PROJECT TITLE: Evaluation of regional spring wheat, durum, and oat yield trials - 2008

PROJECT LEADER:
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PROJECT PERSONNEL:
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OBJECTIVE: To evaluate new and introduced lines and cultivars of spring wheat and durum developed by Universities, the USDA-ARS, and private seed companies, and to determine adaptability of those lines and varieties to conditions in eastern Montana.

MATERIALS ANE METHODS

Dryland site:
Soil type: Williams clay loam
Previous crops: 2007 - fallow, 2006 – safflower, 2005 - small grain plots
Residual soil N to 3 ft: 67 lb N/ac
Residual soil P to 6 in: 19 ppm
Applied fertilizer: 200 lb/ac 18-46-0
Herbicides: BroxM (1.5 pt/ac) applied Jun 19
Precipitation April – August, 2008: 4.55 inches
Ave (60 yr) precipitation April – August: 9.39 inches
Precipitation September 2007 – August 2008: 7.13 inches
Ave (60 yr) precipitation September – August: 13.77 inches

Irrigated site:
Soil type: Savage silty clay
Previous crops: 2007 –sugarbeet, 2006 – barley, 2005 – sugarbeet
Residual soil N to 3 ft: 18 lb N/ac
Residual soil P to 6 in: 24 ppm
Applied fertilizer: 70 lb liquid N/ac, 28-0-0 applied in fall, 2007
Irrigated (flood) on: Jun 18, Jul 2, 3 inches each application
Herbicides: BroxM (1.5 pt/ac) and Axial (1 pt/ac) applied to spring wheat June 6
BroxM (1.5 pt/ac) and Puma (0.5 pt/ac) applied to durum June 6
Precipitation April – August, 2008: 5.21 inches
Ave (59 yr) precipitation April – August: 9.39 inches
Precipitation September 2007 – August 2008: 7.85 inches
Ave (59 yr) precipitation September – August: 13.77 inches
Comments: Conditions were extremely dry. June was cool, with cool night time temperatures.

Nursery	Planting date	Harvest date
Uniform regional hard spring wheat trial	Apr 17	Aug 6
Uniform regional durum trial – dryland	Apr 17	Aug 6
Uniform regional durum trial – irrigated	Apr 29	Aug 18

RESULTS:

Uniform Regional Hard Red Spring Wheat trial: The Uniform Regional Hard Red Spring wheat trial is conducted in cooperation with Dr. D. Garvin of the University of Minnesota, St. Paul. Dr. G. Hareland of North Dakota State University, Fargo, tests quality of each line and variety. Forty-two experimental lines and varieties of spring wheat were tested under dryland conditions (Table 1). Eleven lines and varieties yielded significantly less than the check variety, Keene. Five-year summaries for yield, test weight, and protein are shown in Tables 2-4.

Uniform Regional Durum trial, dryland: The Uniform Regional Durum trial is conducted in cooperation with Dr. E.M. Elias, North Dakota State University, Fargo. Dr. G. Hareland of North Dakota State University, Fargo, tests quality of each line and variety. Thirty-two experimental lines and varieties were tested under dryland fallow conditions (Table 5). One line yielded significantly less than the check variety, Mountrail, and one line yielded significantly more than Mountrail. Five-year summaries for yield, test weight, protein, and hard vitreous amber color are shown in Tables 6-9.

Uniform Regional Durum trial, irrigated: The Uniform Regional Durum trial is conducted in cooperation with Dr. E.M. Elias, North Dakota State University, Fargo. Dr. G. Hareland of North Dakota State University, Fargo, tests quality of each line and variety. Thirty-two experimental lines and varieties were tested under flood irrigated conditions (Table 10). Twenty-three experimental lines and varieties yielded significantly less than the check variety, Mountrail. Five-year summaries for yield, test weight, protein content, lodging, and hard vitreous amber color of durum varieties grown under irrigation are shown in Tables 11-15.

SUMMARY: The experiments reported under this project are all of the replicated small plot type. The uniform regional yield trials are conducted at many sites in several states across the western USA, and have been in place since the 1930's. These trials provide important information about experimental lines from state breeding programs, private companies, and the USDA-ARS breeding programs. New varieties are released based on data from these trials.

