U.S. Wheat and Barley Scab Initiative
FY02 Final Performance Report (approx. May 02 – April 03)
July 15, 2003

Cover Page

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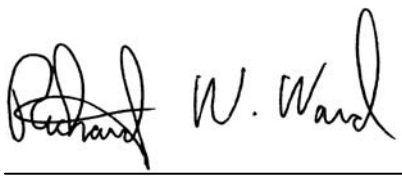
Year:	**FY2002 (approx. May 02 – April 03)**
Grant Number:	**58-1275-0-024**
Grant Title:	**Fusarium Head Blight Research**
FY02 ARS Award Amount:	**$ 68,812**

Project

Program Area	Project Title	USWBSI Recommended Amount
BIO	Microsatellite Marker Development and Mapping.	$49,066
BIO	SSR Mapping of Novel FHB Resistance Genes from a Synthetic Hexaploid Wheat.	$21,467
	Total Amount Recommended	**$70,533**



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Principal Investigator Date

Project 1: Microsatellite Marker Development and Mapping.

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

The major problems being resolved are: The availability of high quality and genetically characterized wheat microsatellite markers unencumbered by intellectual property rights issues is a limiting factor in the application of molecular marker technologies for the improvement of wheat for resistance to FHB. This three lab collaboration seeks to redress this limitation by developing new microsatellite markers and mapping them either via linkage analysis or deletion line analysis. This lab focuses primarily on the genetic mapping of loci polymorphic in the ITMI mapping population though we now conduct the physical mapping as well.

2. What were the most significant accomplishments?

1) 224 new microsatellite loci (prefixed with "Xbarc") have been mapped on the ITMI population. An additional 155 loci have been physically mapped. An integrated physical and genetic map with a total of 1611 loci (1232 from ITMI maps/data available on the web plus the Xbarc loci) is being readied in collaboration with GrainGenes curators.

2) A high throughput and low cost gel system was further refined. This system is capable of separating DNA fragments that differ by as little as two base pairs. The electrophoresis unit holds two 100-sample gels vertically and has a rotating base for easy gel access during loading with a multi-channel pipette. This allows standards and samples from a 96-well plate to be analyzed on a single gel. DNA samples are stained during electrophoresis by ethidium bromide in the running buffer. In addition, one of the gel plates is made of UV-transparent glass so gels can be photographed immediately after electrophoresis without disassembling the gel-plate sandwich. Electrophoresis runs are generally less than two hours. With five of the gel systems, a skilled person can simultaneously process 10 gels and obtain at least 1000 data points in five hours. Sample throughput, using this system, can be further increased by multiplexing 2 or more samples per well. The cost per gel, excluding PCR cost, is currently estimated at about $2.60, so the cost per data point is less than $0.03.

Project 2: SSR Mapping of Novel FHB Resistance Genes from a Synthetic Hexaploid Wheat.

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 putatively derived from introgression of D genome chromatin from Ae.. *tauschii*, and 2) mapping the QTL(s) responsible for conferring this novel resistance to FHB. To characterize this novel source of resistance a mapping population of 171 dihaploid (DH) lines was acquired from K. Mujeeb (CIMMYT). This population arises from a cross between the FHB susceptible line 'Flycatcher' and the resistant line 'CASS94'. CASS94 is derived from a synthetic hexaploid. This mapping population is being phenotypically evaluated for resistance to FHB in two locations: Toluca, Mexico (CIMMYT), and East Lansing, Michigan (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 regression, and composite interval mapping to search for the QTLs conferring resistance.

2. What were the most significant accomplishments?

   The most significant accomplishments were:
   (1) Completion of quarantine procedures for 171 DH lines at Michigan State University.
   (2) The phenotypic evaluation of 144 DH lines and the two parents of the population (CASS94 and Flycatcher) in the greenhouse at Michigan State University for Type II resistance to FHB (resistance to spread). Phenotypic evaluation was conducted across twelve replications and involved rating plants for disease at 7, 10, 14, 17 and 21 days post inoculation.
   (3) The phenotypic evaluation of 171 DH lines in the field at CIMMYT for both Type I (resistance to initial infection) and Type II resistances to FHB.
   (4) Preliminary linkage map created in JoinMap software using data from approximately 135+ polymorphic SSR primer sets amplifying approximately 155 D genome loci.

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.

D. Wang, J. Shi, S. R. Carlson, P. B. Cregan, R. W. Ward, and B. W. Diers. 2004. A low-cost, high-throughput polyacrylamide gel electrophoresis system for genotyping with microsatellite DNA markers. Crop Science (in press).

QJ Song, JR Shi, S Singh, BS Gill, PB Cregan and Rick Ward. Genetic mapping of microsatellite markers in wheat (in preparation).