

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

**SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION
SOUTH DAKOTA STATE UNIVERSITY
PLANT SCIENCE DEPARTMENT**

and

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

RELEASE OF NE01643 HARD RED WINTER WHEAT

NE01643 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 2007 by the developing institutions and the South Dakota Agricultural Experiment Station. NE01643 was released primarily for its superior adaptation to rainfed wheat production systems in Nebraska, South Dakota, and adjacent areas in the northern Great Plains. NE01643 will be marketed under the name Husker Genetics Brand Overland in honor of the pioneers who crossed and stayed in the northern prairies.

NE01643 was selected from the cross Millennium sib//Seward/Archer that was made in 1995. The F₁ generation was grown in the greenhouse in 1996 and the F₂ to F₃ generations were advanced using the bulk breeding method in the field at Mead, NE in 1997 to 1998. In 1999, single F₃-derived F₄ rows were planted for the selection. There was no further selection thereafter.

NE01643 was evaluated in Nebraska replicated yield nurseries starting in 2002, in the Northern Regional Performance Nursery in 2004 and 2005, and in Nebraska cultivar performance trials in 2004 to 2006. In the Nebraska cultivar performance trials, it is widely adapted and performs well throughout the state (Table 1) with the exception of irrigated wheat production systems where it performs near the average of the tested lines. The average Nebraska rainfed yield of NE01643 of 4072 kg ha⁻¹ (39 environments from 2004 to 2006) was greater than the yields of other popular cultivars such as Antelope (3353 kg ha⁻¹), Goodstreak (3653 kg ha⁻¹), Harry (3556 kg ha⁻¹), Infinity CL (3919 kg ha⁻¹), Agripro Brand Jagalene (4028 kg ha⁻¹), Millennium (3815 kg ha⁻¹), Wahoo (3662 kg ha⁻¹), and Wesley (3719 kg ha⁻¹). Though NE01643 has excellent grain yield in rainfed environments, its grain yield (6034 kg ha⁻¹) in irrigated environments is slightly above the test average (6020 kg ha⁻¹) and lower than popular irrigated wheat cultivars Wesley (6464 kg ha⁻¹) and Agripro Jagalene (6383 kg ha⁻¹). The broad adaptation of NE01643 to the Northern Great Plains was evident in its performance in the Northern Regional Performance Nursery where it was the highest yielding line in 2004 (out of 40 lines tested) and 2005 (out of 32 lines tested). Compared to the check cultivars in the

Northern Regional Performance Nursery, NE01643 (4698 kg ha⁻¹) was higher yielding than Nekota (3651 kg ha⁻¹) and Nuplains (3864 kg ha⁻¹).

Other measurements of performance from comparison trials show that NE01643 is moderately late in maturity (143 d after Jan.1, data from observations in NE), about 1 d later flowering than ‘Wesley’ and 0.5 day earlier than Millennium, respectively. NE01643 is a semi-dwarf wheat cultivar and contains the *RhtB1b* (formerly *Rht1*, data provided by Dr. Guihua Bai). The mature plant height of NE01643 (84 cm) is 1 cm shorter than Millennium and 8 cm taller than Wesley (Table 1). NE01643 has good straw strength (5% lodged), similar to Wesley (3.7%), Millennium (3.9%) and Agripro Jagalene (5.8%), and superior to Goodstreak (15% lodged). The winter hardiness of NE01643 (84%) is good to very good, similar to Nekota (84%) and comparable to other winter wheat cultivars adapted and commonly grown in Nebraska.

NE01643 is moderately susceptible to stem rust (caused by *Puccinia graminis Pers.: Pers. f. sp. tritici* Eriks & E. Henn.) in field nursery tests inoculated with a composite of stem rust races (RCRS, QFCS, QTHJ, RKQQ, and TPMK) but resistant to the most prevalent race QFCS. NE01643 likely carries *SrTmp* and it is moderately resistant to race TTKS based on seedling tests (data provided by Y. Jin at the USDA Cereal Disease Laboratory). It is moderately resistant to leaf rust (caused by *P. triticina* Eriks), stripe rust (caused by *P. striiformis* Westendorp f. sp. *tritici*, data obtained from field observations in the Great Plains), and Hessian fly (*Mayetiola destructor* Say, data provided by J. Hatchett and Ming-Shun Chen, USDA and Kansas State University). NE01643 also is more tolerant to Fusarium head blight (caused by *Fusarium spp.*, data obtained from misted screening nurseries in Nebraska and South Dakota) than many widely grown lines. It is susceptible to wheat soilborne mosaic virus, barley yellow dwarf virus, and wheat streak mosaic virus (data obtained from the Northern Regional Performance Nursery, 2004-2005 and field observations in NE).

