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Project Title: Developing Winter Wheat Varieties with Enhanced Resistance to FHB and Low DON

PROJECT 1 ABSTRACT

(1 Page Limit)

South Dakota is the primary state in the US Great Plains hard winter wheat region that is threatened by Fusarium head blight (FHB), a destructive disease with losses to the tune of \$20 million in some years. Developing resistant varieties is one of the most effective ways of limiting losses due to scab. Through years of breeding efforts, we have developed varieties like Lyman, Overland, and Redfield with moderate FHB resistance. However, continuous efforts are needed to develop varieties with higher yield, better FHB resistance and lower DON adapted to South Dakota and the region.

Our larger goal is to develop and release FHB-resistant hard red and white winter wheat varieties with superior agronomic performance, end-use quality characteristics, excellent winter hardiness, and low DON content. Our objectives are to (1) develop FHB resistant and low DON winter wheat varieties for South Dakota and the surrounding regions; (2) pyramiding major and minor genes for FHB resistance by developing phenotypic and genomic selection models for SDSU winter wheat program. We will continue to transfer the *Fhb1* source of resistance into our breeding program and combine it with native and other sources of resistance using genomic assisted breeding. As lines are advanced through various yield trial nurseries, they will also be tested and evaluated for resistance in an inoculated, mist-irrigated nursery. To enrich early segregating populations for resistance, harvested F3 and F4 seed will be passed through a fractionating aspirator. Populations will be evaluated for percent of Fusarium damaged kernels (FDK), and those with the highest % FDK will be discarded. A graduate student will work on combining known sources of resistance in South Dakota backgrounds and develop selection models.

Data on FHB resistant varieties will be made available to regional producers and end-use stakeholders through field day oral presentations, county extension presentations on varieties, and SDSU Crop Performance Test publications. Additionally, varieties and the data supporting their described resistance to FHB will be reported on ScabSmart, in producer trade magazines, and in professional scientific journals as part of the variety registration process. This research would lead to the development of high-yielding winter wheat varieties with better FHB resistance and lower DON content, thus increasing the profitability of the producers and meeting the grain quality needs of the milling and baking industry.