

PROJECT TITLE: Off-station durum variety evaluations in Montana – 2009 (4W2756)

PRINCIPAL INVESTIGATOR: Joyce Eckhoff, MSU Eastern Agricultural Research Center, Sidney, MT

phone: (406)433-2208 e-mail: jeckhoff@sidney.ars.usda.gov

Personnel:

Site/County	Producers	CES/AES cooperators
Flaxville, Daniels	Charlie Cahill	Nicole Winkler, CES
Circle, McCone	Victor Wagner	Ken Nelson, CES
Poplar, Roosevelt	Mark Swank	Ann Ronning, CES
Nashua, Valley	Bill Lauckner	Verlin Koenig, CES
Wibaux, Wibaux	David Maus	Dave Bertelsen, CES
Outlook, Sheridan	Gordon Stoner	Terry Angvick, CES
Turner, Blaine	Max Cederberg	Gregg Carlson, NARC
North Havre, Hill	Mark Petersen	Gregg Carlson, NARC

OBJECTIVE: To evaluate varieties of durum under dryland conditions at various sites in Montana.

RESULTS: The site in Sheridan County was not harvested because of poor stand. Summaries of yields, test weights, protein contents, hard vitreous amber color, and sawfly damage across sites in eastern Montana are shown in Tables 1-5. Strongfield and experimental line Cimmyt #8 yielded most across sites (Table 1). Cimmyt #8 had greatest test weight across sites (Table 2). Dilse had greatest protein content across sites (Table 3). Alzada had greatest percent hard vitreous amber color across sites (Table 4). Strongfield was tallest and MT01649 was shortest across sites (Table 5). Dilse had greatest percent sawfly cutting and Normanno had the least percent sawfly cutting across sites (Table 6).

Circle, McCone County: Performance and relative values of yield, test weight, protein, and HVAC of durum varieties grown at Circle are shown in Tables 7-11. Normanno, Cimmyt #8 and Cimmyt #11 yielded significantly more than the check variety, Mountrail.

Nashua, Valley County: Performance and relative values of yield, test weight, protein and HVAC of durum varieties grown at Nashua are shown in Tables 12-16. Cimmyt #8 yielded significantly more than the check variety, Mountrail.

Flaxville, Daniels County: Performance and relative values of yield, test weight, protein and HVAC of durum varieties grown at Flaxville are shown in Tables 17-21. Cimmyt #8 yielded most.

Poplar, Roosevelt County: Performance and relative values of yield, test weight, protein and HVAC of durum varieties grown at Flaxville are shown in Tables 22-26. Grenora and Strongfield yielded significantly more than the check variety, Mountrail.

Wibaux, Wibaux County: Performance and relative values of yield, test weight, protein and HVAC of durum varieties grown at Flaxville are shown in Tables 27-31. Grenora yielded most. Five lines and varieties yielded significantly less than the check variety, Mountrail.

Turner, Blaine County: Performance and relative values of yield, test weight, protein and sawfly damage of durum varieties grown at Turner are shown in Tables 32-36. Normanno yielded significantly more than the check variety, Mountrail. Three lines and varieties yielded significantly less than the check variety, Mountrail.

North Havre, Hill County: Performance and relative values of yield, test weight, protein and sawfly damage of durum varieties grown at North Havre are shown in Tables 37-41. Cimmyt #5 yielded most. One variety yielded significantly less than the check variety, Mountrail.

SUMMARY: Off-station yield trials are conducted at several sites in northern and eastern Montana. All experiments reported under this project are of the replicated small plot type. These trials provide important information about performance of experimental lines and varieties from Montana, other states, and private companies. Regional durum producers make decisions on varieties to grow 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. Summary of durum yields in bu/acre at seven off-station sites in eastern Montana, 2009.

Variety	Circle, dryland recrop	Flaxville, dryland recrop	Nashua, dryland fallow	Wibaux, dryland recrop	Poplar, dryland fallow	Turner, dryland recrop	N. Havre dryland recrop	average
Strongfield	29.0	10.8	30.3	26.6	60.9	36.5	37.7	33.1
Cimmyt#8	31.3	12.9	31.5	27.6	56.5	36.3	34.8	33.0
Grenora	29.5	11.6	26.7	27.8	62.3	35.4	34.5	32.5
Normanno	32.8	8.3	29.9	25.3	50.7	40.9	39.4	32.5
Cimmyt#11	31.6	9.3	28.5	25.0	54.7	34.6	35.4	31.3
Cimmyt#5	25.6	10.9	25.1	25.9	54.0	36.3	39.8	31.1
Mountrail	24.7	11.4	26.0	27.1	52.6	35.4	34.2	30.2
Divide	26.5	10.3	26.1	22.0	57.4	29.9	35.8	29.7
Pierce	27.2	8.5	28.6	22.8	54.2	32.9	31.8	29.4
MT04174	29.9	9.7	26.1	18.9	48.0	31.9	35.6	28.6
Dilse	24.8	10.6	23.0	26.8	54.4	31.2	29.0	28.5
MT03012	24.7	10.6	25.0	20.6	51.2	33.0	31.7	28.1
Alzada	24.5	8.0	31.0	21.8	49.0	29.1	31.6	27.9
MT01649	22.0	6.4	24.8	22.2	51.9	30.5	36.3	27.7
Alkabo	26.1	11.0	26.4	20.6	51.4	31.9	24.2	27.4
site average	27.4	10.0	27.3	24.1	54.0	33.7	34.1	30.1
probability	0.009	0.215	0.063	0.005	0.021	<0.01	<0.01	
CV (S/Mean)	11.9	24.4	11.6	12.1	8.3	8.34	10.17	
CV(SE/Mean)	6.9	14.1	6.7	7.0	4.8	4.82	5.87	
LSD 0.05	5.4	4.1	5.3	4.8	7.5	4.71	6.8	

Table 2. Summary of durum test weights in lb/bu at seven sites in eastern Montana, 2009.

Variety	Circle, dryland recrop	Flaxville, dryland recrop	Nashua, dryland fallow	Wibaux, dryland recrop	Poplar, dryland fallow	Turner, dryland recrop	N. Havre dryland recrop	average
Cimmyt#8	59.7	59.3	61.5	63.2	62.5	62.3	60.9	61.3
Pierce	60.0	60.5	60.2	62.8	63.2	60.9	60.0	61.1
Alzada	60.5	59.2	61.0	62.0	62.2	60.6	60.2	60.8
Alkabo	59.2	60.0	60.0	62.3	62.5	60.8	59.9	60.7
Strongfield	60.2	59.0	60.5	62.3	62.2	59.9	59.3	60.5
Divide	59.0	59.3	59.8	62.2	62.7	60.0	59.5	60.4
Dilse	59.5	59.2	59.5	62.5	62.0	60.4	59.0	60.3
Mountrail	59.5	58.8	59.7	62.0	61.8	60.2	58.4	60.1
MT04174	58.3	59.2	59.8	61.8	61.7	60.1	58.7	59.9
Grenora	58.2	59.0	59.0	61.3	61.3	60.6	56.2	59.4
Cimmyt#5	57.8	58.2	59.5	61.2	60.0	60.3	58.5	59.4
Normanno	58.7	57.2	59.7	61.2	60.7	59.8	57.6	59.3
Cimmyt#11	57.0	56.7	59.5	60.8	61.3	59.7	56.5	58.8
MT01649	57.0	56.8	58.8	59.0	59.7	58.7	56.7	58.1
MT03012	58.3	58.0	59.8	61.5	61.7	30.1	58.7	55.4
site average	58.9	58.7	59.9	61.7	61.7	60.3	58.9	59.7
probability	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	
CV (S/Mean)	1.1	1.1	0.5	0.5	1.2	0.7	1.39	
CV(SE/Mean)	0.6	0.7	0.3	0.3	0.7	0.4	0.8	
LSD 0.05	1.1	1.1	0.5	0.6	1.3	0.7	1.37	

Table 3. Summary of durum percent protein at seven sites in eastern Montana, 2009.

