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**Project ID: FY06-IB-005**

**FY05 ARS Agreement #: 59-0790-4-130**

**Research Area: VDUN**

**Duration of Award: 1 Year**

**Project Title: Winter Wheat Breeding for Scab Resistance in South Dakota.**

**PROJECT 1 ABSTRACT**

(1 Page Limit)

An increase in planting of winter wheat into spring wheat stubble and in traditional corn – soybean rotations in eastern and central South Dakota have led to an increase in scab. Resistant varieties are the main economical and sustainable components of our integrated strategy to control this problem. Our long term objective is to use traditional breeding techniques, aided by molecular markers selection, to develop scab resistant hard winter wheat varieties and germplasm with superior agronomic performance and end-use quality characteristics, winterhardiness, and resistance to diseases prevalent in South Dakota and the northern Great Plains (a priority of the U.S. Wheat and Barley Scab Initiative's effort on Variety Development and Uniform Nurseries program). Our short term objectives are to: 1) characterize scab resistance among local and regional germplasm, in addition to new introduced sources, 2) identify sources with high levels of scab resistance, and develop populations segregating for scab resistance and desirable agronomic traits, and 3) enter promising resistant lines into regional nurseries to facilitate development of varieties with broad adaptation in collaboration with breeding and pathology programs at the University of Nebraska and Kansas State University. Eight hundred and forty lines have been screened in our mist-irrigated nursery in 2005 including the Northern Regional Performance Nursery (NRPN), Regional Germplasm Observation Nursery (RGON), Southern Regional Performance Nursery (SRPN), in addition to South Dakota Crop Performance Trials (CPT), Advanced Yield Trial (AYT), Preliminary Yield Trials (PYT), and Early Yield Trial (EYT). Expedition hard red winter wheat, released by our program in 2002 showed better resistance to FHB than Wesley and Jagalene in producers' fields in eastern and central South Dakota in 2005. Two experimental lines, SD98102 and SD97059-2, have been increased with intention to release in 2006 and 2007, respectively. Both lines have good FHB resistance in addition to excellent leaf and stem rust resistance. They also had good performance and stability in the NRPN which is essential for adaptation in the northern Great Plains. Seven lines with promising FHB resistance were included in the 2006 AYT, 16 in the 2006 PYT, and 58 in the 2006 EYT. Our program relied on indigenous local resistance in the past. However, with the spread of scab epidemics in winter wheat in South Dakota, the use of highly resistant sources became paramount. In the 2005 – 2006 season, we planted 151 out of 535 F<sub>3</sub>'s and 134 out of 593 F<sub>2</sub>'s with promising scab resistance. Sixty-six of the F<sub>3</sub>'s and 8 of the F<sub>2</sub>'s included resistance sources from Sumai3, Ning7840 and their derivatives. About 7,000 head-rows with Sumai3 type sources were planted in 2005. Best lines out of the head-row nursery will be included in the EYT in 2006. FHB-resistant advanced lines from these populations will be entered in regional nurseries to facilitate development of varieties with broad adaptation to the northern Great Plains.