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PROJECT 2 ABSTRACT

(1 Page Limit)

In the Great Plains, FHB can be found in most hard winter wheat (HWW) fields in the US Great Plains including Nebraska, South and North Dakota, and Kansas. Recent severe FHB epidemics in these areas caused about 10-15% of yield losses. Since 2010, FHB moved south to Oklahoma and west to Idaho and Montana where FHB has never been reported before. Most commercial HWW cultivars currently used in these regions are still highly susceptible. In previous USWBSI-funded projects, we have successfully transferred *Fhb1* from Sumai3 into 16 HWW cultivars, and the derived *Fhb1* lines are being used in HWW breeding programs. However, *Fhb1* alone cannot provide adequate protection in severe epidemics, discovery and pyramiding *Fhb1* with other resistance quantitative trait loci (QTLs) are critical to further improvement of FHB resistance in HWW. Although several moderately resistant cultivars such as Overland and Everest have been identified in US HWW and Yangmai158 and Zhen9023 identified in China, the QTLs underlining their resistance remain unknown and markers are not available for marker-assisted pyramiding of these genes. Also, development of a new high throughput marker system for background selection and genomic selection (GS) may significantly reduce cast of marker-assisted breeding and facilitate accumulation of minor QTLs in a cultivar. In this proposal, we will map QTLs for FHB resistance in these cultivars by genotyping two recombinant inbred line (RIL) populations (Everest/OverlandF7, and Yangmai 158 /Zhen9023F6) with GBS and phenotyping the populations for type II FHB resistance in greenhouses and type I resistance in field; pyramid *Fhb1,* 5A QTLs from PI 277012 and 2DL QTL in US HWW (Overland and Everest) by marker-assisted backcross (MAB); and develop a novel, low cost, next-generation-based marker technology for genome-wide and background selections of FHB resistance to pyramid different QTLs in a cultivar. The proposed research will provide new breeding technologies and germplasm to facilitate quick release of FHB resistant HWW.