Variety	Circle, dryland recrop	Flaxville, dryland recrop	Nashua, dryland fallow	Wibaux, dryland recrop	Poplar, dryland fallow	Turner, dryland recrop	N. Havre dryland recrop	average
Dilse	12.97	13.38	14.80	11.65	11.17	16.3	15.2	13.64
MT01649	12.77	14.02	13.81	12.20	11.78	16.2	13.9	13.53
MT04174	11.88	13.59	14.45	12.15	11.33	15.7	14.0	13.30
MT03012	12.49	13.54	14.03	11.76	11.15	15.5	14.6	13.30
Alzada	11.39	13.37	13.73	11.82	11.11	15.9	15.4	13.25
Pierce	12.79	13.02	14.36	11.71	11.03	15.4	14.1	13.20
Strongfield	10.99	13.55	14.11	11.74	10.79	15.7	15.3	13.17
Alkabo	12.45	12.92	14.14	11.69	10.96	15.2	14.3	13.09
Grenora	12.24	12.61	14.78	11.88	11.07	14.7	14.2	13.07
Mountrail	11.91	13.26	14.44	11.71	10.54	14.8	14.7	13.05
Divide	12.00	12.90	14.57	11.19	10.30	15.7	14.6	13.04
Normanno	12.33	12.82	13.81	11.39	10.60	14.5	14.1	12.79
Cimmyt#5	11.51	13.27	13.04	11.74	11.75	14.0	13.5	12.69
Cimmyt#11	12.45	13.11	11.31	11.00	10.62	14.0	13.3	11.94
Cimmyt#8	10.27	13.05	11.91	10.87	10.53	13.4	12.9	11.85
site average	11.88	13.23	13.82	11.64	10.98	15.13	14.27	12.99
probability	<0.001	0.032	<0.001	0.017	0.001			
CV (S/Mean)	4.7	3.2	3.3	3.5	3.5			
CV(SE/Mean)	2.7	1.8	1.9	2.0	2.0			
LSD 0.05	0.93	0.70	0.76	0.69	0.64			

Table 4. Summary of durum percent hard vitreous amber color at five sites in eastern Montana, 2009.

Variety	Circle, dryland recrop	Flaxville, dryland recrop	Nashua, dryland fallow	Wibaux, dryland recrop	Poplar, dryland fallow	average
Alzada	55.0	90.1	83.5	67.3	94.1	78.0
Mountrail	49.8	91.9	78.2	73.7	89.6	76.6
MT03012	54.8	92.5	80.4	63.3	90.7	76.3
Pierce	44.2	89.6	75.9	76.7	92.5	75.8
Strongfield	41.2	92.8	75.5	75.7	93.7	75.8
Dilse	41.1	93.4	76.8	72.7	91.2	75.0
MT04174	40.5	95.7	78.5	64.3	90.2	73.8
Grenora	49.3	88.3	72.8	68.0	89.2	73.5
Normanno	49.7	86.0	77.7	59.7	87.7	72.2
MT01649	46.8	89.9	78.0	55.7	86.1	71.3
Divide	38.6	85.8	72.3	75.7	83.4	71.1
Alkabo	34.0	88.1	66.3	74.3	89.5	70.4
Cimmyt#5	42.9	83.5	73.0	56.3	85.1	68.2
Cimmyt#8	16.4	87.8	72.2	62.0	85.1	64.7
Cimmyt#11	25.7	83.7	62.6	63.0	81.6	63.3
site average	42.0	89.3	74.9	67.2	88.6	72.4
probability	0.022	0.050	<0.001	<0.001	<0.001	
CV (S/Mean)	27.9	4.9	4.4	4.6	3.6	
CV(SE/Mean)	16.1	2.8	2.5	2.6	2.1	
LSD 0.05	19.6	7.3	5.5	5.1	5.3	

Table 5. Summary of durum heights in cm at seven off-station sites in eastern Montana, 2009.

Variety	Circle, dryland recrop	Flaxville, dryland recrop	Nashua, dryland fallow	Wibaux, dryland recrop	Poplar, dryland fallow	Turner, dryland recrop	N. Havre dryland recrop	average
Strongfield	65.7	60.0	61.3	75.7	83.0	65.8	69.5	68.7
Pierce	67.7	59.7	62.3	76.7	85.7	61.5	66.3	68.5
Divide	62.0	60.0	62.0	75.7	85.0	62.9	71.9	68.5
Dilse	65.3	54.3	57.3	72.7	83.0	62.4	66.6	65.9
Alkabo	63.3	57.7	58.3	74.3	81.0	60.7	65.9	65.9
Mountrail	66.0	53.3	59.7	73.7	83.3	59.1	65.2	65.8
Grenora	59.0	53.7	55.7	68.0	80.3	62.5	62.2	63.0
Alzada	62.3	51.3	54.0	67.3	69.7	56.5	60.3	60.2
MT03012	57.0	49.7	54.3	63.3	69.7	57.9	59.1	58.7
Cimmyt#11	59.0	48.0	51.0	63.0	67.3	62.2	57.9	58.3
MT04174	58.0	52.3	52.7	64.3	67.3	53.0	59.8	58.2
Cimmyt#8	57.3	49.0	47.7	62.0	66.3	54.1	56.5	56.1
Normanno	54.0	47.7	45.7	59.7	65.0	55.4	53.3	54.4
Cimmyt#5	50.3	45.0	47.0	56.3	61.7	47.2	52.5	51.4
MT01649	48.0	40.3	44.7	55.7	58.0	47.6	50.0	49.2
site average	59.7	52.1	54.2	67.2	73.8	57.9	61.1	60.9
probability	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	
CV (S/Mean)	4.4	6.0	6.8	4.6	3.4	7.8	6.9	
CV(SE/Mean)	2.5	3.5	3.9	2.6	1.9	4.5	4.0	
LSD 0.05	4.4	5.2	6.2	5.1	4.2	7.5	7.0	

Table 6. Summary of percent durum sawfly damage at three off-station sites in eastern Montana, 2009.

Variety	Circle, dryland recrop	Turner, dryland recrop	N. Havre dryland recrop	average
Dilse	7.3	15.0	0.7	7.67
Grenora	2.3	15.0	0.0	5.78
Pierce	3.0	11.7	0.3	5.00
MT04174	1.7	8.7	1.0	3.78
Alkabo	2.3	8.7	0.3	3.78
Strongfield	0.7	10.0	0.0	3.56
Alzada	2.3	8.3	0.0	3.55
Mountrail	1.3	8.3	0.3	3.33
MT01649	2.0	5.3	1.0	2.78
MT03012	1.0	5.7	0.3	2.33
Divide	1.3	5.0	0.0	2.11
Cimmyt#11	0.3	2.3	0.0	0.88
Cimmyt#5	0.0	2.3	0.0	0.78
Cimmyt#8	0.0	1.0	0.0	0.33
Normanno	0.0	0.7	0.0	0.22
site average	1.7	7.2	0.3	3.06
probability	0.016	<0.01	<0.01	
CV (S/Mean)	116.7	58.52	118.59	
CV(SE/Mean)	67.4	33.79	68.47	
LSD 0.05	3.3	7.05	0.53	

Table 7. Performance of durum grown under dryland continuous cropping conditions at Circle, MT. Circle, MT. Planted: May 11, 2009 Harvested: September 16, 2009 Cooperator: Victor Wagner

