NEBRASKA AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF NEBRASKA-LINCOLN
DEPARTMENT OF AGRONOMY AND HORTICULTURE

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

WYOMING AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF WYOMING
PLANT SCIENCE DEPARTMENT

and

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

RELEASE OF NH03614 CL HARD RED WINTER WHEAT

NH03614 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 2008 by the developing institutions and the South Dakota Agricultural Experiment Station and the Wyoming Agricultural Experiment Station. NH03614 CL contains a patented gene owned by BASF. BASF retains ownership of the gene. NH03614 CL was released primarily for its herbicide resistance and superior adaptation to rainfed wheat production systems in Nebraska, Wyoming, and South Dakota, and wheat producing counties in adjacent states. NH03614 CL 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-1*H*-imidazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid) BASF Corp., Triangle Park, NC).

NH03614 will be marketed under the name Husker Genetics Brand Settler CL. NH03614 was selected from the cross Wesley sib//Millennium sib/Above sib. The cross between the Millennium sib (formerly NE94481) and the Above sib (TXGH125888-120*4/FS2) was made in the spring of 1997. The final cross to Wesley sib (formerly N95L164) was made in Fall, 1997. The F_1 generation was grown in the greenhouse in 1998 and the F_2 to F_3 generations were advanced using the bulk breeding method in the field at Mead, NE in 1999 to 2000. In both years, the bulks were sprayed with imidazolinone herbicide to select for the herbicide resistant segregants. In 2000, a single F_3-derived F_4 rows were planted for harvest and selection in 2001. In 2001 to 2002, the line was evaluated as a single plot in an observation nursery. In 2002 to 2003, the line was grown at six locations in Nebraska and given the designation of NH03614 where the H acknowledges its herbicide tolerance. There was no further selection thereafter.

NH03614 was evaluated in Nebraska replicated yield nurseries from 2004 to 2007 (Table 1), in Nebraska State Variety Trials in 2007 (Table 2) where is continues to be tested, and in the

Northern Regional Performance Nursery in 2006 and 2007 (Table 3).. As a Clearfield wheat, the line that is most important to compare it with is Infinity CL as both are herbicide tolerant. Based upon the Nebraska data (Table 1), NH03614 seems to be superior in western NE (e.g. yield data from North Platte, Sidney, and Alliance) to Infinity CL which is superior in eastern NE (e.g. data from Mead, Lincoln, and Clay Center). The Nebraska State Variety Trials in 2007 (Table 2) agreed with these results. Both lines would be considered broadly adapted and have been grown successfully throughout the state in rainfed conditions. NH03613 CL and Infinity CL were not grown together in the Northern Regional Performance Nursery, but NH03614 CL performed well there as can be seen by it being the 2nd (out of 30 lines) and 11th (out of 32 lines) in the 2006 and 2007 trials, respectively. In both years, it was not statistically different from the highest yielding line in the trial. Of the 10 lines tested in both 2006 and 2007, NH03614 (4159 kg ha^{-1}) was second only to NW03681 (4171 kg ha^{-1}) and compared favorably to the recently released AgriPro Hawken (4074 kg ha^{-1}) and the popular line Wesley (4069 kg ha^{-1}). As expected, it also outperformed the check cultivars; Harding (3765 kg ha^{-1}) and Nuplains (3434 kg ha^{-1}). Though NH03614 has excellent grain yield in rainfed environments, its grain yield (6187 kg ha^{-1}) in irrigated environments (tested in 3 environments) is slightly above the test average (6046 kg ha^{-1}).

Other measurements of performance from comparison trials show that NH03614 is moderately late in maturity (149.9 d after Jan.1, data from observations in NRPN) which is very similar to Wesley (149.7 after Jan. 1), about 1 d earlier flowering than 'Harding' (150.9 d after Jan. 1). NH03614 is a semi-dwarf wheat cultivar and contains *RhtB1b* (formerly *Rht1*, data provided by Dr. Guihua Bai). The mature plant height of NH03614 (73.7 cm) is 0.7 cm taller than Wesley and 9.6 cm shorter than Harding (Table 2). Using data from the 2007 Nebraska State Variety Trials in locations where lodging occurred, NH03614 has moderate straw strength (24% lodged), which is superior to Infinity CL (39%) and less than Wesley (19%). The winter hardiness of NH03614 is good to very good and comparable to other winter wheat cultivars adapted and commonly grown in Nebraska.

