Project Abstract

Project Title:	Fusarium Head Blight Breeding Research at North Carolina State University	
USWBSI Project ID:	FY24-SW-001	
Principal Investigator:	Nonoy Bandillo	North Carolina State Univ

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Project Summary

The main goal of this project is to provide a continuous supply of new varieties available for the diverse needs of growers in a region stretching from Maryland to Texas that incorporate high levels of FHB resistance with all necessary agronomic and end-use requirements expected. Specific objectives of this project are the following: 1) increase the number of varieties with improved FHB resistance, high yield and quality that are tested in statewide variety trials and available to reduce DON in the US grain supply; 2) increase the efficiency of germplasm selection and cultivar development; 3) evaluate and implement new breeding technologies to enhance short and long-term improvement of FHB resistance. The project has started to implement and will continue to develop 'the essential breeding tools' to support selection breeding decisions that can accelerate breeding cycles, increase the number of lines screened, improve selection accuracy, and scaling up data collection processes at a reduced cost.

1. Nursery coordination.
The Southern Uniform Scab Nursery provides data on scab resistance and promotes germplasm exchange. This project will continue to coordinate the nursery and cooperators from nine public and one private sector breeding program plus USDA-ARS genotyping, and entomology laboratories. Stakeholders benefit from solid information on advanced line resistance in the generations just prior to cultivar release.

2. Improving breeding efficiency and better placement of new cultivars with genomic selection.
Genomic selection predictions of scab resistance will be provided for all first-generation post-head-row lines (>5,000) in breeding programs in NC, SC, GA, FL, LA, AR, TX and MD. Research goals are to improve the accuracy of the estimates through training population optimization. GBS data will be used in machine learning classification models to predict the presence of major QTL as a substitute for KASP markers. Stakeholders benefit from earlier information on scab resistance QTL in their breeding material.

3. Cultivar development and exchange of germplasm to incorporate high levels of FHB resistance
We will collaborate in a large cultivar development program (SunGrains) with small grain breeders in NC, SC, GA, FL, LA, AR and TX. This involves sharing germplasm, four uniform nurseries at different stages of advancement and royalty revenues. Stakeholder benefit from release of new FHB resistant cultivars of wheat.

4. Provide bioinformatics support for genomic selection in the Southern soft wheat region.
Multi-state, multi-environment genomic selection research requires someone to coordinate the movement of DNA through the pipeline, phenotypic data curation, running and optimizing genomic prediction models in a timely fashion and continuously striving to improve the processes. Jeanette Lyerly, Research Associate at NCSU, has filled this role for six years through collaborating with Gina Brown-Guedira, SUNGRAINS and University of Kentucky breeders. Stakeholders benefit from release of new FHB resistant cultivars of wheat.