



Phil L. Bruckner, Associate Professor
Department of Plant Sciences & Plant Pathology
Montana State University
Bozeman, MT 59715-3140
bruckner@montana.edu
PHONE 406-994-5127. FAX 406-994-1848

MEMORANDUM

TO: Wheat Cultivar Release & Recommendation Committee

FROM: Phil Bruckner, Winter wheat breeder

DATE: January 8, 2002

RE: Proposals for HRWW cultivar

The following motions and supporting documentation are presented for consideration at the 2002 Cultivar Release and Recommendation Meeting in Bozeman:

MT9426

Motion: That MT9426 hard red winter wheat (HRWW) be approved for release in 2003.

Motion: That MT9426 be named **Paul**, in honor of the late Paul L. Brown.

Motion: That **Paul** be recommended for dryland production in all Montana cropping districts.

Pedigree: MT8030/Neeley

Type of release: Public, with PVP, Title 5 option.

Potential names: 'Paul' in honor of Paul L. Brown's long-term contributions to Montana dryland agriculture.

Selection history: MT9426 originated from a cross made in 1985. F₂, F₃, and F₄ generations were grown in Bozeman from 1987 to 1989. MT9426 was selected and bulked in 1990 as an F₄-derived F₅ headrow by Dr. Gene Hockett. The line was selected from the 1992 Winterhardiness Observation Nursery grown at Bozeman, Sidney, and Moccasin and the 1993 Winterhardiness Increase nursery grown at Huntley. MT9426 was grown in the 1994 Preliminary Nursery and the Advanced Nursery from 1995 to 1998. MT9426 was tested in the Montana Intrastate Nursery since 1999 and in the Montana Off-station Nursery since 2000. Quality has been evaluated in multi-location Montana trials since 1994 and in the 2001 PNW Crop Quality Council evaluation.

Purification/seed stocks: MT9426 purification was initiated in 2000, when 150 headrows were evaluated for uniformity at Bozeman. Line rows (89) were grown in Bozeman in 2001 and further evaluated for phenotypic uniformity. Sixty-five line rows were selected and harvested in bulk by plot combine as breeder seed. A 0.5 acre breeder seed increase was planted fall, 2001 at the Post farm in Bozeman. Foundation seed increase is proposed for the 2002-2003 cropping season.

Description: MT9426 is a high-yielding, medium to late-maturity HRW wheat line with good winter hardiness, medium grain protein, and excellent bread-baking quality. Yield potential is equal to or superior to high-yielding cultivars Neeley and Judith. Maturity of MT9426 is similar to Neeley. Winterhardiness of MT9426 appears to be

superior to both Judith and Neeley. Baking quality is similar to the excellent quality of Judith. MT9426 is shorter than Neeley and Judith. Coleoptile length of MT9426 is medium to short.

Characteristics/comparisons:

Performance of MT9426 in relation to check cultivars is described in summaries of three data sets (attached). Data set 1 (Tables 1-10) consists of data from the 1999-2001 Intrastate and 2000-2001 Off-station nurseries (42 site-years) and is a balanced analysis for MT9426 and seven check cultivars (Judith not included in analysis). Data set 2 (Tables 11-12) consists of data from the 1994 and 1995-1998 Advanced nurseries (29 site-years) and compares MT9426 to Neeley and Judith. Data set 3 (Tables 13-14) combines data from both data sets 1 and 2, comparing MT9426, Neeley, and Judith over the 1994 to 2001 period (71 site-years).

Yield. In 42 location-years (LY) of testing in the Montana Winter Wheat Intrastate and Off-station nurseries, average yield of MT9426 was similar to Neeley, but superior to yields of Tiber, Bighorn, NuSky, BigSky, Morgan, and Rampart (Table 1). Other analyses (Tables 11, 14) indicate MT9426 has very high yield potential, statistically equivalent to Neeley and Judith. Yield performance of MT9426 is equivalent to Neeley in cropping districts 1, 2, 3, and 6, and superior to Neeley in cropping districts 4 and 5 (Table 13). Yield performance of MT9426 is statistically similar to Judith in all cropping districts (Table 13).