FUTURE PLANS: New and existing varieties and experimental lines of spring wheat, durum and oat will continue to be tested under dryland and irrigated conditions at the Eastern Agricultural Research Center, so that breeders can release improved varieties and producers can have information on varieties that are adapted to this area.

Table 1. Agronomic data obtained from a Uniform Regional hard red spring wheat yield trial grown under dryland fallow conditions at the Eastern Agricultural Research Center, Sidney, MT.

Entry	heading*	height, cm	percent protein	test wt, lb/bu	yield, bu/ac	
CA-907-834	65.3	64.7	15.93	59.7	42.2	
MT 0415	66.0	68.0	16.00	57.5	42.1	
01S0263-28	64.7	58.0	15.26	57.2	42.1	
00S0292-14	66.3	57.3	15.29	57.8	41.9	
CA-905-780	65.7	62.3	15.78	59.0	41.7	
SD4027	61.3	70.7	14.68	58.2	41.3	
00S0211-29-4	64.3	64.0	14.47	58.8	41.1	
01S0263-29	63.7	59.3	15.05	58.2	41.1	
Keene	66.3	69.0	15.22	58.0	41.1	
BW415	65.7	73.0	15.84	58.2	40.9	
ND05/1-3	66.0	65.3	15.44	56.5	40.6	
2375	64.0	67.0	15.46	57.5	40.3	
ND04/3-21	63.0	66.0	15.61	59.3	40.2	
SD4036	62.3	66.0	14.27	55.8	40.2	
WA007954	65.3	69.0	15.55	57.0	40.1	
BZ901-717	63.3	68.3	14.83	56.8	39.9	
MN03169-2-062	66.0	64.7	15.26	55.7	39.9	
ND05/1-2	64.3	66.0	15.45	57.7	39.7	
BW897	64.0	63.3	16.04	58.7	39.3	
Verde	66.7	62.3	15.16	56.5	39.3	
BW396	66.3	68.0	15.33	57.0	39.1	
ND05/1-1	64.0	72.7	15.51	58.7	39.1	
SD4024	65.7	59.0	14.97	57.8	39.0	
NDSW0601	66.3	66.0	15.81	56.7	39.0	
01S0377-6	64.0	56.0	15.03	59.5	38.9	
SD3948	61.3	71.0	14.89	58.5	38.8	
SD4073	65.7	65.7	15.22	54.0	38.6	
MN03196	65.7	61.0	14.91	58.7	38.3	
ND04/3-20	65.0	74.0	15.61	56.0	38.3	
MT 0713	66.7	65.0	16.00	60.8	38.0	
CA-907-835	65.0	66.7	14.88	57.0	37.8	
BW430	66.0	83.3	16.43	57.0	37.3	x
NDSW0501	64.7	73.7	15.54	57.7	37.2	x
06MSP 18	67.3	59.7	15.52	56.0	37.2	x
MN05141-2	64.3	61.7	15.53	57.3	36.6	x
NDSW0449	67.7	65.3	15.33	57.3	36.3	x
BW365	65.3	70.7	15.32	57.0	36.3	x
CA-907-824	66.0	61.3	16.03	59.0	35.6	x
ES101	67.0	70.3	15.60	54.0	35.1	x
MN03308-4	68.0	63.7	16.33	55.8	33.6	x
Marquis	68.7	87.3	15.65	57.0	33.2	x
Chris	67.0	73.7	16.20	56.2	31.6	x
Average	65.3	66.7	15.43	57.5	38.8	
Probability	<0.001	<0.001	<0.001	<0.001	<0.001	
CV (S/MEAN)	1.1	5.0	2.6	1.2	5.8	
LSD (0.05)	0.7	2.9	1.5	0.7	3.4	

*days from planting

x indicates significantly lower yield than check variety, Keene, at a probability of 0.05

Table 2. Relative yields of spring wheat varieties in bu/ac as compared to Keene when grown under dryland fallow conditions in the Uniform Regional Hard Red Spring Wheat trial at Sidney, MT.

