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Project Title: Improve FHB Resistance to Hard Winter Wheat by High-throughput Marker-assisted Selection.

PROJECT 1 ABSTRACT

(1 Page Limit)

Epidemics of Fusarium head blight (FHB) can significantly reduce wheat grain yield and quality. Breeding resistant cultivars is the most effective measure to control the disease. FHB epidemics have been severe in Central and Northern Great Plains, but hard winter wheat cultivars currently grown in this area are highly susceptible to FHB. Because large environmental variation associates with disease evaluation and the disease screening procedure is laborious, progress in breeding for resistant hard winter wheat cultivars has been slow with conventional methods. Due to urgent need of FHB resistance in Great Plains areas, we initiated a marker-assisted backcross project to speed up the processes of deploying Chinese FHB resistance QTLs into hard winter wheat in these regions by use of USDA high-throughput genotyping facility. Resistance QTL on chromosomes 3BS and 5AS from Ning7840 or Sumai 3 will be transferred into adapted hard winter wheat cultivars from the Great Plains areas by direct marker-assisted backcross and marker-assisted background screening. This is a collaborative project between the USDA Genotyping Center in Manhattan and three public wheat-breeding programs in Nebraska, Kansas and South Dakota. Breeding programs provided initial backcross populations segregating for the target QTLs and will be responsible for field selection for disease resistance and other important agronomic traits, whereas the USDA Genotyping Center is responsible for marker assisted screening of these breeding populations for the target QTL using SSR and to minimize donor's genetic backgrounds using AFLP, and further backcross selected plants to recurrent parents. Our objectives is to combine the major QTL from Ning7840 or Sumai 3 with locally adapted minor FHB resistance QTL to develop marketable FHB resistant hard winter wheat cultivars and useful germplasm to minimize FHB damage in hard winter wheat regions. The outputs of this research will provide adapted FHB resistant cultivars and new germplasm to relieve FHB epidemics in Great Plains, and new marker-assisted breeding protocols to speed up conventional breeding process. These are all parts of the Scab Initiative's priority on the **Host Genetic Resources** program.