**NEBRASKA AGRICULTURAL EXPERIMENT STATION**
**UNIVERSITY OF NEBRASKA-LINCOLN**
**DEPARTMENT OF AGRONOMY**

**UNITED STATES DEPARTMENT OF AGRICULTURE**
**AGRICULTURAL RESEARCH SERVICE**
**WASHINGTON, D. C.**

# RELEASE OF INFINITY CL HARD RED WINTER WHEAT

Infinity CL 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 2004 by the developing institutions. Infinity CL contains a patented gene owned by BASF. BASF retains ownership of the gene. Infinity CL was released primarily 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.

Infinity CL was selected from the cross Windstar//Millennium 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 $F_1$ plants were grown in the greenhouse in 1998 and the $F_2$ population in the field in 1998-1999 where heads were snapped prior to harvest. The initial selection was made in 1999-2000 in the head row nursery, which was sprayed with imidazolinone herbicide. The first observation plot was grown in 2000-2001. From 2001 and thereafter, the line was grown in replicated trials in Nebraska. Infinity CL is an $F_2$-derived line that was selected in the $F_4$ 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 $ha^{-1}$ (27 environments from 2003 to 2004) was lower than the yield of Wesley (3990 kg $ha^{-1}$), but was similar to that of Millennium (3860 kg $ha^{-1}$), and higher than Wahoo (3790 kg $ha^{-1}$), and Alliance (3620 kg $ha^{-1}$). The average Wyoming rainfed yield of Infinity CL of 2220 kg $ha^{-1}$ (5 environments from 2003 to 2004) was lower than Goodstreak (2350 kg $ha^{-1}$), but was similar to Buckskin (2280 kg $ha^{-1}$) and higher than Above (2080 kg $ha^{-1}$). Infinity CL has acceptable performance under irrigation, but other wheat cultivars with superior performance, especially with better straw strength (described below), would be recommended.

Other measurements of performance from comparison trials show that Infinity CL is medium in maturity (143 d after Jan.1, data from observations in NE), about 3.1 d and 0.6 d later flowering than Pronghorn and 'Wesley', respectively. Infinity CL is a semi-dwarf wheat cultivar. The mature plant height of Infinity CL (87 cm) is 1 cm shorter than Millennium and 8 cm taller than Wesley. In Wyoming heading 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 semi-dwarf Above. Infinity CL has moderate straw strength (44% lodged), similar to Wahoo (46%), but worse than Wesley (34% lodged) in those environments where lodging

occurred. The winter hardiness of Infinity CL is good to very good and comparable to other winter wheat cultivars adapted 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 *Sr6, Sr10* or *Sr17* [which are no longer effective) and *Sr24*] data provided by Y. Jin at the USDA Cereal Disease Laboratory). It is also moderately resistant to leaf rust (caused by *P. triticina* Eriks.; data obtained from field observations), and stripe rust ( caused by *P. striiformis* Westendorp f. sp. t*ritici,* data obtained from field observations in NE). It is susceptible to Hessian fly (*Mayetiola destructor* Say, data provided by Ming-Shun Chen, USDA and Kansas State University) and wheat soilborne mosaic virus, but may contain a low level of tolerance to wheat streak mosaic virus, data obtained from field observations in NE).

Infinity CL has good grain volume weight (76.2 kg $hl^{-1}$), which is lower than Millennium (76.5 kg $hl^{-1}$), but higher than Wesley (74.6 kg $hl^{-1}$), Wahoo (74.1 kg $hl^{-1}$), and Alliance (75.7 kg $hl^{-1}$). Under the drier conditions of Wyoming (4 environments) Infinity maintained acceptable grain volume weight (74.4 kg $hl^{-1}$), which was lower Buckskin (75.9 kg $hl^{-1}$), and Goodstreak (75.9 kg $hl^{-1}$), and slightly higher than Above (74.2 kg $hl^{-1}$). The milling and baking properties of Infinity CL were determined for two years 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 $kg^{-1}$) was lower than Millennium (142 and 127 g $kg^{-1}$). The average flour extraction on the Buhler Laboratory Mill for Infinity (707 g $kg^{-1}$) was lower than Millennium (718 g $kg^{-1}$). The flour ash content (46 g $kg^{-1}$) was similar to Millennium (46 g $kg^{-1}$). Dough mixing properties of Infinity CL were acceptable and stronger than Millennium. Average baking absorption was slightly less than Millennium. The average loaf volume of Infinity (885 $cm^3$) was less than Millennium (925 $cm^3$). The scores for the internal crumb grain and texture were good, which was slightly better than Millennium. The overall end-use quality characteristics for Infinity CL should be acceptable to the milling and baking industries.

In positioning Infinity CL, based on performance data to date, it should be well adapted to most rainfed wheat production systems in Nebraska and in adjacent states with similar growing conditions where its medium maturity are favored except in times of drought. Where it is adapted, Infinity CL should be a good replacement for Arapahoe and Windstar and for currently available Clearfield™ wheat cultivars (Above and Agripro 502 CL) due to its similar to higher yield potential, better disease resistance, and superior end-use quality attributes. Infinity CL is genetically complementary to 2137, Alliance, Buckskin, Jagger, and Pronghorn. It is non-complementary to Windstar, Above, Agripro 502 CL, TAM 110, Arapahoe, Culver, Millennium, Niobrara, and Vista.

Infinity 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 has no collar, a large brush of medium length, rounded cheeks, large germ, and a narrow and shallow crease.

Infinity CL has been uniform and stable since 2003**.** Less than 0.5 % of the plants were rogued from the Breeder's 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) 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 and/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. The Registered seed class will be a nonsalable seed class. Infinity CL will be submitted for registration and plant variety protection under P. L. 10577 with the certification option. A research and development fee will be assessed on all certified seed sales. Because Infinity CL contains a patented gene, seed will be distributed for research purposes after approval by BASF. Approved distributions of seed may be obtained from the corresponding author and the Department of Agronomy and Horticulture, University of Nebraska-Lincoln for at least 5 yr from the date of this release. Infinity CL was developed with partial financial support from the Nebraska Wheat Development, Utilization, and Marketing Board and BASF Corporation.

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**Approval**

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Director, Nebraska Agricultural Experiment Station — date

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Administrator, Agricultural Research Service
United States Department of Agriculture
Washington, D. C. — date