

**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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FY01 ARS Award Amount:	\$ 72,241

Project

Program Area	Project Title	Requested Amount
Variety/Uniform	Improving White Spring & Specialty Wheat Germplasm for Resistance to Fusarium Head Blight	\$ 79,210
	Total Amount Requested	\$ 79,210

Principal Investigator

Date

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

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

Specialty wheat varieties are promising alternatives to the red spring wheat varieties traditionally grown in the Northern Plains region of the U.S. However, no significant level of genetic resistance to *Fusarium* Head Blight (FHB) exists in this germplasm. The overall goal of this project is to accelerate the development of FHB resistant specialty wheat germplasm for the U.S. Northern Plains. This goal is being specifically addressed by using different sources of resistance to FHB. Adapted North Dakota red spring wheat lines with the ‘Sumai 3’ source of FHB resistance (mainly the cultivar Alsen), Brazilian wheat germplasm, and a *Triticum dicoccoides* accession with resistance are being used as donor sources. The ‘Sumai 3’ source and the Brazilian lines have been hybridized to specialty spring wheat germplasm with advantageous end-use quality traits. The *Triticum dicoccoides* accession has been used to produce synthetic hexaploids, which are being used as “germplasm bridges” to introgress this new source of FHB resistance into hexaploid wheat. Adapted F₁ hybrids with the type II ‘Sumai 3’ source of resistance and hybrids with the Brazilian source of resistance have been pollinated with maize to produce doubled-haploid lines and possibly hasten the development of resistant cultivars. A reciprocal backcross monosomic analysis using ‘Chris’ monosomics and ‘Frontana’, a Brazilian cultivar with resistance, has been initiated to identify the chromosome location of resistance in ‘Frontana’. Plans are to examine whether any specific ‘Frontana’ chromosome contributes to a significant degradation of deoxynivaleno (DON) in grain.

2. What were the most significant accomplishments?

Adapted specialty spring wheat doubled-haploid lines with the ‘Sumai 3’ source of resistance were produced. Seed of 24 lines was increased in a 2001-2002 New Zealand nursery, and these lines are being evaluated in 2002 field scab nurseries in Langdon and Fargo, North Dakota. These lines are also being evaluated for agronomic performance in 2002 yield trials at Casselton and Prosper, North Dakota. A total of four synthetic hexaploids and their derived lines with the *T. dicoccoides* source of resistance were produced. All synthetics and derived lines were characterized as being homozygous for the *T. dicoccoides* resistance QTL using the microsatellite marker *Xgwm2*. These synthetic lines were evaluated in one spring 2002 greenhouse trial, and they are now being evaluated in another greenhouse trial and one 2002 field trial. The objective is to determine if they express the level of resistance exhibited in the *T. dicoccoides* accession. Data from the first greenhouse trial indicate that several synthetic lines express the resistance. Plans are to complete the characterization of these lines and release the most resistant ones as germplasm for use by breeders. These should provide wheat breeders with a “bridging species” to use in incorporating the new FHB resistance from *T. dicoccoides* into hexaploid genotypes. Crosses were made between the complete set of ‘Chris’ monosomics and ‘Frontana’. A graduate student is in the process of selecting the 41-chromosome hybrids, which will be crossed as female and male in a reciprocal monosomic analysis project. Resultant lines will be evaluated for FHB resistance and DON accumulation to determine which chromosome or chromosomes are critical in determining the resistance in ‘Frontana’.

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.

Hartel, K.D., **W.A. Berzonsky**, and S.F. Kianian. 2001. Development of synthetic hexaploids with fusarium head blight resistance from *Triticum turgidum* L. var. *Dicoccoides*. National Fusarium Head Blight Forum. Erlanger, KY.

Hartel, K.D., **W.A. Berzonsky**, and S.F. Kianian. 2001. Development of synthetic hexaploids with fusarium head blight resistance from *Triticum turgidum* L. var. *Dicoccoides*. International Plant, Animal, and Genome Conference X. San Diego, CA.

del Blanco, I.A., R.C. Frohberg, R.W. Stack, **W.A. Berzonsky**, and S.F. Kianian. 2002. Detection of QTL linked to Fusarium head blight resistance in Sumai 3-derived North Dakota bread wheat lines. *Submitted to Theor. Appl. Genet.*