PROJECT TITLE: Evaluation of regional spring wheat and durum yield trials – 2010 (4W2756)

PROJECT LEADER:
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OBJECTIVES: 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.

Methods:
Dryland site:
Soil type: Williams clay loam
Previous crops: 2009 - fallow, 2008 – safflower, 2007- small grain plots
Residual soil N to 3 ft: 89 lb N/ac
Residual soil P to 6 in: 38 ppm
Applied fertilizer: none
Herbicides: Brox M, 1.5 pt/ac, applied June 15
Precipitation April – August, 2010: 15.32 in
Ave (61 yr) precipitation April – August: 9.48 in
Precipitation September 2009 – August 2010:20.25 in
Ave (61 yr) precipitation September – August: 13.90 in

Irrigated site:
Soil type: Savage silty clay
Previous crops: 2009 – safflower, 2008 – sugarbeet, 2007 – small grain
Residual soil N to 4 ft: 138 lb N/ac
Residual soil P to 6 in: 22 ppm
Applied fertilizer: 200 lb/ac 18-46-0, and 30 lb liquid N/ac, applied through sprinkler July 7
Irrigated (sprinkler) on: May 20, July 7, 1 inch each application
Herbicides: Brox M, 1.5 pt/ac, applied June 15
Precipitation April – August, 2010: 14.09 in
Ave (61 yr) precipitation April – August: 9.48 in
Precipitation September 2009 – August 2010:18.98 in
Ave (61 yr) precipitation September – August: 13.90 in

Comments:
It was generally a cool and very wet summer.

Nursery	Planting date	Harvest date
Uniform regional hard spring wheat trial	Apr 22	Aug 13
Uniform regional durum trial – dryland	Apr 22	Aug 13
Uniform regional durum trial – irrigated	May 13	Sep 3

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. Thirty-seven experimental lines and varieties of spring wheat were tested under dryland conditions (Table 1). Thirteen lines and varieties yielded significantly more 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). Two experimental lines yielded significantly more than the check variety, Mountrail, and one yielded significantly less. Five-year summaries for yield, test weight, protein, and NIR hardness are shown in Tables 6-9.

Thirty-two experimental lines and varieties were tested under flood irrigated conditions (Table 10). Eleven experimental lines yielded significantly more than the check variety, Mountrail, and five yielded significantly less. 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.

FUNDING SUMMARY: Expenditure information to be provided by OSP. No other grants support this project.

MWBC FY2011GRANT SUBMISSION PLANS: It is planned to submit this project for funding consideration in the next fiscal year.