NH03614 is moderately resistant 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) and to wheat soilborne mosaic virus. In greenhouse tests, it is moderately resistant to races QFCS, MCCF, RKQQ, and has a heterogeneous reactions (e.g. some plants are resistant and others are susceptible) to races TPMK, TTTT, and TTKS (data provided by Y. Jin at the USDA Cereal Disease Laboratory). NH03614 is moderately resistant to moderately susceptible to Hessian fly (*Mayetiola destructor* Say, data provided by Ming-Shun Chen, USDA and Kansas State University). It is moderately susceptible to leaf rust (caused by *P. triticina* Eriks), stripe rust (caused by *P. striiformis* Westendorp f. sp. t*ritici,* data obtained from field observations in the Great Plains). NH03614 is slightly less susceptible to *Fusarium* head blight (caused by *Fusarium graminearum* Schwabe) than many widely grown lines, based on disease severity ratings obtained from misted screening nurseries in Nebraska and South Dakota,. It is susceptible to wheat streak mosaic virus (data obtained from the Northern Regional Performance Nursery, 2006 and field observations in NE).

NH03614 is genetically high in grain volume weight (75.4 kg hl^{-1}), similar to Harding (75.2 kg hl^{-1}) and higher than Wesley (74.2 kg hl^{-1}) based upon 25 environments in the Northern Regional Performance Nursery. The milling and baking properties of NH03614 were determined for three years by the Nebraska Wheat Quality Laboratory. In these tests, Scout 66,

a good milling and baking wheat, was used as for comparison. The average wheat and flour protein content of NH03614 (141 and 115 g kg^{-1}) were similar to Scout 66 (150 and 130 g kg^{-1}) for the corresponding years. The slightly lower grain protein content was confirmed by the Nebraska cultivar performance trials where NH03614 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 NH03614 (725 g kg^{-1}) was lower than Scout 66 (739 g kg^{-1}). The flour ash content (4.5 g kg^{-1}) was higher than Scout 66 (4.1 g kg^{-1}). Dough mixing properties of NH03614 were strong (mixtime peak was 4.9 minutes and mixtime tolerance was scored as 4.2) which was stronger than Scout 66 (mixtime peak of 3.5 minutes and mixtime tolerance scored as 3.9). Average baking absorption (600 H_2O g kg^{-1}) was slightly lower than Scout 66 (610 H_2Og kg^{-1}) for the corresponding years. The average loaf volume of NH03614 (881 cm^3) was higher than Scout 66 (830 cm^3). The scores for the internal crumb grain and texture ranged from fair to good plus, which was slightly better than Scout 66 which ranged from fair to good). The overall end-use quality characteristics for NH03614 are acceptable and similar to many commonly grown wheat cultivars which are well received by to the milling and baking industries.

In positioning NH03614, based on performance data to date, it should be well adapted to most rainfed wheat production systems in Nebraska, Wyoming, 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, NH03614 should provide growers with an additional choice to Infinity CL for their production systems. Because NH03614 and Infinity CL have similar parentage, they would be considered non-complementary. Both are complementary to 2137, Alliance, Buckskin, Goodstreak, and Pronghorn. It is non-complementary to Windstar, Above, Agripro 502 CL, TAM 110, Arapahoe, and Millennium.

NH03614 is an awned, ivory-glumed cultivar. The flag leaf is erect and twisted at the boot stage. The foliage is gray-green to green with a moderate waxy bloom on the leaves, leaf sheath and spike at anthesis. The leaves are glaborous, though a few plants have very few and very short hairs. The spike is tapering in shape, narrow, mid-long, and middense. The glume is long and narrow to midwide, and the glume shoulder is wide and elevated. The beak is medium in length with an acuminate tip. Kernels are red colored, hard textured, and mainly oval in shape. The kernel has no collar, a large brush of medium length, rounded cheeks, midsized germ, and a narrow and shallow crease.

