USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY05 Final Performance Report (approx. May 05 – April 06)
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Cover Page

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Fiscal Year:	**2005**
FY05 ARS Agreement ID:	**NA**
Agreement Title:	**Use of High Throughput Marker Technologies to Develop FHB Resistant Varieties in Wheat and Barley**
FY05 ARS Award Amount:	**$ 20,000**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
VDUN	Use of High Throughput Marker Technologies to Develop FHB Resistant Varieties in Wheat and Barley	$ 20,000
	Total Award Amount	**$ 20,000**

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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

Project 1: *Use of High Throughput Marker Technologies to Develop FHB Resistant Varieties in Wheat and Barley*

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

The complex inheritance of FHB resistance has rendered the screening of large number of breeding lines by conventional phenotypic testing a challenging task. DNA markers have been identified and tagged to a few major resistance genes in both wheat and barley. But widespread application of marker assisted selection in wheat and barley breeding for FHB resistance is limited up until now. Screening large breeding populations is not feasible by breeders because of the additional cost and time requirements. To facilitate processing a large number of breeding lines and delivering genotyping data back to the breeders in a timely manner, the Fargo genotyping lab has developed a sample preparation protocol and high throughput genotyping procedures that are both efficient and cost-effective for carrying out marker-assistant breeding projects.

2. List the most important accomplishment and its impact (how is it being used?). Complete all three sections (repeat sections for each major accomplishment):

Accomplishment: A sample preparation protocol was developed to replace freeze-dried method with silica gel for processing breeders' materials. Breeders were instructed to collect leaf samples in 96 deep-well plates filled with silica gel. Silica gel serves two purposes, 1) to dry leaf samples, and 2) to grind dry leaf samples into fine powder prior to DNA extraction. The presence of silica gel in the DNA extraction buffer generally doesn't affect DNA quality. To expedite genotyping a large number of samples, all the liquid handling process involving DNA extraction, PCR reaction setup, and multiplexing PCR samples for gel electrophoresis has been automated.

Impact: Silica gel method is easy, cost-effective, and requires no special equipment. The method allows breeders/researchers to collect samples in the greenhouse or in the field. Samples will be dried and preserved during shipping to Fargo genotyping labs for genotyping. The development of an automated genotyping process has greatly improved the efficiency of delivering genotyping data back to the breeders in both timely and cost-effective manners.

As a result of that accomplishment, what does your particular clientele, the scientific community, and agriculture as a whole have now that they didn't have before?:
The protocols have been implemented in the breeding programs to enhance wheat and barley breeding efforts in characterizing parents and selecting lines resistant to *Fusarium* head blight. Breeders from other regions in the country have an access to the protocols. In addition, the protocols have been applied to research projects that require genotyping a large number of samples, such as genetic mapping, chromosomal walking, and association studies, with increased efficiency.

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.

Brady, L., J. Anderson, K. Smith, and S. Chao. 2005. A cost-effective high throughput genotyping method. (Poster presentation) 2005 National Fusarium Head Blight Forum, Dec 11-13, 2005, Milwaukee, WI.

Chao, S., J. Anderson, K. Glover, and K. Smith. 2006. Use of high throughput marker technologies for marker-assisted breeding in wheat and barley. ITMI Workshop (Invited talk), Plant and Animal Genome XIV Conference, January 14-18, 2006, San Diego, CA.

Bodo Slotta, T.A., L. Brady, and S. Chao. 2006. High throughput tissue preparation for large-scale genotyping experiments in plants. (manuscript in prep)