



RESULTS OF AGRONOMIC AND WEED SCIENCE RESEARCH CONDUCTED IN SOUTH CENTRAL MONTANA - 2001

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PROJECT TITLE: Dryland and Irrigated Spring Wheat Performance Trials near Bridger, Hysham, Molt and Ryegate, Montana. (Exps. 019994, 019995, 019996 and 019997).

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OBJECTIVES: To provide wheat growers in south central Montana with a reliable, unbiased, up-to-date source of information that will permit valid comparisons among improved spring wheat varieties. This information should help spring wheat producers in south central Montana select varieties best suited to their particular area and growing conditions.

METHODS: Off-station spring wheat trials were established under dryland conditions near Molt and Ryegate, and under irrigated conditions near Bridger and Hysham, Montana (Fig. 1). The 2001 off-station spring wheat trials each possessed 20 entries.

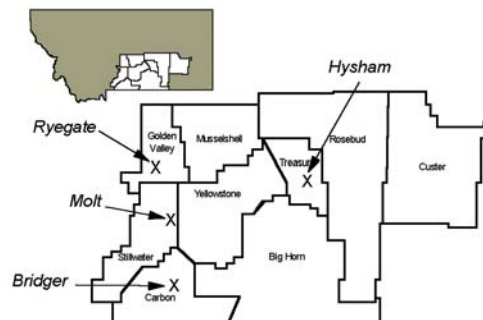


Figure 1. 2001 off-station spring wheat trial locations in south central Montana.

All studies were planted using a randomized complete block design with three replications. Dryland test plots consisted of a 15-foot, 4-row plot with 12-inch row spacing. Irrigated test plots consisted of a 15-foot, 7-row plot with 6-inch row spacing. All rows of each test plot were trimmed 36 inches and harvested using an experimental-plot combine. Recorded grain yields were adjusted to

13% grain moisture content, and are reported in bushels per acre based on a 60 pound standard bushel weight. Test weight (pounds per bushel) and percent grain moisture content were obtained for each plot using a Dickey-john GAC 2100 grain analyzer. Grain protein (%) was determined for each entry bulked across replications. Grain protein values were adjusted to 12% grain moisture content. Plant height was measured in inches from the soil surface to the top of the head, excluding the awns if present. Reported plant height values have been rounded to the nearest inch.

RESULTS:

All four spring wheat off-station trials were planted in the spring of 2001, but only two of the sites, Bridger and Ryegate, were harvested. The Molt dryland site was planted into a minimum-tilled seedbed that was last cultivated during the fall of 2000. Very little moisture was received at this site during the fall and winter months. To conserve surface soil moisture at planting, the trial was direct seeded prior to spring tillage. Fairly uniform stands did emerge, but hot, dry conditions during May and early June caused some seedling mortality, stunted crop growth and reduced tillering of those plants that did establish. Like most areas in the region, 5 to 7 inches of rain was received at this site between mid-June to mid-July. The excess precipitation promoted the germination and growth of volunteer barley, which eventually overran the plots. After several attempts to salvage the Molt spring wheat trial using selective herbicides and hand weeding, the Molt dryland site was abandoned because of the excess volunteer barley contamination. The irrigated trial at Hysham possessed uniform stands and displayed excellent growth during the growing season. Yield potential of the spring wheat cultivars planted at Hysham appeared quite high. Unfortunately, a custom harvester hired by the Hysham site cooperator inadvertently combined the trial before University personnel were able to harvest the plots for research purposes.

The Ryegate dryland trial was plagued by early season drought stress similar to that experienced at Molt, but the Ryegate trial did not receive the mid-season precipitation experienced at the Molt location. Average plant height measured during 2001 indicate drought stress was as great as that experienced at Ryegate during 2000. Average spring wheat yields at Ryegate during 2001 were 21.6 bu/ac (Table 1). The highest yielding spring wheat cultivar at Ryegate during 2001 was 'MT9874', averaging 30.7 bu/ac. 'Amidon' hard red spring wheat, 'Explorer' hard white spring wheat and 'MTHW9420' hard white spring wheat equaled the yield of MT9874, averaging 24.5, 26.9 and 24.8 bu/ac, respectively. Test weights averaged 58.8 lb/bu, with 16 of the 20 cultivars averaging test weights heavier than 58 lb/bu. Grain protein levels were high as a result of the hot, dry conditions that prevailed during the grain fill period. Average protein levels were 17.1 percent and ranged from 15.9 percent for 'MTHW9904' to 18.6 percent for 'Ernest'.