NH03614 has been uniform and stable since 2006. Less than 1 % of the plants were rogued from the Breeder's seed increase in 2004. The rogued variant plants were taller in height (8 - 15 cm) or darker or black chaff which may be due to disease. Up to 2% (0:1000) 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 or marketing groups that hold a marketing license from BASF in 2008. 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. NH03614 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, NH03614 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 Dr. P. S. Baenziger, Department of Agronomy and Horticulture, University of Nebraska-Lincoln for all seed requests; no seed will be distributed without written permission from both BASF and the University of Nebraska for at least 20 years from the date of this release. The corresponding author will forward the request for seed to BASF Corporation. 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 2008. The U.S. Department of Agriculture will not have seed for distribution. The seed classes will be Breeder, Foundation, Registered, and Certified. A research and development fee will be assessed on all certified seed sales. NH03614 was developed with partial financial support from the Nebraska Wheat Development, Utilization, and Marketing Board and BASF Corporation.

Development team: P. S. Baenziger (breeder-inventor), R. A. Graybosch, A. Ibrahim, D. D. Baltensperger, R. N. Klein, L. A. Nelson, J. Krall, Y. Jin, Stephen Wegulo, Ming-Shun Chen, Guihua Bai, Lan Xu, D. Lyon, and M. L. Bernards.

Approval

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Director, Nebraska Agricultural Experiment Station — date

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Director, South Dakota Agricultural Experiment Station — date

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Director, Wyoming Agricultural Experiment Station — date

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

Table 1. Mean grain yield, in rainfed production systems in the Nebraska Intrastate Nursery grown at Mead, Lincoln, Clay Center, North Platte, Sidney and Alliance, NE 0from 2005 to 2007 (16 environments) for the lines that were in common all three years. The number in parentheses under the location is the number of years when trials were harvested.

Year Tested	Line	Mead	Lincoln	Clay Center.	N. Platte	Sidney	Alliance	**St.Avg.**
		kg/ha						
		(3)	(3)	(2)	(3)	(2)	(3)	**(16)**
2005-7	ALLIANCE	4170	4593	4641	3663	3614	4082	**4002**
2005-7	CHEYENNE	3306	4009	3989	2897	3175	3680	**3390**
2005-7	GOODSTREAK	4546	4661	5581	3846	3742	4183	**4249**
2005-7	Hallam	4397	5003	4647	3381	3346	3978	**4062**
2005-7	HARRY	4190	4924	3961	2763	3047	4170	**3817**
2005-7	Infinity CL	4931	5061	4990	3493	3591	4001	**4262**
2005-7	MILLENNIUM	4663	4864	5076	3261	3440	3868	**4121**
2005-7	NE01481	4987	5467	5012	3558	3521	3762	**4323**
2005-7	NE01604	4747	4979	5161	3909	3695	3932	**4257**
2005-7	NE01643	5139	5169	5782	3668	3888	3851	**4474**
2005-7	NE02513	4504	4671	5616	3578	3469	3670	**4124**
2005-7	NE02533	4575	4842	5423	3504	3788	4136	**4261**
2005-7	NE02558	4389	4907	5333	4181	3698	4148	**4306**
2005-7	NE02584	4812	4772	5650	3746	3590	3847	**4292**
2005-7	NE03457	4001	4346	4876	3182	3973	3921	**3917**
2005-7	NE03458	4234	4964	4111	3372	3809	4183	**3986**
2005-7	NE03488	4426	5006	5117	3261	3533	3771	**4089**
2005-7	NE03490	4299	5189	4850	3791	3481	4118	**4203**
2005-7	NH03614	4538	5055	4431	3767	3620	4113	**4299**
2005-7	NI03427	4649	4922	4410	3344	3366	3647	**4113**
2005-7	NW03654	4691	4755	4314	3780	3736	4150	**4270**
2005-7	NW03666	4718	4796	4337	3622	3288	3888	**4176**
2005-7	NW03670	4031	4719	4191	3333	3821	3924	**4017**
2005-7	NW03681	4547	4786	4377	3787	3714	3581	**4158**
2005-7	SCOUT66	3458	3766	2607	2671	2988	3209	**3131**
2005-7	WAHOO	4412	4725	3824	3652	3714	4165	**4104**
2005-7	WESLEY	4367	4711	3987	3546	2043	3289	**3779**
2005-7	**Average**	**4434**	**4802**	**4678**	**3502**	**3507**	**3899**	**4081**

