

PROJECT TITLE: Evaluation of winter wheat variety performance in off-station trials near Denton, Fort Benton, Moore and Winifred.

PROJECT LEADER: D.M. Wichman, Agronomist, Moccasin, MT

PROJECT PERSONNEL: P.L. Bruckner, Winter Wheat Breeder, Bozeman, MT
J.E. Berg, Winter Wheat Research Associate, Bozeman, MT
R.L. Murphy, Agricultural Research Specialist, Moccasin, MT
J. Vavrovsky, Research Technician, Moccasin, MT
Dave Philips, Fergus County Extension Agent, Lewistown, MT
Judee Wargo, Chouteau County Extension Agent, Ft Benton, MT

OBJECTIVES:

To evaluate the performance of winter wheat varieties in environments and cropping methods representative of the southern triangle and central Montana.

RESULTS:

Denton yields ranged from 35 to 48 bu/a and averaged 42 bu/a. Quantum 542 was the top yielding variety with Promontory, Morgan, Halt and Tiber rounding out the top five with yields ranging from 46 to 47 bu/a. The average test weight for the trial was 60 lbs/bu. All varieties were below their long-term yield averages due to extreme moisture stress experienced during the growing season. The top yielding lines at Denton based on five-year averages have been Quantum 542 (63 bu/a), Kestrel (62.5 bu/a), Judith (60bu/a) and Neeley (59 bu/a). The current year's data and multi-year yield summary are presented in Tables 1 and 2.

Fort Benton yields on barley stubble ranged from 37 to 60 bu/a and averaged 49 bu/a. Halt was the highest yielding line followed by Promontory, experimental line MT 9409, Quantum 542 and Rocky, which ranged from 54 to 59 bu/a. Test weights were below normal, averaging 58 lbs/bu. Most varieties were at or above their long-term yield averages. Top yielding varieties for this area based on five-year averages have been Quantum 542 (52 bu/a), Tiber (51 bu/a), Rampart, Rocky and Neeley all at 48 bu/a. The current year's data and multi-year yield summary are presented in Tables 3 and 4.

Moore - this site was not harvested due to a cheat grass infestation. The multi-year yield summary is presented in Table 5.

Winifred yields ranged from 40 to 64 bu/a and averaged 54 bu/a. Halt was the top yielding variety followed by Promontory, experimental line MTS9720, Pronghorn and Quantum 542. Test weights were below normal, averaging 57 lbs/bu. Top yielding varieties for this area based on five-year averages have been Quantum 542 (59 bu/a), Judith, Bighorn, NuWest and Erhardt all at 55 bu/a. In addition, Big Sky has averaged 56 bu/a for the past three years. The current year's data and multi-year yield summary are presented in Tables 6 and 7.

71

SUMMARY:

Early season moisture helped the winter wheat crop get off to a good start before drier weather conditions persisted. The 1999 trial yields were lower than 1998 trial yields in all locations except Fort Benton. The trial at Fort Benton was planted into barley stubble, while the Denton trial followed peas and the Winifred trial was planted on tilled fallow ground. Varieties that were among the top five yielding lines at all locations were Halt, Promontory and Quantum 542. Halt is a Colorado variety released in 1994 that is short, one of the earliest to mature and has Russian wheat aphid resistance. Promontory is a Utah variety released in 1991 that has medium to late maturity and has stripe rust, dwarf smut and snow mold resistance. Quantum 542 is a hybrid wheat variety from Hybritech and was released in 1988. Quantum 542 is a medium to early maturing variety that has consistently yielded well in research center variety trials. Test weights were below normal this year at most locations, with Denton the only location averaging 60 lbs/bu. Plants were stressed for moisture later in the growing season after receiving adequate moisture in late fall and at the beginning of the growing season.

FUTURE PLANS:

Winter wheat variety evaluations will continue at Denton, Fort Benton, Moore and Winifred.

Table 1. 1999 Denton Off-Station Winter Wheat Variety Performance Trial - Exp: 3871.
Central Agricultural Research Center, Moccasin, MT.

