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

Cover Page

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Year:	**FY2000 (approx. May 00 – April 01)**
Grant Number:	
Grant Title:	**Fusarium Head Blight Research**
2000 ARS Award Amount:	**$204,878**

Project

Program Area	Project Title	Requested Amount
Biotechnology	Microsatellite Marker Development and Construction of a Microsatellite Allele Size Database of Elite and Scab Resistance Wheat Genotypes.	$263,225.00
	Requested Total	$263,225.00[1]

Principal Investigator Date

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

PI: Perry Cregan
Grant:

Project 1: Microsatellite Marker Devleopment and Construction of a Microsatellite Allele Size Database of Elite and Scab Resistance Wheat Genotypes.

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

Wheat breeders do not have unfettered access to DNA markers that can be effectively used in the discovery of and selection for genes that control Fusarium resistance in wheat. As a result, wheat breeding programs with the goal of producing agronomically superior cultivars with acceptable grain quality make relatively little use of existing RFLP markers. To solve this problem we are developing microsatellite DNA markers that are more polymorphic and less laborious to use than RFLPs. New microsatellite markers will be placed on the wheat genome map in the ITMI mapping population and by physical mapping with aneuploid stocks. In order to pre-enable application of this technology, markers representing each of the 84 virtual ½ arm map bins (4 per chromosome) will be used to characterize both scab resistant lines (e.g. Sumai 3, Niing7840 and W14) as well as a panel of 36 or more breeder-identified breeding parents.

2. What were the most significant accomplishments?

Microsatellite construction: During the granting period a total of 476 new microsatellite primer pairs were developed. This included 402 from random genomic libraries and 74 from EST sequence data. The latter were selected from the 19230 wheat ESTs available in the database.
Microsatellite mapping: A total of 148 of these markers are polymorphic in the ITMI mapping population. 143 bands generated by 136 primer pairs were mapped (flanking LODs>3.0) on 83 progeny of the ITMI population. Loci from an additional 83 primer pairs were localized to chromosome arms using aneuploid stocks of Chinese Spring. The genomic distribution of these loci is summarized as follows:

Chromosome distribution of microsatellites on wheat chromosomes			
Chromosome	**A**	**B**	**D**
1	11	8	13
2	4	21	6
3	11	13	5
4	13	5	5
5	14	14	8
6	9	11	13
7	8	11	16

Characterization of scab resistance gene sources and likely breeding parents: MSU will request nominations for lines to include in the allele state database from USWBSI wheat breeders during the fall of 2001. Genotyping of that set will be done once the majority of microsatellite markers are mapped. A collaborative arrangement with Dr. G. Brown-Guidera (USDA-ARS) is established and the allele-sizing will occur on a capillary electrophoresis unit using fluorescent-labeled primers. The primers to be used are a subset which have demonstrated polymorphism among U.S. materials.

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.

Song, Q.J., Fickus, E.W., Cregan, P.B. Characterization of trinucleotide SSR motifs in wheat. Thoretical and Applied Genetics. 2001. (In press)

Singh, S., Li, W., Song, Q.J., Cregan, P., Brown-Guedira, G.L., Gill, B.S. Development and physical mapping of microsatellite markers in wheat. 2000 Proceedings of the National Fusarium Head Blight Forum. 2000. p. 52-54.

Ward, R., Chen, X.M., Shi, J.R., Song. Q.J., Cregan, P. Microsatellite marker development and construction of a microsatellite allele size databaseof elite and scab resistant wheat genotypes: Meiotic mapping at MSU and rationale for the overall project. Proceedings of the National Fusarium Head Blight Forum. 2000. p. 59-60.

Song, Q.J., Fickus, E.W. Cregan, P.B. Construction of genomic libraries enriched with microsatellite sequences. Proceedings of the National Fusarium Head Blight Forum. 2000. p. 50-51.

Anderson, J.A., Stack, R.W., Liu, S., Waldron, B.L., Fjeld, A.D., Coyne, C., Moreno-Sevilla, B., Mitchell Fetch, J., Song, Q.J., Cregan, P.B., and Frohberg, R.C. DNA markers for Fusarium head blight resistance QTLs in two wheat populations. Theoretical and Applied Genetics. 2001. v. 102 p. 1164-1168.

Van Sanford, D., Anderson, J., Campbell, K., Costa, J., Cregan, P., Griffey, C., Hayes, P., Ward, R. Discovery and deployment of molecular markers linked to Fusarium head blight resistance: An integrated system for wheat and barley. Crop Science. 2001. v. 41. p. 638-644.

Song, Q.J., Fickus, E.W. Cregan, P.B. Characterization and application of trinucleotide SSR motifs in wheat. 2001 BARC Poster Day, Abstract #38.