

Report for FY24-SW-002: A Double Haploid Initiative to Speed Development of FHB Resistant Soft Winter Wheat

Note: Report must cover the *entire* duration of the project period of performance, May 1, 2022-July 30, 2026.

1. What are the major goals and objectives of the research project?

The overarching goal of this proposal was to use traditional breeding techniques, a misted-nursery, and marker-assisted selection (MAS) to develop FHB resistant SRWW cultivars and to share germplasm with other Southern U.S. programs. Our specific objectives were to: 1) develop DH lines that combine multiple effective FHB resistance genes/QTL. 2) utilize marker assisted selection (MAS) to enrich topcross F1 populations for those genes/QTL. 3) Share new DHs with all VDHR-SWW breeders after the initial culling such that each breeder evaluates about 1,300 new DHs each year. and 4) enter promising FHB-resistant lines into Southeastern University Grains (SunGrains) scab nurseries to facilitate development of resistant cultivars. New FHB-resistant SRWW cultivars with high yield potential, tolerance to other biotic and abiotic stresses, and superior end-use quality provide effective means of resistance not only in Texas but also in other areas in the Southern U.S. where TAM wheat is adapted and where FHB levels require adequate host plant resistance.

2. What was accomplished under these goals or objectives? (For each major goal/objective, address these three items below.)

What were the major activities?

Six F1 crosses with a total of 155 F1 seeds were sent to the wheat genetic program led by Shuyu Liu at Texas A&M AgriLife Research at Amarillo in the spring of 2021. Five F1 crosses with 111 seeds in fall 2022, five F1 crosses with 124 seeds in fall 2023, three F1 crosses in 2025 and three in 2026 were sent to Amarillo for DHL development with combinations of the Fhb1 gene and native resistance QTL. Two crosses were sent in 2023 to Heartland Plant Innovations with about 300 DH lines produced. A set of 934 embryos were cultured in 2023 and 995 embryos were cultured in 2024 by the Amarillo lab. Embryo culture is underway for the 2025 and 2026 crosses. Two hundred Fifty-one DHLs were produced in 2024 by the Amarillo lab.

What were the significant results?

A set of 150 DHLs were harvested and 75 DHLs were sent to Commerce for seed increase in the fall of 2023 and 250 in 2024. Two crosses were sent to the USDA doubled haploid lab in North Carolina in 2023 with 141 DHLs produced. These lines, along with those produced by Heartland in 2023, were grown as headrows in Greenville, TX in 2024 and 2025 where 51 were selected for disease resistance and agronomic traits and entered observation trials in 2025. Out of these, 24 were selected and are entering preliminary yield trials in 2026.

List key outcomes or other achievements.

Over 100 of these DH lines were shared with SunGrains and VDHR-SWW breeders. More DHLs are currently in the process of development.

3. What opportunities for training and professional development has the project provided?

The DHL development was conducted by PhD students, postdocs and undergraduate students. They were trained very well on this process. They can work independently to set up a DHL development program.

4. How have the results been disseminated to communities of interest?

DH lines with Fhb1 and additional native QTL have been produced and shared with SunGrains and VDHR-SWW breeders across the Southeastern US and Gulf Atlantic region.

5. What do you plan to do during the next reporting period to accomplish the goals and objectives?

Not applicable, this is the final report for the agreement.