

### Registration of 'Louise' Wheat

'Louise' soft white spring wheat (*Triticum aestivum* L.) (Reg. No. CV-987, PI 634865) was developed and jointly released in August 2005 by the Agricultural Research Center of Washington State University in cooperation with the Agricultural Experiment Stations (AESs) of the University of Idaho and Oregon State University, and the United States Department of Agriculture-Agricultural Research Service (USDA-ARS). Louise was named in honor of Dr. Louise Slade, Kraft Food Fellow, Kraft Foods, whose extraordinary contributions to the advancement of cereal chemistry have greatly expanded our understanding of and ability to improve the baking quality of soft wheat, and Kriquet 'Louise' Kidwell, Dr. Kidwell's beloved niece. Louise was released as a replacement for the soft white spring variety 'Zak' (Kidwell et al., 2002) in the intermediate to high rainfall (>400 mm of average annual precipitation), nonirrigated wheat production regions of Washington based on its superior end-use quality, high grain yield potential, high-temperature adult-plant resistance to local races of stripe rust (caused by *Puccinia striiformis* Westend. f. sp. *tritici*), and partial resistance to the Hessian fly [*Mayetiola destructor* (Say)].

Louise, tested under the experimental designations WA007921, S9800189, and K93581, which were assigned through progressive generations of advancement, is a F<sub>4.5</sub> head row selection derived from the cross 'Wakanz' (PI 506352) × 'Wawawai' (PI 574538), which was made in 1992. The following modified pedigree-bulk breeding method was used to advance early generation progeny. Bulk seed (30 g) from F<sub>1</sub> plants was used to establish an F<sub>2</sub> field plot. Approximately 100 heads were selected at random from individual F<sub>2</sub> plants, and a 40-g subsample of the bulked seed was used to establish a single F<sub>3</sub> plot. Seed from the F<sub>3</sub> plot was bulk harvested, then a 60-g subsample was used to establish an F<sub>4</sub> field plot. Single heads from approximately 150 F<sub>4</sub> plants were threshed individually to establish F<sub>4.5</sub> head row families. Following selection among rows for general adaptation, plant height, and grain appearance, seed from 30 to 50 plants within each selected head row was bulk harvested to obtain F<sub>4.6</sub> seed for grain yield assessment trials. The F<sub>1</sub>, F<sub>2</sub>, F<sub>4</sub>, and F<sub>5</sub> progeny were advanced in field nurseries at Pullman, WA, whereas F<sub>3</sub> progeny were advanced at the Lind Dryland Experiment Station in Lind, WA. Breeder seed of Louise was produced as a reselection, based on phenotypic uniformity, of 1100 F<sub>4.11</sub> head rows grown under irrigation in Othello, WA, in 2003. Selected head rows were bulked at harvest, resulting in the production of 563 kg of Breeder seed.

Louise is an intermediate height semidwarf cultivar. It has lax, tapering, inclined curved heads with white awns and white glumes that are long in length, wide in width with medium, apiculate shoulders, and narrow beaks. Louise has elliptical kernels that are white, soft, and smooth. Seed of Louise has a midsized germ with a narrow, middepth crease, angular cheeks, and a medium, noncollared brush.

In greenhouse seedling tests conducted in 2003 and 2004 under a low diurnal temperature cycle gradually changing from 4°C at 0200 h to 20°C at 1400 h (Chen and Line 1992) reaction to wheat stripe rust races PST-37, PST-43, PST-45, PST-78, and PST-98 was assessed. Louise was susceptible to all races indicating that it does not have all-stage (seedling) resistance. However, when tested with races PST-78 and PST-100 in adult-plant stages under a high diurnal temperature cycle gradually changing from 10°C at 0200 h to 35°C at 1400 h, Louise was highly resistant indicating that it has high-temperature, adult-plant (HTAP) resistance (Chen and Line 1995). In field tests

conducted in various locations in Washington from 2001 to 2004, Louise displayed a high level of non-race-specific HTAP resistance to the primary virulent races of current stripe rust populations in the Pacific Northwest region of the United States, including PST-78, PST-98, and PST-100. On the basis of insect screening trials conducted at the University of Idaho using a collection containing the three primary biotypes found in the Pacific Northwest, Louise is heterogeneous (65%) for resistance to Hessian fly biotypes E, F, and GP. On the basis of pedigree and natural field infestation ratings from Pullman, WA, Louise is susceptible to the Russian wheat aphid [*Diuraphis noxia* (Mordvilko)].

Louise was evaluated in replicated field trials under fallow, nonirrigated, and irrigated conditions. Grain yields of Louise typically equaled or exceeded those of soft white spring entries in nonirrigated and irrigated field evaluations conducted in Washington, Oregon, and Idaho from 2002 to 2004. In 51 tests conducted across 3 yr in Washington, the average grain yield of Louise was 3702 kg ha<sup>-1</sup>, which was significantly ( $P < 0.05$ ) higher than the yield averages of Zak (3232 kg ha<sup>-1</sup>) and Alturas (3581 kg ha<sup>-1</sup>) (Souza et al., 2004) and comparable to Alpowa (3668 kg ha<sup>-1</sup>), (PI 566596) and Nick (3742 kg ha<sup>-1</sup>) (proprietary cultivar from WestBred LLC, Bozeman, MT). On the basis of 24 site-years of data from the intermediate and high rainfall zones (>400 mm average annual precipitation), the average grain yield of Louise (4952 kg ha<sup>-1</sup>) was equivalent to Alpowa (4905 kg ha<sup>-1</sup>) and Nick (4831 kg ha<sup>-1</sup>), and significantly ( $P < 0.05$ ) higher than Alturas (4690 kg ha<sup>-1</sup>) and Zak (4280 kg ha<sup>-1</sup>).

