

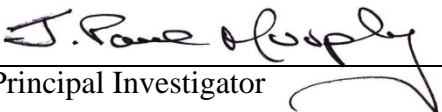
**USDA-ARS/  
U.S. Wheat and Barley Scab Initiative  
FY10 Final Performance Report  
July 15, 2011**

**Cover Page**

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<b>Fiscal Year:</b>	FY10
<b>USDA-ARS Agreement ID:</b>	59-0206-9-083
<b>USDA-ARS Agreement Title:</b>	Breeding for FHB Resistance in the Southeaster U.S. - Uniform Nursery and Marker Characterization.
<b>FY10 USDA-ARS Award Amount:</b>	\$ 58,496

**USWBSI Individual Project(s)**

<b>USWBSI Research Category*</b>	<b>Project Title</b>	<b>ARS Award Amount</b>
VDHR-SWW	Enhancement of Fusarium Head Blight Resistance in the Southeastern U.S. Germplasm.	\$ 58,496
	<b>Total ARS Award Amount</b>	<b>\$ 58,496</b>

  
Principal Investigator

July 12, 2011  
Date

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\* 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:** *Enhancement of Fusarium Head Blight Resistance in the Southeastern U.S. Germplasm.*

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

Fusarium Head Blight is a major concern to the wheat industry in North Carolina due to the annual occurrence of the disease in commercial production. We are resolving this problem by: 1) developing southeastern adapted cultivars and germplasms with moderate to high levels of FHB resistance combined with superior productivity, disease and insect resistance and end-use quality; 2) coordinating the Uniform Southern Soft Red Winter Wheat Scab Nursery to provide breeding programs with reliable, independent data on FHB resistance in advanced generation lines, and 3) seeking to provide eastern U.S. wheat breeders with doubled haploid lines developed from crosses between parents exhibiting scab resistance and overall agronomic superiority.

**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:**

**Doubled Haploids:** 422 doubled haploid lines with FHB resistant parents were distributed to eight public and private programs in fall 2010. Cooperators are free to utilize the materials as they desire, including increase for release. A mapping population of approximately 150 DH lines is being readied for VPI (Griffey), with the parentage Pion26R46/Tribute. Additional populations containing FHB resistant parents are undergoing the DH process.

**Impact:** Creation of doubled haploid lines rapidly cycles combinations of germplasm with excellent FHB resistance and superior agronomics. This is particularly important for lines containing *Fhb1* resistance, but is valuable for combinations containing only native resistance also. Sharing these materials with numerous cooperators insures comprehensive and timely evaluation of resistance and overall agronomic suitability. Developing DH mapping populations is especially useful for quantitative traits such as FHB because one saves approximately four years in the inbreeding process, and facilitates clearer research results due to the genetic uniformity of the experimental units.

**Evaluation of mapping populations:** 177 recombinant inbred lines from the cross NC-Neuse X AGS 2000, 128 DH lines from the cross MD01W233-06-1 x SS8641, and 294 inbred lines from Roane crosses were evaluated in a misted nursery in Kinston, NC as part of a research program to map native FHB resistance QTL in NC-Neuse, MD01W233-06-1 and Roane.

**Impact:** The three mapping populations are researching different adapted lines containing native resistance to FHB. It is imperative that these native sources are investigated as quickly as possible because this form of resistance affords the best opportunity to release

high yielding, agronomically superior cultivars with good milling and baking quality, combined with FHB resistance.

**Uniform Nursery:** We coordinated the 2009-10 Uniform Southern Scab Nursery program containing 54 entries submitted by 9 US public and private breeding programs. Fourteen cooperators (13 US and one Romanian) returned laboratory, greenhouse and/or field nursery data. The data were summarized in a nursery report distributed to wheat breeders and pathologists in Dec 2010. The 2010-11 Uniform Southern Scab Nursery containing 56 entries submitted by 11 US public and private breeding programs was distributed for planting in fall 2010.

**Impact:** The Uniform Southern Nursery provides cooperators with: 1) comprehensive evaluations of the FHB resistance in their advanced generation lines which speeds the release of FHB resistant cultivars, and provides a platform for identification of lines to utilize in crossing programs, and 2) readily disseminates the best resistant germplasm to a broad range of cooperators.