Table 2. Mean grain yield, grain volume weight, plant height, lodging, and grain protein content in rainfed production systems in southeast (3 environments), southcentral (1 environments), west central (4 environments) and western (5 environments); irrigated environments in western (3 environments) NE and eastern WY; and one irrigated environments in Northern Nebraska in 2007. Also included are the mean grain yield, grain volume weight, plant height, lodging, and grain protein content averaged by region for the 13 rainfed environments.

		Southeast Nebraska				
		Grain Yield (kg/ha)	Grain Volume Weight (kg/hl)	Plant Height (cm)	Lodging (%)	Grain Protein (%)
----	2137	4439	75.7	76.2		11.5
----	Antelope(W)	3632	72.2	81.3		12.0
----	Arapahoe	4909	75.3	94.0		12.3
AGRIPRO	Hawken	4237	75.4	71.1		12.2
----	Infinity CL	4708	73.2	88.9		11.8
AGRIPRO	Jagalene	3026	71.3	78.7		11.7
----	Millennium	4977	75.2	91.4		12.0
----	N02Y5117	3632	72.0	76.2		12.0
----	NE01481	4909	73.7	91.4		11.2
----	NE01604	4640	73.9	83.8		12.3
----	NE02584	4506	76.7	76.2		11.9
----	NH03614	4371	74.8	78.7		11.4
----	NI04420	4371	75.1	86.4		12.0
----	NI04421	4035	71.2	81.3		11.9
----	Nuplains (W)	3295	72.1	81.3		11.5
----	NW98S097(W)	3363	72.5	81.3		12.5
Husker Genetics	Overland (NE01643)	5246	75.1	86.4		12.0
AGRIPRO	PostRock	4237	75.2	76.2		12.5
----	Scout66	2959	72.1	96.5		12.2
WESTBRED	Smokey Hill	4506	71.3	78.7		11.6
----	Turkey	3564	74.7	109.2		12.5
----	Wahoo	4708	72.8	88.9		11.5
----	Wesley	4237	71.6	78.7		11.8
Average all entries*		4174	73.7	82.4		11.9
LSD .05**		200	0.7	5.1		0.2

		South Central				
		Grain Yield (kg/ha)	Grain Volume Weight (kg/hl)	Plant Height (cm)	Lodging (%)	Grain Protein (%)
----	2137	3322	70.6	94.0	22	11.6
----	Antelope(W)	2495	66.5	88.9	41	13.1
----	Arapahoe	3208	68.3	96.5	36	12.9
AGRIPRO	Hawken	3302	65.3	78.7	0	12.8
----	Infinity CL	2946	67.0	91.4	40	11.9
AGRIPRO	Jagalene	2165	64.2	83.8	38	12.2
----	Millennium	3235	68.8	101.6	14	12.4
----	N02Y5117	2461	69.2	83.8	30	13.0
----	NE01481	2717	65.7	96.5	40	11.9
----	NE01604	2946	65.7	94.0	11	12.8
----	NE02584	3114	69.3	83.8	9	12.3
----	NH03614	3255	69.5	86.4	27	11.7
----	NI04420	3147	68.8	91.4	32	12.4
----	NI04421	2401	64.1	88.9	23	12.9
----	Nuplains (W)	1701	64.3	91.4	14	12.5
----	NW98S097(W)	3255	65.3	83.8	0	12.9
Husker Genetics	Overland (NE01643)	3336	68.0	96.5	13	12.4
AGRIPRO	PostRock	3302	68.7	81.3	22	12.8
----	Scout66	2038	68.0	96.5	88	12.7
WESTBRED	Smokey Hill	2724	61.6	94.0	34	12.3
----	Turkey	1970	68.7	111.8	87	13.5
----	Wahoo	2670	65.8	96.5	27	12.7
----	Wesley	2999	64.3	86.4	14	12.2
Average all entries*		2939	67.1	88.9	27.8	12.5
LSD .05**		787	3.2	7.6		0.7

