

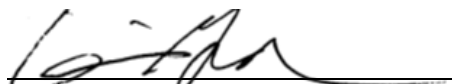
**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY12 Final Performance Report
July 16, 2013**

Cover Page

PI:	Steven Qian
Institution:	North Dakota State University
Address:	Department of Pharmaceutical Sciences NDSU Dept 2665 PO Box 6050 Fargo, ND 58108-6050
E-mail:	steven.qian@ndsu.edu
Phone:	701 231-8511
Fax:	701-231-8333
Fiscal Year:	FY12
USDA-ARS Agreement ID:	59-0206-9-062
FY12 USDA-ARS Award Amount:	\$ 25,585

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
FSTU-R	PH/GBA3-Dependent Stability of D3G's Glycosidic Bond and the Potential Risk to Human Health.	\$ 25,585
	Total ARS Award Amount	\$ 25,585


Principal Investigator

07/16/2013
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
DUR-CP – Durum Coordinated Project
HWW-CP – Hard Winter Wheat Coordinated Project
VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
 SPR – Spring Wheat Region
 NWW – Northern Soft Winter Wheat Region
 SWW – Southern Soft Red Winter Wheat Region

Project 1: *PH/GBA3-Dependent Stability of D3G's Glycosidic Bond and the Potential Risk to Human Health.*

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

Deoxynivalenol-3- β -D-glucoside (D3G) is a plant glucose-conjugated product of Deoxynivalenol (DON), a mycotoxin formed in cereal-based products infected by Fusarium head blight. Although D3G may have less toxic effect to threaten human beings than DON, under certain conditions it is possible that the glycosidic bond of D3G may cleave during human digestion and D3G converts back to DON. Furthermore, the metabolism pathways of D3G and their possible toxicities are still unclear.

In this study, we applied our expertise in chemistry and toxicology to determine the levels of DON and D3G in agricultural products, determine the rate of D3G deconjugation (cleave glycosidic bond of D3G) and relative concentration of D3G vs. DON in biological system, and investigate metabolism pathways of D3G as well as their possible toxic effects on human health.

There **are three specific aims** in this study: (1) to survey D3G and DON levels from samples of barley, durum wheat and hard red spring (HRS) wheat, (2) to validate pH-dependent and GBA-catalyzed hydrolysis of D3G, and (3) to characterize metabolic products of D3G in human parietal and hepatocyte cells.

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:

Aim 1: We have completed survey of D3G and DON for barley samples from researchers in our state. Approximately 100 samples (from 2011 or early) and 50 samples (from 2012) have been analyzed for DON and DON-3-glucoside from my lab by collaborating with colleagues, such as Drs. Paul Schwarz and Senay Simsek.

Aim 2: Among three types of different buffer systems, along with various pH, we discovered that phosphate buffers at pH 6.5 to pH 7.4 showed the capacity of simply cleaving the glycosidic bond of D3G (convert D3G back to DON). However, GBA catalyzed hydrolysis of D3G has been confirmed as a not major enzymatic reaction from the experiments.

Aim 3: Our preliminary study also showed that D3G metabolism can occur in the human body since about 40% D3G was metabolized to the derivatives when mouse liver microsomes was used to mimic human metabolism.

Impact:

Our data lays down the foundation for future investigation on the toxic effects of D3G as well as its metabolites on human health. Not only does our work meet the research priorities of USWBI, but it also fits with our research interests for seeking further long-term funding from NIH and USDA. Our long-term objective is to provide safety guidelines for levels of D3G in agricultural products intended for human and animal consumption. .

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.

Peer Reviewed Article:

Simsek S, Burgess K, Whitney KL, Gu Y, Qian SY. Analysis of Deoxynivalenol and Deoxynivalenol-3-glucoside in Wheat. *Food Control*. **26**: 287-292, 2012.

Oral Presentations:

Schwarz P, Qian S, Brueggeman R, Gillespie J, Xu Y, Barr J. Occurrence of Deoxynivalenol-3-Glucoside in Barley and Malt from North Dakota. *2013 ASBC Annual Meeting*. Tucson, Arizona, May 2013.

Tinsley S, Yang X, Qi J, Xu Y, Qian S. Hydrolysis and Metabolism of Deoxynivalenol-3- β -D-Glucoside. *2013 NDSU STEM Research Internship Program*, Fargo, ND. July 2013 (***the 1st Place Award***).