

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

**and**

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

**RELEASE OF NE05548 HARD RED WINTER WHEAT**

NE05548 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 2014 by the developing institutions. It was released primarily for its superior adaptation to rainfed wheat production systems in western Nebraska and in adjacent wheat producing states. NE05548 will be marketed as Husker Genetics Brand Panhandle Hard Red Winter Wheat due to its area of adaptation being the Panhandle of Nebraska and similar areas in adjacent states. NE05548 genetically is a semi-dwarf wheat, containing the RhtB1b allele (formerly known as Rht1); phenotypically, however, it is a tall wheat, but possesses good agronomic performance and straw strength.

NE05548 was selected from the cross NE97426/NE98574 where the pedigree of NE97426 is BRIGANTINA/2\*ARAPAHOE and the pedigree of NE98574 is CO850267/RAWHIDE. The cross was made in 1999. The F<sub>1</sub> generation was grown in the greenhouse in 2000 and the F<sub>2</sub> to F<sub>3</sub> generations were advanced using the bulk breeding method in the field at Mead, NE in 2001 to 2002. In 2003, single F<sub>3</sub>-derived F<sub>4</sub> rows were planted for selection. There was no further selection thereafter. The F<sub>3.5</sub> was evaluated as a single four row plot at Lincoln, NE and a single row at Mead, NE in 2004. NE05548 was identified in 2005 as the experimental line, NE05548, and selected for further testing.

NE05548 was evaluated in Nebraska replicated yield nurseries starting in 2006, in the USDA-ARS coordinated Northern Regional Performance Nursery in 2008 and 2009, and in the University of Nebraska Fall Sown Wheat Performance Trials in 2009 to 2013. In the Nebraska Intrastate Nursery (2007 to 2013, Table 1), NE05548 performed well in western Nebraska where taller wheat cultivars are preferred. These data are supported by the 2008 and 2009 USDA-ARS Northern Regional Performance Nursery where NE05548 ranked 2 and 6 region-wide of the 31 and 25 entries tested in those years (data available at <http://www.ars.usda.gov/Research/docs.htm?docid=11932>). In the last five years it has been tested in western Nebraska in the Nebraska State Variety Trials across 20 environments (Table 2, full data available at <http://cropwatch.unl.edu/web/varietytest/wheat>). NE05548 (3527 kg/ha) had higher grain yield than comparable tall winter wheat cultivars (Goodstreak, 3393 kg/ha; Pronghorn, 3165 kg/ha; and Buckskin 3111 kg/ha). It was similar in grain yield to Overland (3480 kg/ha), but lower yielding than Robidoux (3709 kg/ha) and Settler CL (3595 kg/ha). Based upon these data, NE05548 is adapted to rainfed wheat production in western NE.

Other measurements of performance from comparison trials indicate that NE05548 is moderately late in maturity (147.1 d after Jan.1, data from 6 observations in eastern NE) which is very similar to Overland (147.3 d after Jan.1). NE05548 is a semi-dwarf wheat cultivar and contains the *Rht1b* (formerly *Rht1*). The mature plant height of NE05548 (80.3 cm) in western NE (20 environments) is 2 cm shorter than Goodstreak, 4 cm shorter than Pronghorn, and 5 cm shorter than Buckskin, the latter being three very popular tall wheat cultivars. NE05548 is 4 cm taller than Overland, and 5 cm taller than Wesley in western NE (data from Table 2). NE05548 is the tallest semi-dwarf wheat cultivar released to date by the USDA-University of Nebraska Wheat Improvement Program. NE05548 has moderate straw strength for a taller wheat (7% lodged in 2009-2012 trials in southwestern NE where lodging is more common; 15 environments), which was lower than Goodstreak (10%), and Pronghorn (16%). The winter hardiness of NE05548 is good and comparable to other winter wheat cultivars grown in Nebraska.