		West Central				
		Grain Yield (kg/ha)	Grain Volume Weight (kg/hl)	Plant Height (cm)	Lodging (%)	Grain Protein (%)
----	2137	4640	72.8	91.4	24	11.3
----	Antelope(W)	4035	72.3	88.9	24	11.8
----	Arapahoe	4237	72.5	101.6	23	12.1
AGRIPRO	Hawken	4573	72.6	81.3	21	12.0
----	Infinity CL	4439	73.2	96.5	24	11.8
AGRIPRO	Jagalene	3766	71.5	88.9	25	11.6
----	Millennium	4506	73.9	101.6	18	12.0
----	N02Y5117	4035	71.5	86.4	24	12.0
----	NE01481	4439	70.5	96.5	25	11.5
----	NE01604	4842	72.2	99.1	24	12.0
----	NE02584	4439	75.1	86.4	24	12.0
----	NH03614	4842	72.9	88.9	22	11.5
----	NI04420	4775	73.7	94.0	25	11.6
----	NI04421	4371	70.5	94.0	24	11.8
----	Nuplains (W)	3363	71.7	86.4	20	11.8
----	NW98S097(W)	4237	72.5	88.9	13	12.1
Husker Genetics	Overland (NE01643)	4708	73.7	96.5	22	11.9
AGRIPRO	PostRock	4708	74.3	83.8	24	11.8
----	Pronghorn	4035	74.7	106.7	35	11.7
----	Ripper	3766	68.0	88.9	24	12.3
----	Scout66	3564	73.4	111.8	38	12.1
WESTBRED	Smokey Hill	4573	71.2	88.9	22	12.2
----	Wahoo	4439	70.3	96.5	24	11.9
----	Wesley	4573	71.7	83.8	23	11.6
Average all entries*		4349	72.3	92.9	23.4	11.8
LSD .05**		165	0.6	1.3	2.9	0.1

		Western			
		Grain Yield (kg/ha)	Grain Volume Weight (kg/hl)	Plant Height (cm)	Lodging (%)	Grain Protein (%)
----	2137	3497	73.4	71.1		11.1
----	Antelope(W)	3295	74.7	73.7		11.7
----	Arapahoe	3363	73.1	78.7		12.2
AGRIPRO	Hawken	3430	74.3	66.0		11.3
----	Infinity CL	3564	73.4	78.7		12.0
AGRIPRO	Jagalene	3497	75.9	71.1		11.7
----	Millennium	3295	74.4	78.7		12.0
----	N02Y5117	3161	69.7	68.6		11.9
----	NE01481	3363	73.2	78.7		11.3
----	NE01604	3632	73.7	81.3		12.0
----	NE02584	3699	77.1	73.7		11.8
----	NH03614	3766	74.1	71.1		11.4
----	NI04420	3833	75.2	76.2		11.8
----	NI04421	3766	73.6	73.7		10.9
----	Nuplains (W)	3094	76.2	68.6		12.9
----	NW98S097(W)	3295	74.3	73.7		11.8
Husker Genetics	Overland (NE01643)	3564	74.8	76.2		11.7
AGRIPRO	PostRock	3430	75.1	71.1		11.8
----	Pronghorn	3497	75.9	86.4		11.6
----	Ripper	3632	74.2	68.6		11.4
----	RonL	3497	74.4	66.0		11.3
----	Scout66	3161	74.8	91.4		11.6
WESTBRED	Smokey Hill	3497	74.4	71.1		12.1
----	Turkey	2825	73.9	88.9		12.5
----	Wahoo	3564	73.1	76.2		11.4
----	Wesley	3363	72.2	71.1		12.1
Average all entries*		3357	72.5	73.4		11.5
LSD .05**		82	0.9	0.9		0.2

