Project Abstract

Project Title:	Enhancement of Fusarium Head Blight Resistance in the Southeastern U.S. Germplasm	
Principal Investigator:	J. Paul Murphy	North Carolina State University

The project goals are to 1) increase the number of varieties with improved FHB resistance available in the Southeastern US; 2) increase cooperation and efficiency of CP cultivar development programs and 3) implement modern breeding technologies to enhance improvement of FHB resistance.

1. Nursery Coordination.
   The Southern Uniform Scab Nursery provides reliable data on scab resistance and promotes germplasm exchange. I coordinate the nursery and cooperators include nine public and two private sector breeding programs plus USDA-ARS genotyping, end-use quality and entomology laboratories. Stakeholders benefit from solid information on advanced line resistance in the generations just prior to release.

2. Build on current genomic selection activities to increase efficiency of Southern wheat breeding programs.
   Genomic selection predictions of scab resistance will be provided for all first generation post-head-row lines (>4,000) 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 to KASP markers. Stakeholders benefit from earlier information on scab resistance QTL in their breeding material.

3. Validate KASP markers associated with scab resistance in NC13-20076.
   NC13-20076 has high levels of scab resistance but does not contain known FHB resistance genes. We identified several QTL on chromosomes 4A, 5A and 7A. The hypothesis to be tested is that resistance associated with the KASP markers previously identified in the DH population will not be associated with resistance in additional DH populations with NC13-20076 as a parent. Stakeholders will benefit from solid information on novel QTL for MAS.

4. Conduct a wheat cultivar development program
   I 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.

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