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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. Four Recombinant Inbred populations are in different stages of research designed to identify QTL associated with FHB resistance in NC-Neuse, Bess, Tribute, Catbird. The populations have undergone DArT, SSR and SNP analyses, and phenotypic data will be collected and analyzed during this grant cycle. Based on efforts in progress, by fall 2014 and fall 2015, doubled haploid lines developed from the following crosses will be distributed to interested cooperators: NC09-22206 / Jamestown, NC08-23323 / V08W294, GA04570-10E46 / NC8170-4-3, GA04570-10E46 / Jamestown, GA04570-10E46 / NC08-20986, Shirley / NC8170-4-3, Shirley / NC08-20986, Jamestown / NC08-20768, NC8170-4-3 / NC08-140, NC8170-4-3 / NC-Cape Fear, NC8170-4-3 / NC08-21273, and NC8170-4-3 / NC09-20768. In each of these crosses, either one or both, parents express moderate resistance to FHB. Selections made by cooperators in from NC-developed DH lines distributed in fall 2012 and 2013 will be evaluated in 2014-15 and likely 2015-16. In the NC program, 1170, 75, 20, 8 and 2 DH lines will be entered in Head Row Increase, Observation, Preliminary, Advanced, and Official Variety Trials in fall 2013. 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 75 percent of our variety development 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, 2B and 'Frontana' 3A and 5A alleles. More emphasis is being placed on parents with 'native' resistance, particularly lines from the MO, IL, VA, MD, GA and NC programs with better yield potential, adaptation and end use quality. Approximately 550 F_2 and F_3 bulks (combined) will be advanced in both seasons utilizing mass selection. Approximately 30,000 headrows in the F_4, F_5 and F_6 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 F_1's, and F_2 bulks using marker assisted selection combined with extensive phenotypic evaluation in later generations when heritabilities are greater. In 2014-15 and 2015-16, we will select among 3-way F_1's and enhance F_2 populations through identification of plants containing the QTL mentioned above, and additional QTL being identified in ongoing studies with NC-Neuse, Jamestown, and Bess.