

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY08 Final Performance Report (approx. May 08 – April 09)
July 15, 2009**

Cover Page

PI:	Tika Adhikari
Institution:	North Dakota State University
Address:	Department of Plant Pathology 331 Walster Hall Fargo, ND 58105
E-mail:	tika.adhikari@ndsu.edu
Phone:	701-231-7079
Fax:	701-231-7851
Fiscal Year:	2008
USDA-ARS Agreement ID:	59-0790-5-076
USDA-ARS Agreement Title:	Effect of Inoculum Levels, Host Resistance, Fungicide and Weather on FHB.
FY08 USDA-ARS Award Amount:	\$ 27,715

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Adjusted Award Amount
VDHR-SPR	Characterizing the Type 1 Resistance to FHB in Wheat.	\$7,750
MGMT	Incorporating Infection Cycle Components into FHB and DON Prediction Models.	\$ 19,965
	Total Award Amount	\$ 27,715

Principal Investigator

Date

* MGMT – FHB Management
FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
GDER – Gene Discovery & Engineering Resistance
PBG – Pathogen Biology & Genetics
BAR-CP – Barley Coordinated Project
HWW-CP – Hard Winter Wheat Coordinated Project
VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
 SPR – Spring Wheat Region
 NWW – Northern Winter Wheat Region
 SWW – Southern Sinter Wheat Region
(Form FPR08)

Project 1: *Characterizing the Type I Resistance to FHB in Wheat.*

1. What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?

Fusarium head blight (FHB) is a devastating disease in wheat throughout the world. FHB resistance consists of two components: resistance to initial infection (type I) and resistance to spread within infected spikes (type II). Current wheat breeding programs for FHB focus on type II resistance, which limits spread but may not be sufficiently durable. Therefore, an alternative approach either exploring type I resistance or combining type I and type II resistance from diverse genetic sources may provide more effective and sustained resistance to FHB. Therefore, we evaluated three genetic stocks (i) reciprocal backcross monosomic (RBCM) lines developed from the resistant cultivar ‘Frontana’, and the susceptible cultivar ‘Chris’, (ii) near-isogenic lines (NILs) developed from wheat cultivar ‘Frontana’ background, and (iii) recombinant inbred lines (RILs) developed from crossing three cultivars, Frontana, Alsen, and W9207.

2. List the most important accomplishment and its impact (i.e. how is it being used) to minimize the threat of Fusarium head blight or to reduce mycotoxins. Complete both sections (repeat sections for each major accomplishment):

Accomplishment:

Greenhouse and field experiments and in vitro seedling bioassay were performed to determine level of resistance to FHB. Few lines were identified even more resistant than parents and reduced DON content.

Impact:

Seedling bioassay may be useful to quantify and differentiate among susceptible and resistant lines to early fungal infection. The resistant RILs identified in this study should be valuable sources of resistance to FHB in spring wheat breeding programs.

Project 2: *Incorporating Infection Cycle Components into FHB and DON Prediction Models.*

1. What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?

Fusarium head blight (FHB) or Scab, caused by *Fusarium graminearum* is a devastating disease of wheat in the United States. Although few moderately resistant wheat cultivars are available and is managed through fungicide sprays and cultural practices, disease forecasting system helps the wheat growers to predict FHB epidemics during crop-growing season and to make decision whether or not fungicide spraying is necessary for their crop. In order to develop robust and reliable disease forecasting model, our main goal of this study was to examine the role(s) of wheat genotypes and inoculation timings on FHB progression and DON production.

2. List the most important accomplishment and its impact (i.e. how is it being used) to minimize the threat of Fusarium head blight or to reduce mycotoxins. Complete both sections (repeat sections for each major accomplishment):

Accomplishment:

The results indicate that i) the wheat cultivars differed significantly in FHB severity but not in disease incidence and DON concentration. Glenn had lowest level (20.60%) where as Trooper and Steele-ND had the highest levels of disease severities. All three disease components such as disease incidence, disease severity, and DON were higher when the cultivars were inoculated at mid-flowering stage (Feekes GS10.52) than at early flowering (GS 10.51).

Impact:

FHB infection at mid-flowering growth stage is crucial in disease incidence, disease severity, and DON production. Incorporation of FHB severity into the FHB disease forecasting model would help in DON level production prior to the harvest. Information generated from this study would assist in developing effective disease forecaster for better FHB management.

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.

1. Ali, S., T. Adhikari, S. Zhong. 2008. Effects of host resistance level, inoculation timings on Fusarium head blight (FHB) development and deoxynivalenol (DON) production in the field in North Dakota. Page 3-5 in the Proceedings of the 2008 National Fusarium Head Blight Forum, December 2-4 December, Crown Plaza Hotel, Indianapolis, IN.
2. Burlakoti, R. R., Mergoum, M., Kianian, S. F., and Adhikari, T. B. 2008. Characterization of Fusarium head blight resistance in Alsen-Frontana derived recombinant inbred lines. Page 151-153 in the Proceedings of the 2008 National Fusarium Head Blight Forum, December 2-4 December, Crown Plaza Hotel, Indianapolis, IN.
3. Burlakoti, R. R., Mergoum, M., Kianian, S. F., and Adhikari, T. B. 2009. Enhanced resistance to Fusarium head blight in spring wheat. *Euphytica* (submitted).

If your FY08 USDA-ARS Grant contained a VDHR-related project, include below a list all germplasm or cultivars released with full or partial support of the USWBSI. List the release notice or publication. Briefly describe the level of FHB resistance. If this is not applicable (i.e. no VDHR-related project) to your FY08 grant, please insert 'Not Applicable' below.

N/A