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	
NDSW0702	67.7	77.3	14.29	57.0	61.5	a
MT 0827	64.3	72.3	12.50	61.5	60.6	a
BW431	67.7	82.3	12.23	62.0	59.2	a
MO6/1-23	64.7	81.7	12.68	63.0	57.9	a
MT 0852	67.3	70.7	12.28	61.0	57.3	a
MN06075-4	56.7	72.0	13.49	62.0	56.0	a
NDSW0703	67.0	75.0	13.92	57.0	55.9	a
03S0352-22	65.3	66.3	11.89	60.0	55.9	a
MN06028	66.3	66.7	13.19	61.0	55.9	a
03S0119-12	66.3	72.0	12.45	61.5	55.7	a
NDSW0701	65.3	64.3	12.36	60.0	55.1	a
MO3/3-23	68.0	77.0	11.65	60.0	54.1	a
Verde	66.3	70.0	11.28	61.0	53.6	a
2375	64.0	73.7	10.87	60.5	53.0	
MN06018	67.3	68.0	12.22	62.0	52.9	
02S0170-3	64.0	65.3	12.54	62.0	52.5	
MT 0832	65.3	69.7	11.16	59.5	52.4	
02S0091-9	65.0	63.7	12.18	59.5	52.1	
BW 928	66.3	65.7	13.26	60.5	51.8	
03S0253-7	64.7	66.0	11.53	60.0	51.5	
09FSP 18	65.7	65.0	10.49	60.0	51.2	
MO5/1-2	64.7	86.3	12.36	61.0	51.1	
SD4112	63.0	70.3	11.47	61.5	50.4	
SD4076	62.3	71.3	12.35	61.5	49.6	
BW427	67.3	82.3	12.86	61.5	49.4	
SD3997	64.7	78.7	11.92	61.0	49.3	
MO5/1-3	67.0	67.0	11.80	60.5	49.1	
MN07098-6	66.3	69.3	11.58	61.0	49.0	
MO6/1-24	65.0	69.3	13.38	60.5	48.3	
NDSW0612	68.3	70.7	14.22	60.5	47.9	
MN05214-3	65.3	68.0	12.37	61.0	46.3	
SD4011	65.0	68.3	11.69	59.5	46.3	
Keene	66.0	86.7	11.23	60.0	46.2	
09FSP3	68.3	64.7	11.68	60.0	46.0	
SD4023	65.3	71.0	11.06	61.5	45.2	
Chris	67.0	88.7	11.73	59.5	41.8	
Marquis	68.7	96.7	10.88	60.0	40.5	
average	65.7	72.8	12.2	60.6	51.7	
probability	0.064	<0.001			<0.001	
CV (S/MEAN)	4.6	6.4			8.3	
CV (SE/MEAN)	2.6	3.7			4.8	
LSD (0.05)	4.9	7.5			7.0	

*days from planting

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

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

Cultivar	2006	2007	2008	2009	2010	Ave	as % of Keene
NDSW0702	--	--	--	--	61.5	61.5	133.1
MT0827	--	--	--	--	60.6	60.6	131.2
MT0852	--	--	--	--	57.3	57.3	124.0
NDSW0703	--	--	--	58.6	55.9	57.3	121.4
NDSW0701	--	--	--	--	55.1	55.1	119.3
MT0832	--	--	--	--	52.4	52.4	113.4
NDSW0612	--	--	--	53.3	47.9	50.6	107.3
Verde	54.0	49.3	39.3	44.3	53.6	48.1	101.0
Keene	53.2	49.6	41.1	48.1	46.2	47.6	100.0
2375	51.1	45.4	40.3	48.3	53.0	47.6	100.0
Chris 525-1	41.5	38.0	31.6	46.4	41.8	39.9	83.7
Marquis	36.4	36.6	33.2	42.3	40.5	37.8	79.3

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 Verde when grown under dryland fallow conditions in the Uniform Regional Hard Red Spring Wheat trial at Sidney, MT.

Cultivar	2006	2007	2008	2009	2010	Ave	as % of Keene
MT0827	--	--	--	--	61.5	61.5	102.5
MT0852	--	--	--	--	61.0	61.0	101.7
NDSW0612	--	--	--	63.5	60.5	62.0	100.2
Keene	59.8	61.5	58.0	63.8	60.0	60.6	100.0
NDSW0701	--	--	--	--	60.0	60.0	100.0
2375	60.0	61.0	57.5	63.5	60.5	60.5	99.8
Verde	59.5	60.7	56.5	63.5	61.0	60.2	99.4
MT0832	--	--	--	--	59.5	59.5	99.2
Marquis	58.0	60.2	57.0	63.0	60.0	59.6	98.4
Chris 525-1	57.7	59.8	56.2	62.7	59.5	59.2	97.6
NDSW0703	--	--	--	61.0	57.0	59.0	95.3
NDSW0702	--	--	--	--	57.0	57.0	95.0