Variety	Grain Yield (bu/a)	Test Weight (lbs/bu)	Plant Height (in.)	Protein Content (%)
QUANTUM 542	48.0	60.5	31	13.8
PROMONTORY	46.6	62.6	30	13.0
MORGAN	46.4	60.3	29	13.4
HALT	46.3	61.3	26	13.8
TIBER	45.6	60.3	32	14.1
MTW9441	45.2	60.3	28	14.2
NEELEY	45.2	60.2	29	13.3
JUDITH	45.2	59.1	28	13.8
NUWEST	45.2	59.8	30	13.8
BIG SKY	43.6	61.0	31	13.9
MT9409	42.8	58.5	29	13.5
PRONGHORN	42.1	62.0	31	14.1
MT9524	42.1	60.8	33	13.8
MTS9720	41.7	57.5	26	14.1
ERHARDT	41.0	61.4	25	14.4
ROCKY	39.6	60.7	30	13.2
BIGHORN	39.1	60.6	25	14.2
REDWIN	38.7	59.0	31	14.4
MTS9719	37.8	58.0	30	14.0
ELKHORN	37.6	59.7	32	13.5
RAMPART	37.3	59.7	28	14.5
MCGUIRE	36.9	60.1	31	15.2
VANGUARD	34.9	59.5	25	14.8
NORSTAR	34.8	57.9	34	13.8
Experimental Mean	41.8	60.0	29.1	13.9
F-Value for Var. (df=23)	2.3*	6.0**	6.3**	-
CV1: (s/mean)*100	8.9	1.2	4.7	-
LSD (0.05)	7.7	1.5	2.9	-

*, ** Denotes Statistical Significance at $P \leq 0.05, 0.01$, respectively

Planted: 9/28/1998

Harvested: 8/3/1999

Previous Crop: Peas

Fertilizer: 60 units N as anhydrous pre-plant.

Growing Season Precipitation (April - July): 5.3"

Producer/Cooperator: Richard Barber, Denton.

13
Table 2. Denton Off-Station Winter Wheat Multi-Year Yield Summary of Selected Varieties, 1991-1999. Central Agricultural Research Center. Moccasin, MT.

Selected Varieties	1991	1992	1993	1995	1996	1997	1998	1999	Avg.	Neeley Same Yrs.
	-----*bu/a-----									
Neeley	64	24	66	82	44	62	61	45	56.0	-
Noistar	39	24	55	51 ^{1/}	35	54	51	35	43.0	56.0
Rocky	60	22	57	73	46	59	61	40	52.2	56.0
Tiber	55	28	65	73	42	65	61	46	54.3	56.0
Judith	61	26	55	87	45	59	66	45	55.5	56.0
Quantum 542		40	59	78	48	67	76	48	59.4	54.9
Bighorn	60 ^{2/}	23	56	73	46	64	67	39	53.5	56.0
NuWest	54			67	43	64	59	45	55.4	59.7
Kestrel			60	80	44	60	66	-	62.0	63.0
Erhardt				71	42	62	55	41	54.2	58.8
Vanguard				56	41	56	62	35	50.0	58.8
Rampart				76	40	51	55	37	51.9	58.8
McGuire				71	42	54	49	37	50.6	58.8
Promontory					53	56	65	47	55.2	53.1
Big Sky						64	62	44	56.5	56.1
Nursery Mean	53.2	22.2	56.0	73.1	42.9	59.6	59.6	41.8		

1/ Suspected low germination resulted in low yields.

2/ Bighorn was planted on one end of the trial (not randomized).

1994 trial was abandoned due to variable stands resulting from wind damage.

1999 only two reps were harvested due to an extremely hard field at planting resulting in poor germination of the 1st rep.