NE05548 is resistant to *Soilborne wheat mosaic virus* in field nurseries in Nebraska and to stem rust (caused by *Puccinia graminis Pers.: Pers. f. sp. tritici* Eriks & E. Henn.) in field nursery tests at St. Paul, MN. In greenhouse seedling tests, it is resistant to races QFCS, QTHJ, MCCF, RCRS, RKQQ, and TMPK, but susceptible to race TTTT (). It is moderately susceptible to susceptible for leaf rust (caused by *P. triticina* Eriks,) and to stripe rust (caused by *P. striiformis* Westendorp f. sp. *tritici*, data obtained from field observations in the Great Plains). NE05548 is considered as being moderately susceptible to Fusarium head blight (caused by *Fusarium graminearum*, data from greenhouse and field observations in Nebraska) and moderately resistant for DON accumulation. NE05548 is moderately resistant to moderately susceptible to Hessian fly (*Mayetiola destructor* Say.). It is susceptible to *Barley yellow dwarf virus*, and *Wheat streak mosaic virus* (data obtained from the USDA-ARS Southern Regional Performance Nursery and field observations in NE).

NE05548 has lower grain volume weight (75.3 kg/hl), which is lower than Goodstreak (76.9 kg/hl), Pronghorn (77.0 kg/hl), and Buckskin (76.6 kg/hl). The grain protein content of NE05548 (11.6%) in western NE was similar to that of Wesley (11.5%) (Table 2). The milling and baking properties of NE05548 were determined for six years by the Nebraska Wheat Quality Laboratory (Table 3). In these tests, Wesley, an excellent milling and baking wheat, was used for comparison. The average flour protein content of NE05548 (12.5%) was similar to Wesley (12.4%) for the corresponding years. The average flour extraction on the Buhler Laboratory Mill for NE05548 (774.7%) was slightly higher than Wesley (74.0 %). The flour ash content (0.43%) was similar to Wesley (0.42 %). Dough mixing properties of NE05548 were acceptable (mixtime peak was 3.72 minutes and mixtime tolerance was scored as 4.1 on a one to 7 scale where 7 is very tolerant) and weaker than Wesley (mixtime peak of 4.39 minutes and mixtime tolerance scored as 4.6). Average baking absorption (62.1 %) was higher than Wesley (61.2 %) for the corresponding years. The average loaf volume of NE05548 (822 cm<sup>3</sup>) was lower than Wesley (841 cm<sup>3</sup>). The scores for the internal crumb grain and texture were 3.7 and 3.7 which were lower than Wesley (4.3 and 4.4 , respectively). The overall end-use quality characteristics for NE05548 (scored as 3.8, where 3 is fair, 4 is good and 7 is excellent) was lower than Wesley (4.4) and similar to many commonly grown wheat cultivars. NE05548 should be acceptable to the milling and baking industries.

In positioning NE05548, based on performance data to date, it should be well adapted to most rainfed wheat production systems in western Nebraska and in adjacent areas of the Great Plains where taller wheat cultivars are preferred. However, NE05548 has a semi-dwarf

coleoptile length similar to Camelot and shorter than Goodstreak (a tall wheat with a long coleoptile. NE05548 is not recommended for irrigated wheat production due to its not having similar straw strength and comparable yield potential to the best available irrigated wheat cultivars (data not shown). Based on our data, NE05548 is also not adapted to or recommended for organic production where other cultivars perform better. Where adapted, NE05548 should be a replacement for Goodstreak, Pronghorn, and Buckskin (under rainfed production). NE05548 is genetically complementary to virtually all wheat cultivars grown in Nebraska.

NE05548 is an awned, ivory-glumed cultivar. Its field appearance is most similar to Wesley, but can be easily separated from Wesley because Wesley has bronze chaff. After heading, the canopy is moderately closed and erect to inclined. The flag leaf is erect and twisted at the boot stage. The foliage is green with a waxy bloom on the leaf sheath, with little waxy bloom on the spike at anthesis and on the leaves. The leaves are glabrous. The spike is tapering, narrow, mid-long, and middense. The glume is medium long and medium wide, and the glume shoulder is square to elevated. The beak is very long in length with an acuminate tip. The spike is predominantly inclined at maturity with some erect spikes. Kernels are red colored, hard textured, and mainly ovate in shape. The kernel has no collar, a medium brush of medium length, rounded cheeks, midsize germ, and a narrow and shallow crease.