Variety	height, cm	% sawfly cutting	grain protein, %	HVAC, %	test wt, lb/bu	yield, bu/acre	
Normanno	54.0	0.0	12.33	49.7	58.7	32.8	a
Cimmyt#11	59.0	0.3	10.23	25.7	57.0	31.6	a
Cimmyt#8	57.3	0.0	10.27	16.4	59.7	31.3	a
MT04174	58.0	1.7	11.88	40.5	58.3	29.9	
Grenora	59.0	2.3	12.24	49.3	58.2	29.5	
Strongfield	65.7	0.7	10.99	41.2	60.2	29.0	
Pierce	67.7	3.0	12.79	44.2	60.0	27.2	
Divide	62.0	1.3	12.00	38.6	59.0	26.5	
Alkabo	63.3	2.3	12.45	34.0	59.2	26.1	
Cimmyt#5	50.3	0.0	11.51	42.9	57.8	25.6	
Dilse	65.3	7.3	12.97	41.1	59.5	24.8	
Mountrail	66.0	1.3	11.91	49.8	59.5	24.7	
MT03012	57.0	1.0	12.49	54.8	58.3	24.7	
Alzada	62.3	2.3	11.39	55.0	60.5	24.5	
MT01649	48.0	2.0	12.77	46.8	57.0	22.0	
average	59.7	1.7	11.88	42.0	58.9	27.4	
probability	<0.001	0.016	<0.001	0.022	<0.001	0.009	
CV (S/Mean)	4.4	116.7	4.7	27.9	1.1	11.9	
CV(SE/Mean)	2.5	67.4	2.7	16.1	0.6	6.9	
LSD 0.05	4.4	3.3	0.93	19.6	1.1	5.4	

Table 8. Relative yielding abilities of durum varieties compared to Mountrail when grown under dryland conditions in McCone County in cooperation with CES.

Variety	2004	2005	2006	2008	2009	average	As % of Mountrail
Normanno	--	--	--	--	32.8	32.8	132.8
Cimmyt #8	--	--	--	12.1	31.3	21.7	128.0
Cimmyt #11	--	--	--	10.9	31.6	21.3	125.4
MT04174	--	--	--	10.7	29.9	20.3	119.8
Strongfield	--	--	12.9	11.3	29.0	17.7	118.0
Grenora	--	26.9	13.2	13.3	29.5	20.7	113.3
MT03012	--	--	13.7	11.9	24.7	16.8	111.5
Alkabo	--	28.6	13.1	12.0	26.1	20.0	109.0
Cimmyt #5	--	--	--	10.7	25.6	18.2	107.1
Alzada	--	27.4	13.7	11.5	24.5	19.3	105.3
Divide	--	25.4	11.7	9.8	26.5	18.4	100.3
Mountrail	24.6	28.1	11.2	9.2	24.7	19.6	100.0
Pierce	20.8	26.0	12.0	10.8	27.2	19.4	99.0
Dilse	20.5	24.1	11.7	8.6	24.8	17.9	91.7
MT01649	--	--	--	--	22.0	22.0	89.1

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 9. Relative test weights of durum varieties as compared to Mountrail when grown under dryland conditions in McCone County in cooperation with CES.

Variety	2004	2005	2006	2008	2009	average	As % of Mountrail
Pierce	61.7	61.8	59.7	61.8	60.0	61.0	101.7
Strongfield	--	--	59.0	61.3	60.2	60.2	101.6
Dilse	62.5	61.8	58.5	61.3	59.5	60.7	101.2
Alkabo	--	61.8	59.7	61.0	59.2	60.4	101.0
Cimmyt #8	--	--	--	60.7	59.7	60.2	100.6
Divide	--	61.0	59.2	61.3	59.0	60.1	100.5
Alzada	--	60.0	59.7	60.0	60.5	60.1	100.4
MT03012	--	--	59.7	60.0	58.3	59.3	100.2
Mountrail	60.8	61.5	58.0	60.2	59.5	60.0	100.0
MT04174	--	--	--	60.8	58.3	59.6	99.5
Grenora	--	61.0	58.5	60.3	58.2	59.5	99.5
Normanno	--	--	--	--	58.7	58.7	98.7
Cimmyt #5	--	--	--	59.3	57.8	58.6	97.8
Cimmyt #11	--	--	--	57.7	57.0	57.4	95.8
MT01649	--	--	--	--	57.0	57.0	95.8

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 10. Relative protein contents of durum varieties as compared to Mountrail when grown under dryland conditions in McCone County in cooperation with CES.

Variety	2004	2005	2006	2008	2009	average	As % of Mountrail
MT01649	--	--	--	--	12.8	12.8	107.6
Dilse	13.9	11.8	15.3	13.4	13.0	13.5	104.2
Normanno	--	--	--	--	12.3	12.3	103.4
Pierce	13.9	11.2	14.6	13.5	12.8	13.2	102.0
MT03012	--	--	14.6	13.6	12.5	13.6	101.0
Grenora	--	11.2	14.3	13.3	12.2	12.8	100.6
Alkabo	--	10.6	14.8	13.2	12.4	12.8	100.6
Mountrail	14.0	10.4	14.7	13.7	11.9	12.9	100.0
Strongfield	--	--	15.1	13.8	11.0	13.3	99.0
MT04174	--	--	--	13.4	11.9	12.7	98.8
Divide	--	10.4	14.6	13.0	12.0	12.5	98.6
Cimmyt #5	--	--	--	13.4	11.5	12.5	97.3
Alzada	--	10.5	13.7	12.3	11.4	12.0	94.5
Cimmyt #8	--	--	--	13.2	10.3	11.8	91.8
Cimmyt #11	--	--	--	13.1	10.2	11.7	91.0

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

Table 11. Relative HVACs of durum varieties as compared to Mountrail when grown under dryland conditions in McCone County in cooperation with CES.

Cultivar	2004	2005	2006	2008	2009	Ave	as % of Mountrail
MT03012	--	--	79.4	70.2	54.8	68.1	105.8
Alzada	--	68.7	79.2	62.9	55.0	66.5	104.3
Strongfield	--	--	85.6	69.7	41.2	65.5	101.7
Pierce	86.5	54.0	80.1	76.0	44.2	68.2	100.1
Mountrail	85.5	61.7	74.1	69.3	49.8	68.1	100.0
Normanno	--	--	--	--	49.7	49.7	99.8
Dilse	89.1	56.9	73.7	63.5	41.1	64.9	95.3
MT01649	--	--	--	--	46.8	46.8	94.0
MT04174	--	--	--	70.8	40.5	55.7	93.5
Grenora	--	43.6	72.1	64.0	49.3	57.3	89.8
Divide	--	40.4	75.5	62.7	38.6	54.3	85.2
Cimmyt #5	--	--	--	57.1	42.9	50.0	84.0
Alkabo	--	25.8	79.8	57.5	34.0	49.3	77.3
Cimmyt #8	--	--	--	56.6	16.4	36.5	61.3
Cimmyt #11	--	--	--	44.6	25.7	35.2	59.0

NOTE: Average HVACs 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 12. Performance of durum grown under dryland conditions at Nashua, MT.
 Planted: April 17, 2009 Harvested: September 9, 2009 Cooperator: Bill Lauckner

Variety	height, cm	grain protein, %	HVAC	test wt, lb/bu	yield, bu/acre
Cimmyt#8	47.7	11.91	72.2	61.5	31.5 a
Alzada	54.0	13.73	83.5	61.0	31.0
Strongfield	61.3	14.11	75.5	60.5	30.3
Normanno	45.7	13.81	77.7	59.7	29.9
Pierce	62.3	14.36	75.9	60.2	28.6
Cimmyt#11	51.0	11.31	62.6	59.5	28.5
Grenora	55.7	14.78	72.8	59.0	26.7
Alkabo	58.3	14.14	66.3	60.0	26.4
Divide	62.0	14.57	72.3	59.8	26.1
MT04174	52.7	14.45	78.5	59.8	26.1
Mountrail	59.7	14.44	78.2	59.7	26.0
Cimmyt#5	47.0	13.04	73.0	59.5	25.1
MT03012	54.3	14.03	80.4	59.8	25.0
MT01649	44.7	13.81	78.0	58.8	24.8
Dilse	57.3	14.80	76.8	59.5	23.0
average	54.2	13.82	74.9	59.9	27.3
probability	<0.001	<0.001	<0.001	<0.001	0.063
CV (S/Mean)	6.8	3.3	4.4	0.5	11.6
CV(SE/Mean)	3.9	1.9	2.5	0.3	6.7
LSD 0.05	6.18	0.76	5.5	0.5	5.3

a indicates significantly greater yield than check variety, Mountrail

Table 13. Relative yielding abilities of spring wheat varieties as compared to Mountrail when grown under dryland conditions in Valley County in cooperation with CES.