**Cultivar and Germplasm Development:** Data were recorded in a misted, inoculated nursery on 196 in-house advanced generation lines, 75 entries in the NC Official Variety Test and 56 entries in the cooperative Gulf Atlantic Wheat Nursery (GAWN), and results distributed to cooperators, producers and end-users. Thirteen of the 40 entries in the Wheat Advanced test had FHB resistance equal to the moderately resistant NC-Neuse. Four of the ten highest yielding lines had moderate resistance to FHB. Thirty four of the 156 entries in the Wheat Preliminary test had moderately resistant FHB ratings including three DH lines, seven lines containing *Fhb1*, 23 lines with native sources of resistance and the remainder contained CIMMYT and European sources of resistance. Eleven of the 36 highest yielding lines had moderate resistance to FHB. Six lines with FHB resistance from the Sando collection backcrossed into a susceptible North Carolina line were entered into the Uniform Southern Scab Nursery. All lines reduced FHB susceptibility by 50% relative to the susceptible recurrent parent. Approximately 520 crosses involving FHB resistant parents were made during winter 2010-11 to develop new breeding populations for the cultivar and germplasm development program. Eight

**Impact:** Data collected on cooperative GAWN nursery are vital for release decisions and for choosing and sharing parents for further population development. Multi-year evaluations of FHB resistance in state OVT entries helps growers make informed decisions on variety selection. This should result in a decline in the use of susceptible cultivars that are high performers in the absence of FHB epidemics, but extremely poor performers in the presence of FHB epidemics. The NC breeding program produced advanced generation lines that have moderate to good levels of FHB resistance combined with good overall agronomic and end-use quality. Several of these are of sufficient overall merit to enter regional cooperative trials, which suggests they may be of variety quality.

**Include below a list of 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.**

None this year

**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.**

Costa, J. M., H. E. Bockelman, G. Brown-Guedira, S. E. Cambron, X. Chen, A. Cooper, C. Cowger, Y. Dong, A. Grybauskas, Y. Jin, J. Kolmer, J. P. Murphy, C. Sneller, and E. Souza. 2010. Registration of the Soft Red Winter Wheat Germplasm MD01W233-06-1 Resistant to Fusarium Head Blight. *J. Plant Reg.* 4: 255-260.

Griffey, C. A. and 31 co- authors. 2011. Registration of ‘SW049029104’ Wheat. *J. Plant Reg.* 5: 91-97

Murphy, J. P., and R. Navarro. 2010. The 2009-10 Southern Uniform Winter Wheat Scab Nursery. In: S. Canty, A. Clark, A. Anderson-Scully, D. Ellis, D. Van Sanford (Eds.) *Proceedings of the National Fusarium Head Blight Forum; 2010 Dec 7-9; Milwaukee, WI. Lexington, KY: University of Kentucky.* p. 154-158.

Shoots, J., M. Guttieri, F. Kolb, J. Lewis, A. McKendry, H. Ohm, C. Sneller, M. E. Sorrells, E. Souza, D. Van Sanford, J. Costa, C. Griffey, S. Harrison, J. Johnson and J. P. Murphy. 2010. Development and distribution of male-sterile facilitated recurrent selection populations. In: S. Canty, A. Clark, A. Anderson-Scully, D. Ellis, D. Van Sanford (Eds.) *Proceedings of the National Fusarium Head Blight Forum; 2010 Dec 7-9; Milwaukee, WI. Lexington, KY: University of Kentucky.* p. 165-166.

Benson, J., G. Brown-Guedira, J. Holland, J. P. Murphy, and C. H. Sneller. 2010. Association analysis of markers for breeding scab resistance in winter wheat. In: S. Canty, A. Clark, A. Anderson-Scully, D. Ellis, D. Van Sanford (Eds.) *Proceedings of the National Fusarium Head Blight Forum; 2010 Dec 7-9; Milwaukee, WI. Lexington, KY: University of Kentucky.* p. 128.

Gao, J., Y. Wang, T. Werner, L. Cardwell, J. P. Murphy, G. Brown-Guedira, C. Griffey, Y. Dong, and J. Costa. 2010. Mapping scab resistance in the winter wheat line MD01W233-06-1. In: S. Canty, A. Clark, A. Anderson-Scully, D. Ellis, D. Van Sanford (Eds.) *Proceedings of the National Fusarium Head Blight Forum; 2010 Dec 7-9; Milwaukee, WI. Lexington, KY: University of Kentucky.* p. 138-141.

Murphy, J. P., and R. A. Navarro. 2010. The 2009-10 Southern Uniform Winter Wheat Scab Nursery.

Also available at [http://scabusa.org/pdfs\\_dbupload/suwwsn10\\_report.pdf](http://scabusa.org/pdfs_dbupload/suwwsn10_report.pdf)