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PROJECT 5 ABSTRACT
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Reducing FHB in grower fields requires improving yield and FHB resistance. Breeding for both trait is expensive and inefficient requiring screening 1,000s of lines. The early stage of phenotypic selection is characterized by testing a large number of lines with limited observations such that selection is based on data with low heritability and produces low gains. Phenotyping also limits the number of lines that can be screened and thus the probability of finding high lines with yield and strong FHB resistance. Early stage selection may be improved if complemented with genomic estimated breeding values (GEBVs) obtained from GS. Each line in the early testing stages (stages 1,2) could be genotyped and its value predicted based on the performance of its relatives in current and past trials, including multi-environment trials and environments where it was never tested: selection would be based on phenotypes and GEBVs. The model is built on data from related lines within a program and this will improve the accuracy of GS for yield, FHB, or any other trait the breeder phenotypes.

We propose to assess 7 selection strategies that are combinations of 4 GS schemes and three selection schemes. We will genotype 1,880 soft winter wheat lines from The Ohio State University wheat breeding program. These include 775 new lines that are entering the 2017-18 stage 1 trials that will be phenotyped for FHB resistance and yield (one location, 1-3 reps). The other 1,005 lines are from the 2017, 2016, and 2015 stage 1, 2, 3 or 4 trials that have been phenotyped for FHB and for yield in past years or again in the 2017-18 season. Data from various subsets of lines will be used to create training sets that will be used to create GS models that will be used to predict the value of lines not include in the training sets. These predicted values will then be correlated to the observed values of these lines. Phenotypes and predicted values will be used to select the best (and worst) lines from the 2017-2018 stage 1 & 2 trials. The selections will be tested in the 2018-19 season in multiple environments to assess the effectiveness of the 7 strategies.