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Project Title: Evaluation and Characterization of Scab Resistance in New Synthetic Wheat Germplasm.

PROJECT 2 ABSTRACT

(1 Page Limit)

The progenitors and related species of hexaploid bread wheat (*Triticum aestivum*) are excellent sources of resistance to pests, pathogens, and abiotic stresses for improving modern wheat cultivars. In an effort to transfer useful genes from tetraploid wheat and *Aegilops tauschii* germplasm, we recently developed 255 synthetic hexaploid wheat (SHW) lines using durum and other six tetraploid subspecies (*Triticum turgidum* subsp. *carthlicum*, *dicoccum*, *dicoccoides*, *polonicum*, *turgidum*, and *turanicum*). In addition, we recently developed or acquired 40 wheat-alien species amphiploids derived from the hybrids of durum or bread wheat crossed to several *Thinopyrum (Th. bessarabicum*, *Th. ponticum*, *Th. elongatum*, and *Th. intermedium*) and *Aegilops* (*Ae. bicornis, Ae. speltoides, Ae. longissima, Ae. searsii, Ae. markgrafii, Ae. umbellulata, Ae. variabilis, Ae. kotschy,* and *Ae. peregrina*) species. Most of these SHW lines and amphiploids have not been evaluated for resistance to Fusarium head blight (FHB). The overall goal of this project is to identify novel genes for FHB resistance derived from these progenitors and related species. The specific objectives are to: 1) Identify the SHW lines carrying FHB resistance by evaluating 255 SHW lines and their tetraploid wheat parents for reactions to FHB, 2) Identify putative novel FHB-resistant QTLs in the FHB-resistant SHW lines, and 3) Identify the wheat-alien species amphiploids carrying FHB resistance by evaluating 40 amphiploids and their tetraploid and bread wheat parents for reactions to FHB. In this project, we proposed to evaluate the SHW lines, amphiploids, and their tetraploid and bread wheat parents for FHB resistance using a randomized complete block design (RCBD) with three replications in the greenhouse for three seasons and field nurseries at two locations for two years. We will genotype the SHW lines using the wheat 9K-SNP array. The marker and FHB data will be used to identify the genomic regions associated with the FHB resistance through association analysis. By implementation of this project, we expect that a number of FHB-resistant SHW lines and wheat-alien species amphiploids will be identified. Putative novel FHB-resistant QTLs in the SHW lines will be identified through association analysis. Introgression of novel FHB-resistant QTLs from SHW lines and wheat-alien species amphiploids into adapted spring wheat cultivars will be initiated based on the outcomes of this project. The SHW lines and amphiploids with FHB resistance will be made available to the U.S. wheat breeding programs for developing adapted wheat germplasm and cultivars through public releases and appropriate agreements.