Test weight. Test weight of MT9426 is relatively low. Based on all data (Table 14, 70 LY), test weight of MT9426 (59.8 lb/bu) is statistically lower than that of Neeley (60.6 lb/bu) but greater than that of Judith (59.5 lb/bu). **I believe low test weight is MT9426's greatest weakness.**

Winter survival. Based on survival in 13 environments where differential winter survival occurred, MT9426 exhibits superior survival to Judith and Neeley (Table 14). MT9426 has also performed very well at Sidney and Williston from 1999 to 2000, although cold stress has been moderate (Tables 4, 5).

MT9426 is of **medium to late maturity** heading about 2 days later than Judith, and slightly earlier (~1 day) than Neeley and Tiber (Tables 1, 11, 14).

Plant height and straw strength. MT9426 is relatively short, averaging 27 inches (Table 1, 40 LY). This is slightly taller than Bighorn but 2 to 4 inches shorter than remaining check cultivars. Straw strength is average and similar to that of Neeley. MT9426 lodged significantly in only 5 of the 71 trials (951401, 951408, 971405, 003505, 013880), each time at high yield potential.

Maximum **coleoptile length** of MT9426 is relatively short (3.2 inches), similar to Judith, Bighorn, and NuSky, and significantly shorter than Neeley, BigSky, Tiber, and Rampart (Table 1).

Grain protein content of MT9426 medium to low, similar to Neeley (Tables 1, 13, & 14) and somewhat lower than most currently recommended cultivars.

MT9426 is **resistant to stem rust** but susceptible to leaf and stripe rust (data not shown). MT9426 is also susceptible to wheat stem sawfly and Russian wheat aphid.

End-use quality. Based on experimental milling using a Brabender Automat Mill, flour yield of MT9426 is acceptable, with similar flour yield to that of Neeley (Tables 1, 11, 14). Flour ash content of MT9426 is relatively high. **Baking qualities** of MT9426 are within acceptable ranges with relatively high dough strength and mixing time and excellent loaf volume similar to Judith (Tables 11, 14). Loaf volume of MT9426 is superior to that of Neeley based on wheat from 27 environments (Table 14). Based on 2 years of **raw Chinese noodle evaluation** (8 LY),

MT9426 has poor potential for Asian noodle products (data not shown).

In summary, MT9426 is a winter-hardy, high-quality hard red winter wheat with yield potential similar to Judith and Neeley. Neeley has been the leading variety in Montana since 1988. MT9426, with improved winter hardiness and baking quality relative to Neeley, has potential to occupy some of the acreage currently planted to Neeley. Test weight of MT9426 is low but slightly higher than that of Judith.

DATASET 1 (Tables 1-10): Data from Intrastate (Exp. 35) and Off-station (Exp. 38) Nurseries.

Table 1. MT9426 Yield, agronomic, and end-use quality comparison, 1999-2001, ALL LOCATIONS.

Variety	Yield	Test weight	Winter survival	Heading date	Plant height	Lodging index	Coleoptile length	Protein	Flour yield	Ash	Mixo. abs.	Mixo. Mixo. time	Baking abs.	Baking mix time	Loaf volume	Crumb grain
Loc/yr	42	40	4	23	40	8	2	42	8	8	8	8	8	8	8	8
MT9426	59.9**	60.0	75.4*	162.0	27.0	0.9	80.6	13.3	66.0*	0.39	59.7	5.1	70.6	7.3	1008	3.0
Neeley	58.0*	60.3	72.6*	162.4	29.6	0.8	97.2	13.2	65.5*	0.34	60.8	3.9	71.7	6.4	968	3.4
Tiber	56.0	61.1*	74.8*	162.3	31.0	0.1	107.8	13.7	64.4	0.32**	61.7*	3.4	72.4*	6.4	986	3.5
Bighorn	55.2	60.9	62.7	161.1	25.7	0.4	86.2	13.7								
NuSky	55.1	60.7	76.9*	161.8	29.5	0.8	78.1	13.7	65.6*	0.35	61.2	4.0	72.0	5.6	966	3.0
BigSky	54.6	61.4**	77.1*	161.2	30.6	0.2	102.7	14.1	64.4	0.33*	62.5**	4.3	73.6*	6.6	996	3.3
Morgan	54.2	60.5	83.3**	163.1	29.8	0.8	65.1	13.6	64.4	0.37	60.6	3.5	70.7	4.9	986	2.9
Rampart	51.8	60.5	54.1	160.6	28.9	1.1	120.8**	14.5**	66.5**	0.35	62.4*	4.2	73.8**	8.0	1053**	3.3
LSD (0.05)	2.5	0.4	17.0	0.6	0.7	ns	7.4	0.3	1.3	0.02	1.3	0.5	1.7	1.4	44	ns
CV %	10.5	1.5	16.0	0.7	5.2	111.8	3.4	4.4	2.0	4.8	2.0	13.3	2.3	21.5	4.3	16.1

