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Project Title: Spring Wheat Breeding Scab Resistance in South Dakota.

PROJECT 1 ABSTRACT

(1 Page Limit)

Within the past decade, severe scab epiphytotics have been incited by *Fusarium graminearum* on wheat, (*Triticum aestivum* L.) durum, and barley (*Hordeum vulgare* L.) in most regions of the United States where growing conditions remain warm and humid during the flowering and grain fill periods. Yearly economic losses to growers caused by this disease have approached or surpassed \$500 million on several occasions since 1993. The overall goal of this proposed work is the production of commercially viable spring wheat varieties that minimize economic loss through increased levels of scab resistance. Past efforts aimed at accomplishing this goal by the spring wheat breeding program at South Dakota State University (SDSU) have proven worthwhile. Several advanced breeding lines and varieties have been created with elevated levels of scab resistance and yield potential. These materials have been developed as the result of a germplasm screening component within our program that has allowed for identification and selection of the most resistant material. One field and two greenhouse scab screening cycles are carried out each year within our program. The objectives of this research are to 1) continue operations involved with the development and release of scab resistant and agronomically acceptable spring wheat varieties and germplasm sources that are regionally adapted, 2) participate with Uniform Regional Scab Nursery (URSN) germplasm screening efforts, 3) increase DON testing and our use of marker assisted selection as a complementary selection tools, and 4) provide growers with accurate scab resistance ratings for commonly grown varieties. To accomplish the first objective, approximately 9,000 hills will be tested in our greenhouse and a larger number of plots may be accommodated in our mist-irrigated field nursery. Disease incidence, severity, and index values for all entries will be collected in each screening environment. This allows for selection of the most resistant materials to be perpetuated within the program, used as parents, etc. The second objective will be accomplished through testing the 2008 version of the URSN for resistant spring wheat germplasm. Disease incidence, severity, and index values for all entries will be collected from this test, along with yield, test weight, and estimates of Fusarium Damaged Kernel (FDK) percentages from the mist-irrigated field screening environment. The third objective will be addressed by submitting both Preliminary and Advanced Yield Trial entries for DON testing. Additionally, the *Fhb1* QTL will be backcrossed into five advanced breeding lines using marker-assisted selection. Each of these lines holds promise for release as a variety and will all serve as parents in our crossing endeavors. Finally, the fourth objective will be addressed by conducting scab resistance and agronomic performance trials where varieties which are common to the region are tested simultaneously. Results from these trials will be made available through inclusion in existing extension publications.