NE01643 is a genetically high in grain volume weight (74.0 kg hl⁻¹), similar to Millennium (73.7 kg hl⁻¹) and Infinity CL (73.7 kg hl⁻¹), and higher than Wesley (71.1 kg hl⁻¹) and Wahoo (70.7 kg hl⁻¹). The milling and baking properties of NE01643 were determined for five years by the Nebraska Wheat Quality Laboratory. In these tests, Millennium, an excellent milling and baking wheat, was used as for comparison. The average wheat and flour protein content of NE01643 (138 and 126 g kg⁻¹) were similar to Millennium (141 and 124 g kg⁻¹) for the corresponding years. The slightly lower grain protein content was confirmed by the Nebraska cultivar performance trials where NE01643 had 122 g protein kg⁻¹ compared to Millennium with a value of 124 g kg⁻¹. The average flour extraction on the Buhler Laboratory Mill for NE01643 (715 g kg⁻¹) was slightly lower than Millennium (719 g kg⁻¹). The flour ash content (45 g kg⁻¹) was higher than Millennium (42 g kg⁻¹). Dough mixing properties of NE01643 were acceptable, but would be considered weak (mixtime peak was 2.74 minutes and mixtime tolerance was scored as 2.5) which was weaker than Millennium (mixtime peak of 4.00 minutes and mixtime tolerance scored as 3.5). Average baking absorption (620 H₂O g kg⁻¹) was slightly higher than Millennium (616 H₂O g kg⁻¹) for the corresponding years. The average loaf volume of NE01643 (827 cm³) was lower than Millennium (913 cm³). The scores for the internal crumb grain and texture ranged from fair to good, which was poorer than Millennium which ranged from fair to very good). The overall end-use quality characteristics for NE01643 are adequate, but less than many commonly grown wheat cultivars and should be acceptable to the milling and baking industries.

In positioning NE01643, based on performance data to date, it should be well adapted to most rainfed wheat production systems in Nebraska and South Dakota, and in adjacent areas of the northern Great Plains. Being a broadly adapted wheat line may explain its excellent agronomic performance in the Northern Regional Performance Nursery. Where it is adapted, NE01643 should be a replacement for Arapahoe, Culver, and possibly Millennium and Wesley, though Millennium and Wesley have better disease and insect resistances and end-use quality. NE01643 is genetically complementary to Agripro Jagalene, Goodstreak, Pronghorn, Wesley, and 2137. It is non-complementary to Arapahoe, Culver, Millennium, Wahoo, and Niobrara.

NE01643 is an awned, white-glumed cultivar. Its field appearance is most similar to Millennium. After heading, the canopy is open and erect to inclined. The flag leaf is erect and twisted (light to moderately) at the boot stage. The foliage is green to dark green with a light waxy bloom on the leaf sheath, but not on the leaves or spike at anthesis. The leaves are very lightly pubescent with very short hairs. The spike is tapering to oblong in shape, narrow, mid-long, and middense. The glume is long and narrow, and the glume shoulder is narrow to midwide and rounded to square. The beak is medium in length with an acuminate to acute tip. The spike is predominantly inclined at maturity with some spikes nodding. Kernels are red colored, hard textured, and mainly elliptical in shape. The kernel has no collar, a large brush of medium length, angular cheeks, large germ, and a mid-wide and mid-deep crease.

NE01643 has been uniform and stable since 2004. 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 and/or 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 2006. The U.S. Department of Agriculture will not have seed for distribution. The seed classes will be Breeder, Foundation, Registered, and Certified. NE01643 will be submitted for plant variety protection under P.L. 10577 with the certification option. 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 Dr. P. S. Baenziger and the Department of Agronomy and Horticulture, University of Nebraska-Lincoln for at least 5 yr from the date of this release. NE01643 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

Director, South Dakota Agricultural
Experiment Station

date

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

date

Table 1. Grain yield, test weight, grain protein content, lodging, and plant height by district in Nebraska for rainfed (39 environments) and irrigated trials (9 environments) grown from 2004 to 2006. The state averages for the rainfed trials are also included.