** = indicates highest yielding variety within a column
 * = indicates varieties yielding equal to highest yielding variety within a column based on Fisher's protected LSD (p=0.05)

Table 2. MT9426 Yield, agronomic, and end-use quality comparison, 1999-2001, BOZEMAN.

Variety	Yield	Test weight	Heading date	Plant height	Lodging index	Protein	Flour yield	Ash	Mixo. abs.	Mixo. Mixo. time	Baking abs.	Baking mix time	Loaf volume	Crumb grain
Loc/yr	4	4	3	3	1	4	2	2	2	2	2	2	2	2
MT9426	98.7	60.1	168.8	34.3	0.0	12.9	67.6	0.41	59.7	5.2	70.7	6.9	1050*	3.0
Neeley	96.6	60.9*	169.4	38.5	0.0	13.3	68.5	0.35*	61.2	3.6	71.1	5.9	1025	3.5
Morgan	92.8	60.4	170.4	37.5	0.0	13.6*	65.5	0.37	60.8	3.4	71.3	5.1	980	3.0
Tiber	91.6	61.7**	169.0	40.7	0.0	13.7*	66.4	0.32**	61.6	2.8	71.8	4.4	973	3.5
NuSky	90.9	60.7	168.8	37.6	0.3	13.5*	68.4	0.32*	61.7	3.9	72.4	6.1	992	3.0
Rampart	89.5	61.4*	166.9	37.4	0.3	13.9*	68.1	0.35*	63.0	4.1	73.2	7.9	1105**	3.5
Bighorn	88.2	60.3	167.7	33.4	0.0	13.5*								
BigSky	87.8	61.6*	168.5	38.3	0.0	14.1**	66.3	0.34*	62.6	3.5	73.3	6.0	1035	3.5
LSD (0.05)	ns	1.0	0.9	1.9	ns	0.7	ns	0.04	ns	ns	ns	ns	63	ns

Table 3. MT9426 Yield, agronomic, and end-use quality comparison, 1999-2001, HAVRE.

Variety	Yield	Test weight	Heading date	Plant height	Protein	Flour yield	Ash	Mixo. abs.	Mixo. Mixo. time	Baking abs.	Baking mix time	Loaf volume	Crumb grain
Loc/yr	5	5	2	5	5	2	2	2	2	2	2	2	2
Neeley	41.1	59.2	159.3	26.9	13.0	62.4	0.35	57.3*	3.7	69.0*	5.6	793	3.0
Tiber	40.3	60.1*	158.3	27.7	13.3	60.4	0.33*	59.7**	3.8	71.9**	7.6	925	3.5
MT9426	39.8	58.8	159.2	24.2	13.4	64.2	0.39	54.7	5.3	65.4	5.8	895	3.0
Bighorn	39.6	60.4*	158.1	23.7	13.5								
BigSky	38.0	60.5**	158.1	27.7	14.1	62.4	0.30**	59.0*	4.7	70.5*	7.0	885	3.0
Rampart	37.8	59.2	158.1	26.1	13.6	64.3	0.35	58.0*	4.3	70.0*	6.8	878	3.5
NuSky	37.4	59.9*	158.3	26.6	13.4	61.8	0.36	55.6	3.5	66.8	5.2	830	3.0
Morgan	36.9	59.3	159.5	26.7	13.4	61.6	0.36	56.5	3.4	66.2	4.7	863	3.0
LSD (0.05)	ns	1.0	ns	1.8	ns	ns	0.03	2.8	ns	3.1	ns	ns	ns

Table 4. MT9426 Yield, agronomic, and end-use quality comparison, 1999-2000, SIDNEY.

