

**PROJECT:** Durum quality in eastern Montana - 1998

**PROJECT COOPERATORS:**

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**OBJECTIVE:** To identify areas in which highest quality durum can be produced in eastern Montana and western North Dakota.

**PROCEDURE:** Three durum varieties (Renville, Munich, and Cortez, a daylength insensitive variety), a hard red spring wheat (Amidon), and a soft white spring wheat (Penewawa) were planted in five sites in eastern Montana and four sites in western North Dakota. Eastern Montana site descriptions are as follows:

Site	County	description	planting date	harvest date
Scobey	Daniels	irrigated	7 May	5 Sep
Poplar	Roosevelt	dryland	8 May	27 Aug
Wibaux	Wibaux	dryland	14 May	3 Sept
Sidney	Richland	irrigated	2 May	8 Aug
Sidney	Richland	dryland	28 Apr	20 Aug

All sites were planted with a plot seeder. Off-station plots were 20 ft long and 18 rows wide with one foot between rows (360 ft<sup>2</sup>) and on-station plots were 20 ft long and 20 rows wide with one foot between rows (400 ft<sup>2</sup>). Off-station irrigated site was under a pivot and the on-station irrigated site was flood irrigated. Plots were harvested with a plot combine. Agronomic characters were measured, and the grain samples were sent to the USDA-ARS Cereal Quality Lab in Fargo for plant scale quality testing.

**RESULTS:** Agronomic characters are shown for the five sites are shown in Tables 1-5. Quality data for 1998 from the cereal quality lab in Fargo is not available yet, but quality data from 1997 for each variety are shown in Tables 6-10.

**FUTURE PLANS:** This study was completed in 1998, but a report with 1998 quality data will be submitted next year.

Table 1. Agronomic characters of three durum, one hard red spring, and one soft white spring wheat varieties grown under irrigated conditions in Scobey (Daniels Co.), MT.

Planted: 8 May 1998

Harvested: 3 Sep 1998

Variety	type	height, cm	yield, bu/ac	test weight	grain protein*
Renville	durum	93.0	37.6	62.0	12.80
Munich	durum	80.0	41.3	60.5	13.20
Cortez	durum	61.3	23.8	57.5	12.50
Amidon	HRS	89.7	49.3	61.8	13.17
Penewawa	SWS	73.3	55.8	60.5	11.33
CV (s/mean)		3.3	11.0	1.2	1.3
probability		0.000	0.000	0.000	0.000
LSD <sub>0.05</sub>		5.0	8.6	1.4	0.32

\*based on 12.5% moisture

Table 2. Agronomic characters of three durum, one hard red spring, and one soft white spring wheat varieties grown under dryland conditions in Poplar (Roosevelt Co.), MT.

Planted: 7 May 1998

Harvested: 8 Aug 1998

Variety	type	yield, bu/ac	test weight	grain protein*
Renville	durum	41.5	63.0	14.97
Munich	durum	44.2	62.7	15.27
Cortez	durum	30.6	61.2	14.67
Amidon	HRS	43.7	62.5	14.20
Penewawa	SWS	45.3	61.7	12.10
CV (s/mean)		7.9	0.8	1.8
probability		0.002	0.8	1.9
LSD <sub>0.05</sub>		6.1	0.9	0.50

\*based on 12.5% moisture

Table 3. Agronomic characters of three durum, one hard red spring, and one soft white spring wheat varieties grown under dryland conditions in Wibaux (Wibaux Co.), MT.

Planted: 28 May 1998

Harvested: 4 Sep 1998

Variety	type	height, cm	yield, bu/ac	test weight	grain protein*
Renville	durum	98.3	52.2	61.5	14.70
Munich	durum	85.0	52.0	59.7	15.57
Cortez	durum	64.3	50.7	59.8	14.40
Amidon	HRS	95.3	49.1	59.8	15.27
Penewawa	SWS	75.0	51.6	59.7	13.53
CV (s/mean)		5.7	17.3	1.7	3.0
probability		0.000	0.997	0.241	0.003
LSD <sub>0.05</sub>		8.9	NS	NS	0.84

\*based on 12.5% moisture

Table 4. Agronomic characters of three durum, one hard red spring, and one soft white spring wheat varieties grown under irrigated conditions at the Eastern Agricultural Research Center, Sidney (Richland Co.), MT.