Cultivar	-----Southeast-----					-----South Central-----				
	Yield kg/ha	Test weight kg/hl	Protein g/kg	Lodging %	Plant Height cm	Yield kg/ha	Test weight kg/hl	Protein g/kg	Lodging %	Plant Height cm
Antelope	3964	71.0	121	6.9	93.2	4388	68.5	135	10.7	88.1
Goodstreak	4233	74.5	125	16.1	103.9	4186	72.1	136	18.0	101.6
Harry	4206	67.7	115	4.2	89.4	3716	64.1	126	9.7	84.6
Infinity CL	4623	74.9	119	15.8	96.8	4616	70.5	128	12.7	93.2
Jagalene	4784	75.8	119	7.6	92.2	5059	72.8	126	8.3	88.1
Millennium	4347	73.4	120	2.7	97.0	4750	70.3	129	8.7	94.0
NE01643	4844	75.3	118	2.2	96.0	4925	70.0	129	8.7	92.2
Pronghorn	3695	71.3	123	43.4	101.9	3877	70.5	140	31.0	98.3
Scout66	3353	69.9	125	44.2	106.9	3474	70.7	135	25.0	99.8
Turkey	3138	67.4	125	36.9	104.1	3071	67.7	136	16.7	99.1
Wahoo	4018	68.9	118	11.0	95.5	4300	67.8	130	9.3	89.7
Wesley	4273	71.4	119	1.8	86.9	4703	67.3	127	7.7	85.6
Average all entries*	4230	72.6	120	11.3	95.2	4348	69.8	131	12.7	91.1
LSD 0.05%**	608	3.4	4	N.S.	4.4	665	2.0	6	14.2	4.9

Table 1 (cont.). Grain yield, test weight, grain protein content, lodging, and plant height by district in Nebraska for rainfed (39 environments) and irrigated trials (9 environments) grown from 2004 to 2006. The state averages for the rainfed trials are also included.

Cultivar	-----West Central-----					-----Panhandle-----				
	Yield kg/ha	Test weight kg/hl	Protein g/kg	Lodging %	Height cm	Yield kg/ha	Test weight kg/hl	Protein g/kg	lodging %	Height cm
Antelope	3212	73.6	131	2.5	72.6	2647	74.9	113		63.8
Goodstreak	3393	75.8	131	10.4	88.9	2802	77.2	114		76.2
Harry	3339	69.0	123	0.6	74.7	2963	73.0	107		67.1
Infinity CL	3601	74.1	128	8.4	77.7	2835	75.4	114		68.1
Jagalene	3487	75.9	132	1.6	73.7	2782	76.6	114		64.8
Millennium	3467	74.9	129	0.3	80.0	2694	76.3	116		69.6
NE01643	3628	74.8	128	3.0	78.5	2889	75.8	114		69.9
Pronghorn	3245	75.3	130	22.8	86.9	2775	76.6	111		72.6
Scout66	2882	75.8	131	47.9	89.7	2466	75.8	113		77.0
Turkey	2708	74.0	135	28.8	88.4	2338	75.8	115		75.4
Wahoo	3615	72.1	128	3.9	76.7	2714	73.9	112		67.3
Wesley	3333	72.6	131	1.6	69.6	2567	73.2	123		60.7
Average all entries*	3289	74.0	130	6.2	77.5	2701	75.4	110		67.8
LSD 0.05%**	467	1.6	4	12.7	3.4	215	1.3	5		4.6

Table 1 (cont.). Grain yield, test weight, grain protein content, lodging, and plant height by district in Nebraska for rainfed (39 environments) and irrigated trials (9 environments) grown from 2004 to 2006. The state averages for the rainfed trials are also included.

Cultivar	-----State-----					-----Irrigated-----				
	Yield kg/ha	Test weight kg/hl	Protein g/kg	Lodging %	Height cm	Yield kg/ha	Test weight kg/hl	Protein g/kg	Lodging %	Height cm
Antelope	3553	72.0	125	6.7	79.4	6121	75.9	112	9.3	85.6
Goodstreak	3653	74.9	127	14.8	92.6					
Harry	3556	68.4	118	4.8	78.9					
Infinity CL	3919	73.7	122	12.3	83.9	5631	74.1	111	33.4	90.2
Jagalene	4028	75.3	123	5.8	79.7	6383	74.4	112	11.7	85.1
Millennium	3815	73.7	124	3.9	85.2	5738	74.9	111	20.1	93.0
NE01643	4072	74.0	122	4.6	84.1	6034	74.8	110	11.8	89.2
Pronghorn	3398	73.4	126	32.4	89.9					
Scout66	3044	73.0	126	39.0	93.3					
Turkey	2814	71.2	128	27.5	91.8					
Wahoo	3662	70.7	122	8.1	82.3	5631	70.5	113	37.2	89.7
Wesley	3719	71.1	125	3.7	75.7	6464	73.9	116	6.5	81.0
Average all entries*						6020	74.2	111.6	18.5	87.3
LSD 0.05%**						581	1.8	6	14.0	2.4

* This value is the average of all the values for the traits for the entries that were in the trial and includes values for many experimental lines not shown in the table.

** The LSD (least significant difference $p < 0.05$) was calculated from the analysis of variance using all of the values of the entries that were in the in trial including many experimental lines not shown in the table.