Variety	Yield	Test weight	Winter survival	Heading date	Plant height	Protein
Loc/yr	2	2	1	2	2	2
MT9426	74.9**	63.1	86.7	158.4	30.7	9.8
Morgan	70.9*	63.0	83.4	157.8	32.9	9.8
Neeley	67.7*	63.5	83.4	158.8	32.2	9.6
NuSky	64.2	62.7	84.8	158.9	33.0	11.7**
Bighorn	64.1	63.2	83.2	157.7	27.8	11.3*
Tiber	61.4	63.4	91.7	159.3	35.0	10.7*
BigSky	61.0	64.0	78.6	157.9	34.3	11.3*
Rampart	52.9	63.2	79.8	157.5	31.4	11.5*
LSD (0.05)	7.5	ns		ns	2.1	1.8

Table 5. MT9426 Yield, agronomic, and end-use quality comparison, 1999-2000, WILLISTON, ND.

Variety	Yield	Test weight	Winter survival	Heading date	Plant height	Protein
Loc/yrs	2	2	2	2	2	2
MT9426	72.1**	62.1*	60.1*	158.5	29.0	12.5
Neeley	69.4*	63.2*	58.2*	158.2	29.3	12.5
Tiber	63.4*	63.1*	60.4*	158.5	31.9	13.5
Morgan	63.0*	62.5*	80.1**	159.4	31.7	13.3
BigSky	62.9*	63.1*	69.4*	157.5	30.4	13.9
NuSky	62.5*	62.3*	66.5*	158.7	30.9	13.2
Bighorn	53.8	62.4*	39.6	158.7	26.2	13.8
Rampart	39.4	61.1	25.4	158.2	28.3	14.5
LSD (0.05)	17.4	1.2	26.3	ns	ns	ns

Table 6. MT9426 Yield, agronomic, and end-use quality comparison, 1999-2001, KALISPELL.

Variety	Yield	Test weight	Heading date	Plant height	Lodging index	Protein
Loc/yrs	4	4	3	3	2	4
MT9426	123.1**	62.3*	159.3	34.9	1.1	11.9
Neeley	116.0*	62.1	159.6	38.5	0.4	12.3
Tiber	111.0*	62.9*	160.4	41.9	0.0	13.3*
Bighorn	110.3	62.1	158.4	33.7	0.7	13.0*
NuSky	106.7	61.7	159.9	38.2	0.6	12.9
BigSky	106.5	63.2**	158.6	39.7	0.2	13.6*
Rampart	101.9	62.1	156.6	37.7	2.3	13.8**
Morgan	96.7	61.5	160.8	37.2	0.8	12.7
LSD (0.05)	12.2	1.0	2.2	1.3	ns	0.8

Table 7. MT9426 Yield, agronomic, and end-use quality comparison, 1999-2001, MOCCASIN.