Cultivar	2004	2005	2006	2008	2009	Ave	As % of Mountrail
Normanno	--	--	--	--	29.9	29.9	115.0
Cimmyt #8	--	--	--	16.5	31.5	24.0	111.1
Divide	--	61.0	29.1	16.3	26.1	33.1	107.9
Grenora	--	57.7	32.2	15.4	26.7	33.0	107.5
Strongfield	--	--	33.5	14.9	30.3	26.2	107.4
Alkabo	--	59.3	28.5	16.2	26.4	32.6	106.2
MT04174	--	--	--	19.2	26.1	22.7	104.9
Cimmyt #11	--	--	--	16.8	28.5	22.7	104.9
Alzada	--	48.2	27.5	20.0	31.0	31.7	103.2
Mountrail	58.6	49.5	30.1	17.2	26.0	36.3	100.0
MT03012	--	--	28.8	19.1	25.0	24.3	99.5
Pierce	51.1	48.9	32.1	16.3	28.6	35.4	97.6
Cimmyt #5	--	--	--	16.9	25.1	21.0	97.2
Dilse	49.1	57.2	30.0	14.8	23.0	34.8	96.0
MT01649	--	--	--	--	24.8	24.8	95.4

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 14. Relative test weights of durum varieties as compared to Mountrail when grown under dryland conditions in Valley County in cooperation with CES.

Cultivar	2004	2005	2006	2008	2009	Ave	As % of Mountrail
Cimmyt #8	--	--	--	57.2	61.5	59.4	102.2
Pierce	61.8	62.5	60.3	58.5	60.2	60.7	101.6
Alkabo	--	61.7	60.0	58.8	60.0	60.1	101.6
Dilse	62.5	61.8	61.3	57.5	59.5	60.5	101.4
Strongfield	--	--	60.0	57.0	60.5	59.2	101.1
Divide	--	61.0	60.0	58.0	59.8	59.7	100.8
Grenora	--	61.8	59.8	56.8	59.0	59.4	100.3
MT03012	--	--	59.7	56.3	59.8	58.6	100.2
MT04174	--	--	--	56.5	59.8	58.2	100.1
Mountrail	61.7	61.3	59.3	56.5	59.7	59.7	100.0
Normanno	--	--	--	--	59.7	59.7	100.0
Alzada	--	58.5	59.0	56.5	60.0	58.5	98.8
Cimmyt #5	--	--	--	55.2	59.5	57.4	98.7
MT01649	--	--	--	--	58.8	58.8	98.5
Cimmyt #11	--	--	--	54.3	59.5	56.9	97.9

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 15. Relative protein contents of durum varieties as compared to Mountrail when grown under dryland conditions in Valley County in cooperation with CES.

Cultivar	2004	2005	2006	2008	2009	Ave	As % of Mountrail
Dilse	10.3	12.7	12.7	16.4	14.8	13.4	102.3
Strongfield	--	--	13.6	16.8	14.1	14.8	101.8
MT03012	--	--	14.1	15.7	14.0	14.6	100.2
Mountrail	10.3	11.4	12.9	16.4	14.4	13.1	100.0
Grenora	--	11.1	13.2	15.9	14.8	13.8	99.8
Pierce	9.9	10.6	14.0	16.2	14.4	13.0	99.5
MT04174	--	--	--	15.8	14.4	15.1	98.1
Alkabo	--	10.6	13.2	15.8	14.1	13.4	97.5
Divide	--	10.6	12.4	15.6	14.6	13.3	96.6
Alzada	--	11.4	12.7	15.3	13.7	13.3	96.4
Normanno	--	--	--	--	13.8	13.8	95.8
MT01649	--	--	--	--	13.8	13.8	95.8
Cimmyt #5	--	--	--	15.4	13.0	14.2	92.2
Cimmyt #11	--	--	--	16.5	11.3	13.9	90.3
Cimmyt #8	--	--	--	15.9	11.9	13.9	90.3

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

Table 16. Relative HVACs of durum varieties as compared to Mountrail when grown under dryland conditions in Valley County in cooperation with CES.

Cultivar	2004	2005	2006	2008	2009	Ave	as % of Mountrail
Alzada	--	61.7	59.5	70.3	83.5	68.8	127.1
Grenora	--	51.1	52.8	73.9	72.8	62.7	115.8
MT03012	--	--	71.1	76.3	80.4	75.9	114.9
Dilse	75.0	66.7	48.8	74.8	76.8	68.4	111.5
Strongfield	--	--	67.6	75.8	75.5	73.0	110.4
Pierce	70.2	37.2	66.5	78.9	75.9	65.7	107.1
MT04174	--	--	--	77.9	78.5	78.2	103.0
Mountrail	90.5	18.2	46.4	73.6	78.2	61.4	100.0
MT01649	--	--	--	--	78.0	78.0	99.7
Normanno	--	--	--	--	77.7	77.7	99.4
Divide	--	33.4	32.9	70.4	72.3	52.3	96.6
Cimmyt #8	--	--	--	68.3	72.2	70.3	92.6
Cimmyt #5	--	--	--	66.5	73.0	69.8	91.9
Alkabo	--	5.4	48.9	74.4	66.3	48.8	90.1
Cimmyt #11	--	--	--	59.3	62.6	61.0	80.3

NOTE: Average HVACs 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 17. Performance of durum grown under dryland conditions at Flaxville, MT.
 Planted: May 19, 2009 Harvested: September 17, 2009 Cooperator: Charlie Cahill

variety	height, cm	grain protein, %	HVAC	test wt, lb/bu	yield, bu/acre
Cimmyt#8	49.0	13.05	87.8	59.3	12.9
Grenora	53.7	12.61	88.3	59.0	11.6
Mountrail	53.3	13.26	91.9	58.8	11.4
Alkabo	57.7	12.92	88.1	60.0	11.0
Cimmyt#5	45.0	13.27	83.5	58.2	10.9
Strongfield	60.0	13.55	92.8	59.0	10.8
Dilse	54.3	13.38	93.4	59.2	10.6
MT03012	49.7	13.54	92.5	58.0	10.6
Divide	60.0	12.90	85.8	59.3	10.3
MT04174	52.3	13.59	95.7	59.2	9.7
Cimmyt#11	48.0	13.11	83.7	56.7	9.3
Pierce	59.7	13.02	89.6	60.5	8.5
Normanno	47.7	12.82	86.0	57.2	8.3
Alzada	51.3	13.37	90.1	59.2	8.0
MT01649	40.3	14.02	89.9	56.8	6.4
site average	52.1	13.23	89.3	58.7	10.0
probability	<0.001	0.032	0.050	<0.001	0.215
CV (S/Mean)	6.0	3.2	4.9	1.1	24.4
CV(SE/Mean)	3.5	1.8	2.8	0.7	14.1
LSD 0.05	5.2	0.70	7.3	1.1	4.1

Table 18. Relative yields of durum varieties as compared to Mountrail when grown under dryland conditions in Daniels County in cooperation with CES.