The irrigated off-station spring wheat trial grown at Bridger during 2001 did not yield as good as spring wheat studies grown at this location during previous years. Although irrigation provided adequate moisture for crop growth and development, the site suffered from excess residual nitrogen. Soil samples taken at planting revealed more than 300 pounds of NO₃-N per acre in the top 24 inches of the soil profile. Mean plant height was substantially taller at Bridger compared to the dryland site at Ryegate, but was approximately four inches shorter than the plant height observed among spring wheats planted at Bridger the previous year (Table 2). Mean yield of the 20 spring wheat cultivars grown at Bridger in 2001 was 65.7 bu/ac, only 68 percent of the spring wheat yield obtained under irrigation at Bridger in 2000. No difference in yield among the 20 cultivars was detected. All cultivars tested at Bridger produced test weights heavier than 58 lb/bu, averaging 61.0 lb/bu. The elevated soil nitrate levels resulted in high grain protein levels, averaging 18.2 percent. Grain proteins varied from 16.8 percent for 'Conan' and MTHW9420 to 19.2 percent for Ernest and 'Westbred 936'.

SUMMARY:

The loss of two locations prior to harvest limits the scope of environments comparing spring wheat performance, but use of multi-year analysis provides some indication of how broadly adapted some spring wheat cultivars are to south central Montana. Based on three-year averages analyzed for both sites harvested in 2001, 'McNeal' has been the highest yielding spring wheat cultivar grown in south central Montana since 1999 (Tables 1 and 2). Other spring wheats that have shown similar adaptation under both dryland and irrigated conditions include Amidon, 'Lew', 'Reeder' and 'Scholar'. The cultivar Conan has produced yields comparable to McNeal under dryland conditions, but has averaged about 20 percent less yield than McNeal under irrigation. The spring wheats Ernest, 'Grandin', 'Hi-Line', MTHW9420, Newana, Rambo and 'Westbred Express' have produced yields equal to McNeal under irrigation, but have not yielded as well as McNeal under dryland conditions.

FUTURE PLANS:

Off-station spring wheat variety performance trials will continue in 2002 at the Bridger, Hysham, Molt and Ryegate locations.

Table 1. Performance of 20 hard red and hard white spring wheat cultivars and experimental lines tested under dryland conditions near Ryegate, Montana during 2001. Cultivars listed alphabetically. (Exp. 019995).

Cultivar	1/ Grain Yield			Test Weight	2/ Grain Moisture		Grain Protein	Plant Height
	2001	2000-2001	1999-2001					
	----- bushels/acre -----			lb/bu	%	%	inches	
Amidon	24.5*	21.5	28.3*	58.3	7.6	16.4	25	
Conan	20.8	23.1*	30.0*	60.0	7.9	17.0	20	
Ernest	22.7	21.3	25.6	58.3	7.4	18.6	25	
Explorer (MTHW9710)	26.9*	27.0*		59.3	7.6	16.4	20	
Fortuna	18.0	18.0	26.8	59.5	8.2	16.6	21	
Grandin	18.4	17.7	26.5	58.9	7.8	17.3	21	
Hi-Line	21.4	21.3	27.6	59.7	7.6	17.3	21	
Lew	20.7	28.3**	31.0*	58.6	8.0	17.0	25	
McNeal	23.3	26.1*	33.6**	57.5	7.4	17.0	22	
MT9874	30.7**			57.5	7.2	17.2	25	
MT9929	18.5			58.1	8.0	18.2	18	
MTHW9420 (hard white)	24.8*	20.8	27.9	59.6	8.0	16.1	18	
MTHW9904 (hard white)	23.9			60.5	8.1	15.9	22	
Newana	18.1	20.8	27.5	59.0	7.7	16.3	22	
Rambo	18.6	19.0	27.4	56.7	7.6	17.2	20	
Reeder	22.8	23.7*	30.8*	59.4	7.7	16.8	20	
Scholar	23.0	24.2*	29.0*	60.1	7.8	17.3	23	
Westbred 926	20.4	13.4	24.7	59.2	7.4	17.9	18	
Westbred 936	19.1	12.9	22.3	57.7	7.5	18.2	17	
Westbred Express	16.0	18.1	29.0*	58.3	7.6	17.3	16	
Average	21.6	21.0	28.0	58.8	7.7	17.1	21.0	
LSD (p=0.05)	6.5	6.3	4.8	1.5	0.4	-	3.0	
CV%	18.3	25.9	18.5	1.6	3.0	-	8.6	

1/ Yields are based on a 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.