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

Cultivar	2006	2007	2008	2009	2010	Ave	as % of Keene
NDSW0702	--	--	--	--	14.3	14.3	127.7
NDSW0612	--	--	--	15.5	14.2	14.9	116.5
NDSW0703	--	--	--	15.5	13.9	14.7	115.3
MT0827	--	--	--	--	12.5	12.5	111.6
NDSW0701	--	--	--	--	12.4	12.4	110.7
MT0852	--	--	--	--	12.3	12.3	109.8
Chris 525-1	14.4	14.4	16.2	15.4	11.7	14.4	103.7
Keene	14.4	14.4	15.2	14.3	11.2	13.9	100.0
MT0832	--	--	--	--	11.2	11.2	100.0
Marquis	13.3	13.9	15.6	15.2	10.9	13.8	99.1
2375	12.3	12.6	15.5	15.4	10.9	13.3	96.0
Verde	12.5	12.7	15.2	12.8	11.3	12.9	92.8

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	grain protein, %	NIR hardness	test wt, lb/bu	yield, bu/ac	
DH06039	67.3	81.7	11.99	38.6	61.5	60.1	a
D06952	67.3	73.7	11.95	25.6	62.5	60.1	a
D06956	68.7	77.0	12.47	56.2	63.0	58.4	
Grenora	67.3	66.7	12.15	19.0	60.5	58.0	
Divide	67.3	77.3	11.63	1.7	61.0	57.7	
D06587	66.7	75.3	11.86	29.1	61.5	57.5	
D06710	67.3	73.0	12.45	52.3	62.5	56.4	
D06886	67.3	74.0	12.51	48.5	63.5	56.1	
D03028	68.3	77.7	10.95	5.0	61.5	55.4	
Alkabo	67.3	70.0	12.84	17.0	60.5	55.1	
D031671	66.3	75.0	12.66	45.1	61.5	55.0	
D06855	67.0	73.7	12.14	35.3	61.0	54.6	
D03708	66.7	68.7	12.74	44.1	60.5	54.4	
D06931	67.0	77.3	12.23	33.1	60.5	54.2	
D06707	67.7	78.0	12.54	43.7	63.0	54.0	
Mountrail	68.0	71.0	11.98	13.6	60.5	53.9	
D06605	66.7	69.0	12.56	41.0	61.0	53.6	
D05674	67.3	73.0	11.89	21.7	62.0	53.5	
D05547	67.3	68.3	12.43	33.7	61.5	53.4	
Tioga (D00095)	67.3	81.3	12.36	26.8	60.5	53.4	
D06953	68.3	76.0	10.87	5.6	60.5	53.3	
D06529	67.0	73.3	12.40	29.2	61.0	53.1	
Lebsock	66.3	73.0	13.34	55.7	61.0	52.9	
D041735(+)	66.3	70.0	13.57	53.3	59.5	52.7	
D041708(+)	66.7	73.0	12.45	39.4	62.0	52.0	
D06932	67.0	74.3	12.10	38.1	61.5	51.6	
D04581	66.3	76.3	12.19	13.3	61.0	50.6	
D06528	67.3	72.3	11.51	1.0	60.0	50.4	
DH05047	67.3	75.3	12.05	2.5	61.5	49.6	
D06065	66.7	73.3	13.08	54.4	61.0	49.5	
D04586	66.0	79.3	12.52	30.4	61.0	49.1	
D04008	66.3	80.3	12.46	23.5	61.0	48.1	x
average	67.1	74.3	12.28	30.5	61.3	54.0	
probability	<0.001	0.236				0.002	
CV (S/MEAN)	1.0	7.9				6.4	
CV (SE/MEAN)	0.6	4.6				3.7	
LSD (0.05)	1.1	9.6				5.7	

*days from planting
a indicates significantly greater yield than check variety, Mountrail, at probability <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	2006	2007	2008	2009	2010	Ave	as % of Mountrail
Alkabo	46.4	50.1	33.3	30.7	55.1	43.1	101.8
Grenora	45.7	52.3	31.6	25.7	58.0	42.7	100.8
Divide	41.5	49.2	32.0	32.5	57.7	42.6	100.6
Mountrail	45.7	51.1	30.6	30.4	53.9	42.3	100.0
Tioga	42.7	46.4	32.6	31.8	53.4	41.4	97.7
Lebsock	47.6	44.9	32.5	27.2	52.9	41.0	96.9

