

PROJECT TITLE: Statewide Durum Variety Performance – 2011 (4W2756)

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OBJECTIVE: To evaluate new and existing varieties and experimental lines of durum under various growing conditions and environments in Montana.

RESULTS: The 2011 Statewide durum yield trial was grown at one irrigated and seven dryland sites. The irrigated site was at Sidney, and dryland sites were at Bozeman, Huntley, Havre, Moccasin, Conrad, Sidney, and Williston, ND. Replicated multiple-row plots were established at all locations using standard research techniques. Summaries of heading, height, test weight, protein content, seed weight, NIR hardness, sawfly damage, and yield are in Tables 1-8. A summary of all characters across sites is shown in Table 9.

Earliest blooming line across sites was Belfield, latest blooming line was Divide (Table 1). Shortest line across sites was APB D1-35, tallest line was Tioga (Table 2). Alkabo had the greatest test weight across sites (Table 3). APB D1-35 had the highest protein content across sites (Table 4). Alzada had the heaviest seed across sites (Table 5). MT05166 had the highest NIR hardness across sites (Table 6). Pierce had the most sawfly damage, while MT04340 had the least sawfly damage (Table 7).

Highest yielding varieties at each site were Alkabo at **Williston**, Westhope at **Sidney dryland**, Mountrail at **Sidney irrigated**, MT03012 at **Conrad**, Alzada at **Moccasin**, APB D1-35 at **Havre**, Westhope at **Huntley** and APB D1-35 at **Bozeman** (Table 8). Highest yielding across dryland sites was MT03012 and highest yielding across all sites was Westhope (Table 8).

SUMMARY: Highest yielding varieties at each site were Alkabo at **Williston**, Westhope at **Sidney dryland**, Mountrail at **Sidney irrigated**, MT03012 at **Conrad**, Alzada at **Moccasin**, APB D1-35 at **Havre**, Westhope at **Huntley** and APB D1-35 at **Bozeman**. Highest yielding across dryland sites was MT03012 and highest yielding across all sites was Westhope..

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

MWBC FY2012 GRANT SUBMISSION PLANS: It is planned to submit this project for funding consideration in the next fiscal year.

Table 1. Heading (days from planting) of durum lines and varieties in the 2011 statewide durum yield trial.

entry	Williston	Sidney		Conrad	Moccasin	Havre	Huntley	Bozeman	Average
		Dry	Irr						
Mountrail	54.3	55.0	58.7	74.0	80.7	69.3	78.7	64	66.8
Divide	55.0	55.7	59.7	73.0	80.7	69.0	78.0	64	66.9
Pierce	54.0	54.7	58.0	71.7	80.0	69.3	78.0	62	66.0
Alkabo	54.0	54.0	58.7	72.3	80.0	68.7	78.0	62	66.0
Grenora	53.7	54.3	55.7	71.3	80.0	70.3	78.3	62	65.7
Tioga	54.7	55.0	58.0	71.7	80.0	69.0	78.0	63	66.2
Alzada	53.0	51.0	55.7	68.0	77.0	67.3	75.0	60	63.4
Strongfield	54.3	54.3	57.0	73.3	81.3	70.0	78.0	63	66.4
Belfield	50.0	49.7	52.7	67.0	76.0	68.0	73.0	59	61.9
Westhope	54.3	53.3	58.3	75.0	80.7	69.3	78.3	64	66.7
Saragolla	54.0	52.3	58.3	68.3	77.3	68.3	75.0	60	64.2
APB D1-35	53.3	53.3	58.3	68.3	77.7	69.3	75.0	61	64.5
APB D6-419	53.0	51.0	56.7	69.3	78.3	68.0	76.0	61	64.2
MT03012	52.3	50.0	55.0	67.0	76.0	66.7	73.7	59	62.5
MT04174	52.7	50.7	56.3	66.3	76.3	66.3	73.3	60	62.7
MT04340	53.7	52.7	59.0	70.7	78.3	68.7	77.0	63	65.4
MT05166	54.3	54.3	60.0	71.7	80.7	68.7	78.7	64	66.6
MT05183	54.0	52.3	57.0	70.7	80.3	68.3	78.0	63	65.5
Average	53.8	53.3	57.7	71.0	79.4	68.9	76.9	62.1	65.4
Probability	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
CV (S/mean)	0.8	1.8	1.1	0.6	0.6	0.6	2.0		
CV (SE/mean)		1.0	0.6	0.3	0.3	0.4			
LSD 5%	0.7	1.6	1.0	1.9	0.8	1.9	0.2		

