Project Abstract

Project Title:	Development of Scab Resistant Soft Red Winter Wheat Germplasm Adapted GA and the Southeast Regions	
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In recent years, epidemic levels of scab disease were observed in many areas of Georgia (GA) and the US Southeast (SE). This caused significant economic losses for wheat growers and substantial decrease in wheat acreages. Therefore, the main objectives of our program are to (1) develop high yielding soft red winter wheat (SRWW) germplasm/cultivars with improved FHB resistance and end-use quality; (2) increase 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 elite germplasm. To achieve this goal, we need to generate populations with QTL/genes from both native and exotic FHB resistance; and introgress Fhb1/other FHB resistance QTL using field screening, MAS, and genomic selection (GS).

Elite UGA germplasm derived from crosses involving divers FHB resistant sources with major FHB QTL such as *Fhb1*, 1b_JT, 2DL, 5AS have shown high resistance and improved grain yields. Bi-parental, 3 and 4-way crosses will be made between elite 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. These efforts include phenotyping; evaluation of regional nurseries; exchange of data, germplasm, crosses, and DH; joint evaluation of FHB 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 and grain yield. Selected DH lines with QTL including *Fhb1*, 5AS, 2DL, 1B, 6A, 1A, 4A, 6A, 2B, 3BL,.. and resistant germplasm from NC, MD, and KY will be genotyped and evaluated for agronomic performance. Selected DH lines will shared with other cooperators. We will use MAS enrichment of F1's, to accumulate favorite genes and QTLs from early generation screening, and haplotype parents for crossing. Marker assisted Backcrossing (MABC) of major QTL including *Fhb1*, into UGA SRWW background will be performed using adapted and moderately resistant FHB lines. Lines in PYTs will be subjected to GS to select adapted lines with FHB and other pests' resistances.