**Table 3. 1999 Highwood/Fort Benton Winter Wheat Variety Performance Trial - Exp. 3872.
Central Agricultural Research Center, Moccasin, MT.**

Variety	Grain Yield (bu/a)	Test Weight (lbs/bu)	Plant Height (in.)	Protein Content (%)
HALT	59.7	60.8	27	12.1
PROMONTORY	59.4	59.9	33	12.3
MT9409	58.5	58.2	33	11.9
QUANTUM 542	54.2	58.8	34	13.0
ROCKY	53.7	59.4	35	12.0
JUDITH	53.5	55.9	35	12.9
TIBER	51.6	58.0	36	13.1
MT9524	51.6	59.3	38	11.9
BIG SKY	50.8	59.8	36	11.3
PRONGHORN	50.6	60.5	33	13.5
RAMPART	50.2	58.7	34	12.9
BIGHORN	50.2	58.1	29	12.8
MTS9720	49.6	54.0	33	12.8
MORGAN	49.4	59.0	33	11.1
REDWIN	48.2	56.7	35	13.1
VANGUARD	47.8	57.3	34	14.7
MTW9441	46.3	56.1	34	13.7
MCGUIRE	44.7	56.9	30	14.0
NEELEY	44.7	56.2	35	12.6
NUWEST	43.6	56.9	34	12.2
ERHARDT	42.8	55.8	31	14.9
MTS9719	41.2	53.0	34	13.0
NORSTAR	40.0	54.7	41	13.7
ELKHORN	37.3	55.1	39	13.6
Experimental Mean	49.2	57.5	34.0	12.9
F-Value for Var. (df=23)	5.9**	7.5**	-	-
CV1: (s/mean)*100	8.5	2.3	-	-
LSD (0.05)	6.9	2.2	-	-

** Denotes Statistical Significance at P<= 0.01

Planted: 10/1/1998

Harvested: 8/3/1999

Previous Crop: Barley

Growing Season Precipitation (April - July): 7.1"

Producer/Cooperator: Steve Birkeland, Fort Benton.

75
Table 4. Highwood/Fort Benton Off-Station Winter Wheat Multi-Year Yield Summary of Selected Varieties, 1991-1999. Central Agricultural Research Center. Moccasin, MT.

Selected Varieties	1991	1993	1994	1995	1996	1997	1998	1999	Avg.	Neeley Same Yrs.
	-----*bu/a-----									
Neeley	74	58	50	69	47	51	27	45	52.6	-
Norstar	55	49	43	56 ^{2/}	32	45	25	40	43.1	52.6
Rocky	68	51	44	63	42	56	25	54	50.4	52.6
Tiber	66	56	47	74	46	54	28	52	52.9	52.6
Judith	63	39	44	70	36	51	26	54	47.9	52.6
Quantum 542		54	52	78	45	54	28	54	52.1	49.6
Bighorn	66 ^{1/}	55	43	70	34	55	27	50	50.0	52.6
NuWest	63		41	66	36	49	28	44	46.7	51.9
Kestrel		58	44	70	43	49	27		48.5	50.3
Erhardt			44	72	35	49	26	43	44.8	48.2
Vanguard			40	68 ^{2/}	40	51	25	48	45.3	48.2
Rampart			45	77	39	52	24	50	47.8	48.2
McGuire				59	34	51	24	45	42.6	47.8
Promontory					49	55	25	59	47.0	42.5
Big Sky						52	26	51	43.0	41.0
Nursery Mean	62.1	51.3	44.5	68.7	40.0	51.7	25.1	49.2		

1/ Bighorn was planted on one end (not randomized).

2/ Suspected low germination resulted in low yields.

1992 trial was abandoned due to volunteer barley infestation.

1995 trial had a high incidence of volunteer spring wheat.

The trial was located on the Ron Long farm, Shonkin, MT 1995 - 1996, and on the Steve Birkeland farm, Fort Benton, MT 1997 - 1999.

Table 5. Moore Off-Station Winter Wheat Multi-Year Yield Summary of Selected Varieties, 1990 -1998. Central Agricultural Research Center. Moccasin, MT.

Selected Varieties	1990	1991	1992	1994	1995	1996	1997	1998	Avg.	Neeley SameYrs.
Neeley	34	64	42	37	45	36	56	72	48.3	-
Norstar	35	49	28	37	31 ^{2/}	34	48	67	41.1	48.3
Rocky	29	57	33	36	40	41	57	66	44.9	48.3
Tiber	33	56	41	35	43	39	57	69	46.6	48.3
Judith	36	56	32	34	47	35	54	65	44.9	48.3
Quantum 542	41		48	35	43	46	58	78	49.9	44.9
Bighorn	42	58 ^{1/}	34	35	41	34	60	66	46.3	48.3
NuWest	47	55		42	46	34	55	70	49.9	49.1
Kestrel				34	41	36	56	70	47.4	49.2
Erhardt				37	42	43	57	56	47.0	49.2
Vanguard				29	29 ^{2/}	35	52	57	40.4	49.2
Rampart				34	44	33	49	57	43.4	49.2
McGuire					41	37	48	54	45.0	52.3
Promontory						39	56	62	52.3	54.7
Big Sky							56	67	61.5	64.0
Nursery Mean	36.4	54.3	35.4	35.4	40.5	36.3	54.0	63.1		

