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SMALL GRAIN CROPS IN SOUTHWESTERN NORTH DAKOTA

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SUMMARY

New crop cultivars and advanced experimentals from public and private agencies must be developed for the continued viability of crop and crop-livestock systems in southwestern North Dakota. The North Dakota Agricultural Experiment Station is obligated to provide unbiased data and interpretations which can be used by producers to choose cultivars for farm production. This project will collect and publish: (1) information on the comparative performance of small grain cultivars in southwestern North Dakota; and (2) data on experimental lines which may be released and utilized by North Dakota farmers. This project will also provide grain for quality evaluation.

OBJECTIVE

Evaluate genotypes of hard red spring wheat, durum wheat, barley, and oats in southwestern North Dakota.

INTRODUCTION

Crop production is a significant income generator for southwestern farmers and ranchers. Cash receipts from crops accounted for 24% of total farm income in the South Central, Southwestern, and West Central Crop Reporting Districts in 1991 (Wiyatt and Hamlin, 1992). When government payments were considered, over 40% of total farm income came directly from cash receipts for crops. This excludes the value of forages grown and fed directly to livestock on farms.

Wheat, barley, and oat are the major small grain crops grown in western North Dakota. The annual value of these cereal grains grown between 1986-90 was over $170,000,000 in the three southwestern crop reporting districts (Wiyatt and Hamlin, 1992). Development of improved small grain cultivars is necessary to ensure that the farm income generated by grain crops, either directly by cash payment or indirectly through livestock, can be maintained or enhanced.

Cultivar comparison trials have been the foundation of yield, quality, and agronomic evaluation of crop cultivars in North Dakota. Early reports from the Agricultural Experiment Station contained data obtained from comparison trials (Hays, 1893a, 1893b). These trials still are important to obtain information for varietal release and recommendations (Cox et al., 1988; Frohberg, 1991). Each year approximately 40 or more hard red spring wheat, 25 to 30 durum wheat, 20 to 25 oat, and 25 to 30 barley are evaluated in comparison studies at the Dickinson Research Extension Center (DREC). These comparisons include both named cultivars and experimental lines from NDSU, and other public and private breeding programs in the U.S. and Canada. Evaluations are used to make cultivar recommendations.

Grain produced in plots from the comparison trials is used in quality evaluations by personnel of the Department of Cereal Chemistry and Food Technology at NDSU, Fargo, ND. Quality evaluations of experimental lines are compared to cultivars currently grown by producers. The quality and agronomic performance of an experimental line at various locations is one of the major bases for the recommended release of that line as a named cultivar or its removal from consideration for further testing.

Experimental lines from other state experiment stations and private plant breeding companies also are evaluated for

quality. Although data from this project are not instrumental in the eventual release or rejection of lines from these sources, it does provide information on agronomic characteristics prior to release and does assist in cultivar recommendations.

Soils at the Dickinson Research Extension Center (DREC) are representative of a large percentage of southwestern North Dakota soils. However, not all prominent soil types occurring in the southwestern portion of the state occur at the DREC. Moreover, local climatic differences between different areas in the region exist. For these reasons, cultivar comparison studies are conducted at sites besides the DREC to provide an area test of crop cultivar performance at several locations in southwestern North Dakota.

MATERIALS AND METHODS

Seed of cultivars evaluated in comparison trials generally were provided by plant breeders at North Dakota State University in Fargo, or from drill strips at the DREC. Cultivars developed from neighboring land-grant institutions and Canada, as well as private plant breeding companies were included.

Cultural practices including tillage and seeding, fertilization, herbicide application, and harvesting followed currently acceptable agronomic procedure in implementing and maintaining cultivar comparison trials. Cultivars and genotypes of each small grain crop (hard red spring wheat, durum wheat, barley, and oat) were evaluated using a replicated randomized complete block design. Demonstration strips also were maintained for grower observation, crop field tours, and for a sufficient amount of seed for quality evaluations. All crop trials were conducted on previously fallowed cropland.

Plant growth was monitored throughout the growing season. Variables that were measured on each plot included: date of emergence, date of plant establishment, days to heading, plant height, plant lodging at physiological maturity, grain yield, 100 seed weight, grain volume weight, grain protein content for wheat, and percentage of plump kernels for barley. Ten random plants in each plot of three replicates within the hard red spring wheat comparison trial were evaluated for flag leaf spotting, using the system developed by McMullen and Francl (M. McMullen and L. Francl, per. comm., 1992).

