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:	**59-0790-9-028**
Grant Title:	**Fusarium Head Blight Research**
FY02 ARS Award Amount:	**$ 61,942**

Project

Program Area	Project Title	USWBSI Recommended Amount
VDUN	Improving Specialty Spring Wheat Germplasm for Resistance to Fusarium Head Blight.	$63,491
	Total Amount Recommended	**$63,491**

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Principal Investigator Date

(Form – FPR02)

Project 1: Improving Specialty Spring Wheat Germplasm for Resistance to Fusarium Head Blight.

1. What major problem or issue is being resolved and how are you resolving it?
Specialty spring wheat genotypes, for example white wheat and spring wheats with unique starch and protein quality traits, are considered plausible alternatives to red spring wheat for growers in the Upper Northern Plains of the U.S. In order for growers in this region of the U.S. to have suitably resistant specialty wheat cultivars, we are enhancing the host plant resistance to Fusarium head blight (FHB) in specialty spring wheats. This is being accomplished by hybridizing specialty spring wheat genotypes to 'Alsen', a red spring wheat with the Type II 'Sumai 3' source of FHB resistance, and by proceeding to develop advanced lines through a doubled-haploid breeding approach. We have also developed synthetic hexaploids by hybridizing a durum wheat *Triticum turgidum* L. Var. *dicoccoides* 3A chromosome substitution line to different accessions of *Triticum tauschii*. The 3A chromosome substitution line represents a different source of FHB resistance compared with Sumai 3. Our approach has been to develop these synthetics, confirm that they express the resistance, and transfer this resistance to 'Alsen' and specialty wheat genotypes. We are also working with another source of FHB resistance, which is a Type I resistance expressed by the spring wheat cultivar 'Frontana'. A backcross reciprocal monosomic technique is being employed to isolate individual Frontana chromosomes in a genetic background, which will enable the determination of which chromosomes confer Type I resistance to FHB. Determining which chromosomes are involved in the expression of resistance in Frontana will help us to more efficiently incorporate this Type I source of resistance into specialty spring wheat genotypes.

2. What were the most significant accomplishments?
Homozygous doubled-haploid (DH) lines were produced from crosses between Alsen and hard white spring wheat genotypes, and these DH lines were entered in advanced statewide yield trials for the first time in 2003. The resistance of these lines and their agronomic performance are being analyzed and compared to other advanced specialty wheat breeding lines during the 2003 growing season. Four wheat synthetic hexaploids were produced in an attempt to transfer a quantitative trait locus (QTL), *Qfhs.ndsu-3AS,* expressing FHB resistance from *Triticum turgidum* L. Var. *dicoccoides* to a hexaploid genetic background. In 2002, synthetics were evaluated for FHB resistance in two separate greenhouse screenings after artificial inoculation of spikes. Transfer of *Qfhs.ndsu-3AS* to synthetics was tracked by utilizing the tightly linked microsatellite marker, *Xgwm2*. Greenhouse evaluations for Type II FHB resistance revealed that there was expression of resistance in synthetic hexaploids, and some synthetics demonstrated a resistance comparable to Alsen. To demonstrate the possible utility of these resistant synthetics and the molecular markers in breeding, synthetic x Alsen backcross-derived lines were produced. The *Xgwm2* marker for the *T. dicoccoides* source of FHB resistance and *Xgwm533*, a microsatellite marker linked to the 'Sumai 3' source of FHB resistance in Alsen were successfully employed to confirm the existence of both QTL in some Alsen backcross-derived lines. A *Crop Science* germplasm release was submitted for the synthetic lines, and presently, four backcrosses to Alsen have been completed. New backcross progeny will be analyzed for the presence of both sources of FHB resistance. In 2002, we continued to produce reciprocal backcross chromosome lines by hybridizing Frontana to monosomic chromosome lines of 'Chris'. These lines are to be tested for resistance to FHB in 2003 fall greenhouse screenings.

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.

2003: del Blanco, R.C. Frohberg, R.W. Stack, **W.A. Berzonsky**, and S.F. Kianian. Detection of QTL linked to Fusarium head blight resistance in Sumai 3-derived North Dakota bread wheat lines. Theor. Appl. Genet. 106:1027-1031.

Berzonsky, W.A.. K.D. Hartel, SF. Kianian, and G.D. Leach. Registration of four synthetic hexaploid wheat germplasm lines with resistance to Fusarium head blight. Crop Sci. (submitted).

Hartel, K.D., **W.A. Berzonsky**, S.F. Kianian, and S. Ali. Expression of a *Triticum turgidum* L. var. *dicoccoides* source of Fusarium head blight resistance transferred to synthetic hexaploid wheat. Genome (submitted).

Gebhard, B.L. Backcross reciprocal monosomic analysis of FHB resistance in Frontana wheat. Oral Presentation - The 19th Annual Plant Science Graduate Student Symposium, Winnipeg, Manitoba, Canada, March 14.

2002: Gonzalez-Hernandez, J.L., A. del Blanco, **B. Berzonsky**, and S.F. Kianian. Genetic analysis of Type II Fusarium Head Blight (FHB) resistance in the hexaploid wheat cultivar 'Wangshubai. Poster - National FHB Forum. Erlanger, KY, Dec. 7-9.

Hartel, K.D., **W.A. Berzonsky**, and S.F. Kianian. Evaluation of Fusarium head blight resistance from Triticum turgidum L. var. dicoccoides in a synthetic hexaploid background. Oral Presentation - National ASA Meetings, Indianapolis, IN, Nov. 10-14.

Hartel, K.D., **W.A. Berzonsky**, and S.F. Kianian. Development of sythetic hexaploids with Fusarium head blight resistance from Triticum turgidum L. Var. dicoccoides. Poster - International Plant, Animal, and Microbe Genome X Conf., San Diego, CA, Jan. 12-16 (http://www.intl-pag.org/).