Cultivar	2004	2005	2006	2007	2008	Ave	as % of Keene
MT0415	--	--	52.3	54.6	42.1	49.7	103.5
Keene	62.5	44.7	53.2	49.6	41.1	50.2	100.0
2375	66.6	45.2	51.1	45.4	40.3	49.7	99.0
Verde	57.8	47.4	54.0	49.3	39.3	49.6	98.7
MT0713	--	--	--	--	38.0	38.0	92.5
Chris 525-1	44.1	34.6	41.5	38.0	31.6	38.0	75.6
Marquis	40.8	36.6	36.4	36.6	33.2	36.7	73.1

NOTE: Average yields in this summary should not be compared to each other since they are not grown in the same years. Compare yields only to the check variety.

Table 3. Relative test weights of spring wheat varieties in lb/bu as compared to Keene when grown under dryland fallow conditions in the Uniform Regional Hard Red Spring Wheat trial at Sidney, MT.

Cultivar	2004	2005	2006	2007	2008	Ave	as % of Keene
MT0713	--	--	--	--	60.8	60.8	104.8
Keene	62.0	62.0	59.8	61.5	58.0	60.7	100.0
MT0415	--	--	60.7	61.0	57.5	59.7	99.9
2375	61.7	62.0	60.0	61.0	57.5	60.4	99.6
Verde	61.0	62.0	59.5	60.7	56.5	59.9	98.8
Marquis	59.2	60.8	58.0	60.2	57.0	59.0	97.3
Chris 525-1	58.8	59.7	57.7	59.8	56.2	58.4	96.3

NOTE: Average test weights in this summary should not be compared to each other since they are not grown in the same years. Compare test weights only to the check variety.

Table 4. Relative protein contents of spring wheat varieties in percent as compared to Keene when grown under dryland fallow conditions in the Uniform Regional Hard Red Spring Wheat trial at Sidney.

Cultivar	2004	2005	2006	2007	2008	Ave	as % of Keene
MT0713	--	--	--	--	16.0	16.0	105.3
MT0415	--	--	13.8	15.7	16.0	15.2	103.4
Chris 525-1	16.0	13.3	14.4	14.4	16.2	14.9	101.4
Keene	15.8	13.5	14.4	14.4	15.2	14.7	100.0
Marquis	16.3	12.8	13.3	13.9	15.6	14.4	98.1
Verde	14.4	12.6	12.5	12.7	15.2	13.5	92.0
2375	14.6	12.3	12.3	12.6	15.5	13.5	91.8

NOTE: Average protein contents in this summary should not be compared to each other since they are not grown in the same years. Compare protein contents only to the check variety.

Table 5. Agronomic data obtained from a Uniform Regional durum yield trial grown under dryland fallow conditions at the Eastern Agricultural Research Center, Sidney, MT

Entry	heading*	height, cm	percent protein	HVAC	test wt, lb/bu	yield, bu/ac	
D021667	67.3	70.3	13.78	68.6	59.7	34.9	a
D041708(+)	66.0	67.0	14.24	74.3	59.5	34.1	
D031527	66.7	68.0	14.19	72.2	59.8	34.0	
D04102	66.7	72.0	14.51	78.2	58.7	33.5	
D021657	66.7	71.3	14.11	73.2	60.0	33.3	
Alkabo	65.3	70.0	14.44	78.7	59.2	33.3	
D00752	67.7	70.7	14.76	80.9	59.8	33.3	
D031350	66.3	71.3	14.18	73.9	59.0	32.7	
D00095	66.7	75.7	14.65	79.0	59.0	32.6	
Lebsock	66.0	70.0	14.18	76.0	59.3	32.5	
Pierce	66.3	73.0	14.31	81.3	59.7	32.3	
Divide	66.3	72.7	14.13	76.6	59.2	32.0	
D031606	66.3	70.7	14.19	77.4	59.3	31.9	
D031671	66.0	71.7	14.05	75.3	59.3	31.7	
D031607	66.0	70.3	13.94	73.1	59.5	31.6	
DH05047	65.7	75.0	14.75	75.6	59.0	31.6	
Grenora	66.3	64.7	14.26	80.7	58.5	31.6	
D04581	67.0	71.3	14.37	74.7	59.3	31.5	
D041734(+)	66.7	67.0	14.27	77.2	58.2	31.3	
D041603(+)	66.0	76.3	14.65	72.3	59.3	31.1	
D04008	66.7	67.0	14.61	81.9	59.7	31.0	
D041733(+)	66.3	68.3	14.29	79.6	58.8	30.6	
Mountrail	67.0	70.7	15.02	77.6	57.5	30.6	
D041642(+)	67.3	73.7	14.73	82.8	60.3	30.2	
D04573	66.7	70.7	14.95	78.9	57.5	30.2	
D041735(+)	66.3	67.0	14.25	75.2	58.8	30.0	
D04630	66.3	70.0	14.76	81.2	59.0	29.9	
D04586	66.3	70.3	14.11	78.9	59.0	29.7	
D03708	67.0	71.7	14.65	79.0	58.5	29.3	
D021110	66.0	75.0	14.22	79.3	58.3	28.6	
D03004	66.3	70.0	14.71	80.3	59.0	28.2	
D03028	68.0	68.3	15.35	77.3	58.0	26.9	x
Average	66.5	70.7	14.43	77.2	59.1	31.4	
probability	0.004	<0.001	0.004	<0.001	<0.001	0.010	
CV (S/MEAN)	1.0	3.5	2.8	3.4	0.9	7.0	
LSD (0.05)	0.6	2.0	1.6	1.9	0.5	4.1	

