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Research Category: HWW-CP **Duration of Award: 1 Year**

Project Title: Developing FHB Resistant Red and White Winter Wheat Varieties for SD.

PROJECT 1 ABSTRACT
(1 Page Limit)

South Dakota winter wheat production is threatened by Fusarium head blight (FHB) [caused by *Fusarium graminearum* Schwabe [teleomorph *Gibberella zeae* (Schwein) Petch] each year. State losses due to FHB have been estimated at as much as 20 million dollars in a single year. Our objective is to use traditional breeding techniques, aided by molecular marker-assisted selection (MAS), to develop and release FHB-resistant hard red and white winter wheat varieties and germplasm with superior agronomic performance and end-use quality characteristics, excellent winter survival ability, and resistance to diseases prevalent in South Dakota and the Upper Great Plains. More specific objectives are to 1) Use *Fhb1* backcross lines and germplasm to develop resistant varieties and increase the acreage planted to these varieties in South Dakota and the winter wheat region of the U.S. Upper Great Plains, 2) Increase the efficiency of our breeding program to develop and release red and white FHB resistant winter wheat varieties and, 3) Develop a milling and DON measurement procedure to assess potential differences between red and white winter wheat and enhance selection between red and white breeding lines. Within the traditional breeding program, Wesley backcross lines with the *Fhb1* source of resistance and other *Fhb1* sources will be crossed to 'Lyman' to combine *Fhb1* with a native source of resistance in 'Lyman', a recently released highly FHB resistant South Dakota State University winter wheat variety. Field evaluations of these lines and other advanced breeding lines will be conducted using replicated, mist-irrigated trials, which will be visually evaluated for response to FHB. Samples and data will be processed to determine DON content, disease incidence, severity, and to calculate FHB disease index. These activities will hasten the release of more FHB resistant winter wheat varieties and germplasm and consequently, enable an increase in the regional acreage planted to resistant winter wheat varieties. USDA single-kernel NIR (SKNIR) technology will be utilized to compare levels of DON in bran fractions obtained from near-isogenic red and white wheat genotypes and to improve selection for lower grain DON levels in both red and white winter wheat breeding lines. The results of this study should help determine the potential impact of DON on whole-grain products manufactured from either red or white winter wheat. 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.