

**PI: J. Paul Murphy****PI's E-mail: Paul\_Murphy@ncsu.edu****Project ID: FY12-SW-001****ARS Agreement #: 59-0206-9-083****Research Category: VDHR-SWW****Duration of Award: 1 Year****Project Title: Enhancement of Fusarium Head Blight Resistance in the Southeastern U.S. Germplasm.****PROJECT 1 ABSTRACT**

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The objectives of this project are 1) increased acreage planted to varieties with improved FHB resistance and low DON, 2) Increased efficiency of Coordinated Project breeding programs to develop FHB resistant varieties, and 3) Develop new breeding technologies to further enhance short term and long term improvement of FHB resistance and to efficiently introgress effective resistance genes into breeding germplasm. The Southern Uniform Scab Nursery provides public and private sector breeders with multi-environment evaluations of FHB resistance in advanced generation breeding lines compared with the resistant check varieties Ernie, Bess and Jamestown. One hundred seventy F5:7 lines from the cross NC-Neuse / AGS2000 will be evaluated for components of FHB resistance in 2011-13 in field tests in NC, VA, and MD. The population has undergone DARt, SSR and SNP analyses. In 2011-13 phenotypic data will be collected on 73 F4-derived RIL from crosses between Roane with three KY wheat lines, and 176 RIL from the cross of Pioneer 25R47 / Jamestown. In 2011-12, phenotypic data will be collected on doubled haploid lines for the MD01W233-06-1 / SS 8641 mapping population. Doubled haploid lines developed at NCSU for the Bess / NC-Neuse population will be evaluated in NC and MO in 2011-13. The objective is to validate the QTL identified in NC-Neuse and Truman (Bess is a sib of Truman). In fall 2012, doubled haploid lines developed from the following crosses will be distributed to interested cooperators: Jamestown / SS8641, NC-Yadkin / Oakes, NC-Neuse / VA05W-500, NC06-19896 / NC08-140, Bess / NC06-19896, NC-Yadkin / Oakes // NC-Neuse, and NC05-20671 / NC-Yadkin // VA04W-90. One or both parents in each cross expresses moderate resistance to FHB. Another cycle of DH line development will begin in spring 2012 and produce DH lines for increase in 2013-14. The five populations chosen will address both mapping populations and cultivar / germplasm development. As a member of SUNGRAINS (Southeastern University Grains), I partner closely in a collaborative cultivar development program by public small grain programs in NC, GA, FL, LA, AR and TX. Over 95 percent of our variety development breeding populations result from crosses between one or more parents exhibiting partial to high levels of resistance to FHB. Typical FHB sources include in-house advanced generation lines containing Fhb1, Qhhs.ifa-5A, FHB 5A (Ernie), 2DL, 3BSc and 'Frontana' 3A and 5A alleles. More emphasis is being placed on parents with 'native' resistance, particularly lines from the MO, IL, VA GA and NC programs with better yield potential, adaptation and end use quality. Approximately 550 F2 and F3 bulks (combined) will be advanced in both seasons utilizing mass selection. Approximately 35,000 headrows in the F4, F5 and F6 generations (combined) will be advanced each season using the pedigree method. Our current misted/inoculated nursery contains 3200 headrows. Evaluations of Preliminary and Advanced tests are conducted in the misted nursery annually. In addition to the Uniform Southern FHB Nursery, we will evaluate the seven state Gulf-Atlantic Nursery in our misted/inoculated nursery. We will evaluate important released varieties (60 plus) entered in the annual NC Official Variety Testing (OVT) program. Results from the OVT will be posted on the NC Small Grains Production website: Our approach is enrichment of targeted populations of three-way F1's, and F2 bulks using marker assisted selection combined with extensive phenotypic evaluation in later generations when heritabilities are greater. QTL identified in ongoing studies identifying resistance QTL's in NC-Neuse, Jamestown, and Bess, which have been utilized extensively in my crossing program over past few years.