RELEASE OF ALICE HARD WHITE WINTER WHEAT

‘Alice’ hard white 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 Stations. Alice was released on the basis of its white grain color and earliness, in addition to excellent baking quality, pre-harvest sprouting resistance, and yield potential in South Dakota and the northern Great Plains. Alice has been named to honor Alice Wright, administrative assistant for the South Dakota Wheat Commission for 23 years.

Alice was derived from the cross ‘Abilene’ (PI 511307)/Karl (PI 527480) made in 1992. Alice was developed by means of the bulk breeding method. The cross (coded X92103) was advanced to the F$_3$ generation as a bulk population. Seed harvested from the F$_3$ bulk was sorted for white kernel color in 1995. The bulk of selected white kernels was coded X92103W and was grown in the greenhouse in spring 1996. Single heads were harvested from this selected F$_4$ bulk and planted in the field as head-rows in fall 1996. Alice was derived as an F$_4$ line selected by S.D. Haley in 1997. Alice was evaluated as SD97W609 in the South Dakota Early Yield Trial nursery in 1998. It was advanced to the South Dakota Advanced Yield Trial in 1999 due to superior performance. It was tested in the South Dakota Crop Performance Testing (CPT) Variety Trial between 2000 and 2006, excluding 2002 because of a seed mix up, and in the Northern Regional Performance Nursery in 2003.

Alice is an awned, white-glumed, early maturing, semi-dwarf hard white winter wheat. Alice has green foliage at anthesis. The spike is tapered, inclined, and mid-dense. The glume is wide with a medium length, a wanting shoulder, and an acuminate tip. Kernels are white, hard textured, and elliptical in shape with a collarless short brush, rounded cheeks, and a shallow crease.

In 26 site-years of testing between 2003 and 2006 in the CPT, Alice was the earliest maturing wheat (148 d to heading from 1 Jan.), similar to Wendy (PI 638521) and Expedition’ (PI 629060), 2 d earlier than ‘Wesley’ (PI 605742), and 6 d earlier than ‘Harding’ (PI 608049) (LSD0.05, 1 d). Plant height obtained from 35 site-years of Alice (71 cm) is slightly taller than Wendy (68 cm) and Wesley (69 cm) and 15 cm shorter than Harding. The winter survival of Alice, as tested in six South Dakota locations in the very cold winter of 2001, was fair, similar to ‘Culver’ (PI 606726). Winter survival of Alice during 2002 – 2006 was excellent. Alice has a short coleoptile similar to Wesley and ‘Trego’ (PI 612576) (70
mm; 117% of Wendy; 88% of Expedition; and 78% of Harding). Alice has the best pre-harvest sprouting resistance among any hard white tested in the CPT (1.8 score; 1 = highly resistant to 9 = highly susceptible), similar to Crimson (PI 601818) (1.8), better than Trego (2.6) and Wendy (4.2).

In 38 site-years of testing in the CPT, grain yield of Alice (3602 kg ha$^{-1}$) was greater than Wendy (3557 kg ha$^{-1}$), Wesley (3553 kg ha$^{-1}$), Expedition (3532 kg ha$^{-1}$), Trego (3473 kg ha$^{-1}$), and ‘Arapahoe’ (PI 518591) (3508 kg ha$^{-1}$), and was less than ‘Millennium’ (PI 613009) (3769 kg ha$^{-1}$), (LSD0.05, 99 kg ha$^{-1}$). In 39 site-years of testing in the CPT Alice had similar grain volume weight to Expedition (76 kg hl$^{-1}$), higher than Wesley (74 kg ha$^{-1}$) and lower than Millennium and Trego (77 kg ha$^{-1}$) (LSD0.05, 0.4 kg ha$^{-1}$).

