RELEASE OF DARRELL HARD RED WINTER WHEAT

‘Darrell’ hard red winter wheat (*Triticum aestivum* L.) was developed by the South Dakota Agricultural Experiment Station and released in 2006 to seed producers by the developing institution and the Nebraska Agricultural Experiment Station. Darrell was released on the basis of its good disease resistance and excellent yield potential in the northern Great Plains. Darrell has been named to honor Darrell Wells, late former winter wheat breeder at South Dakota State University (1962 – 1982).

Darrell was derived from the cross 2076-W12-11/‘Karl 92’ (PI 564245)//NE89526. Darrell was developed by means of the bulk breeding method. The cross (coded XNE94031) was developed by P. S. Baenziger at the University of Nebraska and shared as an F2 population. It was planted as an F3 Bulk in South Dakota in 1997. Darrell was derived as an F3:4 line selected by S.D. Haley in 1998. Darrell was evaluated as SD98102 in the South Dakota Early Yield Trial nursery in 1999, in the Preliminary Yield Trial in 2000, and in the Advanced Yield Trial in 2001. It was tested in the South Dakota Crop Performance Testing (CPT) Variety Trial between 2002 and 2006 and in the Northern Regional Performance Nursery in 2003 and 2004.

Darrell is awned and has green foliage at anthesis. The spike is tapered, inclined, and mid-dense. At maturity, Darrell has white, midlong, midwide glumes that have wanting shoulders, and acuminate tips. Kernels are red, hard textured, and elliptical in shape with collarless short brushes, rounded cheeks, and shallow creases.

In 26 site-years of testing between 2003 and 2006 in the CPT, Darrell was a medium maturing wheat (152 d to heading from 1 Jan.), similar to ‘Millennium’ (PI 613009), 1 d later than ‘Arapahoe’ (PI 518591), 4 d later than ‘Expedition’ (PI 629060), and 2 d earlier than ‘Harding’ (PI 608049). Plant height obtained from 35 site-years of Darrell (80.6 cm) is similar to ‘Tandem’ (PI 601817), slightly taller than Arapahoe (79.3 cm) and 5.3 cm shorter than Harding. The winter survival of Darrell, as tested in South Dakota in the very cold winter of 2001, was good to excellent, similar to ‘Alliance’ (PI 573096). Darrell has a medium long coleoptile similar to Expedition (80 mm; 133% of Wendy (PI 638521) and 89% of Harding). Darrell has good straw strength similar to Alliance and Expedition (1.8) and better than Arapahoe (2.2), Trego (PI 612576) (2.2) and Tandem (3.1) (score; 0 = no lodging to 9 = severe lodging).

In 38 site-years of testing in the CPT, grain yield of Darrell (3692 kg ha⁻¹) was greater than Wendy (3557 kg ha⁻¹), Wesley (PI 605742) (3553 kg ha⁻¹), Expedition (3532 kg ha⁻¹), Trego
(3473 kg ha\(^{-1}\)), and Arapahoe (3508 kg ha\(^{-1}\)), and was less than ‘Millennium’ (3769 kg ha\(^{-1}\)), (LSD0.05, 99 kg ha\(^{-1}\)). In 39 site-years of testing in the CPT, Darrell had similar grain volume weight to Expedition (75.8 kg hl\(^{-1}\)), higher than Wesley (73.6 kg ha\(^{-1}\)) and lower than Millennium and Trego (76.7 kg ha\(^{-1}\)) (LSD0.05, 0.4 kg ha\(^{-1}\)).