Variety	2008	2009	average	As % of Mountrail
Grenora	11.8	11.6	11.7	109.3
Divide	12.7	10.3	11.5	107.5
MT03012	11.4	10.6	11.0	102.8
Cimmyt #5	10.6	10.9	10.8	100.9
Mountrail	10.0	11.4	10.7	100.0
Alkabo	10.4	11.0	10.7	100.0
Cimmyt #8	8.1	12.9	10.5	98.1
Dilse	9.8	10.6	10.2	95.3
Alzada	11.8	8.0	9.9	92.5
Cimmyt #11	8.6	9.3	9.0	84.1
MT04174	8.3	9.7	9.0	84.1
Strongfield	6.8	10.8	8.8	82.2
Pierce	8.9	8.5	8.7	81.3
Normanno	--	8.3	8.3	71.6
MT01649	--	6.4	6.4	55.2

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

Table 19. Relative test weights of durum varieties as compared to Mountrail when grown under dryland conditions in Daniels County in cooperation with CES.

Variety	2008	2009	average	As % of Mountrail
Pierce	61.8	60.5	61.2	101.8
Alkabo	61.5	60.0	60.8	101.2
Divide	61.5	59.3	60.4	100.5
Mountrail	61.3	58.8	60.1	100.0
Strongfield	61.2	59.0	60.1	100.0
Alzada	60.8	59.2	60.0	99.8
MT04174	60.7	59.2	60.0	99.8
Dilse	60.5	59.2	59.9	99.7
Cimmyt #8	60.5	59.3	59.9	99.7
Grenora	60.5	59.0	59.8	99.5
MT03012	60.0	58.0	59.0	98.2
Cimmyt #5	58.7	58.2	58.5	97.3
Normanno	--	57.2	57.2	97.3
MT01649	--	56.8	56.8	96.6
Cimmyt #11	58.3	56.7	57.5	95.7

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

Table 20. Relative protein contents of durum varieties as compared to Mountrail when grown under dryland conditions in Daniels County in cooperation with CES.

Variety	2008	2009	average	As % of Mountrail
MT01649	--	14.0	14.0	105.3
MT04174	13.8	13.6	13.7	101.5
Mountrail	13.6	13.3	13.5	100.0
Dilse	13.6	13.4	13.5	100.0
Strongfield	13.4	13.6	13.5	100.0
MT03012	13.3	13.5	13.4	99.3
Cimmyt #5	13.2	13.3	13.3	98.5
Alzada	13.1	13.4	13.3	98.5
Alkabo	13.4	12.9	13.2	97.8
Pierce	13.2	13.0	13.1	97.0
Divide	13.3	12.9	13.1	97.0
Cimmyt #11	13.1	13.1	13.1	97.0
Cimmyt #8	13.0	13.0	13.0	96.3
Normanno	--	12.8	12.8	96.2
Grenora	13.1	12.6	12.9	95.6

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

Table 21. Relative hard vitreous amber color (HVAC) of durum varieties as compared to Mountrail when grown under dryland conditions in Daniels County in cooperation with CES.

Variety	2008	2009	average	As % of Mountrail
MT04174	90.5	95.7	93.1	101.2
Dilse	92.1	93.4	92.8	100.9
Mountrail	92.0	91.9	92.0	100.0
MT03012	90.3	92.5	91.4	99.3
Strongfield	88.2	92.8	90.5	98.4
Pierce	90.7	89.6	90.2	98.0
Alkabo	91.8	88.1	90.0	97.8
MT01649	--	89.9	89.9	97.8
Grenora	91.1	88.3	89.7	97.5
Alzada	88.5	90.1	89.3	97.1
Divide	92.6	85.8	89.2	97.0
Normanno	--	86.0	86.0	93.6
Cimmyt #8	80.5	87.8	84.2	91.5
Cimmyt #11	81.8	83.7	82.8	90.0
Cimmyt #5	81.8	83.5	82.7	89.9

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

Table 22. Performance of durum grown under dryland conditions at Poplar, MT.
 Planted: May 18, 2009 Harvested: September 15, 2009 Cooperator: Mark Swank

Variety	height, cm	grain protein, %	HVAC	test wt, lb/bu	yield, bu/acre
Grenora	80.3	11.07	89.2	61.3	62.3 a
Strongfield	83.0	10.79	93.7	62.2	60.9 a
Divide	85.0	10.30	83.4	62.7	57.4
Cimmyt#8	66.3	10.53	85.1	62.5	56.5
Cimmyt#11	67.3	10.62	81.6	61.3	54.7
Dilse	83.0	11.17	91.2	62.0	54.4
Pierce	85.7	11.03	92.5	63.2	54.2
Cimmyt#5	61.7	11.75	85.1	60.0	54.0
Mountrail	83.3	10.54	89.6	61.8	52.6
MT01649	58.0	11.78	86.1	59.7	51.9
Alkabo	81.0	10.96	89.5	62.5	51.4
MT03012	69.7	11.15	90.7	61.7	51.2
Normanno	65.0	10.60	87.7	60.7	50.7
Alzada	69.7	11.11	94.1	62.2	49.0
MT04174	67.3	11.33	90.2	61.7	48.0
Average	73.8	10.98	88.6	61.7	54.0
probability	<0.001	0.001	<0.001	<0.001	0.021
CV (S/Mean)	3.4	3.5	3.6	1.2	8.3
CV (SE/Mean)	1.9	2.0	2.1	0.7	4.8
LSD 0.05	4.2	0.64	5.3	1.3	7.5

a indicates significantly greater yield than check variety, Mountrail, at p = 0.05

Table 23. Relative yields of durum varieties as compared to Mountrail when grown under dryland conditions in Roosevelt County in cooperation with CES.

Cultivar	2003	2004	2005	2006	2009	Ave	as % of Mountrail
Strongfield	--	--	--	21.1	60.9	41.0	110.4
Cimmyt #8	--	--	--	--	56.5	56.5	107.4
Grenora	--	--	37.9	21.1	62.3	40.4	105.0
Cimmyt #11	--	--	--	--	54.7	54.7	104.0
Cimmyt #5	--	--	--	--	54.0	54.0	102.7
Alzada	--	--	42.1	25.4	49.0	38.8	100.9
Divide	--	--	37.2	21.4	57.4	38.7	100.4
Mountrail	47.4	47.7	41.2	21.7	52.6	42.1	100.0
Alkabo	--	--	41.0	22.5	51.4	38.3	99.5
MT01649	--	--	--	--	51.9	51.9	98.7
MT03012	--	--	--	21.8	51.2	36.5	98.3
Dilse	46.3	42.2	39.4	21.5	54.4	40.8	96.8
Normanno	--	--	--	--	50.7	50.7	96.4
Pierce	40.6	46.4	38.4	20.8	54.2	40.1	95.2
MT04174	--	--	--	--	48.0	48.0	91.3

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 24. Relative test weights of durum varieties as compared to Mountrail when grown under dryland conditions in Roosevelt County in cooperation with CES.