Variety	Yield	Test weight	Winter survival	Heading date	Plant height	Lodging index	Protein	Flour yield	Ash	Mixo. abs.	Mixo. Mixo. time	Baking abs.	Baking mix time	Loaf volume	Crumb grain
Loc/yr	10	8	1	4	10	1	10	1	1	1	1	1	1	1	1
MT9426	35.1**	59.2	94.7	168.4	22.6	0.0	14.9	63.7	0.43	55.1	5.3	67.3	7.8	815	2.0
Neeley	34.4*	59.4	90.7	169.8	25.1	0.0	14.5	63.7	0.38	56.8	4.9	69.5	6.6	760	3.0
NuSky	34.3*	60.5*	89.7	168.2	24.8	0.3	15.3	63.6	0.43	59.2	5.4	70.9	7.5	805	3.0
Tiber	32.8*	60.4*	86.7	168.5	25.6	0.3	15.1	63.5	0.37	60.0	4.7	71.2	6.9	880	4.0
BigSky	32.7*	60.9**	91.0	167.5	26.0	0.7	15.6*	62.1	0.37	59.6	4.8	73.3	7.2	795	3.0
Bighorn	32.6*	60.3*	88.3	167.9	21.9	1.0	15.4*								
Morgan	31.3	59.8	89.7	170.6	25.3	1.0	15.5*	64.5	0.44	58.7	3.5	68.4	4.6	850	4.0
Rampart	30.4	59.9	85.7	167.8	25.4	0.0	15.8**	65.2	0.40	61.1	5.5	76.3	10.7	950	3.0
LSD (0.05)	2.9	0.9		1.5	1.4		0.5								

Table 8. MT9426 Yield, agronomic, and end-use quality comparison, 1999-2001, HUNTLEY.

Variety	Yield	Test weight	Heading date	Plant height	Lodging index	Protein	Flour yield	Ash	Mixo. abs.	Mixo. Mixo. time	Baking abs.	Baking mix time	Loaf volume	Crumb grain
Loc/yr	11	11	5	11	2	11	2	2	2	2	2	2	2	2
MT9426	59.1	59.8	157.9	27.4	1.7	12.9	66.1	0.38	66.0	5.0	76.5	9.6	1155	3.0
Tiber	58.5	61.0*	158.0	32.4	0.2	13.1	66.2	0.31**	64.7	3.7	74.7	8.6	1105	3.5
Bighorn	57.7	60.8	156.5	26.1	0.0	12.8								
Neeley	57.7	60.4	158.3	30.4	2.0	12.9	65.9	0.31*	65.5	4.4	75.5	8.8	1153	3.5
BigSky	56.9	61.7**	157.0	32.1	0.0	13.2	64.9	0.33*	66.9	4.9	77.4	8.1	1133	3.5
Morgan	56.4	61.0*	158.3	30.7	1.2	12.7	65.4	0.36	64.7	4.0	74.7	5.9	1150	2.0
NuSky	56.1	60.6	158.3	30.8	1.4	12.9	67.2	0.36	66.7	4.7	77.2	5.6	1115	3.0
Rampart	55.2	60.4	156.1	30.2	1.0	14.2**	67.3	0.34	65.8	4.3	76.3	9.4	1165	3.0
LSD (0.05)	ns	0.8	1.3	1.1	ns	0.6	ns	0.03	ns	ns	ns	ns	ns	ns

Table 9. MT9426 Yield, agronomic, and end-use quality comparison, 1999-2001, CONRAD.

Variety	Yield	Test weight	Heading date	Plant height	Protein	Flour yield	Ash	Mixo. abs.	Mixo. Mixo. time	Baking abs.	Baking mix time	Loaf volume	Crumb grain
Loc/ys	4	4	2	4	4	1	1	1	1	1	1	1	1
MT9426	33.4	58.8	163.0	25.8	14.6	68.5	0.36	62.0	4.5	72.2	5.7	1045	4.0
Morgan	33.1	58.6	165.0	28.5	14.9	65.7	0.36	62.1	2.6	72.3	3.3	1055	3.0
Bighorn	32.9	60.7	162.0	23.3	14.8								
Neeley	32.1	57.8	163.0	27.8	14.3	67.1	0.31	62.1	2.8	73.3	4.3	1050	4.0
BigSky	31.8	58.5	162.0	27.5	15.2*	66.1	0.32	63.5	3.3	73.2	3.9	1070	3.0
Rampart	31.6	59.8	161.0	23.5	15.6**	67.8	0.35	64.5	2.9	75.2	5.6	1185	3.0
NuSky	30.7	59.3	160.0	25.8	14.5	66.4	0.32	62.6	2.3	72.3	3.8	1050	3.0
Tiber	30.2	59.4	164.5	27.3	14.8	65.5	0.29	61.7	2.2	71.4	3.2	1005	3.0
LSD (0.05)	ns	ns	ns	2.9	0.6								

Table 10. MT9426 Yield, agronomic, and end-use quality comparison, 1999-2001, ALL LOCATIONS EXCEPT BOZEMAN & KALISPELL.