On the basis of 51 tests, grain volume weight of Louise averaged 757 kg m<sup>-3</sup>, which was significantly higher ( $P < 0.05$ ) than that of Zak (750 kg m<sup>-3</sup>), similar to Alturas (756 kg m<sup>-3</sup>) and Nick (763 kg m<sup>-3</sup>), and significantly ( $P < 0.05$ ) lower than Alpowa (771 kg m<sup>-3</sup>). Thousand-kernel weight averages of Louise, Zak, Alpowa, Alturas, and Nick were 50.1, 44.5, 44.7, 34.7, and 36.4 g, respectively. The average plant height of Louise was 80 cm, which was 4, 6, 8, and 9 cm taller than Zak (76 cm), Alpowa (74 cm), Nick (72 cm), and Alturas (71 cm), respectively. Lodging percentages of Louise (5–10%) when grown with irrigation were comparable to Alpowa (5–10%), higher than Nick (2–5%) and Alturas (2–5%), and lower than Zak (25–30%). Louise headed 1 d earlier than Zak (Day of Year [DOY] 168), on the same date as Alpowa (DOY 167), 1 d later than Alturas (DOY 166), and 2 d later than Nick (DOY 165).

In tests conducted at the USDA-ARS Western Wheat Quality Laboratory in Pullman, WA, using grain produced in breeding and commercial variety testing trials in Washington from 2002 through 2004, grain protein content of Louise (117 g kg<sup>-1</sup>) was similar to Alpowa and Alturas (116 g kg<sup>-1</sup>), and lower than Nick (120 g kg<sup>-1</sup>) and Zak (123 g kg<sup>-1</sup>). Flour yield of Louise (671 g kg<sup>-1</sup>) was comparable to Zak (667 g kg<sup>-1</sup>), Alturas (666 g kg<sup>-1</sup>), and Nick (665 g kg<sup>-1</sup>), and significantly ( $P < 0.01$ ) higher than Alpowa (640 g kg<sup>-1</sup>). Flour ash content for Louise (3.6 g kg<sup>-1</sup>) was similar to Alpowa (3.5 g kg<sup>-1</sup>) and significantly ( $P < 0.01$ ) lower than Zak (3.9 g kg<sup>-1</sup>), Alturas (3.7 g kg<sup>-1</sup>), and Nick (3.8 g kg<sup>-1</sup>). Louise had a higher average milling score (84.0) than Zak (81.4), Alpowa (80.6), Alturas (82.4), and Nick (81.5). Mixograph water absorption of Louise was identical to Zak and Nick (531 g kg<sup>-1</sup>), slightly lower than Alpowa (534 g kg<sup>-1</sup>), and significantly ( $P < 0.01$ ) lower than Alturas (544 g kg<sup>-1</sup>). Average cookie diameter for Louise (9.7 cm) was comparable to Zak (9.7 cm) and larger than Alpowa (9.3 cm), Alturas (9.5 cm), and Nick (9.5 cm), and average sponge cake volume of Louise (1305 cm<sup>3</sup>) was smaller than Zak (1322 cm<sup>3</sup>) and Alpowa (1362 cm<sup>3</sup>) and larger than

Alturas (1225 cm<sup>3</sup>) and Nick (1230 cm<sup>3</sup>) when compared across production regions.

Foundation seed of Louise will be maintained by the Washington State Crop Improvement Association under supervision of the Department of Crop and Soil Sciences and the Washington State Agricultural Research Center. Small quantities may be obtained for research purposes by contacting the National Plant Germplasm System. U.S. Plant Variety Protection status for this cultivar is pending.

K.K. KIDWELL,\* G.B. SHELTON, V.L. DEMACON, J.W. BURNS, B.P. CARTER, X.M. CHEN, C.F. MORRIS, AND N.A. BOSQUE PÉREZ

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K.K. Kidwell, G.B. Shelton, V.L. Demacon, and J.W. Burns, Dep. of Crop and Soil Sciences, Washington State Univ., Pullman, WA 99164-6420; B.P. Carter, Decagon Devices, Pullman, WA 99163; X.M. Chen and C.F. Morris, USDA-ARS Wheat Genetics, Quality, Physiology, and Disease Research Unit, Washington State Univ., Pullman, WA 99164-6420; N.A. Bosque Pérez, Dep. of Plant, Soil, and Entomological Sciences, P.O. Box 442339, Univ. of Idaho, Moscow, ID 83844-2339. Registration by CSSA. Received 5 July 2005. \*Corresponding author (kidwell@wsu.edu).

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