

Project FY22-SW-006: Developing FHB-resistant Soft Red Winter Wheat for Texas and the Gulf-Atlantic Region

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

The overarching goal of this proposal is 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 are to 1) develop, screen, and release SRWW that combine superior yield and end-use quality with tagged or native FHB resistance, 2) use MAS to complement traditional breeding methods and improve gain from selection, and 3) 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 will 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?**

A mist-irrigated FHB evaluation nursery was established at the main campus in College Station, Texas for evaluating incidence and disease severity. We have specifically evaluated the Texas Soft Uniform Variety Trial (SUVT), Uniform Southern SRWW Nursery (USSRWWN), and the Southern Uniform Winter Wheat Scab Nursery (SUWWSN) in 2022–2023, and we continued the same during the 2023–2024 wheat growing season. FDK was evaluated for all samples. The DON results from U. of Minnesota were shared.

What were the significant results?

During the third year of testing in the scab misted nursery, we had excellent uniform symptoms. The FHB index ranged from 1.0 to 6.5, based on a scale of 0 - 9 in the Southern Scab Nursery the FDK ranged from 10% - 48%. The FHB index and FDK were not correlated ($r = 0. -0.2$, $P = 0.10$). Earlier lines had more DON content in 2023. The best performers were lines possessing the *Fhb1* gene in 2023. A total of 130 lines were evaluated for INC, SEV, and FDK for two reps. INC ranged from 0 to 100% with mean of 55%, SEV ranged from 0 to 90% with means of 52%, FHBI ranged from 0 to 90% with means of 31%, FDK ranged from 1 to 70% with means of 24%. The overall means of INC ranged from 9-90%, SEV ranged from 9-89%, FHBI ranged from 3-79%, FDK ranged from 10-70%, and ON ranged from 0.8-23.8 ppm.

List key outcomes or other achievements.

Our third-year nursery showed that we can produce and apply inoculum appropriately, mist-irrigate, establish symptoms, and take good readings of wheat head scab. The correlation between FHB index and heading was -0.80 ($P < 0.001$), which indicates that the later lines had lower FHB symptoms despite grouping of entries by heading for symptom evaluation. We applied the corn spawn right at the beginning of stem elongation in 2023. FHB pressure was higher in the third year compared to the 2021-2022 growing season when we had dryer than normal weather conditions across the region. This is confirmed by higher FDK ratings compared to year 2. There is an increase in the *Fhb1* frequency in our germplasm; we appreciate the USWBSI funding support. We expect to release cultivar with FHB resistance in about two years.

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

Three technicians and several undergraduate and graduate students were trained in symptom rating, including disease incidence, severity, and FDK, as part of this project.

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

So far, data of regional nurseries has been shared widely with colleagues in SunGrains. Results will be communicated in producers' meetings and field days. Any future significant outcomes of this project will also be highlighted in popular press articles. Furthermore, results will be communicated to scientific peers via peer-reviewed scientific journals upon the release of current candidates screened during 2025.

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

FHB incidence, severity, index, FDK and DON will be summarized, and resistance germplasm and cultivars will be released.