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Project Title: Enhancement of Scab Resistant Wheat Varieties Adapted to the Southeast.

PROJECT 1 ABSTRACT

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The development of resistant varieties with the level of FHB resistance from native resistance (Truman/Bess) or *Fhbl*-derived lines is needed that are adapted to the Southeast. Our objectives are to enhance the development of high yielding soft red winter wheat (SRWW) varieties with improved FHB resistance and end-use quality, to generate populations for marker assisted selection with QTL associated with both native and exotic FHB resistance, and to introgress two or more known FHB resistance QTL into adapted SRWW background by using marker assisted selection. This project is a collaborative effort with cooperators from University of Arkansas, Louisiana State University, North Carolina State University, Virginia Tech, and the USDA-ARS Genotyping Center, Raleigh, NC.

Populations with broadly adaptive cultivars or their derivatives with (Fhbl) and native resistant sources are being evaluated to developed FHB resistant varieties. Phenotyping, marker assisted selection (MAS), and Double Haploid (DE) are all being employed to identify and incorporate resistant germplasm that combine improved FHB resistance with leaf and stripe rust, wheat soil-borne mosaic virus and Hessian fly resistance. Marker Assisted Selection accelerates the development of adapted FHB resistant cultivars by the selections within populations containing *Fhbl*, 2DL, 5AS, 3BSc, and 2BErnie in the UGA molecular lab and in cooperation with Gina Brown-Guedira, USDA Genotyping Center. Data and DON samples from the Uniform Southern FHB nursery grown in Georgia will be submitted.

The level of Fusarium resistance from native sources within our program and other cooperators has significantly improved. Breeding lines with Truman, Bess, Jamestown, Neuse, IN981359, and IN97397 background have shown high levels of FHB resistance and high grain yields in field evaluations. To develop new high yielding lines with FHB resistance, a combination of backcrossing and three-way crosses will continue to be employed using molecular markers to expedite the selection process. Four-way crosses will also be made to add resistance from both parents. Cooperative evaluation of nurseries including the Southern Uniform Scab, the Uniform Southern Wheat, and the GA state performance trial, and FHB double-haploid lines will be evaluated in the misted, inoculated field nursery at Griffin, GA. Additional phenotypic data on FHB resistance will be collected from both native and exotic resistant sources to help us elucidate the type of resistance.

Marker Assisted Backcrossing (MABC) of QTL (*Fhb*1, 5AS, 2DL (Ning 7840), 3BSc and 5A (Ernie), and 3BL (Massey) into SRWW background will be performed using high yielding and moderately resistant FHB lines as recurrent parents. Pyramiding QTLs will greatly facilitate development of cultivars that have more effective FHB resistance. Improved derived lines with Fhb1 and other QTLs will be further evaluated among elite lines and backcross populations. The widely adapted varieties, such as Baldwin, AGS 2035, and SS 8641 have been used as recurrent parents to develop populations of BC_2F_3 and BC_2F_4 plants with improved FHB resistance.