount	**$ 303,099**

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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

(Form – FPR04)

Project 1: ***U.S. Wheat & Barley Scab Initiative's Networking and 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) has been in existence since 1999. The goal of the NFO is to minimize the barriers to the success of the U.S. Wheat & Barley Scab Initiative arising from the administrative burdens and communication challenges. In FY04, there were 76 researchers working in 25 institutions (including ARS) across 25 states and Mexico. 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 provides administrative support to the various committees, as well as being responsible for the organization of the Initiative's scientific conference. Finally, the NFO facilitates the annual resolution of a comprehensive national research plan and budget, and represents the Initiative's only 'fixed' asset.

2. What were the most significant accomplishments?

Volume 6 Issue 1 of the Initiative's newsletter "Fusarium Focus" has been published. The USWBSI has completed the restructuring of its research areas for FY06. This recent re-structuring, led by the NFO, is designed to facilitate even greater advances in the future by taking advantage of new science and technology as well as the experience gained during the past several years. The re-structuring process has delayed the FY06 Call for Pre-Proposals, which should go out in early August. The final performance reports (FPRs) for the FY04 agreements are being completed by researchers and will be forwarded to ARS in late July. Information pertaining to the FY05 Awards, as well as the FY04 Final Performance Reports, has been added to the web-based database (http://www.scabusa.org/database.htm).

The NFO is responsible for organizing/coordinating meetings, conference calls and workshops for the various USWBSI committees and research area collaborators. A complete list of all communication activities for FY04 is detailed in Table 1. New web-based discussion forum software was purchased in time for use during the development of the FY05 Research Area Program Descriptions and Research Priorities. Further enhancements and customizations have been made which should greatly enhance the communication of the USWBSI Administrative branch, the scab research community and the Initiative's stake-holders

The most significant accomplishment, other than the Research Area re-structuring, was the USWBSI's hosting and management of the 2nd International Symposium on Fusarium Head Blight, which incorporated the *8th European Fusarium Seminar*. The Symposium was held December 11-15 in Orlando, Florida. Over 320 scientists, growers, and industry representatives from 27 different countries participated in this Symposium. It was the largest gathering to date of scientists and stakeholders working on combating this disease.

Table 1. Summary of Meetings, Conference Calls and Workshops facilitated by the Networking & Facilitation Office (NFO).

Date	Committee/ Research Area	Type	Description	Number of Participants	Meeting Location
5-11-04	VDUN RAC	Workshop	USWBSI Genotyping Workshop (Part 1 – meet with Canadian Scientists)	14	Winnipeg, Canada
5-18-04	VDUN RAC	Workshop	USWBSI Genotyping Workshop (Part 2 – Meet with ARS scientist)	10	College Station, TX
5-27-04	Steering Committee (SC)	Meeting	Semi-Annual Meeting	22	Chicago, IL
8-18-04	VDUN RAC	Workshop	USWBSI Genotyping Workshop (Part 3 – Strategizing collaborative projects for FY05 Pre-proposal submission)	18	Denver, CO
10-1-04	Executive Committee (EC)	Conference Call	EC's Quarterly Conference Call	10	NA
10-15-04	USWBSI Co-Chairs, NFO and RAC Chairs	Conference Call	Discuss upcoming FY05 Pre-Proposal Review Process.	7	NA
10-29-04	EDM Review Panel	Conference Call	Discuss panel's review of FY05 submitted pre-proposals.	5	NA
11-16-04	CBC Review Panel	Conference Call	Discuss panel's review of FY05 submitted pre-proposals.	4	NA
11-16-04	GIE Review Panel	Conference Call	Discuss panel's review of FY05 submitted pre-proposals.	3	NA
11-17-04	EDM Review Panel	Conference Call	Discuss panel's review of FY05 submitted pre-proposals.	5	NA
11-19-04	VDUN Review Panel	Conference Call	Discuss panel's review of FY05 submitted pre-proposals.	4	NA
12-10-03	EC/RAC Chairs and Vice-Chairs	Meeting	Discuss review panels recommendation for pre-proposals submitted for FY05 funding.	23	Orlando, FL
12-11-04	SC	Meeting	Semi-Annual Meeting – Review FY05 Research Plan and Budget	30	Orlando, FL
12-14-04	EC	Meeting	Follow-up of Annual Forum and USWBSI's recommendation for FY04 Research Plan and Budget.	10	Orlando, FL
1-11-05	USWBSI Co-Chairs/USDA-ARS ADODR	Conference Call	Discuss collaborative projects between USWBSI breeders and ARS Genotyping Centers	3	NA
3-3-05	USWBSI Co-Chairs and aerial PIs	Conference Call	Discuss planning of aerial application projects	5	NA
3/15-16/05	EDM	Workshop	USWBSI FHB Forecasting Models	13	Wooster, OH

Project 2: ***Mapping of FHB resistance QTL carried by 'CJ 9306'.***

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

CJ9306, a line of Chinese origin, exhibits strong type II resistance to scab. This project aims to discover if this resistance is governed by unique genes, and to identify the region(s) in which the genes conditioning resistance are located in the wheat genome. We are employing a SSD population and SSR markers to address this problem.

