

**USDA-ARS / USWBSI
FY04 Final Performance Report
July 15, 2005**

Cover Page

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Year:	FY2004
FY04 ARS Agreement ID:	NA
FY04 ARS Agreement Title:	Characterization of QTL for FHB Resistance in Wheat Cultivar Wangshuibai.
FY04 ARS Award Amount:	\$ 42,997

USWBSI Individual Project(s)

USWBSI Research Area *	Project Title	ARS Adjusted Award Amount
BIO	Characterization of QTL for FHB Resistance in Wheat Cultivar Wangshuibai.	\$ 42,997
	Total ARS Award Amount	\$ 42,997

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: *Characterization of QTL for FHB Resistance in Wheat Cultivar Wangshuibai.*

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

Effective utilization of scab resistance resources relies on understanding inheritance of wheat resistance to scab and to DON accumulation in wheat grain. Major scab resistance QTL from Sumai 3 has been mapped and widely used in breeding programs. Identification of resistance genes from different sources may enrich scab resistance gene diversity and provide new genes to enhance scab resistance level through gene pyramiding. We screened a collection of Asian wheat cultivars and landraces to identify new resistance sources different from Sumai 3, mapping scab resistance QTL in Wangshuibai from China and Chokwang from Korea that are different from Sumai 3, with SSR markers, and to elucidate genetic effects of these QTL by testing the mapping population for scab resistance and DON accumulation under greenhouse conditions. The results are also expected to provide breeders with selectable markers for breeding wheat cultivars with low DON and high levels of scab resistance to speed up breeding process.

2. What were the most significant accomplishments and their impacts?

Accomplishments

1. One new major QTL from Chokwang was mapped on 5DL using RIL population derived from Chokwang/Clark. This QTL showed a major effect and is different from the one on 3BS. *Xbarc 239* is the closed marker to the QTL and can be used in MAS for the QTL. 3BS QTL was also detected with marginal significance in Chokwang, but the effect is very small ($r^2 < 10\%$) Therefore, this QTL from Chokwang can be used together with 3BS QTL from Sumai 3 to develop new cultivars with better resistance than both parents.
2. About 140 F6 RILs from Wangshuibai/Wheaton were evaluated for Type I resistance and DON content in two greenhouse cycles and 200 SSR markers were mapped. The Type I resistance QTL will be mapped and compared with QTL locations of Type II resistance to determine that if the two types of resistance are controlled by different QTLs.
3. About 150 wheat accessions from China, Japan and other Asian countries were repeatedly screened for Type I and Type II resistance. About 60 accessions from Japan and China were haplotyped for markers linked to 3BS, 5AS and 6B etc. The result showed that many Chinese and Japanese landraces might not carry 3BS QTL.

Impact: This is the first time that a new QTL with a major effect was identified on chromosome other than 3BS as that identified in Sumai 3. Also this is the first time to systematically characterize Asian scab resistance germplasm by using a combination of molecular and classical approaches. The identified new QTL and new sources of resistance will enhance genetic diversity of FHB resistance and provide new sources of QTL for pyramiding of major scab resistance QTLs from different sources to improve stability of scab resistance in wheat cultivars

As a result of that accomplishments, what does your particular clientele, the scientific community, and agriculture as a whole have now that they didn't have before?:

The identified new QTL and new germplasm will be published and represent an important technology transfer event because wheat geneticists, pathologists and breeders will have access to the information and used them as genetic materials in their research or breeding programs.

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 your grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

Peer-reviewed articles

1. Zhang, X, M Zhou, L Ren, G-H Bai, H Ma, OE Scholten, PG Guo, W-Z Lu. 2004. Molecular characterization of Fusarium head blight resistance from wheat variety Wangshuibai. *Euphytica* 139:59-64
2. Zhou, W-C, FL Kolb, J-B Yu, G-H Bai, LK Boze, LL Domier. 2004. Molecular characterization of Fusarium head blight resistance in Wangshuibai with SSR and AFLP markers. *Genome* 43:1137-1143.
3. Bai, G-H, GE Shaner. 2004. Management and resistance in wheat and barley to Fusarium head blight *Ann Rev. of Phytopathology* 42:135-161

Meeting abstracts

1. Ma H-X, Bai G-H, BS Gill. 2004. Deletion of a chromosome arm altered wheat resistance to by Fusarium head blight in Chinese Spring. "2nd International Symposium on Fusarium Head Blight". Dec. 11-15. Orlando, FL. P100
2. Yang J, Shaner GE, Bai G-H. 2004. Identifying new QTs for wheat resistance to Fusarium head blight using SSR and TRIP markers. *Plant and Animal Genome XIII*, January 15 - 19, 2005 San Diego, CA.
3. Yu J-B, Bai G-H, Zhou W-C, Kolb FL, Dong Y-H, and Hart P. 2004. Fine mapping of wheat QTL for resistance to FHB and DON in Chinese landrace Wangshuibai. *Plant and Animal Genome XIII*, January 15 - 19, 2005 San Diego, CA.
4. Yang J, Shaner GE, Bai G-H. 2004. Identifying new QTs for wheat resistance to Fusarium head blight using SSR and TRIP markers. . "2nd International Symposium on Fusarium Head Blight". Dec. 11-15. Orlando, FL. P213.
5. Yu J-B, Bai G-H, Zhou W-C, Kolb FL, Dong Y-H, and Hart P. 2004. Fine mapping of wheat QTL for resistance to FHB and DON in Chinese landrace Wangshuibai. . "2nd International Symposium on Fusarium Head Blight". Dec. 11-15. Orlando, FL. P218.
6. Yu J-B, Bai G-H, Dong Y-H, Cai S-B, and Hart P. 2004. Identification of new FHB resistance sources from Asian wheat germplasm. . "2nd International Symposium on Fusarium Head Blight". Dec. 11-15. Orlando, FL. P224.
7. Bernardo, A.N., **Ayoubi P.**, and Guenzi A. **Bai G-H** . 2004. Expression of defense related genes during early wheat-*F. graminearum* interaction. "2nd International Symposium on Fusarium Head Blight". Dec. 11-15. Orlando, FL. P15