*days from planting
a indicates significantly greater yield than check variety, Mountrail, at probability of <0.05
x indicates significantly lower yield than check variety, Mountrail, at probability <0.05

Table 6. Relative yields of durum varieties in bu/ac as compared to Mountraiil when grown in the Uniform Regional Durum trial under dryland fallow conditions at the EARC, Sidney, MT.

Cultivar	2004	2005	2006	2007	2008	Ave	as % of Mountrail
Alkabo	57.9	42.5	46.4	50.1	33.3	46.0	100.7
Mountrail	60.7	40.6	45.7	51.1	30.6	45.7	100.0
Grenora	57.1	40.7	45.7	52.3	31.6	45.5	99.4
Divide	55.9	41.5	41.5	49.2	32.0	44.0	96.2
Pierce	54.8	38.3	42.8	45.9	32.3	42.8	93.6
Lebsock	45.6	41.1	47.6	44.9	32.5	42.3	92.6

NOTE: Average yields in this summary should not be compared to each other since they are not grown in the same years. Compare yields only to the check variety.

Table 7. Relative test weights of durum varieties in lb/bu as compared to Mountrail when grown in the Uniform Regional Durum trial under dryland fallow conditions at the EARC, Sidney, MT.

Cultivar	2004	2005	2006	2007	2008	Ave	as % of Mountrail
Lebsock	61.0	61.8	60.8	63.0	59.3	61.2	102.2
Pierce	61.8	61.3	60.3	62.5	59.7	61.1	102.1
Alkabo	61.7	61.0	60.8	62.3	59.2	61.0	101.9
Divide	60.8	60.2	59.8	62.0	59.2	60.4	100.9
Grenora	61.7	59.8	59.0	62.0	58.5	60.2	100.6
Mountrail	61.2	59.7	59.8	61.0	57.5	59.8	100.0

NOTE: Average test weights in this summary should not be compared to each other since they are not grown in the same years. Compare test weights only to the check variety.

Table 8. Relative protein contents of durum varieties in percent as compared to Mountrail when grown in the Uniform Regional Durum trial under dryland fallow conditions at the EARC, Sidney, MT.

Cultivar	2004	2005	2006	2007	2008	Ave	as % of Mountrail
Grenora	13.6	12.8	13.3	12.5	14.3	13.3	100.3
Mountrail	13.4	12.2	13.1	12.6	15.0	13.3	100.0
Pierce	13.7	12.5	13.3	12.4	14.3	13.2	99.8
Lebsock	14.5	11.9	13.4	12.0	14.2	13.2	99.5
Divide	13.8	11.8	12.9	12.4	14.1	13.0	98.0
Alkabo	12.5	12.7	12.9	12.0	14.4	12.9	97.3

NOTE: Average protein contents in this summary should not be compared to each other since they are not grown in the same years. Compare only to the check variety.

Table 9. Relative hard vitreous amber color in percent of durum varieties as compared to Mountrail when grown in the Uniform Regional Durum trial under dryland fallow conditions at the EARC, Sidney, Montana.

