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Project Title: Implementing Genomic Selection for FHB Resistance in Soft Winter Wheat (SWW).

PROJECT 3 ABSTRACT

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Soft red winter wheat has considerable “native” genetic variation for FHB resistance controlled by genes of small effect that are not amenable to traditional marker-assisted selection. Currently only traditional plant breeding employing phenotypic selection (PS) can affect those genes. The main problem with PS for FHB resistance is that it takes many years to complete a breeding cycle due to the years needed to inbreed a population, generate lines, obtain sufficient seed to test the lines, and acquire data over years to produce phenotypes with good predictive ability.

Our objectives are:

1. To implement Genomic Selection (GS) for FHB resistance in soft winter wheat by completing two cycles of GS.
2. Initiate evaluation of the effectiveness of GS.

Genomic selection (GS) is a technology that affects nearly all the genes that control FHB resistance, including those with small effects. With GS the breeder builds a model using marker data and past phenotypes. The model is then used to predict the value of individuals that have not been phenotyped and these predicted values are used in selection. This allows a breeding cycle to be completed very quickly: we estimate that a breeding cycle of PS for FHB takes five years in winter wheat while a breeding cycle of GS in winter wheat can be completed in one year. Our results so far indicate that GS has potential to significantly improve the annual gain in improving FHB resistance in soft winter wheat. Over the past three years the USWBSI has funded the phenotyping of a training population of 649 lines and the implementation of two cycles of GS. We propose to complete two additional GS cycles (cycles 3 and 4) and evaluate the effectiveness of GS by phenotyping lines derived from the first three cycles of GS.