Cultivar	2003	2004	2005	2006	2009	Ave	as % of Mountrail
Divide	--	--	60.3	53.3	62.7	58.8	101.9
MT03012	--	--	--	53.3	61.7	57.5	101.8
Alkabo	--	--	60.2	53.0	62.5	58.6	101.6
Cimmyt #8	--	--	--	--	62.5	62.5	101.1
Dilse	64.2	63.8	59.5	52.5	62.0	60.4	100.8
Pierce	62.8	63.8	59.3	52.5	63.2	60.3	100.6
Alzada	--	--	58.0	53.2	62.2	57.8	100.2
Mountrail	63.7	63.0	60.0	51.2	61.8	59.9	100.0
Strongfield	--	--	--	50.7	62.2	56.5	99.9
MT04174	--	--	--	--	61.7	61.7	99.8
Cimmyt #11	--	--	--	--	61.3	61.3	99.2
Grenora	--	--	59.3	51.0	61.3	57.2	99.2
Normanno	--	--	--	--	60.7	60.7	98.2
Cimmyt #5	--	--	--	--	60.0	60.0	97.1
MT01649	--	--	--	--	59.7	59.7	96.6

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

Table 25. Relative proteins of durum varieties as compared to Mountrail when grown under dryland conditions in Roosevelt County in cooperation with CES.

Cultivar	2003	2004	2005	2006	2009	Ave	as % of Mountrail
MT01649	--	--	--	--	11.8	11.8	112.4
Cimmyt #5	--	--	--	--	11.8	11.8	112.4
MT04174	--	--	--	--	11.3	11.3	107.6
Strongfield	--	--	--	19.6	10.8	15.2	103.1
Dilse	12.7	13.4	16.2	18.5	11.2	14.4	102.6
Pierce	12.6	12.8	15.8	18.7	11.0	14.2	101.0
Normanno	--	--	--	--	10.6	10.6	101.0
Cimmyt #11	--	--	--	--	10.6	10.6	101.0
Alkabo	--	--	15.1	19.4	11.0	15.2	100.4
Mountrail	12.1	12.8	15.8	19.0	10.5	14.0	100.0
Cimmyt #8	--	--	--	--	10.5	10.5	100.0
Grenora	--	--	15.3	18.0	11.1	14.8	98.0
MT03012	--	--	--	17.7	11.2	14.5	98.0
Divide	--	--	15.1	17.9	10.3	14.4	95.6
Alzada	--	--	14.4	17.0	11.1	14.2	93.8

NOTE: Average proteins 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 26. Relative HVAC of durum varieties as compared to Mountrail when grown under dryland conditions in Roosevelt County in cooperation with CES.

Cultivar	2003	2004	2005	2006	2009	Ave	as % of Mountrail
MT03012	--	--	--	81	91	86.0	105.5
Strongfield	--	--	--	78	94	86.0	105.5
Dilse	82	87	94	76	91	86.0	104.4
Alkabo	--	--	91	75	90	85.3	101.2
Alzada	--	--	88	72	94	84.7	100.4
Mountrail	83	76	90	73	90	82.4	100.0
Grenora	--	--	90	74	89	84.3	100.0
MT04174	--	--	--	--	90	90.0	100.0
Pierce	58	84	93	76	92	80.6	97.8
Normanno	--	--	--	--	88	88.0	97.8
Divide	--	--	92	72	83	82.3	97.6
MT01649	--	--	--	--	86	86.0	95.6
Cimmyt #5	--	--	--	--	85	85.0	94.4
Cimmyt #8	--	--	--	--	85	85.0	94.4
Cimmyt #11	--	--	--	--	82	82.0	91.1

NOTE: Average HVACs 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 27. Performance of durum grown under dryland conditions at Wibaux, MT.
 Planted: May 18, 2009 Harvested: September 10, 2009 Cooperator: David Maus

Variety	height, cm	grain protein, %	HVAC	test wt, lb/bu	yield, bu/acre	
Grenora	68.0	11.88	87.0	61.3	27.8	
Cimmyt#8	62.0	10.87	81.4	63.2	27.6	
Mountrail	73.7	11.71	87.0	62.0	27.1	
Dilse	72.7	11.65	88.8	62.5	26.8	
Strongfield	75.7	11.74	95.9	62.3	26.6	
Cimmyt#5	56.3	11.74	74.1	61.2	25.9	
Normanno	59.7	11.39	87.5	61.2	25.3	
Cimmyt#11	63.0	11.00	82.3	60.8	25.0	
Pierce	76.7	11.71	88.7	62.8	22.8	
MT01649	55.7	12.20	86.4	59.0	22.2	x
Divide	75.7	11.19	84.7	62.2	22.0	x
Alzada	67.3	11.82	89.1	62.0	21.8	x
Alkabo	74.3	11.69	84.0	62.3	20.6	x
MT03012	63.3	11.76	88.1	61.5	20.6	x
MT04174	64.3	12.15	88.6	61.8	18.9	x
average	67.2	11.64	86.2	61.7	24.1	
probability	<0.001	0.017	<0.001	<0.001	0.005	
CV (S/Mean)	4.6	3.5	4.8	0.5	12.1	
CV(SE/Mean)	2.6	2.0	2.8	0.3	7.0	
LSD 0.05	5.1	0.69	6.9	0.6	4.8	

x indicates significantly lower yield than check variety, Mountrail, at p = 0.05

Table 28. Relative yielding abilities of durum varieties as compared to Mountrail when grown under dryland conditions in Wibaux County in cooperation with CES.

Cultivar	2002	2003	2004	2005	2009	Ave	as % of Mountrail
Grenora	--	--	--	43.4	27.8	35.6	102.0
Cimmyt #8	--	--	--	--	27.6	27.6	101.8
Mountrail	36.4	16.8	28.1	42.7	27.1	30.2	100.0
Alzada	--	--	--	46.9	21.8	34.4	98.4
Strongfield	--	--	--	--	26.6	26.6	98.2
Cimmyt #5	--	--	--	--	25.9	25.9	95.6
Normanno	--	--	--	--	25.3	25.3	93.4
Cimmyt #11	--	--	--	--	25.0	25.0	92.3
Pierce	32.8	15.4	26.5	41.7	22.8	27.8	92.1
Dilse	27.1	15.6	27.0	39.9	26.8	27.3	90.3
Alkabo	--	--	--	40.5	20.6	30.6	87.5
Divide	--	--	--	38.1	22.0	30.1	86.1
MT01649	--	--	--	--	22.2	22.2	81.9
MT03012	--	--	--	--	20.6	20.6	76.0
MT04174	--	--	--	--	18.9	18.9	69.7

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 29. Relative test weights of durum varieties as compared to Mountrail when grown under dryland conditions in Wibaux County in cooperation with CES. Cooperator: David Maus

Cultivar	2002	2003	2004	2005	2009	Ave	as % of Mountrail
Cimmyt #8	--	--	--	--	63.2	63.2	101.9
Divide	--	--	--	61.7	62.2	62.0	101.3
Pierce	61.4	59.2	60.2	60.8	62.8	60.9	101.3
Dilse	60.1	60.3	60.1	61.3	62.5	60.9	101.2
Alkabo	--	--	--	61.2	62.3	61.8	101.0
Strongfield	--	--	--	--	62.3	62.3	100.5
Mountrail	60.0	58.8	59.5	60.3	62.0	60.1	100.0
Alzada	--	--	--	60.2	62.0	61.1	99.9
Grenora	--	--	--	60.7	61.3	61.0	99.8
MT03012	--	--	--	--	61.5	61.5	99.2
MT04174	--	--	--	--	61.5	61.5	99.2
Cimmyt #5	--	--	--	--	61.2	61.2	98.7
Normanno	--	--	--	--	61.2	61.2	98.7
Cimmyt #11	--	--	--	--	60.8	60.8	98.1
MT01649	--	--	--	--	59.0	59.0	95.2

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 30. Relative protein contents of durum varieties as compared to Mountrail when grown under dryland conditions in Wibaux County in cooperation with CES. Cooperator: David Maus