Planted: 1 May 1998

Harvested: 13 Aug 1998

Variety	type	heading <sup>1</sup>	height, cm	yield, bu/ac	test weight	grain protein*
Renville	durum	58	96.3	59.0	61.2	12.70
Munich	durum	59	86.3	73.0	61.3	13.17
Cortez	durum	57	70.0	57.8	59.3	13.27
Amidon	HRS	59	94.3	54.1	60.2	12.93
Penewawa	SWS	59	77.7	56.3	58.7	11.17
CV s/mean)		1.4	3.1	6.4	0.5	0.9
probability		0.020	0.000	0.002	0.000	0.000
LSD <sub>0.05</sub>		1.5	4.9	7.3	0.6	0.22

\*based on 12.5% moisture

<sup>1</sup> days from 1 January

\*based on 12.5% moisture

Table 5. Agronomic characters of three durum, one hard red spring, and one soft white spring wheat varieties grown under dryland conditions at the Eastern Agricultural Research Center, Sidney (Richland Co.), MT.

Planted: 19 Apr 1998

Harvested: 6 Aug 1998

Variety	type	heading <sup>1</sup>	height, cm	yield, bu/ac	test weight	grain protein*
Renville	durum	61	97.3	56.9	61.2	13.80
Munich	durum	60	82.7	55.7	60.3	14.30
Cortez	durum	57	64.7	49.9	60.5	14.30
Amidon	HRS	61	95.0	57.8	60.2	13.03
Penewawa	SWS	63	79.3	63.8	58.7	11.47
CV (s/mean)		1.4	1.8	3.3	0.8	4.5
probability		0.000	0.000	0.000	0.001	0.002
LSD <sub>0.05</sub>		1.6	2.9	3.6	0.8	1.1

\*based on 12.5% moisture

<sup>1</sup> days from 1 January

\*based on 12.5% moisture

Table 6. Penewawa soft white spring wheat quality at five sites in eastern Montana, as reported by the USDA Wheat Quality Lab, Fargo, ND.

Site	Test weight	kernel characters					
		large	small	1000 kwt	NIR hardness	grain protein*	Grain Ash*
Poplar, fallow	60.4	77.0	1.0	35.6	9.4	14.70	1.7
Wibaux, fallow	58.2	50.3	3.3	30.8	12.1	14.16	1.5
Scobey, irrigated	57.1	48.7	4.3	28.7	9.3	13.15	1.7
Sidney, fallow	59.2	64.7	2.7	32.8	17.5	15.69	1.9
Sidney, irrigated	60.8	69.7	3.0	33.7	8.5	12.40	1.6
ANOVA p-value	0.000	0.000	0.005	0.001	0.456	0.003	0.009
LSD <sub>0.05</sub>	1.1	10.0	1.4	2.4	NS	1.4	0.2

Site	flour characters			Farino characters		
	flour protein*	flour ash*	flour ext.	mix abs*	mix time	mixograph
Wibaux, fallow	11.98	0.53	58.6	54.9	3.2	2.0
Scobey, irrigated	11.71	0.53	62.0	55.3	3.2	2.0
Sidney, fallow	13.31	0.61	60.3	58.4	2.5	2.3
Sidney, irrigated	11.11	0.54	63.3	52.9	2.8	1.0
ANOVA p-value	0.017	0.023	0.804	0.002	0.012	0.014
LSD <sub>0.05</sub>	1.3	0.05	NS	2.1	0.4	0.7

\*based on 14% moisture

Table 7. Amidon hard red spring wheat quality at five sites in eastern Montana, as reported by the USDA Wheat Quality Lab, Fargo, ND.

