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Project Title: Developing Doubled Haploids to Expedite Variety Development in Soft Red Winter Wheat

PROJECT 2 ABSTRACT

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One of the main objectives of the VDHR research area is to increase the efficiency of coordinated project breeding programs in developing and releasing FHB-resistant varieties. Doubled haploids (DH) shorten variety development time in fall-sown small grains by three to four years and allow efficient marker assisted selection and gene pyramiding.

Wheat DH production requires a large investment in laboratory equipment, greenhouse space, and expert personnel. This approach has been successfully used in the Southern Winter Wheat region through the efforts of the breeding program at NCSU (Murphy) that distributed over 500 DH lines since 2010 involving crosses with native resistance soft red winter wheat parents such as Bess and Neuse, and lines containing Fhb1 in current variety backgrounds.

We plan to expand the use of this technique for the whole Southern Winter Wheat region by the coordinated development of four breeding populations through DH production followed by collaborative phenotyping across the region once the DH lines are developed and seed is being increased for testing. This proposal fits into the overall Coordinated Project because it will quickly provide inbred breeding lines having several diverse FHB resistance genes (exotic and native) to five breeding programs for testing in the Southern Winter Wheat (SWW) region.

For 2019 there are 78 LSU DHs in Wheat Prelim-H from three crosses containing multiple FHB QTL from Jamestown, NC11-22289 (Coker 9511) ARGE07-1347-6-7-9 (Catbird) and MDC07026-F2-19-13-4 (Fhb1). The crosses are: MDC07026-F2-19-13-4//NC11-22289/LA06146E-P4; LA06146E-P4 //NC11-22289/ARGE07-1347-6-7-9; and GA 03564-12E6//LA06146E-P4/NC11-22289. The LSU Genomic Selection Preliminary yield trial (WPGS) includes 92 DH's with FHB QTL. WPGS data will include molecular marker data for FHB, misted nursery phenotyping for incidence, FDK, and Don, and genomic estimated breeding values for FDK and Don.

The LSU program submitted 20+ F1 seed per each of four biparental crosses made in March of 2018 to the NC State DH Lab in the fall of 2018 with the expectation of getting 600 DH plants back in the fall of 2019. All four crosses included Fhb1 along with a number of additional FHB QTL. Two of these populations will be funded by this grant and another six FHB targeted DHs through other funding avenues.