Cultivar	2002	2003	2004	2005	2009	Ave	as % of Mountrail
MT01649	--	--	--	--	12.2	12.2	104.3
MT04174	--	--	--	--	12.2	12.2	104.3
Dilse	17.7	15.1	17.7	15.2	11.6	15.5	104.0
MT03012	--	--	--	--	11.8	11.8	100.9
Pierce	16.1	14.8	17.1	14.9	11.7	14.9	100.4
Mountrail	16.3	14.2	17.3	14.8	11.7	14.9	100.0
Strongfield	--	--	--	--	11.7	11.7	100.0
Cimmyt #5	--	--	--	--	11.7	11.7	100.0
Alkabo	--	--	--	14.3	11.7	13.0	98.1
Normanno	--	--	--	--	11.4	11.4	97.4
Alzada	--	--	--	13.9	11.8	12.9	97.0
Grenora	--	--	--	13.7	11.9	12.8	96.6
Divide	--	--	--	14.1	11.2	12.7	95.5
Cimmyt #11	--	--	--	--	11.0	11.0	94.0
Cimmyt #8	--	--	--	--	10.9	10.9	93.2

NOTE: Average proteins 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 31. Relative HVAC of durum varieties as compared to Mountrail when grown under dryland conditions in Wibaux County in cooperation with CES. Cooperator: David Maus

Cultivar	2003	2004	2005	2009	Ave	as % of Mountrail
Strongfield	--	--	--	96	96.0	110.3
MT04174	--	--	--	89	89.0	102.3
Dilse	93	107	90	89	94.8	101.1
Normanno	--	--	--	88	88.0	101.1
MT03012	--	--	--	88	88.0	101.1
Mountrail	89	108	91	87	93.8	100.0
Alzada	--	--	89	89	89.0	100.0
MT01649	--	--	--	86	86.0	98.9
Divide	--	--		85	85.0	97.7
Alkabo	--	--	89	84	86.5	97.2
Grenora	--	--	86	87	86.5	97.2
Pierce	71	108	93	89	90.3	96.3
Cimmyt #11	--	--	--	82	82.0	94.3
Cimmyt #8	--	--	--	81	81.0	93.1
Cimmyt #5	--	--	--	74	74.0	85.1

NOTE: Average HVACs 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 32. Performance of durum grown under dryland conditions at Turner, MT.
 Planted: May 12, 2009 Harvested: September 10, 2009 Cooperator: Max Cederberg

Variety	height, cm	sawfly rating	grain protein, %	test wt, lb/bu	yield, bu/acre	
Normanno	55.4	0.7	14.5	59.8	40.9	a
Strongfield	65.8	10.0	15.7	59.9	36.5	
Cimmyt#5	47.2	2.3	14.0	60.3	36.3	
Cimmyt#8	54.1	1.0	13.4	62.3	36.3	
Grenora	62.5	15.0	14.7	60.6	35.4	
Mountrail	59.1	8.3	14.8	60.2	35.4	
Cimmyt#11	62.2	2.3	14.0	59.7	34.6	
MT03012	57.9	5.7	15.5	60.1	33.0	
Pierce	61.5	11.7	15.4	60.9	32.9	
Alkabo	60.7	8.7	15.2	60.8	31.9	
MT04174	53.0	8.7	15.7	60.1	31.9	
Dilse	62.4	15.0	16.3	60.4	31.2	
MT01649	47.6	5.3	16.2	58.7	30.5	x
Divide	62.9	5.0	15.7	60.0	29.9	x
Alzada	56.5	8.3	15.9	60.6	29.1	x
average	57.9	7.2	15.13	60.3	33.7	
probability	<0.01	<0.01		<0.01	<0.01	
CV (S/Mean)	7.8	58.5		0.7	8.3	
CV(SE/Mean)	4.5	33.8		0.4	4.8	
LSD 0.05	3.0	7.1		0.7	4.7	

a indicates significantly greater yield than check variety, Mountrail at p=0.05
 x indicates significantly lower yield than check variety, Mountrail at p=0.05

Table 33. Relative yielding abilities of durum varieties as compared to Mountrail when grown under dryland conditions at Turner, MT.

Cultivar	2006	2007	2008	2009	Ave	as % of Mountrail
Normanno	--	--	--	40.9	40.9	115.5
Cimmyt#8	--	--	21.9	36.3	29.1	114.6
Strongfield	21.6	24.0	19.4	36.5	25.4	110.4
Cimmyt#11	--	--	20.6	34.6	27.6	108.7
Cimmyt#5	--	--	17.2	36.3	26.8	105.5
MT03012	21.7	24.3	16.5	33.0	23.9	103.9
Grenora	19.1	25.6	15.4	35.4	23.9	103.9
Alzada	23.7	25.2	17.1	29.1	23.8	103.5
Mountrail	18.9	22.3	15.3	35.4	23.0	100.0
Alkabo	18.4	22.5	14.8	31.9	21.9	95.2
MT04174	--	--	15.3	31.9	23.6	92.9
Divide	17.9	20.0	17.2	29.9	21.3	92.6
Pierce	17.6	20.0	14.8	32.9	21.3	92.6
Dilse	18.2	--	12.8	31.2	20.7	89.2
MT01649	--	--	--	30.5	30.5	86.2

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 34. Relative test weights of durum varieties as compared to Mountrail when grown under dryland conditions Turner, MT.

Cultivar	2006	2007	2008	2009	Ave	as % of Mountrail
Cimmyt#8	--	--	58.1	62.3	60.2	102.2
Alkabo	58.5	57.5	57.4	60.8	58.6	101.7
Pierce	57.3	57.6	57.0	60.9	58.2	101.0
Dilse	57.5	--	56.9	60.4	58.3	100.5
Divide	57.3	56.7	57.3	60.0	57.8	100.3
Alzada	57.0	56.1	57.4	60.6	57.8	100.3
Mountrail	56.3	56.1	57.6	60.2	57.6	100.0
Strongfield	56.7	56.1	57.5	59.9	57.6	100.0
Grenora	57.0	55.7	56.5	60.6	57.5	99.8
MT04174	--	--	57.2	60.1	58.7	99.7
MT03012	57.3	55.0	56.9	60.1	57.3	99.5
Cimmyt#5	--	--	56.6	60.3	58.5	99.3
Normanno	--	--	--	59.8	59.8	99.3
Cimmyt#11	--	--	55.7	59.7	57.7	98.0
MT01649	--	--	--	58.7	58.7	97.5

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 35. Relative protein contents of durum varieties as compared to Mountrail when grown under dryland conditions Turner, MT.

Cultivar	2007	2008	2009	Ave	as % of Mountrail
MT01649	--	--	16.2	16.20	109.5
Dilse	--	16.6	16.3	16.45	108.2
Strongfield	19.8	16.2	15.7	17.23	104.6
MT04174	--	15.8	15.7	15.75	103.6
Pierce	18.3	16.1	15.4	16.60	100.8
MT03012	18.7	15.5	15.5	16.57	100.6
Divide	18.2	15.6	15.7	16.50	100.2
Mountrail	19.0	15.6	14.8	16.47	100.0
Alzada	17.8	15.3	15.9	16.33	99.1
Normanno	--	--	14.5	14.50	98.0
Alkabo	17.8	15.0	15.2	16.00	97.1
Grenora	17.4	15.4	14.7	15.83	96.1
Cimmyt#11	--	14.2	14.0	14.10	92.8
Cimmyt#5	--	14.2	14.0	14.10	92.8
Cimmyt#8	--	14.0	13.4	13.70	90.1

NOTE: Average proteins 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 36. Relative sawfly damage of durum varieties as compared to Mountrail when grown under dryland conditions Turner, MT.