Site	kernel characters						
	Test weight	large	small	1000 kwt	NIR hardness	grain protein*	Grain Ash*
Poplar, fallow	61.7	70.3	2.0	31.9	95.1	15.53	1.6
Wibaux, fallow	59.9	76.0	1.3	32.5	94.9	15.26	1.5
Scobey, irrigated	59.8	64.3	3.3	29.7	78.5	13.96	1.6
Sidney, fallow	58.7	33.0	7.7	25.4	91.6	16.29	1.8
Sidney, irrigated	61.7	74.0	2.3	32.6	97.0	14.38	1.7
ANOVA p-value	0.000	0.000	0.003	0.000	0.046	0.000	0.009
LSD <sub>0.05</sub>	0.8	4.9	2.7	1.6	12.5	0.6	0.1

Site	flour characters			Farino characters		
	flour protein*	flour ash*	flour ext.	mix abs*	mix time	mixograph
Poplar, fallow	14.47	0.50	67.9	61.0	2.5	2.7
Wibaux, fallow	14.25	0.47	69.6	59.8	2.9	3.0
Scobey, irrigated	13.02	0.50	66.9	59.2	3.3	3.0
Sidney, fallow	15.05	0.53	68.6	63.1	3.1	4.3
Sidney, irrigated	13.59	0.54	69.1	59.8	2.8	2.7
ANOVA p-value	0.000	0.016	0.494	0.307	0.245	0.013
LSD <sub>0.05</sub>	0.5	0.04	NS	NS	NS	0.9

\*based on 14% moisture

Table 8. Cortez durum quality at five sites in eastern Montana, as reported by the USDA Wheat Quality Lab, Fargo, ND.

Site	kernel characters							
	Test weight	large	small	1000 kwt	grain protein*	grain ash*	NIR hardness	Total ext
Poplar, fallow	61.4	83.3	0.3	45.9	15.00	1.9	112.9	86.0
Wibaux, fallow	59.3	73.7	2.3	38.9	14.90	1.8	99.0	84.1
Scobey, irrigated	56.6	40.0	8.7	34.4	13.07	2.0	98.1	85.2
Sidney, fallow	58.5	65.3	4.7	43.2	15.93	2.2	101.4	83.5
Sidney, irrigated	59.7	55.3	6.3	39.2	13.67	2.2	93.6	84.7
ANOVA p-value	0.011	0.000	0001	0.039	0.000	0.002	0.009	0.307
LSD <sub>0.05</sub>	2.2	12.3	2.9	7.1	0.86	0.2	9.0	NS

Site	semolina characters						spaghetti characters					
	Ext	protein	ash	mixo		Color		color		Cook		residue
				graph	specks	L	b	L	b	firm	weight	
Poplar	61.7	14.47	0.72	6.3	2.6	84.6	29.9	63.7	51.6	9.8	31.4	5.4
Wibaux	60.8	14.60	0.68	5.0	4.2	84.4	29.9	63.2	53.3	10.3	31.0	5.1
Scobey	59.9	12.70	0.73	5.3	3.0	84.5	31.2	63.8	52.8	8.8	31.8	5.6
Sidney, dry	58.7	15.73	0.77	4.7	12.3	83.7	27.7	61.2	49.1	10.2	30.8	5.1
Sidney, irr	61.0	13.13	0.81	4.3	20.9	83.2	30.2	61.4	51.6	8.7	31.8	5.7
ANOVA p-value	0.336	0.000	0.018	0.074	0.000	0.013	0.000	0.001	0.001	0.044	0.108	0.124
LSD <sub>0.05</sub>	NS	0.91	0.07	1.4	5.4	0.8	1.0	1.1	1.5	1.3	NS	NS

\*based on 14% moisture

Table 9. Renville durum quality at five sites in eastern Montana, as reported by the USDA Wheat Quality Lab, Fargo, ND.

