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Project Title: Developing Double Haploids to Expedite Variety Development in SRWW.

PROJECT 3 ABSTRACT

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In 2003 and 2009 and more recently in 2014 and 2015, scab epidemics devastated much of the wheat crop in the southeastern U.S. Currently, production of cultivars having moderate FHB resistance derived predominantly from native sources, and fungicide applications offer the primary means of disease control. However, neither control strategy provides optimal protection in years of severe epidemics. Information provided from extensive and collaborative phenotypic and genotypic characterization of FHB resistance in breeding lines, commercial cultivars, and mapping populations can be deployed in marker assisted selection (MAS) and pyramiding of complementary FHB resistance genes concurrently with development of doubled haploid (DH) lines. This will greatly accelerate the development of wheat cultivars having enhanced levels of resistance to FHB and DON toxin.

Each year the southern breeding programs make multiple single and/or three way crosses to pyramid validated FHB resistance QTL and other traits of interests. For this proposal, each program (AR, VA, LA, NC, and GA) will use one or more of these crosses to develop 270 double haploid lines per year at Heartland Plant Innovations. These lines will be genotyped in collaboration with the Eastern Regional Genotyping Center and collaboratively phenotyped in future years of the project.

Previous years of this project have resulted in superior advance lines being identified. For example, twenty five superior DH lines derived from crosses having *Fhb1* and other QTL (Jamestown FHB-1B) were selected among headrows of three populations (MD03W61-09-7/Jamestown//GA04570-10E46, MD03-69-15/ Yorktown, and Pioneer 25R32/ GA001138-8E36//VA09W-73) evaluated in the field at Warsaw, VA in 2014. These lines were evaluated in observation yield tests at two locations in Virginia in 2015. Seed of superior lines were provided to other breeding programs. In Arkansas, 40 DH lines were selected from populations exchanged from VA, NC and LA. New DH lines currently being developed will have diverse pyramids of FHB resistance genes including *Fhb1* and QTL on chromosomes 2DL, 5AS (Ning 7840), 1B (Jamestown) 1A and 2A of Tribute, 3B and 4B of Ernie, 2B and 3B of Bess, 3B of Massey, and 1A, 4A, and 6A of Neuse combined with other favorable agronomic traits.

Virginia Tech FHB-DH lines developed in conjunction with the U.S. Wheat and Barley Scab Initiative include 3 DH lines in the 2017 Advance test, 5 lines in the Preliminary test, and 317 lines in an Observation test. In fall 2016, we distributed seed of 750 FHB-MAS Doubled Haploid lines, developed in our program and grown and harvested at Griffin, GA in collaboration with University of Georgia, to breeders at University of Arkansas, University of Kentucky, Ohio State University, NCSU, and LSU. We also sent FHB-MAS selected and vernalized plants to Heartland Plant Innovations to develop DH lines for VA (34 plants), LSU (15 plants), University of Arkansas (10 plants), University of Georgia (16 plants), NCSU (13 plants), and University of Kentucky (17 plants).