1/ Bighorn was planted on one end (not randomized).

2/ Lower yields resulted from suspected low germination.

1993 nursery suffered hail damage.

1999 nursery not harvested due to cheat grass infestation.

77
Table 6. 1999 Winifred Winter Wheat Variety Performance Trial - Exp. 3874. Central Agricultural Research Center. Moccasin, MT.

Variety	Grain Yield (bu/a)	Test Weight (lbs/bu)	Plant Height (in.)	Protein Content (%)
HALT	63.8	57.3	27	13.9
PROMONTORY	61.4	59.1	30	11.7
MTS9720	59.1	53.6	34	14.2
PRONGHORN	58.8	59.1	36	14.1
QUANTUM 542	58.7	56.5	34	14.0
JUDITH	58.5	55.7	32	12.9
MTW9441	57.0	57.7	36	13.0
MT9409	57.0	55.1	33	12.1
NUWEST	56.8	56.9	34	13.1
MTS9719	55.5	55.2	34	12.5
BIGHORN	55.2	58.0	28	11.6
MT9524	54.9	56.7	36	12.8
MORGAN	54.5	56.9	34	10.8
RAMPART	53.4	57.1	33	13.0
ERHARDT	52.7	59.4	32	12.9
MCGUIRE	52.2	58.2	32	14.9
REDWIN	51.9	57.2	34	14.4
VANGUARD	51.7	55.8	32	14.5
BIG SKY	51.2	56.8	36	12.8
TIBER	49.8	55.5	36	12.8
ROCKY	49.6	58.2	34	13.6
NEELEY	49.3	56.2	33	13.0
ELKHORN	42.5	56.2	36	13.3
NORSTAR	40.1	55.3	41	14.1
Experimental Mean	54.0	56.8	33.6	13.2
F-Value for Var. (df=23)	2.9**	3.8**	-	-
CV1: (s/mean)*100	10.3	2.2	-	-
LSD (0.05)	9.1	2.1	-	-

** Denotes Statistical Significance at P<= 0.01

Planted: 9/28/1998

Harvested: 8/18/1999

Previous Crop: Fallow

Growing Season Precipitation (April - July): 7.4"

Producer/Cooperator: Bruce Udelhoven, Winifred.

Table 7. Winifred Off-Station Winter Wheat Multi-Year Yield Summary of Selected Varieties, 1992 - 1999. Central Agricultural Research Center. Moccasin, MT.

Selected Varieties	1992	1994	1996	1997	1998	1999	Avg.	Neeley Same Yrs.
	-----bu/a-----							
Neeley	40	52	43	51	65	49	50.0	-
Norstar	30	50	50	51	66	40	47.8	50.0
Rocky	32	50	55	45	62	50	49.0	50.0
Tiber	36	47	57	38	72	50	50.0	50.0
Judith	30	51	52	43	70	59	50.8	50.0
Quantum 542	47	59	55	45	75	59	56.7	50.0
Bighorn	31	53	50	54	63	55	51.0	50.0
NuWest		49	50	46	72	57	54.8	52.0
Kestrel		54	52	38	59		50.8	52.8
Erhardt		52	52	50	66	53	54.6	52.0
Vanguard		44	45	39	53	52	46.6	52.0
Rampart		49	43	33	52	53	46.0	52.0
McGuire			49	51	57	52	52.3	52.0
Promontory			54	41	58	61	53.5	52.0
Big Sky				50	66	51	55.7	55.0
Nursery Mean	31.6	50.5	49.9	45.1	63.9	54.0		

1993 and 1995 trials were not harvested due to hail damage.