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

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PROJECT TITLE:

Dryland and Irrigated Durum Performance Trials near Bridger, Hysham, Molt and Ryegate, Montana. (Exps. 019894, 019895, 019896 and 019897).

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OBJECTIVES:

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

METHODS:

Off-station durum trials were established under dryland conditions near Molt and Ryegate, and under irrigated conditions near Bridger and Hysham, Montana (Fig. 1). Fifteen durum entries plus 'McNeal' hard red spring wheat (HRSW) were planted at each location.

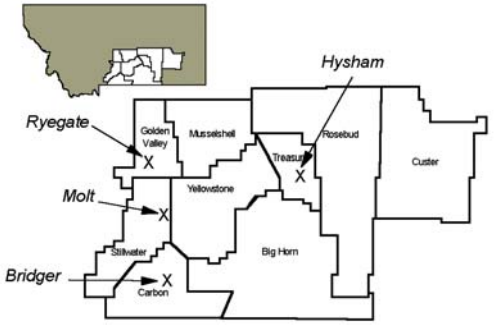

Figure 1. 2001 off-station durum trial locations in south central Montana.

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. Lodging of some entries was noted at the irrigated locations. Lodging severity was recorded on a 0 to 9 scale representing no lodging to all stems lying flat on the ground, respectively.

RESULTS:

All four durum 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 trial using selective herbicides and hand weeding, the 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 durum 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 by the Molt location. Average plant height measured during 2001 indicates that drought stress was as great as that experienced at Ryegate during 2000. Average durum yields at Ryegate during 2001 were 12.3 bu/ac (Table 1). McNeal hard red spring wheat was the highest yielding entry in this trial during 2001, averaging 19.8 bu/ac. The highest yielding durum cultivar at Ryegate during 2001 was 'Lebsock', averaging 16.5 bu/ac, which statistically equaled the yield of McNeal spring wheat. 'Kyle', 'Mountrail', 'Plaza', 'Vic' and 'Ward' also equaled the yield of McNeal, averaging 14.2, 16.0, 15.2, 14.4 and 14.3 bu/ac, respectively. Test weights averaged 58.6 lb/bu, with only four of the 16 cultivars tested averaging test weights heavier than 60 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 17.4 percent and ranged from 15.2 percent for Vic to 19.9 percent for 'Medora'.

The irrigated off-station durum trial grown at Bridger during 2001 did not yield as well as the durum study grown at this location the previous year (Table 2). No foliar diseases were evident, but the site did suffer from excess residual soil nitrogen. Soil samples taken at planting revealed more than 300 pounds of NO_3-N per acre in the top 24 inches of the soil profile. Although irrigation and seasonal rainfall provided adequate moisture for crop growth and development, the excess soil nitrogen appeared to stunt the durum study more than the spring wheat trial grown concurrently at this site. Mean plant height of the durum planted at Bridger was eight inches taller compared to the durum grown at Ryegate, but was approximately ten inches shorter than the plant height observed among durum entries planted at Bridger the previous year. Mean yield of the 16 entries grown at Bridger in 2001 was 49.8 bu/ac, compared to the 103.2 bu/ac mean yield of entries grown under irrigation at Bridger in 2000. McNeal hard red spring wheat was the highest yielding entry in this trial during 2001, averaging 75.2 bu/ac. The durum cultivar Plaza averaged 58.9 bu/ac, and was the only durum to statistically equal the yield of McNeal spring wheat. Most durum cultivars tested at Bridger

produced test weights heavier than 60 lb/bu, averaging 60.1 lb/bu. The elevated soil nitrate levels resulted in high grain protein levels, averaging 18.5 percent. Grain protein levels varied from 16.1 percent for 'Laker' to 20.1 percent for 'Maier'.

SUMMARY:

The loss of two locations prior to harvest limits the scope of environments comparing durum cultivar performance. Based on three-year averages analyzed for the Ryegate site and two-year averages analyzed for the Bridger location, the McNeal spring wheat check has been the highest yielding entry grown in off-station durum trials for south central Montana (Tables 1 and 2). The durum cultivars Kyle and Plaza have equaled the yields of McNeal under dryland conditions, but high levels of variability are associated with yield among entries tested at the Ryegate location. No durum tested in the past two years has equaled the yield of McNeal under irrigation.