Table 2. Height in inches of durum lines and varieties in the 2011 statewide durum yield trial.

entry	Williston	Sidney		Conrad	Moccasin	Huntley	Bozeman	Average
		Dry	Irr					
Mountrail	27.3	24.4	26.9	39.0	24.0	38.0	33.3	30.4
Divide	26.8	26.8	26.1	39.1	25.3	40.6	35.5	31.5
Pierce	28.6	27.0	29.0	40.0	26.2	39.2	36.0	32.3
Alkabo	27.2	25.5	28.1	39.1	24.0	38.1	33.5	30.8
Grenora	27.4	24.4	26.1	36.1	22.4	37.7	31.7	29.4
Tioga	30.3	29.0	31.2	38.5	28.2	40.5	32.7	32.9
Alzada	25.6	23.2	23.8	29.7	23.2	31.1	28.2	26.4
Strongfield	24.8	26.0	26.9	37.0	25.5	38.8	34.0	30.4
Belfield	25.6	22.0	22.3	28.6	22.2	29.9	27.3	25.4
Westhope	27.3	25.2	28.1	37.7	23.9	38.6	33.5	30.6
Saragolla	23.1	20.3	24.3	29.1	21.8	30.6	26.5	25.1
APB D1-35	23.7	17.8	22.3	24.7	18.8	27.5	24.1	22.7
APB D6-419	27.2	23.1	24.9	30.7	22.4	32.2	29.9	27.2
MT03012	26.3	22.0	23.1	29.4	20.9	29.5	28.0	25.6
MT04174	24.5	21.0	23.9	28.5	20.3	29.5	27.1	25.0
MT04340	23.5	21.0	24.0	27.7	18.5	26.8	26.4	24.0
MT05166	22.7	22.6	24.8	29.0	20.2	30.0	30.5	25.7
MT05183	22.8	23.1	22.7	28.7	21.0	28.2	27.0	24.8
Average	25.3	23.1	25.2	32.2	22.4	32.8	29.6	27.2
Probability	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	
CV (S/mean)	6.1	6.0	5.6	3.7	10.7	2.4	6.6	
CV (SE/mean)		3.5	3.3	2.1	6.2			
LSD 5%	2.6	2.3	2.3	2.0	4.0	0.5	3.2	

Table 3. Test weight as lb/bu of durum lines and varieties in the 2011 statewide durum yield trial.

entry	Williston	Sidney		Conrad	Moccasin	Havre	Huntley	Bozeman	Average
		Dry	Irr						
Mountrail	59.0	61.0	59.8	58.9	55.2	59.9	56.7	61.6	59.0
Divide	59.4	61.7	59.8	59.3	57.4	60.0	59.1	61.2	59.7
Pierce	59.1	61.7	60.7	60.1	58.6	60.7	58.5	62.0	60.2
Alkabo	60.1	62.0	60.3	61.0	58.7	60.9	58.1	61.4	60.3
Grenora	58.3	60.7	60.2	60.2	56.9	60.6	56.5	61.2	59.3
Tioga	58.2	61.8	59.7	59.9	57.9	60.7	58.6	61.5	59.8
Alzada	57.7	60.5	56.3	58.6	57.6	59.9	56.7	61.5	58.6
Strongfield	57.2	60.8	59.2	60.0	55.3	59.9	58.7	61.2	59.0
Belfield	59.5	60.8	56.7	60.3	58.5	60.9	58.1	62.2	59.6
Westhope	59.0	61.5	59.0	61.2	57.5	61.0	60.0	61.4	60.1
Saragolla	55.8	59.2	54.7	58.3	55.8	59.0	56.3	61.2	57.5
APB D1-35	54.8	56.0	51.0	54.6	51.7	55.8	50.7	59.4	54.2
APB D6-419	58.0	60.3	55.5	58.5	58.4	59.4	57.4	61.5	58.6
MT03012	57.5	60.5	56.8	60.6	57.1	60.4	57.7	62.5	59.1
MT04174	57.0	61.0	57.7	59.5	58.1	60.3	58.0	62.1	59.2
MT04340	56.1	59.3	55.3	56.0	56.6	59.6	55.8	60.4	57.4
MT05166	58.1	62.0	57.8	58.1	59.2	61.1	57.7	62.4	59.5
MT05183	58.9	62.0	57.8	59.7	59.0	60.8	55.5	61.2	59.4
Average	57.8	60.3	57.37	59.1	57.4	60.0	57.0	61.2	58.8
Probability	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
CV (S/mean)	1.4	1.1	1.7	2.2	1.2	0.7	1.4		
CV (SE/mean)		0.6	1.0	1.3	0.9	0.4			
LSD 5%	1.7	1.1	1.6	2.2	1.5	0.7	1.3		