Site	Test weight	kernel characters						
		large	small	1000 kwt	grain protein*	grain ash*	NIR hardness	Total ext
Poplar, fallow	62.0	72.7	2.7	45.1	15.47	1.7	127.4	88.2
Wibaux, fallow	60.2	47.0	6.3	38.1	14.27	1.6	106.9	85.0
Scobey, irrigated	58.9	44.7	7.0	34.0	12.53	1.8	100.8	85.9
Sidney, fallow	59.3	44.0	9.3	37.8	15.57	2.0	105.6	84.2
Sidney, irrigated	62.0	66.0	4.0	43.2	12.63	1.9	104.4	86.1
ANOVA p-value	0.000	0.000	0.010	0.000	0.000	0.000	0.018	0.028
LSD <sub>0.05</sub>	0.9	10.5	3.3	2.3	0.6	0.1	14.8	2.3

Site	semolina characters							spaghetti characters				
	Ext	Protein	ash	mixo		color		color		Cook		residue
				graph	specks	L	b	L	b	firm	weight	
Poplar	63.4	15.33	0.70	4.0	1.8	85.1	27.4	64.7	49.2	10.6	31.2	5.4
Wibaux	61.8	13.83	0.60	4.7	1.6	84.6	29.8	64.6	53.9	10.1	31.7	5.4
Scobey	62.6	12.10	0.65	4.7	1.3	85.3	29.1	64.7	52.6	8.3	32.6	5.7
Sidney, dry	60.4	14.90	0.76	4.3	7.8	83.7	27.0	63.5	49.6	10.4	31.5	5.1
Sidney, irr	63.9	12.23	0.69	3.0	5.5	84.8	27.3	64.5	50.2	8.0	31.5	6.0
ANOVA												
p-value	0.053	0.002	0.000	0.213	0.002	0.104	0.000	0.007	0.000	0.000	0.038	0.020
LSD <sub>0.05</sub>	2.4	1.49	0.05	NS	2.8	NS	0.9	0.6	1.5	0.4	0.9	0.5

\*based on 14% moisture

Table 10. Munich durum quality at five sites in eastern Montana, as reported by the USDA Wheat Quality Lab, Fargo, ND.

Site	kernel characters							
	Test weight	large	small	1000 kwt	grain protein*	grain ash*	NIR hardness	Total ext
Poplar, fallow	61.2	69.0	2.7	43.2	15.07	1.8	113.3	86.5
Wibaux, fallow	59.4	55.7	3.7	38.3	14.37	1.7	103.7	84.7
Scobey, irrigated	58.2	40.0	10.3	33.9	12.83	1.8	98.7	85.6
Sidney, fallow	58.8	44.0	8.3	36.6	15.70	2.1	102.4	83.6
Sidney, irrigated	61.7	67.0	3.0	41.8	12.53	1.9	102.5	85.7
ANOVA p-value	0.001	0.002	0.012	0.002	0.000	0.028	0.117	0.119
LSD <sub>0.05</sub>	1.3	12.8	4.6	3.8	0.80	0.2	NS	NS

Site	semolina characters						spaghetti characters					
	Ext	protein	ash	mixo		color		color		Cook		residue
				graph	specks	L	b	L	b	firm	weight	
Poplar	62.9	15.07	0.73	4.3	4.0	84.5	31.6	64.2	53.1	10.3	31.9	5.3
Wibaux	60.9	14.07	0.65	4.0	1.4	85.4	33.2	64.4	56.7	10.5	31.7	5.2
Scobey	61.8	12.60	0.71	3.0	3.1	84.5	32.3	64.5	55.5	8.8	32.3	5.7
Sidney, dry	60.0	15.87	0.81	4.0	5.9	84.2	30.6	63.2	52.6	10.6	31.3	5.3
Sidney, irr	62.9	12.10	0.71	3.0	6.8	83.9	31.3	63.7	53.7	7.2	33.5	6.4
ANOVA												
p-value	0.001	0.000	0.001	0.120	0.005	0.006	0.000	0.188	0.002	0.000	0.043	0.002
LSD <sub>0.05</sub>	1.2	0.85	0.05	NS	2.5	0.6	0.6	NS	1.7	0.8	1.4	0.5

\*based on 14% moisture