Variety	Yield	Test weight	Winter survival	Heading date	Plant height	Lodging index	Protein	Flour yield	Ash	Mixo. abs.	Mixo. Mixo. time	Baking abs.	Baking mix time	Loaf volume	Crumb grain
Loc/ys	35	33	4	17	34	3	35	6	6	6	6	6	6	6	6
MT9426	48.1**	59.7	75.4*	161.2	25.6	1.1	13.5	65.5*	0.39	59.8	5.1	70.5	7.4	993*	3.0
Neeley	46.8*	59.9	72.6*	161.7	28.1	1.3	13.3	64.6*	0.33*	60.7	4.0	71.9*	6.6	950	3.3
Tiber	45.8*	60.7*	74.8*	161.5	29.2	0.2	13.8	63.7	0.32**	61.8*	3.7	72.6*	7.1	991*	3.5
Bighorn	45.1	60.8*	62.7	160.4	24.3	0.3	13.9								
NuSky	45.0	60.5	76.9*	160.9	28.0	1.0	13.8	64.7*	0.36	61.1*	4.0	71.9*	5.5	957	3.0
Morgan	44.9	60.3	83.3**	162.2	28.5	1.1	13.7	64.0	0.37	60.5	3.5	70.5	4.8	988*	2.8
BigSky	44.8	61.1**	77.1*	160.3	29.1	0.2	14.2	63.8	0.33*	62.5**	4.5	73.7*	6.9	983*	3.2
Rampart	41.8	60.2	54.1	160.1	27.3	0.6	14.6**	66.0**	0.35	62.2*	4.3	74.0**	8.1	1036**	3.2
LSD (0.05)	2.5	0.5	17.0	0.8	0.7	ns	0.3	1.5	0.02	1.7	0.6	2.2	1.7	54	ns

DATASET 2 (Tables 11-12): Data from Advanced (Exp. 14) and Preliminary (Exp. 36) Nurseries.

Table 11. MT9426 Yield, agronomic, and end-use quality comparison, 1994-1998, ALL LOCATIONS.

Variety	Yield	Test weight	Winter survival	Heading date	Plant height	Lodging index	Protein	Flour yield	Ash	Mixo. abs.	Mixo. Mixo. time	Baking abs.	Baking mix time	Loaf volume	Crumb grain
Loc/yrs	29	29	6	28	27	6	25	19	19	19	19	19	19	19	8
MT9426	74.3	59.6	49.1	166.3	31.3	3.5	12.3	67.5	0.43	64.5	4.6	75.7	8.3	1061**	3.0
Neeley	73.9	60.9**	39.6	167.1	34.1	2.7	12.2	67.7	0.38**	64.1	3.9	75.2	7	1001	3.1
Judith	73.5	59.7	45.5	164.2	33.9	1.5	12.5	68.7**	0.39	65.2**	3.7	75.9	7.3	1054*	2.9
LSD (0.05)	ns	0.5	ns	0.9	0.7	ns	ns	0.7	0.01	0.7	0.4	ns	1.0	33	ns
CV %	8.2	1.7	14.9	1	4.1	58.7	3.3	1.5	5.4	1.6	14.5	2.4	19.7	4.9	22.6

** = indicates highest yielding variety within a column
 * = indicates varieties yielding equal to highest yielding variety within a column based on Fisher's protected LSD (p=0.05)

Table 12. MT9426 Yield, agronomic, and end-use quality comparison, 1994-1998, ALL LOCATIONS EXCEPT BOZEMAN & KALISPELL.