Table 4. Grain protein as percent of durum lines and varieties in the 2011 statewide durum yield trial.

entry	Williston	Sidney		Conrad	Moccasin	Havre	Huntley	Bozeman	Average
		Dry	Irr						
Mountrail	14.41	15.77	15.08	13.46	16.08	15.03	15.40	11.38	14.58
Divide	14.63	15.62	15.54	13.57	14.67	15.06	14.47	11.32	14.36
Pierce	13.83	15.50	15.10	13.69	15.23	14.90	14.32	12.08	14.33
Alkabo	13.95	16.09	15.34	13.05	16.43	15.24	14.79	13.31	14.77
Grenora	13.92	15.79	15.34	13.49	15.24	14.37	14.56	14.55	14.66
Tioga	13.85	15.51	15.16	13.72	16.03	14.88	14.51	13.56	14.65
Alzada	14.35	15.41	16.43	13.54	14.68	14.16	13.73	12.10	14.30
Strongfield	14.56	16.27	16.15	13.93	16.29	15.61	15.03	12.04	14.99
Belfield	13.56	15.43	15.83	12.95	14.62	14.10	13.81	12.76	14.13
Westhope	14.44	16.09	15.25	13.26	15.50	15.30	14.64	11.95	14.55
Saragolla	13.72	15.61	16.74	12.38	14.49	14.23	14.39	11.21	14.10
APB D1-35	14.61	16.70	17.56	14.14	15.23	15.32	15.38	13.60	15.32
APB D6-419	13.70	15.04	15.45	13.20	13.89	14.48	13.73	12.71	14.03
MT03012	14.46	15.90	16.31	13.39	14.90	14.64	14.82	12.75	14.65
MT04174	14.24	15.59	16.10	13.84	14.77	15.04	14.51	12.34	14.56
MT04340	14.55	15.64	15.85	13.59	14.96	14.52	13.74	14.36	14.65
MT05166	14.31	15.10	15.43	13.97	14.68	14.16	14.70	13.73	14.51
MT05183	14.19	15.61	15.38	13.25	14.22	14.40	14.26	12.72	14.25
Average	14.24	15.77	15.83	13.43	15.00	14.67	14.54	12.74	14.53
Probability		0.0101	<0.001						
CV (S/mean)		3.0	2.1						
CV (SE/mean)		1.8	1.2						
LSD 5%		0.79	0.55						

Table 5. Weight of 100 seed in gm of durum lines and varieties in the 2011 statewide durum yield trial.

entry	Williston	Sidney		Conrad	Moccasin	Havre	Huntley	Bozeman	Average
		Dry	Irr						
Mountrail	3.13	3.74	3.85	3.05	2.46	3.16	2.70	3.94	3.25
Divide	3.22	3.71	3.85	3.17	2.86	3.52	3.16	4.22	3.46
Pierce	3.08	3.88	3.58	2.97	2.66	3.44	2.99	4.00	3.33
Alkabo	3.64	3.96	3.90	3.61	2.49	3.60	3.28	4.22	3.59
Grenora	3.26	3.36	3.74	3.46	2.59	3.38	2.85	4.25	3.36
Tioga	3.69	3.59	4.01	3.59	2.66	3.75	3.36	4.60	3.66
Alzada	3.83	3.53	3.59	3.76	3.08	3.92	3.31	4.89	3.74
Strongfield	3.37	3.12	3.54	3.46	2.65	3.41	3.08	4.19	3.35
Belfield	3.58	3.66	3.60	3.65	2.92	3.42	3.12	4.39	3.54
Westhope	3.33	3.63	3.55	3.76	2.80	3.69	3.21	4.39	3.55
Saragolla	3.10	3.18	2.93	3.35	2.74	3.17	3.01	3.99	3.18
APB D1-35	3.28	3.29	3.08	3.30	2.81	3.53	2.68	4.74	3.34
APB D6-419	3.29	3.62	3.52	3.87	3.05	3.16	3.32	4.33	3.52
MT03012	2.99	3.58	2.86	3.52	2.55	3.51	3.10	4.03	3.27
MT04174	3.06	3.42	3.15	3.28	2.69	3.24	2.86	3.89	3.20
MT04340	3.18	3.56	3.06	3.24	2.92	3.57	2.80	4.53	3.36
MT05166	3.36	3.59	3.60	2.99	2.87	3.46	2.98	4.10	3.37
MT05183	3.67	3.83	3.40	3.54	3.24	3.69	2.92	4.30	3.57
Average	3.36	3.60	3.46	3.49	2.85	3.51	3.06	4.34	3.46

