

### Registration of 'Infinity CL' Wheat

'Infinity CL' (Reg. No. CV-982, PI 639922) is a hard red winter wheat (*Triticum aestivum* L.) cultivar developed cooperatively by the Nebraska Agricultural Experiment Station and the USDA-ARS and released in 2005 by the developing institutions. Infinity CL was released primarily for its herbicide tolerance to imadazoline compounds which control many previously difficult to control weeds in wheat production systems, and for its superior adaptation to rainfed wheat production systems in Nebraska and counties in adjacent states. The name Infinity CL was chosen because it is a Clearfield wheat that will be used with Beyond herbicide {active ingredient imazamox, 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid; BASF Corp., Triangle Park, NC}.

Infinity CL was selected from the cross 'Windstar' (Baenziger et al., 1998)/'Millennium' (Baenziger et al., 2001) sib/'Above' sib. The cross between the Millennium sib (formerly NE94481) and the Above sib (TXGH12588-120\*4/FS2) was made in the spring of 1997. The final cross to Windstar was made in fall 1997. The FS2 (syn. FS4) line contains a single gene at the *als1* locus for acetolactate synthesis, which conveys tolerance to imidazolinone herbicides. The F<sub>1</sub> plants were grown in the greenhouse in 1998 and the F<sub>2</sub> population in the field in 1998 to 1999 where heads were selected before harvest. The initial selection was made in 1999 to 2000 in the head row nursery, which was sprayed with imazamox. The first observation plot was grown in 2000 to 2001. From 2001 and thereafter, the line was grown in replicated yield trials in Nebraska without imazamox applications to allow comparisons to herbicide susceptible lines. Infinity CL is an F<sub>2</sub>-derived line that was selected in the F<sub>4</sub> generation.

Infinity CL was evaluated as NH01046 in Nebraska yield nurseries starting in 2002, and in Nebraska and Wyoming cultivar performance trials in 2003 to 2004. In the Nebraska cultivar performance trials, it has performed well throughout most of Nebraska. The average Nebraska rainfed yield of Infinity CL of 3870 kg ha<sup>-1</sup> (27 environments from 2003 to 2004) was lower than the yield of 'Wesley' (3990 kg ha<sup>-1</sup>; Peterson et al., 2001), but was similar to that of Millennium (3860 kg ha<sup>-1</sup>), and higher than 'Wahoo' (3790 kg ha<sup>-1</sup>; Baenziger et al., 2002), and 'Alliance' (3620 kg ha<sup>-1</sup>; Baenziger et al., 1995). The average Wyoming rainfed yield of Infinity CL of 2220 kg ha<sup>-1</sup> (five environments from 2003 to 2004) was lower than 'Goodstreak' (2350 kg ha<sup>-1</sup>; Baenziger et al., 2004a), but was similar to 'Buckskin' (2280 kg ha<sup>-1</sup>; Schmidt et al., 1976) and higher than Above (2080 kg ha<sup>-1</sup>). Infinity CL has acceptable performance under irrigation, but other wheat cultivars with superior performance, especially with better straw strength (described below), would be recommended. Infinity CL was tested for herbicide tolerance at the recommended (35 g ai ha<sup>-1</sup>) and twice (71 g ai ha<sup>-1</sup>) the recommended rate of imazamox application in 2004 in six environments and performed similarly to Above for herbicide tolerance as determined by visual signs of injury or change in flowering date after herbicide application.

Other measurements of performance from comparison trials show that Infinity CL is medium in maturity (flowering 143 d after January 1, four environments), about 3 and 0.6 d later than 'Pronghorn' (Baenziger et al., 1997) and Wesley, respectively. Infinity CL is a semidwarf wheat cultivar. Infinity CL has a medium short coleoptile (45 mm), as expected for a semidwarf wheat cultivar and is shorter than Goodstreak (61 mm) and slightly longer than the semidwarf wheat cultivars such as 'Harry' (36 mm; Baenziger et al., 2004b). The mature plant height of Infinity CL (87 cm, 27 environments) is 1 cm shorter than Millennium and 8 cm taller than Wesley. In Wyoming, the height

of Infinity CL (56 cm) was 5 and 7 cm shorter than the conventional wheats Goodstreak and Buckskin, respectively, and 3 cm taller than the semidwarf Above. Infinity CL has moderate straw strength (44% lodged), similar to Wahoo (46%), but weaker than Wesley (34% lodged) in those environments where lodging was noted (three environments). The winter hardiness of Infinity CL is good to very good and comparable to other winter wheat cultivars adapted to and commonly grown in Nebraska.