NE05548 has been uniform and stable since 2010. Less than 0.5 % of the plants were rogued from the Breeder's seed increase in 2010-13. The rogued variant plants were taller in height (5 - 15 cm) or were awnless and/or had red chaff. Up to 1% (10:1000) variant plants may be encountered in subsequent generations. The Nebraska Crop Improvement Association 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 2012 with the first sale of certified seed in 2013. The U.S. Department of Agriculture will not have commercial seed for distribution. The seed classes will be Breeder, Foundation, Registered, and Certified. NE05548 will be submitted for plant variety protection under P.L. 10577 with the certification option. A fee will be assessed on all certified seed sales. Small quantities of seed for research purposes may be obtained from Dr. P. S. Baenziger and the Department of Agronomy and Horticulture, University of Nebraska-Lincoln for at least 5 years from the date of this release. In addition, a seed sample has been deposited in the USDA-ARS National Small Grains Collection, Aberdeen, ID, and this seed is freely available to interested researchers.

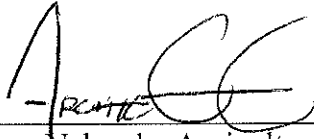
NE05548 was developed with partial financial support from the Nebraska Agricultural Experiment Station and the Nebraska Wheat Development, Utilization, and Marketing Board. Partial funding for P.S. Baenziger is from Hatch project NEB-22-328, USDA- IFAFS competitive grant 2001-04462, USDA, NRICGP 00-353000-9266, 2004-35300-1470, and 2007-51300-0375, USDA, CSREES NRICAP grant number 2006-55606-16629, USDA OREI 2007-51300-03785, AFRI/2011-68002-30029, the CERES Trust Organic Research Initiative, and USDA under Agreement No. 59-0790-4-092 which is a cooperative project with the U.S. Wheat & Barley Scab Initiative. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the view of the USDA. Cooperative investigations of the Nebraska Agric. Res. Div., Univ. of Nebraska, and USDA-ARS.

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**References:**

Baenziger, P.S., D. R. Shelton, M.J. Shipman, and R. A. Graybosch. 2001. Breeding for end-use quality: reflection on the Nebraska experience. *Euphytica* 119:95-100.

Approval



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Director, Nebraska Agricultural  
Experiment Station

1/16/14  
date



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Administrator, Agricultural Research Service  
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Washington, D. C.

1/27/14  
date

Table 1. Head to head comparisons of NE05548 to popularly grown or new cultivars from trials in Nebraska beginning in 2007 until 2013. Data on grain yield was from trials at up to seven rainfed locations (Mead, Lincoln, Clay Center, North Platte, McCook, Sidney, and Alliance) in Nebraska and not every cultivar was grown in the same trial across the state.

Cultivar	Trial Number	Cultivar Yield kg/ha	NE05548 Yield kg/ha	% of NE05548	
Camelot	64	3775	3738	101	n.s.
Goodstreak	62	3700	3768	98	n.s.
NE06545	57	4234	3844	110	**
Overland	72	4067	3897	104	**
Settler CL	55	3966	3798	104	**
Wesley	72	3763	3897	97	**

\*\* Significantly different at the P=0.01 probability level.

Table 2. Grain yield, grain volume weight, grain protein content, and plant height for western Nebraska from 2009 to 2013 representing 20 location-years of data from rainfed environments.

		<b>Grain Yield (kg/ha)</b>	<b>Grain Volume Weight (kg/hl)</b>	<b>Grain Protein (%)</b>	<b>Plant Height (cm)</b>
Husker Genetics	Robidoux	3709	76.6	10.8	74.9
Husker Genetics	Settler CL	3595	76.3	11.3	73.9
WESTBRED	Winterhawk	3575	77.0	11.0	74.2
----	<b>NE05548</b>	<b>3527</b>	<b>75.3</b>	<b>11.6</b>	<b>80.3</b>
Husker Genetics	Overland	3480	76.2	11.1	76.2
Husker Genetics	McGill	3480	75.6	11.0	75.7
PlainsGold	Hatcher	3474	76.2	11.0	70.1
----	Alliance	3467	75.6	10.9	75.2
----	NW03666 (W)	3400	76.1	11.2	73.9
----	Goodstreak	3393	76.9	11.2	82.8
----	Infinity CL	3393	76.7	11.3	76.5
NuPride	Camelot	3386	76.1	11.4	75.7
----	NE05496	3386	76.0	11.1	72.9
----	Arrowsmith (W)	3306	75.6	11.5	80.3
----	Wesley	3245	75.3	11.5	70.1
----	Pronghorn	3165	77.0	11.5	84.3
----	Buckskin	3111	76.6	11.3	85.3
----	Millennium	3104	73.9	11.4	77.0
----	Scout 66	2795	76.3	11.6	85.3
----	Mace	2721	72.5	11.5	67.8
----	Turkey	2674	75.7	11.8	84.6
<b>Mean†</b>		<b>3304</b>	<b>75.9</b>	<b>11</b>	<b>77.0</b>
<b>LSD ‡ (p&lt;0.05)</b>		<b>269</b>	<b>2.0</b>	<b>0.5</b>	<b>4.3</b>

† 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 L.S.D. (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 trial including many experimental lines not shown in the table.