Cultivar	2004	2005	2006	2007	2008	Ave	as % of Mountrail
Grenora	94	77	72	76	81	80.0	102.3
Mountrail	93	78	69	73	78	78.2	100.0
Pierce	87	78	70	71	81	77.4	99.0
Alkabo	96	79	61	63	79	75.6	96.7
Lebsock	92	77	63	64	76	74.4	95.1
Divide	88	58	53	70	77	69.2	88.5

NOTE: Average protein contents in this summary should not be compared to each other since they are not grown in the same years. Compare only to the check variety.

Table 10. Agronomic data obtained from a Uniform Regional durum yield trial grown under flood irrigated conditions at the Eastern Agricultural Research Center, Sidney, MT.

entry	heading*	height, cm	lodging index	percent protein	hvac	test wt, lb/bu	yield, bu/ac	
Mountrail	62.3	87.3	0.00	12.03	76.4	63.5	104.0	
Grenora	59.3	90.7	0.00	11.91	62.2	63.3	102.5	
D04581	61.7	90.7	0.67	11.48	76.7	63.7	100.4	
Divide	61.0	94.3	0.33	11.18	47.2	63.8	97.3	
D03708	61.3	91.3	0.33	11.59	63.1	64.2	95.8	
D00752	62.0	94.3	0.67	10.81	41.7	64.7	94.4	
D031350	60.7	86.0	0.00	11.62	57.7	64.0	93.7	
D04586	62.7	90.7	0.33	10.22	59.0	63.2	93.2	
Pierce	60.3	93.0	0.00	11.90	72.9	64.5	92.8	
D04102	62.3	88.7	0.33	12.04	75.6	63.8	91.6	x
D041642(+)	62.3	89.0	0.00	11.94	68.8	65.0	91.5	x
D03028	63.0	88.3	1.33	11.72	68.5	63.7	90.2	x
DH05047	60.0	97.0	0.67	11.06	30.0	64.2	90.1	x
D04008	60.3	87.0	0.00	10.12	33.5	63.8	88.9	x
D041733(+)	60.3	84.7	0.00	12.01	58.1	63.5	88.2	x
D00095	61.7	93.7	0.33	11.37	55.7	63.8	87.8	x
D04573	61.0	87.3	0.67	11.66	61.7	63.5	86.9	x
D041603(+)	61.0	91.7	0.33	11.85	62.4	64.2	86.0	x
D041734(+)	60.0	88.3	0.33	11.21	17.8	62.8	85.9	x
D031607	60.7	90.3	0.00	11.82	68.2	64.0	85.3	x
D031671	61.0	89.3	0.00	11.99	73.1	64.5	84.9	x
D04630	61.7	88.0	0.00	11.98	70.8	64.5	84.1	x
D03004	61.0	86.0	0.33	11.32	57.4	64.3	82.8	x
D041708(+)	59.7	82.7	0.00	11.49	55.2	63.5	82.1	x
D021667	63.0	83.3	0.00	11.08	51.1	64.5	82.1	x
D031606	60.7	88.0	0.00	11.82	75.0	64.3	81.9	x
D031527	62.0	84.3	0.67	12.66	87.3	64.0	81.7	x
D021110	61.7	90.3	0.00	11.62	65.1	64.3	80.7	x
Lebsock	61.3	82.3	0.00	10.59	13.8	63.7	72.1	x
D021657	61.3	85.7	0.00	11.83	79.8	64.8	70.8	x
Alkabo	61.0	81.3	0.00	10.52	42.3	63.3	70.7	x
D041735(+)	62.0	81.3	0.00	12.03	58.2	63.0	67.0	x
Average	61.3	88.3	0.23	11.52	59.0	63.9	87.1	
probability	0.002	0.145	0.024	0.246	0.135	<0.001	<0.001	
CV (S/mean)	1.7	6.6	181.2	7.9	43.3	0.6	8.2	
CV (SE/mean)	1.0	3.8	104.6	4.5	25.0	0.3	4.7	
LSD (0.05)	1.7	9.6	0.68	1.48	41.6	0.6	11.6	

*days from planting
x indicates significantly lower yield than check variety, Mountrail, at a probability of 0.05

Table 11. Relative yields of durum varieties in bu/ac as compared to Mountrail when grown in the irrigated Uniform Regional Durum Trial at the EARC, Sidney, Montana.