2/ Grain protein values adjusted to 12 percent grain moisture content.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

Ryegate Dryland Spring Wheat (Exp. 019995)

Planted: April 3, 2001
Harvested: August 8, 2001
Fertility: 11-52-00, 120 lb/a in-furrow, April 3, 2001
40-20-00, 125 lb/a broadcast, May 3, 2001
Herbicide: Harmony Extra, 0.5 oz/a; Bronate, 1 pt/a; R-11, 1 pt/a, May 3, 2001
Insecticide: none
Previous Crop: summer fallow
Precipitation: not available

Table 2. Performance of 20 hard red and hard white spring wheat cultivars and experimental lines tested under irrigation near Bridger, Montana during 2001. Cultivars listed alphabetically. (Exp. 019997).

Cultivar	1/ Grain Yield			Test Weight	2/ Grain	Grain	Plant Height
	2001	2000-2001	1999-2001		Moisture	Protein	
	-----	bushels/acre	-----	lb/bu	%	%	inches
Amidon	68.4	81.2*	83.4*	60.4	8.2	18.4	34
Conan	55.9	69.7	74.3	60.8	8.4	16.8	27
Ernest	65.5	81.0*	81.9*	61.5	8.3	19.2	32
Explorer (MTHW9710)	70.0	83.7*		60.7	8.3	18.3	25
Fortuna	58.5	76.6	77.5	60.8	8.4	18.0	31
Grandin	81.1	82.1*	87.9*	61.2	8.5	18.2	33
Hi-Line	80.9	84.4*	89.2*	61.0	8.3	18.3	26
Lew	65.3	84.8*	82.5*	62.5	8.5	17.9	35
McNeal	72.5	93.6**	91.0**	61.2	8.0	18.7	32
MT9874	69.1			60.9	8.1	18.6	32
MT9929	55.9			60.3	8.2	19.0	27
MTHW9420	74.5	80.4*	81.8*	61.1	8.3	16.8	27
MTHW9904	66.3			62.9	8.7	18.2	27
Newana	51.3	85.1*	88.7*	61.1	8.4	17.9	27
Rambo	55.6	78.6*	83.7*	62.5	8.1	17.8	27
Reeder	76.4	84.7*	87.2*	62.0	8.3	18.0	31
Scholar	81.0	91.1*	86.0*	61.4	8.5	17.8	34
Westbred 926	62.9	71.3	75.1	59.6	7.9	18.4	23
Westbred 936	49.4	59.8	68.4	59.6	8.2	19.2	19
Westbred Express	53.1	76.7	82.7*	58.7	7.9	18.8	21
Average	65.7	80.3	82.6	61.0	8.3	18.2	28.4
LSD (p=0.05)	ns	15.0	10.8	1.0	0.4	-	5.7
CV%	24.2	16.1	13.9	1.0	2.9	-	12.2

1/ Yields are based on 60 pound standard bushel weight and adjusted to 13.0 percent moisture content.

2/ Grain protein values adjusted to 12 percent grain moisture content.

** Indicates highest yielding cultivar within a column.

* Indicates cultivars yielding equal to highest yielding cultivar within a column based on Fisher's protected LSD (p=0.05).

ns Indicates no significant difference between cultivars within a column based on Fisher's protected LSD (p=0.05).

Bridger Irrigated Spring Wheat (Exp. 019997)

Planted: April 2, 2001
 Harvested: August 6, 2001
 Fertility: 11-52-00, 120 lb/a in-furrow, April 2, 2001
 Herbicide: Harmony Extra, 0.5 oz/a; Bronate, 1 pt/a; R-11, 1 pt/a, May 22, 2001
 Insecticide: Malathion, 1 pt/a; R-11, 1 pt/a, May 22, 2001
 Previous Crop: summer fallow
 Irrigation: profile flooded, May 16, 2001
 profile flooded, July 3, 2001
 Precipitation: 6.39 inches