Darrell is homogeneous for the 1AL.1RS wheat-rye translocation based on SDS-PAGE gel analysis. Darrell was found to be resistant to stem rust (caused by *Puccinia graminis* f. sp. *tritici* Erliks. & E. Henn.) pathotypes TPMK, RTQQ, RCRS, and QFCS and resistant to moderately resistant to pathotypes TTTT and QTHJ, based on tests conducted by the USDA Cereal Disease Laboratory, St. Paul, MN in 2003 and 2004. Darrell was found to be heterogeneous to the Great Plains biotype of Hessian fly (*Mayetiola destructor* (Say)) based on seedling tests. Darrell was found to be moderately susceptible (moderate mosaic and/or moderate stunting) to wheat soil-borne mosaic virus. Darrell was tested in a blast-inoculated wheat streak mosaic virus (WSMV) nursery in Brookings, SD between 2002 and 2005. Yield losses and stunting of Darrell, Arapahoe, and Millennium, due to WSMV were 8.8% and 20.2%; 30.3% and 16.6%; and 24.2% and 18.1%, respectively. WSMV disease severity of Darrell, Arapahoe, and Millennium was 1.9, 3.3, and 2.0, respectively (score; 0 = no symptoms; 1 = very mild symptoms, isolated small light green areas of mosaic, no stunting; 2 = mild symptoms, small areas of light green or yellow mosaic, short streaks, mild stunting; 3 = moderate symptoms, predominant yellow mosaic, extending streaks, moderate stunting; 4 = severe symptoms, severe yellow mosaic, some necrosis, severe stunting; and 5 = severe symptoms, extreme yellowing, necrosis; very severe stunting, and plant death). Darrell has the second best *Fusarium* head blight (caused by *Fusarium graminearum* Schwabe) rating among all Great Plains HRWW varieties tested in South Dakota during the last six years, next to Expedition.

Composite milling and bread baking properties of Darrell were determined during 2003 - 2005 cooperative baking tests conducted by the USDA-ARS Hard Winter Wheat Quality Laboratory in Manhattan, KS. Darrell has acceptable milling and good baking quality. Relative to the check cultivars Millennium and Arapahoe, Darrell had similar kernel size (29.1 vs. 29.7 and 29.1 mg, respectively). Flour extraction of Darrell, Millennium, and Arapahoe was 665, 674, and 663 g kg\(^{-1}\), respectively. Flour ash of Darrell was higher (3.9 g kg\(^{-1}\)) than both Millennium (3.6 g kg\(^{-1}\)) and Arapahoe (3.8 g kg\(^{-1}\)). Flour protein of Darrell (118 g kg\(^{-1}\)) was higher than both Millennium (112 g kg\(^{-1}\)) and Arapahoe (114 g kg\(^{-1}\)). In bread baking tests, flour water absorption and loaf volume of Darrell (625 g kg\(^{-1}\); 875 L) were both higher than Millennium (614 g kg\(^{-1}\); 855 L) and Arapahoe (616 g kg\(^{-1}\); 822 L). Darrell had better mixograph tolerance (4.0) than both Millennium (3.0) and Arapahoe (3.3) (0 = unacceptable, 4 = acceptable, 6 = outstanding). Darrell mixograph mix time (5.4 min) was longer than Millennium (4.0 min) and Arapahoe (4.8 min). Darrell was evaluated in the Wheat Quality Council tests in 2004. In spite of having the red kernel color, Darrell has relatively low grain polyphenol oxidase (PPO) levels and very desirable alkaline noodles characteristics. Darrell was found to have a bright noodle sheet color similar to Lakin (84.6; L value, higher is better), better chewiness (111) than Lakin (101), and an average cooking loss (7.8%; lower is better) slightly lower than Lakin (7.2%).

The Breeder Seed originated from a purification program in 2002 – 2003, 2003 – 2004, and 2004 – 2005 designed to remove off-types by rouging. Darrell has been uniform for all morphological characters (such as maturity and plant height) during the last four
generations of increase. Darrell contains 0.17% red chaff off-type and 0.15% tall white chaff variant.

The South Dakota Foundation Seed Stocks Division (Plant Science Department, South Dakota State University, Brookings, SD) has Foundation seed of Darrell available to seed producers for planting during fall 2006. Seed classes will be Breeder, Foundation, Registered, and Certified. Darrell will be submitted for U.S. Plant Variety Protection under P.L. 910577 with the certification option.

Approval

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Director, South Dakota Agricultural Experiment Station  Date

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Director, Nebraska Agricultural Experiment Station  Date