Western Irrigated

		Grain Yield (kg/ha)	Grain Volume Weight (kg/hl)	Plant Height (cm)	Lodging (%)	Grain Protein (%)
----	2137	5649	75.2	78.7	0	10.8
----	Antelope(W)	5851	75.4	83.8	0	10.8
AGRIPRO	Hawken	6120	75.8	73.7	0	10.9
AGRIPRO	Jagalene	5851	75.7	78.7	0	10.8
----	Millennium	5851	75.6	91.4	1	10.6
----	N02Y5117	5784	74.1	81.3	1	10.8
----	NE01481	6120	74.3	88.9	2	9.9
----	NE01604	6456	74.9	88.9	1	11.0
----	NE02584	6254	76.8	76.2	1	10.8
----	NH03614	6187	75.1	81.3	1	10.8
----	NI04420	6053	76.2	83.8	0	10.4
----	NI04421	6591	75.3	81.3	2	10.1
----	Nuplains (W)	5582	76.3	81.3	1	10.5
----	Nuplains (W)	4008	76.3	81.3		13.5
----	NW98S097(W)	5918	76.1	81.3	0	10.4
Husker Genetics	Overland (NE01643)	6187	74.8	88.9	0	10.3
AGRIPRO	PostRock	5380	74.6	78.7	1	11.4
----	RonL	6120	74.6	76.2	0	9.9
----	Wesley	6053	74.6	76.2	0	10.8
Average all entries*		6048	75.3	81.4	0.6	10.6
LSD .05**		224	0.5	1.4	0.5	0.2

Northern Irrigated

		Grain Yield (kg/ha)	Grain Volume Weight (kg/hl)	Plant Height (cm)	Lodging (%)	Grain Protein (%)
----	2137	4855	76.4	83.8		12.3
----	Antelope(W)	4963	77.3	83.8		13.0
AGRIPRO	Hawken	4721	76.8	73.7		13.3
AGRIPRO	Jagalene	4465	76.2	81.3		12.8
----	Millennium	4896	77.2	96.5		13.3
----	N02Y5117	4580	76.1	78.7		13.2
----	NE01604	5279	76.9	86.4		13.4
----	NE02584	4768	78.6	78.7		12.8
----	NH03614	5044	76.9	81.3		12.3
----	NI04420	4862	77.6	88.9		13.6
----	NI04421	4694	75.8	83.8		12.8
----	NW98S097(W)	4674	77.7	83.8		13.6
Husker Genetics	Overland (NE01643)	5266	77.3	88.9		13.4
AGRIPRO	PostRock	4943	77.8	78.7		13.9
----	RonL	4909	75.2	73.7		13.5
----	Wesley	5252	75.8	81.3		13.8
Average all entries*		4822	76.8	81.3		13.1
LSD .05**		545	1.4	5.1		N.S.