2. What were the most significant accomplishments?

Approximately 400 SSR markers have been screened for polymorphism between the two parents of the RIL population, Veery and CJ 9306. About 120 SSR markers exhibit polymorphism. More markers are being screened and the markers with polymorphism will be used to map QTLs for the resistance in this RIL population. FHB resistance was evaluated again in greenhouse in this year for more accurate phenotyping. The results showed a good correlation with the previous phenotyping data (collected in 2002). In addition, DON content and some agronomic traits were also tested for this RIL population. Phenotyping for FHB resistance was conducted for another RIL population derived from the improved Chinese FHB resistant germplasm line 'CJ 9403' developed by Dr. Jiang. The data are currently being processed. We expect to complete the experiment by the end of August.

A paper on this research has been submitted to Crop Science for publication.

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?

All of the currently grown soft white winter wheat cultivars grown in Michigan or neighboring regions are highly susceptible to FHB. We employ conventional plant breeding approaches including field and greenhouse FHB screening nurseries to redress this shortcoming.

2. What were the most significant accomplishments?

The scale of our field screening under inoculated and misted conditions was increased substantially compared to previous years. In addition to all yield trials and uniform nurseries, 120 F4:5 and 155 F3:5 single plant progenies, all with scab resistant parents, were evaluated. The F4:5 lines derive from progeny which exhibited the most effective resistance witnessed by this program to date. They are all derived from bi-parental crosses of Michigan-adapted soft white wheats and W14, CJ 9403 and similar improved FHB resistant germplasms from China. Twenty-four of the F4:5 lines were selected this spring, where they again exhibited extremely strong scab resistance. Since these lines well combine white seed coat, winter habit/hardiness, and extremely strong FHB resistance, they will be used as breeding parents as well as considered for multiple-location trials and accelerated multiplication/release (at least as the resistant white winter wheat germplasm/parents). Fifty-six backcross populations were also planted for scab screening this year, and individual plant selection was conducted.

Preliminary results indicate that soft white winter wheat breeding lines E0001 and E2043 exhibited good resistance in the 2004-2005 scab nursery. E0001, which exhibits resistance to both pre-harvest sprouting and scab, E0009 and E2043 will be released during this coming winter. Pre-breeder seed of all three was produced in the 04/05 season. These lines also all performed well in yield trials. Each of those lines will be considered for further trials as well as accelerated multiplication and release.

Three-hundred thirty-five CIMMYT lines were increased for distribution to other breeders in the United States. Two RIL populations (derived from the cross Veery/CJ 9306 and Veery/CJ 9403, respectively) were evaluated in the greenhouse for scab resistance (Type II).

Two papers based on research from this grant have been submitted for publication.

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.

Publications:

Q.J. Song, J.R. Shi, S. Singh, E.W. Fickus, J.M. Costa, J. Lewis, B. S. Gill, R. Ward and P.B. Cregan. 2005. Development and mapping of microsatellite (SSR) markers in wheat. TAG Theoretical and Applied Genetics 110 (3): 550-560.

J.M. Lewis, K. Suenaga, M. Van Ginkel, L. Gilchrist, J.R. Shi, G.L. Jiang, S. Kravchenko, A. Mujeeb-Kazi and R.W. Ward. 2004. Identification and Mapping of a QTL for Type II Resistance to Fusarium Head Blight on Chromosome Arm 2DL of Wheat. *In: Canty, S., T. Boring, J. Wardwell and R. Ward (Eds). Proceedings of the 2nd International Symposium on Fusarium Head Blight incorporating the 8th European Fusarium Seminar*; 2004, 11-15 December; Orlando, FL, USA. East Lansing, MI. pp. 89-92.

JianRong Shi and Richard W. Ward. 2004. A High Density Linkage Map of Wheat. *In: Canty, S., T. Boring, J. Wardwell and R. Ward (Eds). Proceedings of the 2nd International Symposium on Fusarium Head Blight incorporating the 8th European Fusarium Seminar*; 2004, 11-15 December; Orlando, FL, USA. East Lansing, MI. p. 164

Canty, S., T. Boring, J. Wardwell and R. Ward, editors. *Proceedings of the 2nd International Symposium on Fusarium Head Blight incorporating the 8th European Fusarium Seminar*; 2004, December 11-15; Orlando, Florida. East Lansing, MI, Michigan State University 2004. 581pp.

Publications in Review:

Jiang, G.-L., and R.W. Ward, 2005. Conventional analysis of inheritance of Fusarium head blight resistance in 'CJ 9306' and 'CJ 9403'. Crop Science (in review).

Lewis, J.M., S. Kravchenko, G.-L. Jiang, J.-R. Shi, L.P. Hart, and R.W. Ward. 2005. Bioassay versus Conventional Characterization of Fusarium Head Blight Resistance in Ning 7840. Phytopathology (in review).

Invited Talks:

Ward, R. The War on Scab and DON. *2005 IAOM Conference & Expo*. May 2005, Nashville, Tennessee, USA (Invited Talk).