

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

**UNITED STATES DEPARTMENT OF AGRICULTURE
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WASHINGTON, D. C.**

RELEASE OF HALLAM HARD RED WINTER WHEAT

Hallam 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. Hallam was released primarily for its superior adaptation to rainfed wheat production systems in eastern Nebraska. The name Hallam was chosen to honor Hallam, NE, a town and its people rebuilding after a tornado.

Hallam was selected from the cross Brule/Bennett/Niobrara that was made in 1992. The F₁ generation was grown in the greenhouse and the F₂ to F₃ generations were advanced using the bulk breeding method in the field at Mead, NE. In 1995, single F₃-derived F₄ rows were planted for the selection. There was no further selection thereafter.

Hallam was evaluated as NE98471 in Nebraska yield nurseries starting in 1999, in the Northern Regional Performance Nursery in 2001 and 2002, and in Nebraska cultivar performance trials in 2002 to 2004. In the Nebraska cultivar performance trials, it appears to be narrowly adapted and performs best in eastern Nebraska. The average Nebraska rainfed yield of Hallam of 4110 kg ha⁻¹ (41 environments from 2002 to 2004) was greater than the yields of Wahoo (4030 kg ha⁻¹), Alliance (3880 kg ha⁻¹), and Harry (4000 kg ha⁻¹), but was lower than Millennium (4180 kg ha⁻¹), and Wesley (4210 kg ha⁻¹). In its primary area of adaptation (eastern NE), Hallam (5 environments) has yielded 4540 kg ha⁻¹, which was greater than Wesley (4150 kg ha⁻¹), Millennium (4250 kg ha⁻¹), Wahoo (3940 kg ha⁻¹), and Alliance (3900 kg ha⁻¹). Hallam was tested in the Northern Regional Performance Nursery in 2001 and 2002. It ranked 14th of 30 in 2001 (12 environments) and 4th of 25 entries in 2002 (13 environments) and averaged 100 kg ha⁻¹ more grain yield than Nekota. Hallam is not recommended for irrigation where 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 Hallam is moderately early in maturity (142 d after Jan. 1, data from observations in NE), about 2.5 d and 1.2 d earlier flowering than Millennium and 'Wesley', respectively. Hallam is a semi-dwarf wheat cultivar. The mature plant height of Hallam (86 cm) is 3 cm shorter than Millennium and 6 cm taller than Wesley. Hallam has moderate straw strength (45% lodged), similar to Wahoo (46% lodged), but worse than Wesley (34% lodged) in those environments where lodging was found. The winter hardiness of Hallam is good to very good, similar to Abilene and comparable to other winter wheat cultivars adapted and commonly grown in Nebraska.

Hallam is moderately resistant to stem rust (caused by *Puccinia graminis* Pers.: Pers. f. *sp. tritici* Eriks & E. Henn; most likely containing *Sr6* and *Sr24*; data provided by Y. Jin at the USDA Cereal Disease Laboratory), stripe rust (caused by *P. striiformis* Westendorp f. *sp. tritici*,

data obtained from field observations in NE), and Hessian fly (*Mayetiola destructor* Say, data provided by J. Hatchett and Ming-Shun Chen, USDA and Kansas State University). It is moderately susceptible to leaf rust (caused by *P. triticina* Eriks, data obtained from field observations in NE). It is susceptible to wheat soilborne mosaic virus and barley yellow dwarf virus, but may contain a low level of tolerance to wheat streak mosaic virus (data obtained from the Uniform Winter Wheat Northern Regional Performance Nursery, 2000-2001 and field observations in NE).

Hallam is genetically lower in grain volume weight (74.0 kg hl⁻¹), lower than Millennium (76.5 kg hl⁻¹) and Wesley (74.6 kg hl⁻¹), and Alliance (75.7 kg hl⁻¹), but similar to Wahoo (74.1 kg hl⁻¹). The milling and baking properties of Hallam were determined for six years by the Nebraska Wheat Quality Laboratory. In these tests, Arapahoe (4 years) and Millennium (2 years) were used as check cultivars. The average wheat and flour protein content of Hallam (133 and 121 g kg⁻¹) was lower than Arapahoe and Millennium for the corresponding years. The average flour extraction on the Buhler Laboratory Mill for Hallam (711 g kg⁻¹) was higher than Millennium and similar to Arapahoe for the corresponding years. The flour ash content (40 g kg⁻¹) was lower than Millennium and Arapahoe for the corresponding years. Dough mixing properties of Hallam were acceptable, slightly stronger than Millennium and slightly weaker than Arapahoe. Average baking absorption (605 H₂Og kg⁻¹) was less than Millennium and Arapahoe for the corresponding years. The average loaf volume of Hallam (947 cm³) was greater than Millennium and Arapahoe for the corresponding years. The scores for the internal crumb grain and texture were good to very good, which was better than Millennium and Arapahoe. The overall end-use quality characteristics for Hallam are superior to the commonly grown wheat cultivars and should be acceptable to the milling and baking industries.

In positioning Hallam, based on performance data to date, it should be well adapted to most rainfed wheat production systems in eastern Nebraska. Being a narrowly adapted wheat line may explain its above average to very good performance in the Northern Regional Performance Nursery. Where it is adapted, Hallam should be a good replacement for Arapahoe as it has a higher yield potential and similar or superior disease and insect resistances. Hallam is genetically complementary to Wesley and 2137. It is non-complementary to Arapahoe, Culver, Millennium, Wahoo, and Niobrara.

Hallam is an awned, white-glumed cultivar. Its field appearance is most similar to Niobrara and Brule. After heading, the canopy is moderately closed and inclined to nodding. The flag leaf is erect and twisted at the boot stage. The foliage is dark green with a light waxy bloom on the flag leaf, leaf sheath, and spike at anthesis. The leaves are pubescent with very short hairs. The spike is tapering in shape, narrow, mid-long to long, and middense. The glume is midlong and narrow, and the glume shoulder is narrow to midwide and square. The beak is medium in length with an acuminate tip. The spike is inclined to nodding at maturity. Kernels are red colored, hard textured, and mainly elliptical in shape. The kernel has no collar, a large brush of short length, rounded cheeks, large germ, and a narrow and middeep crease.

Hallam has been uniform and stable since 2001. Less than 0.5 % of the plants were rogued from the Breeder's seed increase in 2001. 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 had foundation seed available to qualified certified seed enterprises in 2002. 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. A research and development fee will be assessed on all certified seed sales. Small quantities of seed for research purposes 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. Hallam was developed with partial financial support from the Nebraska Wheat Development, Utilization, and Marketing Board.

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Approval

Director, Nebraska Agricultural
Experiment Station

date

Administrator, Agricultural Research Service
United States Department of Agriculture
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date