Table 6. NIR hardness as percent of durum lines and varieties in the 2011 statewide durum yield trial.

entry	Williston	Sidney		Conrad	Moccasin	Havre	Huntley	Bozeman	Average
		Dry	Irr						
Mountrail	86.9	98.4	93.4	64.9	89.0	82.1	76.8	84.7	84.5
Divide	84.0	102.6	92.5	69.0	88.4	82.8	81.2	82.0	85.3
Pierce	89.3	102.0	95.2	80.9	91.4	87.0	81.0	83.6	88.8
Alkabo	80.7	106.4	95.9	69.2	87.1	89.6	77.2	55.1	82.7
Grenora	81.9	105.8	98.3	77.8	80.5	82.8	76.7	100.9	88.1
Tioga	83.9	102.3	93.5	83.4	86.7	90.1	79.4	70.0	86.1
Alzada	81.2	98.5	87.4	80.6	85.3	87.6	67.8	106.8	86.9
Strongfield	89.2	101.9	96.5	86.9	90.8	85.8	88.0	84.7	90.5
Belfield	82.6	101.0	89.5	83.8	87.3	86.4	77.0	100.4	88.5
Westhope	85.3	103.9	89.4	81.3	90.1	92.0	82.5	89.1	89.2
Saragolla	67.3	83.7	83.2	46.3	68.1	64.6	60.9	39.0	64.1
APB D1-35	76.1	103.0	90.5	67.9	82.4	69.0	70.1	87.7	80.8
APB D6-419	75.0	98.0	90.8	85.5	90.6	84.3	74.0	77.1	84.4
MT03012	82.4	98.3	97.1	84.4	91.1	86.4	80.6	107.4	90.9
MT04174	81.3	103.5	95.7	81.9	92.5	88.5	79.6	56.6	84.9
MT04340	86.9	94.7	92.9	83.5	78.9	82.7	80.9	119.1	89.9
MT05166	89.2	101.5	94.6	85.6	96.1	91.1	88.1	120.5	95.8
MT05183	91.1	109.4	93.5	80.0	94.3	89.9	76.1	82.3	89.6
Average	83.5	100.3	92.88	77.5	87.5	83.9	77.3	86.3	86.1
Probability		<0.001	0.001						
CV (S/mean)		3.6	3.9						
CV (SE/mean)		2.1	2.3						
LSD 5%		6.0	6.0						

Table 7. Sawfly damage (percent cut) of durum lines and varieties in the 2011 statewide durum yield trial.

entry	Moccasin	Havre	Average
Mountrail	6.0	30.0	18.0
Divide	4.3	23.3	13.8
Pierce	5.7	41.7	23.7
Alkabo	4.7	30.0	17.3
Grenora	4.3	25.0	14.7
Tioga	3.7	18.3	11.0
Alzada	2.0	18.3	10.2
Strongfield	0.3	13.3	6.8
Belfield	1.0	20.0	10.5
Westhope	3.0	25.0	14.0
Saragolla	0.7	10.3	5.5
APB D1-35	1.0	10.0	5.5
APB D6-419	0.7	11.7	6.2
MT03012	2.0	30.0	16.0
MT04174	3.3	28.3	15.8
MT04340	0.3	10.0	5.2
MT05166	0.0	15.0	7.5
MT05183	0.7	11.7	6.2
Average	2.2	18.8	10.5
Probability	<0.001	<0.001	
CV (S/mean)	47.2	30.4	
CV (SE/mean)	27.2	17.6	
LSD 5%	1.7	9.5	

Table 8. Yield in bu/ac of durum lines and varieties in the 2011 statewide durum yield trial.