Infinity CL is moderately resistant to stem rust (caused by *Puccinia graminis* Pers.:Pers. f. sp. *tritici* Eriks & E. Henn) [most likely containing genes *Sr6*, *Sr10*, or *Sr17* (which alone are no longer effective) and *Sr24* data provided by Y. Jin at the USDA Cereal Disease Laboratory, 2005]. It is also moderately resistant to leaf rust (caused by *P. triticina* Eriks.) (data obtained from field observations, 2004), and stripe rust (caused by *P. striiformis* Westendorp f. sp. *tritici*) (data obtained from field observations in Nebraska, 2005). Seedlings are susceptible to Hessian fly (*Mayetiola destructor* Say) (data for tests using the Great Plains biotype provided by Ming-Shun Chen, USDA and Kansas State University, 2004–2005) and *Wheat soilborne mosaic virus*, but may contain a low level of tolerance to *Wheat streak mosaic virus* (data obtained from field observations in Nebraska, 2004).

Infinity CL has good grain volume weight (76.2 kg m<sup>-3</sup>, 27 environments), which is lower than Millennium (76.5 kg m<sup>-3</sup>), but higher than Wesley (74.6 kg m<sup>-3</sup>), Wahoo (74.1 kg m<sup>-3</sup>), and Alliance (75.7 kg m<sup>-3</sup>). Under the drier conditions of Wyoming (four environments), Infinity CL maintained acceptable grain volume weight (74.4 kg m<sup>-3</sup>), which was lower than Buckskin (75.9 kg m<sup>-3</sup>) and Goodstreak (75.9 kg m<sup>-3</sup>), and slightly higher than Above (74.2 kg m<sup>-3</sup>). The milling and baking properties of Infinity CL were determined for 2 yr by the Nebraska Wheat Quality Laboratory. In these tests, Millennium was used as a check cultivar. The average wheat and flour protein content of Infinity CL (128 and 113 g kg<sup>-1</sup>) were lower than those of Millennium (142 and 127 g kg<sup>-1</sup>). The average flour extraction on the Buhler Laboratory Mill for Infinity CL (707 g kg<sup>-1</sup>) was lower than that of Millennium (718 g kg<sup>-1</sup>). The flour ash content of Infinity CL (4.6 g kg<sup>-1</sup>) was similar to that of Millennium (4.6 g kg<sup>-1</sup>). Dough mixing properties of Infinity CL were acceptable and stronger than those of Millennium as determined by a Mixograph. Average bake water absorption of Infinity CL (620 g H<sub>2</sub>O kg<sup>-1</sup> flour) was similar to that of Millennium (615 g H<sub>2</sub>O kg<sup>-1</sup> flour). The average loaf volume of Infinity CL (885 cm<sup>3</sup>) was less than Millennium (925 cm<sup>3</sup>). The scores for the internal crumb grain and texture were good, which were slightly better than those of Millennium. The overall end-use quality characteristics for Infinity CL should be acceptable to the milling and baking industries.

Infinity CL is an awned, white-glumed cultivar. Its field appearance is most similar to Windstar. After heading, the canopy is moderately open and upright. The flag leaf is erect and twisted at the boot stage. The foliage is dark green with a waxy bloom on the flag leaf, leaf sheath, and spike at anthesis, though less so than for Windstar. The leaves are pubescent. The spike is tapering in shape, narrow, mid-long to long, and middense. The glume is midlong and midwide, and the glume shoulder is narrow to midwide and square. The beak is medium in length with an acuminate to acute tip. The spike is nodding at maturity. Kernels are red colored, hard textured, and ovate in shape. The kernel is collarless with a large brush of medium length, rounded cheeks, large germ, and a narrow and shallow crease.

