

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY07 Final Performance Report (approx. May 07 – April 08)
July 15, 2008**

Cover Page

PI:	Alan Dyer
Institution:	Montana State University
Address:	Dept. of Plant Sciences and Plant Pathology 119 Ag Bioscience Facility Bozeman, MT 59717-3150
E-mail:	adyer@montana.edu
Phone:	406-994-6535
Fax:	406-994-7600
Fiscal Year:	2007
USDA-ARS Agreement ID:	59-0790-6-059
USDA-ARS Agreement Title:	Responding to Montana's Head Scab Epidemic.
FY07 ARS Award Amount:	\$ 20,488

USWBSI Individual Project(s)

USWBSI Research Area *	Project Title	ARS Adjusted Award Amount
VDUN	Responding to Montana's Head Scab Epidemic.	\$20,488
	Total Award Amount	\$ 20,488

Principal Investigator

Date

* CBCC – Chemical, Biological & Cultural Control
 EEDF – Etiology, Epidemiology & Disease Forecasting
 FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
 GET – Genetic Engineering & Transformation
 HGR – Host Genetics Resources
 HGG – Host Genetics & Genomics
 IIR – Integrated/Interdisciplinary Research
 PGG – Pathogen Genetics & Genomics
 VDUN – Variety Development & Uniform Nurseries

(Form FPR07)

Project 1: *Responding to Montana's Head Scab Epidemic.*

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

There are 540,000 irrigated production acres in the northern Rocky Mountain range and western Great Plains that are potentially impacted by Fusarium Head Blight (FHB). Many growers in scab-infested areas are converting to FHB tolerant varieties from public and private companies. However, the current FHB resistant varieties are tall in stature and weak-strawed. The objective of the spring wheat breeding effort is to develop FHB-resistant varieties suitable for production in high-yield, irrigated systems. The FHB nursery is located on a producer's field with a history of FHB disease and a uniform inoculum source of *F.pseudograminearum* and *F. graminearum* from the wheat residues. In the 2006 and 2007, the overall grain deoxynivalenol (DON) concentration of the nursery was 1.88 ppm. Susceptible varieties had 0.6 to 2.0 ppm grain DON levels, including; Hank, Vida, Howard, Explorer (HWW), Choteau and Espresso. Tolerant varieties had less than 0.5 ppm grain DON, including; Kuntz, Volt, Freyr, Granite, Knudson, Alsen, Glenn, Kelby, and an experimental line MT0550 (Choteau/ND709-9). Tolerant varieties had 8% incidence of symptomatic scab heads as compared to 28% among varieties lacking the Sumai3 gene. Overall, resistant varieties yielded 80.4 bu/ac or 18% higher than varieties lacking tolerance to FHB. Grain test weights were 61.8 lb/bu in the tolerant varieties and 57.6 lb/bu in the susceptible varieties.

We have used molecular markers to backcross the Sumai 3 QTL into three backgrounds of spring wheat. The Sumai 3 QTL has performed well under Montana scab disease conditions. We have used molecular markers to backcross the Sumai3 QTL into Choteau, a solid-stem variety with resistance to the wheat stem sawfly and which has performed very well in irrigated production. Molecular marker GWM 533 was utilized for selection in Choteau lines. An FHB-resistant line similar to Choteau should find immediate utility in irrigated production areas as well as in sawfly infested areas of eastern Montana. Another line used as recurrent parent for backcrossing include MT0249, a variety with long green leaf duration and short stature. MT0249 is a sister line to our recent cultivar release 'Vida' but is about 6 cm shorter under irrigation. BARC 133 was used when MT0249 was a recurrent parent. Sufficient seed of Choteau and MT0249 BC3-derived lines will be available for single hill plot screening in the MSU FHB nursery in 2008. The third line we have focused on 'MTHW9420' is a hard white spring wheat with high yield potential under irrigation. MTHW9420 has relatively low protein, thus we truncated the backcrossing program at BC₁ and will follow a single seed descent program to develop materials with white seeds, higher protein, and scab resistance. This project will have inbred materials in the field in 2009. We have made additional crosses with numerous FHB-resistant parents, and these materials are included in the standard spring wheat breeding cycle. We have concentrated on the Sumai-3 resistance source, although we also have materials in the program that derive from the 'dicoccoides' resistance found in 'Howard'. Our long-term plan with these crosses is to select for agronomic and quality characteristics first, and then to screen elite lines for resistance. The goal is to be sure that the breeding program has germplasm at all stages of development with FHB resistance. We will have a more extensive set of

materials for testing in 2009. These will include superior lines selected from the Choteau and MT0249 backcrosses, along with inbred materials from additional forward crossing 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:

We have documented the impact of Scab disease on spring wheat under irrigated conditions in Montana. Growers were also not aware of the high levels of grain DON as documented by the tests conducted from NDSU laboratory. These field trials have convinced growers and seed dealers that FHB resistance was an effective tool in management of scab disease. We have utilized extension networks such as AgAlerts, a MontGuide, and MAES Research & Extension Center Tours to educate the importance of scab disease and the available management tools.

Impact:

Several varieties with FHB resistance from WestBred, LLC and AgriPro-Coker, Inc. have been widely distributed through their dealer associates. MSU spring wheat program is making rapid progress on FHB resistance with adapted varieties for Montana.

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?:

Fusarium head blight in Montana does originate from infested residue and volunteer wheat following grain harvest. The primary inoculum for infection is macroconidia produced from the infested residue and it is not thought that ascospore infection from corn or wheat residue plays a major role. The effective resistance from the Sumai3 QTL under disease conditions and molecular markers have allowed for the backcross of FHB resistance into adapted spring wheat varieties for Montana. Screening the breeding lines and varieties under natural field conditions has been successful. Our goal is the development of scab resistant varieties adapted to sawfly areas and irrigated production.

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.

William Grey, Alan Dyer and Luther Talbert. 2007. Responding to Fusarium head blight for the northern Rocky Mountains and western Great Plains. pg. 179-181. Proceedings of the 2007 National Fusarium Head Blight Forum. The Westin Crown Center, Kansas City, MO, 2-4 December 2007.

William Grey, Alan Dyer, and Luther Talbert. 2008. Responding to Fusarium Head Blight and Grain Deoxynivalenol in Montana. Midwest Association of Analytical Communities, International. Midwest Sectional Meeting, Bozeman June 8-10, 2008.

Mary Burrows, William Grey, and Alan Dyer. 2008. Fusarium head blight (scab) of wheat and barley. MontGuide, MSU Extension, MT200806AG New 6/08.

MSU Press Release

“Growers gain approval for fungicide to fight wheat and barley scab, 23 May 2008”

Radio News Alerts:

July 8, 2007: Northern Ag Network, Fusarium head scab risk.

April 29, 2008: Northern Ag Network, Current condition of the wheat crop and diseases to be aware of.

June 16, 2008: Northern Ag Network, Wheat viruses and chemicals available for head scab control.

AgAlerts released and number of hits as of 25 June, 2008 (359 total subscribers):

2007

11 April. Proline registered for use, 117 hits

19 July. Spray to reduce scab risk, 139 hits

23 July. Information available online about Fusarium head scab, 207 hits

2008

16 January. Assess your risk for scab when choosing a spring wheat variety to be planted under irrigated conditions, 151 hits

17 January. Pesticide issues to be aware of in 2008, 187 hits

30 April. Possible fungicide shortages in the United States, 318 hits

22 May. Tebuconazole registered for control of Fusarium head blight (scab) of wheat and barley, 200 hits

16 June. Prosaro labeled for scab control in wheat and barley, 167 hits

16 June. Scab risk in 2008, 152 hits