Alice was found to be resistant to moderately resistant to stem rust (caused by Puccinia graminis f. sp. tritici. Eriks. & E. Henn.) pathotypes QTHJ and RTQQ and moderately susceptible to moderately resistant to pathotype TTTT, based on tests conducted by the USDA Cereal Disease Laboratory, St. Paul, MN in 2003. Alice is susceptible to the Great Plains biotype of Hessian fly [Mayetiola destructor (Say)] based on seedling tests. Alice was found to be moderately susceptible (moderate mosaic and/or moderate stunting) to wheat soil-borne mosaic virus. Alice was tested in a blast-inoculated wheat streak mosaic virus (WSMV) nursery in Brookings, SD between 2000 and 2005. Yield losses and stunting of Alice, Wendy, and Trego, due to WSMV were 13.6% and 18.5%; 20.1% and 7.7%; and 29.0% and 20.9%, respectively. WSMV disease severity of Alice, Wendy, and Trego was 2.2, 2.4, 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).

Composite milling and bread baking properties of Alice were determined during 2003 - 2005 cooperative baking tests conducted by the USDA-ARS Hard Winter Wheat Quality Laboratory in Manhattan, KS. Both milling and baking scores were very good. Relative to the check cultivars Wendy and Wesley, Alice had medium-sized kernels (28.9 vs. 27.5 and 29.7 mg, respectively). Flour extraction of Alice, Wendy, and Wesley was 674, 660, and 672 g kg$^{-1}$, respectively. Flour ash of Alice was lower (3.4 g kg$^{-1}$) than both Wendy (3.7 g kg$^{-1}$) and Wesley (3.8 g kg$^{-1}$). Flour protein of Alice (115 g kg$^{-1}$) was similar to Wendy and lower than Wesley (125 g kg$^{-1}$). In bread baking tests, flour water absorption and loaf volume of Alice (614 g kg$^{-1}$; 905 L) were intermediate between Wendy (598 g kg$^{-1}$; 830 L) and Wesley (631 g kg$^{-1}$; 932 L). Alice had higher mixograph tolerance (4.3) than Wendy (0.7) but slightly lower than Wesley (5.0) (0 = unacceptable, 4 = acceptable, 6 = outstanding). Mixograph mix time for Alice (4.8 min) was intermediate between Wendy (3.2 min) and Wesley (7.0 min). Alice was evaluated in the Wheat Quality Council tests in 2004. Its bread baking quality was found to be better than all hard winter experimental lines and checks including “Tandem” (PI 601817). Alice has moderate grain polyphenol oxidase (PPO) levels [4.0, similar to Trego (4.1), higher than Wendy (3.4), but lower than ‘NuFrontier’ (5); 1-5 scale, lower is better]. Alice was entered into the Asian Products Collaborative (APC) Project, coordinated by the U.S. Wheat Associates and the Wheat Marketing Center (WMC) in 2004. It was tested, together with a number of US wheat experimental lines and cultivars,
against two control flours from one Chinese and one Australian Prime Hard (APH) wheat lines. Alice was found to be acceptable for Chinese raw noodles and Thailand bamee noodles. In preliminary screening at the WMC prior to the APC testing, Alice was evaluated against standard control flour. The noodle sheet color (L value, higher is better) of Alice and the control flour at 24 h was 72.0 (meeting the APC minimum target level) and 75.9, respectively, and the decrease in noodle brightness (L value) of Alice and the control flour between 0 and 24 h was 9.7 and 8.1 units, respectively. Noodle hardness of Alice (1,272 g) was higher than the control flour (1255 g) and the APC minimum target level of 1200 g.

Breeder seed of Alice originated from a composite of 200 F_{10:1} head-rows selected in 2004 based on visual uniformity and white kernel color purity. Alice has been uniform for all morphological characters (such as maturity and plant height) during the last four generations of increase. Alice contains 0.05% purple-chaffed, tall hard red off-type and 0.28% tall white variant.

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

Approval

______________________________________________  ______________  
Director, South Dakota Agricultural Experiment Station  Date

______________________________________________  ______________  
Director, Nebraska Agricultural Experiment Station  Date