NOTE: Average yields 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 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	2006	2007	2008	2009	2010	Ave	as % of Mountrail
Lebsock	60.8	63.0	59.3	61.8	61.0	61.2	101.8
Alkabo	60.8	62.3	59.2	62.5	60.5	61.1	101.6
Divide	59.8	62.0	59.2	62.2	61.0	60.8	101.2
Tioga	58.8	62.3	59.0	62.7	60.5	60.7	100.9
Grenora	59.0	62.0	58.5	61.5	60.5	60.3	100.3
Mountrail	59.8	61.0	57.5	61.7	60.5	60.1	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 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	2006	2007	2008	2009	2010	Ave	as % of Mountrail
Lebsock	13.4	12.0	14.2	15.2	13.3	13.6	101.3
Mountrail	13.1	12.6	15.0	14.5	12.0	13.4	100.0
Grenora	13.3	12.5	14.3	14.9	12.2	13.4	100.0
Tioga	13.9	11.7	14.6	14.5	12.4	13.4	99.9
Alkabo	12.9	12.0	14.4	13.8	12.8	13.2	98.1
Divide	12.9	12.4	14.1	14.4	11.6	13.1	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. NIR hardness 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	2006	2007	2008	2009	2010	Ave	as % of Mountrail
Lebsock	63	64	76	108	56	73.4	108.3
Grenora	72	76	81	107	19	71.0	104.7
Tioga	70	57	79	107	27	68.0	100.3
Mountrail	69	73	78	105	14	67.8	100.0
Alkabo	61	63	79	110	17	66.0	97.3
Divide	53	70	77	108	2	62.0	91.4

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	grain protein, %	NIR hardness	test wt, lb/bu	yield, bu/ac	
D06952	49.3	87.7	0.3	14.53	90.6	59.5	78.6	a
D06953	50.3	85.7	0.3	14.32	87.0	59.0	77.9	a
D06931	49.0	91.7	1.0	13.98	81.2	60.0	77.3	a
D06855	50.3	86.3	0.0	13.96	82.8	59.5	77.1	a
D06956	50.7	88.3	1.0	14.33	89.1	60.5	77.1	a
D06587	49.0	90.3	1.7	14.19	90.7	59.5	75.5	a
D06932	49.0	91.0	0.7	13.87	78.0	59.5	75.0	a
Divide	50.3	89.3	0.3	13.55	86.7	58.0	74.1	a
Tioga	50.0	91.7	0.0	14.14	88.3	59.0	72.7	a
D03028	51.0	93.0	1.7	14.25	80.2	59.0	71.8	a
D06605	50.0	85.0	0.0	14.16	81.0	58.5	70.9	a
D05547	48.7	80.3	0.0	14.04	75.7	58.5	69.9	
D06065	48.7	85.0	0.0	14.80	95.9	60.0	69.1	
DH06039	49.7	94.3	3.0	14.58	92.4	59.0	68.9	
D05674	50.0	90.7	1.7	13.68	87.7	60.5	68.3	
Grenora	48.0	84.0	1.0	14.20	84.2	58.5	66.0	
D041735(+)	49.3	83.3	0.0	13.94	80.2	58.5	65.7	
D04008	48.3	85.3	2.0	14.55	90.9	60.0	65.3	
Mountrail	50.0	83.3	1.3	14.01	86.0	59.0	64.4	
D031671	48.7	86.0	0.0	13.69	87.4	60.0	64.3	
D06707	48.7	80.3	0.0	13.93	83.6	60.0	64.2	
D06710	49.0	87.3	0.7	14.31	86.5	59.5	64.1	
D03708	48.3	82.0	0.7	14.48	89.8	60.0	63.6	
D04581	49.0	91.0	2.3	14.63	91.6	59.5	63.5	
Lebsock	49.7	84.0	0.0	14.30	79.7	60.0	62.1	
D06886	49.0	78.3	0.0	13.58	77.4	59.5	62.0	
D041708(+)	49.7	90.7	2.0	14.38	81.6	60.0	59.8	
D04586	50.0	95.3	3.0	14.49	84.1	58.0	57.4	x
Alkabo	49.0	84.3	0.3	14.05	66.8	59.5	52.7	x
DH05047	49.3	94.0	2.0	14.22	72.7	59.0	52.6	x
D06529	48.7	80.3	0.0	14.06	78.5	58.5	52.6	x
D06528	49.0	78.0	0.0	14.35	75.5	59.0	49.7	x
Average	49.36	86.81	0.8438	14.17	83.9	59.3	66.7	
probability	<0.001	<0.001	<0.001				<0.001	
CV (S/mean)	0.9	5.1	94.3				5.6	
CV (SE/mean)	0.5	2.9	54.4				3.2	
LSD (0.05)	0.7	7.2	1.3				6.1	