FUTURE PLANS:

Off-station durum performance evaluations will continue in 2002 with locations at Bridger, Hysham, Molt and Ryegate, Montana.

Table 1. Performance of 15 spring durum cultivars compared to McNeal hard red spring wheat tested under dryland conditions near Ryegate, Montana during 2001. Cultivars listed alphabetically. (Exp. 019895).

Cultivar	1/ Grain Yield 2001	1/ Grain Yield 2000-2001	Test Weight	2/ Grain Moisture	2/ Grain Protein	Plant Height
	------- bushels/acre -------		lb/bu	%	%	inches
Belzer	11.4	13.2	57.9	7.1	17.1	20.0
Ben	6.6	8.7	58.9	6.6	19.2	15.7
Kyle	**14.2***	**19.4***	57.4	7.7	16.4	24.4
Laker	9.8	8.1	60.5	7.7	17.6	17.8
Lebsock	**16.5***	15.4	60.5	7.4	16.1	17.9
Maier	10.6	13.5	58.9	6.6	19.1	15.2
McNeal (HRSW)	**19.8****	**21.9****	57.8	6.8	16.3	21.6
Medora	8.5	10.5	59.1	6.8	19.9	18.5
Monroe	9.0	11.3	58.3	7.3	17.6	15.6
Mountrail	**16.0***	13.7	58.8	7.2	15.8	20.5
Munich	12.4	16.5	55.7	7.3	18.3	15.4
Plaza	**15.2***	**17.4***	60.5	6.9	17.2	20.0
Renville	10.4	14.8	57.4	7.1	18.4	16.4
Sceptre	8.3	8.3	55.7	6.6	18.3	17.7
Vic	**14.4***	12.9	60.6	7.5	15.2	20.0
Ward	**14.3***	11.8	59.7	7.3	16.6	20.3
Average	12.3	13.6	58.6	7.1	17.4	18.6
LSD (p=0.05)	7.1	5.0	- 3/	- 3/	- 3/	4.2
CV%	34.7	32.0	-	-	-	13.6

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.
3/ Test weight, grain moisture and grain protein determined from samples bulked across replications.
** 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 Durum Wheat (Exp. 019895)

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 15 spring durum cultivars compared to McNeal hard red spring wheat tested under irrigated conditions near Bridger, Montana during 2001. Cultivars listed alphabetically. (Exp. 019897).

Cultivar	Grain Yield 1/ 2001	Grain Yield 1/ 2000-2001	Test Weight	Grain Moisture	Grain Protein 2/	Plant Height	Lodging 3/
	---- bushels/acre ----		lb/bu	%	%	inches	0-9
Belzer	45.7	81.7	58.0	7.8	17.9	25.2	0.0
Ben	42.6	71.2	59.6	7.8	18.9	25.2	0.0
Kyle	41.0	71.9	60.2	8.4	18.8	30.3	0.3
Laker	50.9	77.7	61.1	8.3	16.1	25.9	0.0
Lebsock	47.6	76.0	60.0	8.1	18.8	25.0	0.0
Maier	42.4	75.2	60.6	8.2	20.1	24.3	0.0
McNeal (HRSW)	**75.2****	**97.9****	61.6	7.6	17.8	29.1	0.0
Medora	51.8	72.9	60.4	8.1	19.3	28.1	0.0
Monroe	38.0	59.8	58.7	7.7	19.5	22.0	0.0
Mountrail	44.1	77.9	60.0	8.0	18.9	23.5	0.0
Munich	57.1	78.0	60.0	7.8	18.1	24.4	0.0
Plaza	**58.9***	85.3	61.0	8.4	17.0	25.3	0.0
Renville	55.2	78.5	60.4	8.3	18.9	27.5	0.3
Sceptre	43.8	74.1	59.2	7.7	19.2	25.1	0.0
Vic	48.5	70.1	59.6	8.2	18.7	29.9	0.0
Ward	53.9	71.9	60.9	8.5	17.5	26.5	0.0
Average	49.8	76.3	60.1	8.0	18.5	26.1	0.0
LSD (p=0.05)	17.7	10.0	1.4	0.5	-	3.8	ns
CV%	21.3	11.4	1.4	4.0	-	8.7	498.0

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.
3/ Lodging severity scores of 0 to 9 represent no lodging to all stems flat on the ground, respectively.
** 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 Durum Wheat (Exp. 019897)

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