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Project Title: Identification and Deployment of FHB Resistance QTL in US Hard Winter Wheat.

PROJECT 1 ABSTRACT

(1 Page Limit)

Fusarium head blight (FHB) significantly reduced yield and quality of wheat grain. Growing resistant cultivars is the most effective strategy to control the disease. However, hard winter wheat cultivars grown in the Great Plains are highly susceptible. Transferring major QTL into adopted hard winter wheat will minimize losses caused by FHB epidemics. In addition, exploring new QTLs for FHB resistance from US hard winter wheat native sources will enhance genetic diversity of resistance QTLs and facilitate pyramiding of those resistance QTLs to enhance the degree of cultivar resistance. Our objectives in this proposal are to 1) Transfer Asian FHB-resistant QTL (*Fhb1*) into 11 new elite hard winter wheat lines or cultivars from ND, SD, KS, OK and NE by marker-assisted backcross (MSB); 2) Pyramid *Fhb1* with at least one additional QTL from Asian source in HWW cultivars Jagger (KS), Overley (KS) and Overland (NE) using MAB; 3) identify QTL and linked SNP markers in US native HWW cultivars/lines use association mapping; 4) develop a DH or RIL mapping population of Overland/Overley to identify QTL in the HWW Overland. Simple sequence repeat (SSR) and sequence tagged site (STS) markers will be used for MAB coupled with phenotypic selection in Tristate FHB Nurseries to transfer resistance QTLs into elite hard winter wheat backgrounds. Single nucleotide polymorphism (SNP) and SSR markers will be used to map new QTL for FHB resistance in association mapping populations. DNA markers will be analyzed using Illumina beadchip and ABI 3730 DNA sequencer. Repeated FHB evaluation of these mapping and breeding populations will be conducted in both greenhouse and Tri-state FHB Nurseries, which is a major component of the Coordinated Project. Breeders in the Coordinated Project will use the materials freely in their breeding crosses or select for new cultivars as they need. This objective uses MAB to speed up the breeding process as described in Goals #2 and #3 of VDHR Action Plan. New QTL identified from this project will be directly used to enhance resistance levels of HWW and also be released to public for use in other breeding programs through publications. Identification of new QTL and markers for effective use of FHB resistance meets Goals #4 of VDHR Action Plan.