*days from planting
a indicates significantly greater yield than check variety, Mountrail, at probability <0.05
x indicates significantly lower yield than check variety, Mountrail, at probability <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	2006	2007	2008	2009	2010	Ave	as % of Mountrail
Mountrail	92.4	42.5	104.0	138.6	64.4	88.4	100.0
Grenora	91.1	40.5	102.5	134.3	66.0	86.9	98.3
Divide	84.0	45.6	97.3	129.1	74.1	86.0	97.3
Tioga	83.9	39.6	87.8	132.1	72.7	83.2	94.2
Alkabo	79.7	43.8	70.7	125.0	52.7	74.4	84.2
Lebsock	74.1	28.5	72.1	121.9	62.1	71.7	81.2

NOTE: Average yields 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. 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	2006	2007	2008	2009	2010	Ave	as % of Mountrail
Lebsock	62.0	60.5	63.7	62.5	60.0	61.7	101.1
Alkabo	61.3	60.0	63.3	63.0	59.5	61.4	100.6
Tioga	61.8	59.7	63.8	62.0	59.0	61.3	100.3
Mountrail	61.8	58.8	63.5	62.3	59.0	61.1	100.0
Divide	61.5	59.0	63.8	62.5	58.0	61.0	99.8
Grenora	61.0	59.5	63.3	62.0	58.5	60.9	99.6

NOTE: Average test weights 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. 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	2006	2007	2008	2009	2010	Ave	as % of Mountrail
Grenora	11.9	14.7	11.9	13.4	14.2	13.2	102.2
Tioga	11.8	14.3	11.4	13.6	14.1	13.0	100.8
Divide	12.4	15.2	11.2	12.4	13.6	13.0	100.2
Mountrail	11.5	14.5	12.0	12.7	14.0	12.9	100.0
Lebsock	11.5	14.6	10.6	12.7	14.3	12.7	98.5
Alkabo	11.5	15.0	10.5	12.2	14.0	12.6	97.7

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. 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	2006	2007	2008	2009	2010	Ave	as % of Mountrail
Mountrail	0.0	0.0	0.0	2.0	1.3	0.7	100.0
Divide	1.0	0.0	0.3	1.3	0.3	0.6	87.9
Alkabo	0.0	0.0	0.0	0.7	0.3	0.2	30.3
Grenora	0.0	0.0	0.0	0.0	1.0	0.2	30.3
Tioga	0.3	0.0	0.3	0.0	0.0	0.1	18.2
Lebsock	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 only to the check variety. Hail damage in 2007.

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

Cultivar	2006	2007	2008	2009	2010	Ave	as % of Mountrail
Mountrail	68	84	76	97	86	82.2	100.0
Grenora	69	88	62	101	84	80.8	98.3
Tioga	69	81	56	98	88	78.4	95.4
Divide	71	86	47	98	87	77.8	94.6
Alkabo	38	89	42	88	67	64.8	78.8
Lebsock	59	74	14	97	80	64.8	78.8

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 only to the check variety. Hail damage in 2007.