Cultivar	2004	2005	2006	2007	2008	Ave	as % of Mountrail
Mountrail	79.4	93.5	92.4	42.5	104.0	82.4	100.0
Grenora	86.8	89.6	91.1	40.5	102.5	82.1	99.7
Divide	68.8	91.3	84.0	45.6	97.3	77.4	94.0
Alkabo	84.2	84.4	79.7	43.8	70.7	72.6	88.1
Pierce	65.5	88.1	83.4	31.4	92.8	72.2	87.7
Lebsock	68.4	85.8	74.1	28.5	72.1	65.8	79.9

NOTE: Average yields in this summary should not be compared to each other since they are not grown in the same years. Compare yields only to the check variety. Hail damage in 2007.

Table 12. Relative test weights of durum varieties in lb/bu as compared to Mountrail when grown in the irrigated Uniform Regional Durum Trial at the EARC, Sidney, Montana.

Cultivar	2004	2005	2006	2007	2008	Ave	as % of Mountrail
Lebsock	63.5	62.7	62.0	60.5	63.7	62.5	101.0
Pierce	63.2	62.5	62.2	58.8	64.5	62.2	100.6
Alkabo	63.8	62.5	61.3	60.0	63.3	62.2	100.5
Divide	62.8	62.7	61.5	59.0	63.8	62.0	100.2
Mountrail	62.8	62.3	61.8	58.8	63.5	61.8	100.0
Grenora	63.7	61.7	61.0	59.5	63.3	61.8	100.0

NOTE: Average test weights in this summary should not be compared to each other since they are not grown in the same years. Compare yields only to the check variety. Hail damage in 2007.

Table 13. Relative protein contents of durum varieties in percent as compared to Mountrail when grown in the irrigated Uniform Regional Durum Trial at the EARC, Sidney, Montana.

Cultivar	2004	2005	2006	2007	2008	Ave	as % of Mountrail
Divide	13.5	13.4	12.4	15.2	11.2	13.1	102.2
Pierce	12.8	13.4	11.8	15.1	11.9	13.0	101.1
Grenora	12.3	13.6	11.9	14.7	11.9	12.9	100.2
Mountrail	13.0	13.3	11.5	14.5	12.0	12.9	100.0
Lebsock	13.2	13.4	11.5	14.6	10.6	12.7	98.4
Alkabo	11.5	13.2	11.5	15.0	10.5	12.3	96.0

NOTE: Average protein contents in this summary should not be compared to each other since they are not grown in the same years. Compare yields only to the check variety. Hail damage in 2007.

Table 14. Relative lodging indices of durum varieties as compared to Mountrail when grown in the irrigated Uniform Regional Durum Trial at the EARC, Sidney, Montana.

Cultivar	2004	2005	2006	2007	2008	Ave	as % of Mountrail
Divide	0.3	1.3	1.0	0.0	0.3	0.6	223.1
Mountrail	0.0	1.3	0.0	0.0	0.0	0.3	100.0
Pierce	0.0	0.7	0.3	0.0	0.0	0.2	76.9
Grenora	0.0	0.3	0.0	0.0	0.0	0.1	23.1
Lebsock	0.0	0.3	0.0	0.0	0.0	0.1	23.1
Alkabo	0.0	0.0	0.0	0.0	0.0	0.0	0.0

NOTE: Average lodging indices in this summary should not be compared to each other since they are not grown in the same years. Compare yields only to the check variety.

Table 15. Relative hard vitreous amber color of durum varieties in percent as compared to Mountrail when grown in the irrigated Uniform Regional Durum Trial at the EARC, Sidney, MT.

Cultivar	2004	2005	2006	2007	2008	Ave	as % of Mountrail
Mountrail	96	90	68	84	76	82.8	100.0
Pierce	95	89	71	84	73	82.4	99.5
Grenora	98	89	69	88	62	81.2	98.1
Divide	97	88	71	86	47	77.8	94.0
Alkabo	93	90	38	89	42	70.4	85.0
Lebsock	99	85	59	74	14	66.2	80.0

NOTE: Average hard vitreous amber color values in this summary should not be compared to each other since they are not grown in the same years. Compare yields only to the check variety. Hail damage in 2007.