Table 3. Comparison of NE05548 to Wesley from 2006 to 2012 (2008 excluded due to limited grain) for flour yield, bran score, mill type scores, mill type scores, flour protein content, ash content, Mixograph water absorption (water abs.), Mixograph mixing time (MTime), Mixograph tolerance (MTol.), loaf volume, and external appearance (Ext. score), crumb grain score, crumb texture score, and overall baking score (Overall) as determined by the Wheat Quality Laboratory at the University of Nebraska (Baenziger et al., 2001). All reported values were measured at a 140 g H<sub>2</sub>O 1000 g<sup>-1</sup> flour basis.

Line	Year	Milling			Protein in Flour, %	Flour Ash%	Mixograph (14%amb)			Baking (14%mb)				
		Flour Yield, %	Bran Score†	Mill Type Score‡			Water Abs, %	Mtime, min	MTol.‡	Loaf Vol. mL	Ext. Score§	Crumb Grain Score§	Crumb Texture Score§	Overall§
<b>NE05548</b>	2006	73.2	3.5	3.5	13.6	0.430	60.0	3.55	5.0	800	4.0	4.0	4.0	4.0
	2007	74.8	3.5	4.0	13.5	0.450	60.0	2.80	4.0	765	3.0	3.3	3.0	3.1
	2009	75.6	3.5	3.5	13.7	0.420	60.0	2.43	2.5	773	3.5	3.3	3.3	3.3
	2010	74.7	3.0	3.0	9.8	0.410	61.5	4.38	4.4	870	4.0	3.5	3.3	3.6
	2011	76.9	3.5	4.5	11.2	0.450	63.5	3.88	3.8	828	4.3	4.0	4.0	4.1
	2012	73.1	3.5	4.5	13.3	0.410	66.0	5.26	4.8	893	5.0	4.0	4.3	4.4
<b>Mean</b>		<b>74.7</b>	<b>3.4</b>	<b>3.8</b>	<b>12.5</b>	<b>0.428</b>	<b>61.8</b>	<b>3.7</b>	<b>4.1</b>	<b>822</b>	<b>4.0</b>	<b>3.7</b>	<b>3.7</b>	<b>3.8</b>
<b>WESLEY</b>	2006	72.9	3.5	4.0	12.7	0.430	60.0	4.95	5.0	903	4.5	5.0	5.0	5.0
	2007	73.3	3.5	2.5	13.9	0.430	60.0	3.55	4.3	800	4.0	4.8	5.0	4.8
	2009	75.1	3.5	3.5	13.3	0.410	60.0	3.02	3.5	860	4.8	4.5	4.5	4.6
	2010	74.1	3.5	4.5	10.7	0.400	62.3	4.93	4.9	870	4.3	4.3	4.5	4.3
	2011	75.1	3.5	4.5	11.5	0.460	63.5	4.01	4.6	835	4.3	3.4	3.6	3.8
	<b>2012</b>	73.4	4.0	4.5	12.3	0.390	64.0	5.85	5.4	775	3.8	3.8	3.8	3.8
<b>Mean</b>		<b>74.0</b>	<b>3.6</b>	<b>3.9</b>	<b>12.4</b>	<b>0.420</b>	<b>61.6</b>	<b>4.4</b>	<b>4.6</b>	<b>841</b>	<b>4.3</b>	<b>4.3</b>	<b>4.4</b>	<b>4.4</b>
<b>LSD*</b>		1.66	0.3	1.0	1.9	0.03	3.0	1.4	1.1	67	0.7	0.7	0.8	0.7

† Scores use a 1 to 5 scale with 5 being very good and 1 being very poor

‡ Scores use a 0 to 7 scale with 7 being very tolerant.

§ Scores use a 0 to 6 scale with 6 being excellent

\* Least significant difference (p=0.05) for the mean values of NE05548 and Wesley