entry	Williston	Sidney Dry	Sidney Irr	Conrad	Moccasin	Havre	Huntley	Bozeman	Average, all sites	Average, dryland sites
Mountrail	32.9	41.1	54.5	60.8	20.3	39.4	54.5	50.4	44.2	42.8
Divide	32.3	38.3	44.1	60.1	20.1	36.4	59.7	48.2	42.4	42.1
Pierce	31.6	37.0	49.3	58.2	17.9	40.0	52.7	46.0	41.6	40.5
Alkabo	34.7	38.1	49.7	68.1	20.3	39.5	58.0	51.0	44.9	44.2
Grenora	34.1	37.7	54.0	67.2	18.3	36.5	59.3	50.9	44.8	43.4
Tioga	30.8	40.9	50.0	60.1	19.6	41.9	57.5	49.4	43.8	42.9
Alzada	27.1	37.8	31.3	68.2	24.8	43.9	61.6	44.5	42.4	44.0
Strongfield	22.4	36.8	44.4	62.1	19.1	40.7	60.5	43.5	41.2	40.7
Belfield	29.8	36.8	27.7	71.3	23.5	42.7	60.8	46.1	42.3	44.4
Westhope	32.9	43.5	49.9	66.8	17.1	37.1	62.3	53.1	45.3	44.7
Saragolla	27.5	30.8	34.0	65.8	22.7	41.3	58.7	51.8	41.6	42.6
APB D1-35	30.7	26.0	31.6	70.7	22.7	44.4	59.5	55.2	42.6	44.2
APB D6-419	31.9	35.8	33.9	63.3	20.9	40.6	59.6	50.1	42.0	43.2
MT03012	31.0	35.4	33.2	76.9	21.1	40.4	61.7	51.1	43.9	45.4
MT04174	27.6	33.2	33.3	57.6	21.2	38.3	59.8	48.4	39.9	40.9
MT04340	28.4	34.9	34.4	58.3	17.0	38.4	51.6	48.1	38.9	39.5
MT05166	26.3	37.6	44.2	55.5	21.0	38.1	52.1	54.8	41.2	40.8
MT05183	30.7	42.3	38.9	64.7	22.9	40.2	54.7	48.6	42.9	43.4
Average	28.4	34.6	39.2	60.8	19.6	37.5	55.4	47.6	40.4	40.6
Probability	<0.001	<0.001	<0.001	<0.001	0.001	<0.001		<0.001		
CV (S/mean)	9.1	11.9	11.3	15.3	18.6	9.3	5.2	8.07		
CV (SE/mean)		6.9	6.5	8.8	10.8	5.4				
LSD 5%	4.3	6.8	7.3	15.4	6.0	5.8	4.7	6.4		

Table 9. Across site summary of durum lines and varieties in the 2011 statewide durum yield trial.

entry	Heading*	Height, in	Test wt, lb/bu	Grain protein, %	NIR hardness	100-seed wt, gm	Yield, bu/ac, all sites	Yield, bu/ac, dryland sites	sawfly damage ¹
Mountrail	66.8	30.4	59.0	14.58	84.5	3.25	44.2	42.8	18.0
Divide	66.9	31.5	59.7	14.36	85.3	3.46	42.4	42.1	13.8
Pierce	66.0	32.3	60.2	14.33	88.8	3.33	41.6	40.5	23.7
Alkabo	66.0	30.8	60.3	14.77	82.7	3.59	44.9	44.2	17.3
Grenora	65.7	29.4	59.3	14.66	88.1	3.36	44.8	43.4	14.7
Tioga	66.2	32.9	59.8	14.65	86.1	3.66	43.8	42.9	11.0
Alzada	63.4	26.4	58.6	14.30	86.9	3.74	42.4	44.0	10.2
Strongfield	66.4	30.4	59.0	14.99	90.5	3.35	41.2	40.7	6.8
Belfield	61.9	25.4	59.6	14.13	88.5	3.54	42.3	44.4	10.5
Westhope	66.7	30.6	60.1	14.55	89.2	3.55	45.3	44.7	14.0
Saragolla	64.2	25.1	57.5	14.10	64.1	3.18	41.6	42.6	5.5
APB D1-35	64.5	22.7	54.2	15.32	80.8	3.34	42.6	44.2	5.5
APB D6-419	64.2	27.2	58.6	14.03	84.4	3.52	42.0	43.2	6.2
MT03012	62.5	25.6	59.1	14.65	90.9	3.27	43.9	45.4	16.0
MT04174	62.7	25.0	59.2	14.56	84.9	3.20	39.9	40.9	15.8
MT04340	65.4	24.0	57.4	14.65	89.9	3.36	38.9	39.5	5.2
MT05166	66.6	25.7	59.5	14.51	95.8	3.37	41.2	40.8	7.5
MT05183	65.5	24.8	59.4	14.25	89.6	3.57	42.9	43.4	6.2
overall average	65.4	27.2	58.8	14.53	86.1	3.46	40.4	40.6	10.5

*days from planting

¹/Havre and Moccasin sites only