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Project Title: Spring Wheat Breeding for 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. Efforts of the spring wheat breeding program at South Dakota State University to help alleviate local and regional losses from scab have proven worthwhile. Several advanced breeding lines and varieties have been created that have 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 screening cycles are carried out each year within our program. Approximately 150 F₂ populations are screened for scab resistance in each fall greenhouse cycle. Lines are derived from within populations and further screened in the spring greenhouse and summer field nursery cycles. Approximately 9,000 hills can be tested in our greenhouse each year. A larger number of plots can be accommodated in our mist-irrigated field nursery. 'Granger' and 'Briggs' are recently developed spring wheat varieties that possess elevated scab resistance, yield potential, and quality characteristics. A concerted effort has been made by the small grains pathology group at South Dakota State University to identify unique sources of resistance to scab. Two years ago, a new goal within our project was initiated to simultaneously introgress several of these resistant germplasm sources into an agronomically acceptable background. A complex population has been formed as a means of achieving this goal through recurrent selection methods. Although this is a long-term research project, the diverse parental backgrounds used to form our population lead us to believe that much progress may be attained in increasing scab resistance levels within this population. New projects have also been undertaken within the program. We are working with colleagues at North Dakota State University to empirically gauge progress in scab resistance breeding that have been made over time. We also are backcrossing the 3BS scab resistance QTL from 'Sumai 3' into released South Dakota derived spring wheat varieties. This work will be aided with Marker Assisted Selection carried out at the USDA small grains genotyping center in Fargo, North Dakota. With these populations, a Master's level research assistant will confirm the utility of the QTL in our released varieties.