In positioning Infinity CL, it has performed extremely well throughout most of Nebraska and Wyoming in rainfed production systems. Infinity CL is genetically complementary to '2137' (Sears et al., 1997a), Alliance, Buckskin, 'Jagger' (Sears et al.,

1997b), and Pronghorn. It is noncomplementary to Windstar, Above, 'Agripro 502 CL', 'TAM 110' (Lazar et al., 1997), Arapahoe, 'Culver' (Baenziger et al., 2000), Millennium, 'Niobrara' (Baenziger et al., 1996), and 'Vista' (Baenziger et al., 1993).

Infinity CL has been uniform and stable since 2003. Beginning in 2001, all seed increases were sprayed with imazamox to ensure Infinity CL was homogeneous for herbicide tolerance. The Breeder seed originated from an F<sub>5</sub> bulk that was rogued each generation as the experimental line progressed toward release. Less than 0.5% of the plants were rogued from the Breeder seed increase in 2004. The rogued variant plants were taller in height (10–15 cm) or were awnless with red chaff. Up to 1% (10:1000) of such variant plants may be encountered in subsequent generations. The Nebraska Crop Improvement Association and Mr. Roger Hammons provided technical assistance in describing the cultivar characteristics and accomplishing technology transfer.

The Nebraska Foundation Seed Division, Department of Agronomy and Horticulture, University of Nebraska-Lincoln, Lincoln, NE 68583 has Foundation seed available to companies or marketing groups that hold a marketing license from BASF. The U.S. Department of Agriculture will not have seed for distribution. The seed classes will be Breeder, Foundation, Registered, and Certified. Registered seed will be a nonsalable class. Infinity CL will be submitted for U.S. Plant Variety Protection under P.L. 10577 with the certification option. A research and development fee will be assessed on all Certified seed sales. The variety, Infinity CL, contains a patented herbicide tolerance trait owned by BASF that confers tolerance to imidazolinone herbicides, such as imazamox. Any use of this variety requires a Material Transfer Agreement (for research use only) or a Commercial License to the trait, as well as permission from the variety originator. Contact the corresponding author at the Department of Agronomy and Horticulture, University of Nebraska-Lincoln for all seed requests. The corresponding author will forward the request for seed to BASF Corporation. No seed will be distributed without written permission from both BASF and the University of Nebraska for 20 yr from the date of release by the University of Nebraska (11 Apr. 2005), at which time seed will also be available from the NPGS.

P.S. BAENZIGER,\* B. BEECHER, R.A. GRAYBOSCH,  
D.D. BALTENSBERGER, L.A. NELSON, J.M. KRALL,  
YUE JIN, J.E. WATKINS, D.J. LYON, A.R. MARTIN,  
MING-SHUN CHEN, AND GUIHUA BAI

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P.S. Baenziger, D.D. Baltensperger, L.A. Nelson, D.J. Lyon, and A.R. Martin, Dep. of Agronomy and Horticulture; R.A. Graybosch, USDA-ARS and Dep. of Agronomy and Horticulture; J.E. Watkins, Dep. of Plant Pathology; Univ. of Nebraska, Lincoln, NE 68583; J.M. Krall, Torrington Res. and Ext. Center, University of Wyoming, Torrington, WY 82240; B. Beecher, USDA-ARS, E-202 Food Quality Bldg., Pullman, WA, 99164; USDA-ARS and Dep. of Plant Pathology, Univ. of Minnesota, St. Paul, MN 55108; J.H. Hatchett and Ming-hun Chen, USDA-ARS and Dep. of Entomology; Guihua Bai, USDA-ARS-PSERU and Dep. of Agronomy, Kansas State Univ., Manhattan, KS 66506. Infinity CL was developed with partial financial support from the Nebraska Wheat Development, Utilization, and Marketing Board and BASF Corporation. Cooperative investigations of the Nebraska Agric. Res. Div., Univ. of Nebraska, and USDA-ARS. Contribution no. 14514 from the Nebraska Agric. Res. Div. Registration by CSSA. Accepted 30 Sept. 2005. \*Corresponding author (Pbaenziger1@unl.edu).

doi:10.2135/cropsci2005.05-0044  
Published in *Crop Sci.* 46:975–977 (2006).