Project FY22-SP-007: Centralized Genomic Selection Resources for FHB-Resistant Spring Wheat Breeding

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1. **What are the major goals and objectives of the research project?**
   1) Develop a low-cost assay that is useful in US breeding programs.
   2) Generate a standard pipeline for phenotyping and prediction.

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

Objective 1:

a) **What were the major activities?**
The USDA-3K has been well-validated and dual- and tri- hybridization experiments have been performed to check accuracy. Processes for automatically converting this data into standard genotyping formats have been put together. In this reporting period, 12,120 wheat samples were genotyped with the Illumina 3K, with 2,688 samples being run in combination with other crops to decrease costs.

b) **What were the significant results?**
Wheat researchers and breeders have used the Illumina array to genetically fingerprint lines, map QTL and generate predictors for genomic selection.

c) **List key outcomes or other achievements.**
The 3K array has shown itself to be a useful genotyping platform for its intended purposes and has already drawn attention from other crops to build similar resources. Additionally, a marker-assisted selection report is now provided for every project that provides predicted alleles (traits) at 113 loci for customers.

Objective 2:

a) **What were the major activities?**
The genomic selection coordinator has assembled genomic selections models with the URN/URSN data alone and in concert with environmental co-variates. She has also used this data to identify significant gene regions through GWAS and is now able to predict line performance in individual breeding program data.

b) **What were the significant results?**
The coordinator is now using what was learned in the initial phase of model building and is assisting each of the VDHR-SPR breeders in developing genomic-selections models within their individual programs.

c) **List key outcomes or other achievements.**
Within this reporting period, the first manuscript describing the initial model work was published.

3. **What opportunities for training and professional development has the project provided?**
   The postdoc hired for this role has been exposed to wheat genomics and FHB disease resistance and learned how to build prediction models with many different data types. She has also traveled to several field days and has interacted with producers directly.

4. **How have the results been disseminated to communities of interest?**
   The results have been published in peer-reviewed journals and presented at conferences such as The FHB Forum and Plant and Animal genome.

5. **What do you plan to do during the next reporting period to accomplish the goals and objectives?**
   Building on the success of the initial work, we will continue putting together models for individual breeding programs and evaluate the historical data to describe the genetic gain that has occurred due to the inclusion of FHB resistance loci in the germplasm.