Cultivar	2006	2007	2008	2009	Ave	as % of Mountrail
Dilse	50.0	--	28.3	15.0	31.1	133.5
Grenora	50.0	33.3	21.7	15.0	30.0	126.6
Pierce	43.3	21.7	26.7	11.7	25.9	109.3
Alkabo	48.3	25.0	18.3	8.7	25.1	105.9
Mountrail	48.3	25.0	13.3	8.3	23.7	100.0
MT01649	--	--	--	5.3	5.3	63.9
MT04174	--	--	4.0	8.7	6.4	59.3
Divide	26.7	13.3	8.3	5.0	13.3	56.1
Strongfield	16.7	10.0	10.0	10.0	11.7	49.4
Alzada	20.0	6.7	10.0	8.3	11.3	47.7
MT03012	11.7	11.7	11.7	5.7	10.2	43.0
Cimmyt#11	--	--	2.3	2.3	2.3	21.3
Cimmyt#5	--	--	1.0	2.3	1.7	15.7
Cimmyt#8	--	--	1.0	1.0	1.0	9.3
Normanno	--	--	--	0.7	0.7	8.4

NOTE: Average sawfly damage 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 37. Performance of durum grown under dryland conditions at North Havre, MT.
 Planted: May 6, 2009 Harvested: Aug 28, 2009 Cooperator: Mark Peterson

Variety	height, cm	sawfly rating	grain protein, %	test wt, lb/bu	yield, bu/acre
Cimmyt#5	52.6	0.0	13.5	58.5	39.8
Normanno	53.3	0.0	14.1	57.6	39.4
Strongfield	69.6	0.0	15.3	59.3	37.7
MT01649	50.0	1.0	13.9	56.7	36.3
Divide	71.9	0.0	14.6	59.5	35.8
MT04174	59.9	1.0	14.0	58.7	35.6
Cimmyt#11	57.9	0.0	13.3	56.5	35.4
Cimmyt#8	56.6	0.0	12.9	60.9	34.8
Grenora	62.2	0.0	14.2	56.2	34.5
Mountrail	65.3	0.3	14.7	58.4	34.2
Pierce	66.3	0.3	14.1	60.0	31.8
MT03012	59.2	0.3	14.6	58.7	31.7
Alzada	60.5	0.0	15.4	60.2	31.6
Dilse	66.5	0.7	15.2	59.0	29.0
Alkabo	65.8	0.3	14.3	59.9	24.2 x
average	61.1	0.3	14.27	58.9	34.1
probability	<0.01	<0.01		<0.01	<0.01
CV (S/Mean)	6.8	118.6		1.4	10.2
CV(SE/Mean)	4.0	68.5		0.8	5.9
LSD 0.05	7.0	0.5		1.4	6.8

x indicates significantly lower yield than check variety, Mountrail at p=0.05

Table 38. Relative yielding abilities of durum varieties as compared to Mountrail when grown under dryland conditions at North Havre, MT.

Cultivar	2006	2007	2008	2009	Ave	as % of Mountrail
Cimmyt#5	--	--	48.2	39.8	44.0	124.3
Cimmyt#8	--	--	49.3	34.8	42.1	118.9
Normanno	--	--	--	39.4	39.4	115.2
MT04174	--	--	45.7	35.6	40.7	115.0
Cimmyt#11	--	--	43.9	35.4	39.7	112.1
MT01649	--	--	--	36.3	36.3	106.1
MT03012	18.2	40.0	46.4	31.7	34.1	103.3
Strongfield	13.6	46.3	38.5	37.7	34.0	103.0
Alzada	18.3	44.0	39.6	31.6	33.4	101.2
Mountrail	16.0	45.1	36.6	34.2	33.0	100.0
Divide	15.7	42.1	37.8	35.8	32.9	99.7
Grenora	15.8	40.9	39.9	34.5	32.8	99.4
Dilse	15.8	--	35.7	29.0	26.8	92.6
Pierce	12.6	40.7	33.4	31.8	29.6	89.7
Alkabo	16.4	43.7	33.5	24.2	29.5	89.4

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 39. Relative test weights of durum varieties as compared to Mountrail when grown under dryland conditions North Havre, MT.

Cultivar	2006	2007	2008	2009	Ave	as % of Mountrail
Cimmyt#8	--	--	61.9	60.9	61.4	104.2
Pierce	52.6	59.2	60.2	60.0	58.0	102.7
Divide	54.5	58.1	59.3	59.5	57.9	102.5
Alkabo	52.9	58.5	60.1	59.9	57.9	102.5
Strongfield	52.8	57.1	59.8	59.3	57.3	102.3
MT03012	53.8	57.5	60.8	58.7	57.7	102.1
Alzada	52.5	58.6	59.4	60.2	57.7	102.1
MT04174	--	--	61.3	58.7	60.0	101.9
Cimmyt#5	--	--	60.7	58.5	59.6	101.2
Dilse	51.7	--	59.7	59.0	56.8	100.5
Mountrail	51.8	56.5	59.4	58.4	56.5	100.0
Grenora	51.6	57.6	60.1	56.2	56.4	99.8
Normanno	--	--	--	57.6	57.6	98.6
Cimmyt#11	--	--	59.1	56.5	57.8	98.1
MT01649	--	--	--	56.7	56.7	97.1

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 40. Relative protein contents of durum varieties as compared to Mountrail when grown under dryland conditions North Havre, MT.

Cultivar	2007	2008	2009	Ave	as % of Mountrail
Mountrail	16.7	14.7	14.7	15.37	100.0
Dilse	--	14.1	15.2	14.65	99.7
Strongfield	16.8	13.7	15.3	15.27	99.3
Divide	15.8	15.3	14.6	15.23	99.1
Alkabo	16.1	14.7	14.3	15.03	97.8
MT03012	16.5	13.7	14.6	14.93	97.1
Alzada	15.4	13.7	15.4	14.83	96.5
Grenora	16.2	14.0	14.2	14.80	96.3
Normanno	--	--	14.1	14.10	95.9
Pierce	15.5	14.4	14.1	14.67	95.4
MT04174	--	13.8	14.0	13.90	94.6
MT01649	--	--	13.9	13.90	94.6
Cimmyt#5	--	13.2	13.5	13.35	90.8
Cimmyt#11	--	12.7	13.3	13.00	88.4
Cimmyt#8	--	12.0	12.9	12.45	84.7

NOTE: Average proteins 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 41. Relative sawfly damage of durum varieties as compared to Mountrail when grown under dryland conditions North Havre, MT.

Cultivar	2006	2007	2008	2009	Ave	as % of Mountrail
MT01649	--	--	--	1.0	1.0	333.3
Alkabo	48.3	11.7	15.0	0.3	18.8	118.2
Grenora	50.0	10.0	11.7	0.0	17.9	112.6
Dilse	50.0	--	8.3	0.7	19.7	100.9
Mountrail	48.3	5.0	10.0	0.3	15.9	100.0
Pierce	43.3	5.3	8.3	0.3	14.3	89.9
Divide	26.7	4.0	3.7	0.0	8.6	54.1
MT04174	--	--	3.7	1.0	2.4	46.2
Alzada	20.0	2.3	2.3	0.0	6.2	39.0
Strongfield	16.7	1.0	2.3	0.0	5.0	31.4
MT03012	11.7	5.0	2.3	0.3	4.8	30.2
Cimmyt#11	--	--	1.0	0.0	0.5	9.6
Cimmyt#8	--	--	0.7	0.0	0.4	7.7
Cimmyt#5	--	--	0.7	0.0	0.4	7.7
Normanno	--	--	--	0.0	0.0	0.0

NOTE: Average sawfly damage 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.