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Project Title: Developing Scab (FHB) Resistant Wheat Germplasm Adapted to GA and the Southeast

PROJECT 1 ABSTRACT

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Epidemic levels of scab disease were observed in many areas of Georgia and the US Southeast recently. This has resulted in significant economic losses for wheat growers and substantial decrease in wheat acreages. Therefore, our main objectives are to (1) develop high yielding soft red winter wheat varieties (SRWW) with improved FHB resistance and end-use quality; (2) increase the efficiency of coordinated project breeding programs to develop and release FHB resistant varieties; and (3) implement modern breeding technologies to enhance the efficiency to introgress FHB resistance into germplasm. To achieve this, we need to generate populations with QTL from both native and exotic FHB resistance; and introgress *Fhb1*/other FHB resistance QTL using field screening, MAS, and genomic selection (GS).

Germplasm from crosses involving FHB resistant sources such as Jamestown, Bess/Truman, Neuse, VA lines and lines with major *Fhb1*, 2DL, 5AS have shown high resistance and increased grain yields. Bi-parental, 3 and 4-way crosses will be made between GA lines and these FHB resistance sources. Segregating populations will be evaluated and advanced to select adapted lines with improved FHB and other pests' resistances. In addition, FHB resistance sources from SUNGRAINS, Illinois, Ohio, Missouri and Kentucky will be transferred into Rht2 GA elite germplasm.

Enhancing the efficiency of the coordinated project breeding programs to develop and release FHB resistant varieties will continue between the SUNGRAINS, Virginia Tech, and the USDA Genotyping Center, NC. These efforts include phenotyping germplasm; evaluation of regional nurseries; exchange of data, germplasm, crosses, and DH; joint evaluation of FHB resistant germplasm; and GS. Data and DON samples from the regional nursery grown in Georgia will be shared.

MAS, DH, and GS will be used to identify and incorporate resistant germplasm combining FHB with other pests' resistances. Selected DH lines with QTL/genes including *Fhb1*, 5AS, 2DL, 1B, 6A, 1A, 4A, 6A, 2B, 3BL, IL07-4415 and resistant germplasm from NC, MD, and KY will be genotyped and evaluated for agronomic performance. Selected DH lines will be shared with other cooperators. We will use MAS enrichment of F1's, to accumulate favorable genes and QTLs from early generation screening, and haplotype parents for crossing. Marker assisted Backcrossing of QTL including *Fhb1*, 5AS, 2DL, 1B, 6A, 1A, 4A, 2B, 3B, and 3BL into SRWW background will be performed using adapted and moderately resistant FHB lines. Lines in PYTs will be subjected to GS to select lines with high yield, FHB and other pests' resistances.