			----------Rainfed Environments----------				
			Grain Yield (kg/ha)	Grain Volume Weight (kg/hl)	Plant Height (cm)	Lodging (%)	Grain Protein (%)
----		2137	3974	73.1	83.2	23	11.4
----	Antelope(W)		3364	71.4	83.2	32	12.2
----	Arapahoe		3929	72.3	92.7	30	12.4
AGRIPRO	Hawken		3885	71.9	74.3	11	12.1
----	Infinity CL		3914	71.7	88.9	32	11.9
AGRIPRO	Jagalene		3114	70.7	80.6	32	11.8
----	Millennium		4003	73.1	93.3	16	12.1
----	N02Y5117		3322	70.6	78.7	27	12.2
----	NE01481		3857	70.8	90.8	33	11.5
----	NE01604		4015	71.4	89.5	18	12.3
----	NE02584		3939	74.5	80.0	16	12.0
----	NH03614		4059	72.8	81.3	24	11.5
----	NI04420		4032	73.2	87.0	28	12.0
----	NI04421		3643	69.8	84.5	23	11.9
----	Nuplains (W)		2863	71.1	81.9	17	12.2
----	NW98S097(W)		3537	71.1	81.9	7	12.3
Husker Genetics	Overland (NE01643)		4213	72.9	88.9	17	12.0
AGRIPRO	PostRock		3919	73.3	78.1	23	12.2
----	Scout66		2930	72.1	99.1	63	12.2
WESTBRED	Smokey Hill		3825	69.6	83.2	28	12.1
----	Wahoo		3845	70.5	89.5	26	11.9
----	Wesley		3793	70.0	80.0	19	11.9

* 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 trial including many experimental lines not shown in the table.

Table 3. Mean grain yield, grain volume weight, days to flower, and plant height in rainfed production systems in the Northern Regional Performance Nursery in 2006 (14 environments) and 2007 (11 environments) and over both years for those 10 lines in common in each year.

Year	Line/selection	Grain Yield (kg/ha) mean	Grain Volume Weight (kg/hl) mean	Days to Flowering after Jan. 1 (d) mean	Plant Height (cm) mean
2006	Harding	4239	75	154.2	89.7
2006	Hawken	4638	76.1	150.5	73.5
2006	Kharkof	3201	75.9	155.3	104.5
2006	**NH03614**	**4740**	**76**	**151.7**	**76.3**
2006	Nuplains	4018	76.3	154.4	76.5
2006	NW03681	4608	77.3	151.7	79.5
2006	SD96240-3-1	4350	74.1	152.7	80.7
2006	SD98W175-1	4650	76.9	152.5	81.1
2006	Wesley	4628	74.9	151.2	73.4
	Mean*	**4311**	**75.6**	**152.3**	**81.6**
	c.v.	10.8			
	l.s.d. (0.05)**	344			

Year	Line/selection	Grain Yield (kg/ha)	Grain Volume Weight (kg/hl)	Day to Flowering after Jan. 1 (d)	Plant Height (cm)
2007	Harding	3292	75.4	150.9	76.9
2007	Hawken	3511	74.8	147.4	70.6
2007	Kharkof	2613	75.7	151.6	81.6
2007	**NH03614**	**3577**	**74.8**	**148**	**71**
2007	Nuplains	2849	74.4	150.6	72
2007	NW03681	3736	76	148	70.2
2007	SD96240-3-1	3240	72.4	150.8	69.6
2007	SD98W175-1	3143	76.2	149.7	74.3
2007	Wesley	3509	73.6	148.2	72.6
	Mean*	**3274**	**74.8**	**149.5**	**73.2**
	cv (%)	15.2			
	l.s.d. (0.05)**	410			

Year	Line/selection	Grain Yield (kg/ha)	Grain Volume Weight (kg/hl)	Days to Flowering after Jan. 1 (d)	Plant Height (cm)
2006-2007	Harding	3765	75.2	152.6	83.3
2006-2007	Hawken	4074	75.4	149	72.1
2006-2007	Kharkof	2907	75.8	153.4	93.1
2006-2007	NE03458	3919	74.3	149.8	71.8
2006-2007	**NH03614**	**4159**	**75.4**	**149.9**	**73.7**
2006-2007	Nuplains	3434	75.3	152.5	74.2
2006-2007	NW03681	4172	76.7	149.8	74.8
2006-2007	SD96240-3-1	3795	73.3	151.7	75.1
2006-2007	SD98W175-1	3897	76.5	151.1	77.7
2006-2007	Wesley	4069	74.2	149.7	73
	Mean*	**3793**	**75.2**	**150.9**	**77.4**

* 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 trial including many experimental lines not shown in the table.