Variety	Yield	Test weight	Winter survival	Heading date	Plant height	Lodging index	Protein	Flour yield	Ash	Mixo. abs.	Mixo. Mixo. time	Baking abs.	Baking mix time	Loaf volume	Crumb grain
Loc/yrs	20	20	6	19	18	1	17	14	14	14	14	14	14	14	6
MT9426	62.3	59.3	49.1	166.4	28.7	6.1	12.6	67.0	0.43	64.1	4.7	75.5	8.7	1051**	2.8
Judith	61.5	59.4	45.4	164.6	31.0	0.0	12.8	68.3**	0.40*	64.9**	4.0	75.5	7.5	1039*	3.2
Neeley	59.5	60.7**	39.6	167.0	30.7	1.0	12.5	67.2	0.39**	63.9	4.1	75.0	7.1	1001	3.3
LSD (0.05)	ns	0.7	ns	1.1	0.8		ns	0.8	0.02	0.8	0.4	ns	1.3	37	ns
CV %	8.2	1.8	14.9	1	3.9		2.8	1.6	5.4	1.7	13.3	2.4	21.3	4.6	18.2

DATASET 3 (Tables 13-14): Data from Intrastate (1999-2001), Advanced (1995-98), Off-station (2000-1), and Preliminary (1994) Nurseries.

Table 13. MT9426 Yield, test weight, and grain protein by cropping district, 1994-2001. Williston, ND data included in district 6 analysis.

Variety	DISTRICT 1 (N=7)			DISTRICT 2 (N=9)			DISTRICT 3 (N=15)			DISTRICT 4 (N=14)			DISTRICT 5 (N=17)			DISTRICT 6 (N=9)		
	Yield	Test weight	Grain protein	Yield	Test weight	Grain protein	Yield	Test weight	Grain protein	Yield	Test weight	Grain protein	Yield	Test weight	Grain protein	Yield	Test weight	Grain protein
MT9426	112a	61.3a	11.3a	99a	60.3b	12.9a	63a	59.1b	13.2a	42a	59.4ab	14.1ab	52a	59.4a	13.2ab	63a	61.0b	11.6a
Judith	107a	60.3b	11.7a	98a	60.3b	13.1a	65a	58.9b	13.2a	40a	59.2b	14.2a	52a	59.3a	13.4a	59a	60.3c	12.1a
Neeley	111a	61.5a	11.4a	101a	61.5a	13.1a	63a	60.0a	13.1a	39b	60.1a	13.6b	50b	59.9a	13.0b	60a	61.7a	11.6a

Means within columns followed by the same letter do not differ at the 5% probability level based on LSD.

Table 14. MT9426 Yield, agronomic, and end-use quality comparison, 1994-2001, ALL LOCATIONS. Balanced analysis with respect to MT9426, Judith, and Neeley. Remaining cultivars not tested in all environments, Least square means presented for comparison only.

Variety	Yield	Test weight	Winter survival	Heading date	Plant height	Lodging index	Protein	Flour yield	Flour Ash	Baking abs.	Loaf volume
Loc/yrs	71	70	13	51	68	11	68	27	27	27	27
MT9426	65.7a	59.8b	65a	164b	28.8a	2.4a	13.0b	67.0b	0.41c	74.2a	1045a
Judith	64.4a	59.5c	59b	162a	31.6b	1.1a	13.2a	68.6a	0.38b	74.9a	1045a
Neeley	64.5a	60.6a	59b	165c	31.5b	1.9a	12.9b	67.1b	0.36a	74.1a	992b
LSMEANS											
BigSky	60.6	61.4	66	164	32.5	0.9	13.7	65.4	0.35	76.0	997
Morgan	60.3	60.5	70	166	31.6	3.2	13.2	65.5	0.39	73.3	1003
NuSky	60.7	60.7	68	164	31.7	1.9	13.3	67.5	0.37	74.2	967
NuWest	61.2	60.6	67	164	31.1	1.8	13.2	67	0.38	74.8	983
Tiber	62.1	61.1	61	165	32.8	0.8	13.4	65.5	0.34	75	1003
CV %	8.4	1.4	9.6	0.8	4.5	71.2	4.3	1.7	4.9	2.4	4.7

Means within columns followed by the same letter do not differ at the 5% probability level based on LSD.