Data collected at off-station sites included grain yield, grain volume weight, and grain protein content for wheat. Quality characteristics for product acceptance will be determined by the Department of Cereal Science and Food Technology at North Dakota State University from grain samples provided.

Data were analyzed using a computer statistical program.

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RESULTS

Hard Red Spring Wheat

XW398A4 was among the highest yielding cultivars, if not the highest, at Dickinson and other locations in 1994. Yield performance of this cultivar has been consistent in the three years it has been tested at Dickinson. Average yield of XW398A4 between 1992 and 1994 has been 125% that of Grandin, the most widely grown variety in the southwest in 1994. By comparison, yields of other popular varieties at Dickinson compared to that of Grandin have been: 2375, 91%; Amidon, 99%; and Butte 86, 90%.

Durum Wheat

Yield of Renville, the most widely planted durum wheat in 1994, was 38 bushels per acre. Significant differences in yield among the 25 cultivars evaluated at Dickinson were not detected, in part because some of the variability in yield (as indicated by a CV(%) of 19.5) could not be explained by variety differences. It is likely that yield differences between varieties were masked by soil variability.

Average yield of the varieties Laker, Plenty, Rugby, and Ward has been greater than that of Renville over the last three years. Average yield of Renville over this same time period has been greater than that of Medora and Monroe at all locations tested by DREC scientists.

Barley

Stander was among the top yielding barley cultivars evaluated at Dickinson in 1994. Between 1992 and 1994, average yield of Stander has been 107% that of Stark. Excel, another six-rowed barley, has generally been among the highest yielding barley varieties at Beach, Beulah, Dickinson, Hannover, and Glen Ullin between 1992 and 1994.

Stark compares favorably to the other two-rowed barley cultivars evaluated at Dickinson over the past three years. Yield of Gallatin has been comparable to that of Stark during this period, but grain of Gallatin has generally had a lighter test weight. Test weight for Bowman has been similar to Stark in trials at Beach, Beulah, Dickinson, Glen Ullin, and Hannover during this three-year period, but yields of Stark have consistently been higher than those of Bowman.

Oat

Grain yield of the highest yielding variety at Dickinson in 1994, Derby, was 172 bushels per acre. Paul, a naked oat variety released in 1994, produced grain with the heaviest test weight of all varieties tested, but yield was only 70% that of the average yield for the 28 varieties evaluated. Grain yield of Whitestone, another 1994 release, was not significantly different than that of Dumont. Otana produced significantly more grain than Whitestone in 1994, although yield levels of Otana and Whitestone have been similar when averaged over the last three years.

Dryland Hard Red Spring Wheat Variety Trial - Fallow -- Dickinson, ND, 1994										
Variety	Type	Days to heading	Flag leaf spotting %	Height inches	Test Weight lbs/bu	Yield				% of Grandin
						1994	1993	1992	Avg	
2370	Semidw arf	48.2	70.8	29.0	61.7	44.2	42.1	52.0	46.1	88
2371	Semidw arf	54.7	14.0	32.7	60.6	42.3	42.6	73.0	52.6	100
2375	Semidw arf	47.7	63.9	30.5	61.2	44.1	45.1	54.0	47.7	91
AC Domain	Conventional	49.2	71.1	30.2	61.5	39.4	35.7	----	----	----
AC Eatonia	Conventional	50.5	67.8	31.7	61.5	39.1	----	----	----	----
Amidon	Conventional	52.0	37.4	31.7	61.0	40.0	47.4	69.0	52.1	99
BW152	Conventional	53.0	----	33.5	60.1	38.4	----	----	----	----
BW661	Conventional	53.5	----	33.2	60.5	40.4	----	----	----	----
Bergen	Semidw arf	49.0	53.3	27.5	60.6	49.2	54.6	82.0	61.9	118
Butte 86	Conventional	46.7	62.5	32.0	61.9	43.5	41.1	56.0	46.9	90
CDC Merlin	Conventional	51.7	32.5	34.0	60.0	42.2	----	----	----	----
CDC Teal	Conventional	50.5	31.6	32.2	60.2	38.2	42.1	47.0	42.4	81
Dalen	Semidw arf	50.2	55.0	27.0	62.6	43.8	51.2	70.0	55.0	105
Express	Semidw arf	50.0	37.5	24.0	60.4	39.3	----	66.0	----	----
Grandin	Semidw arf	49.5	50.3	29.2	61.4	42.3	46.8	68.0	52.4	100
Gus	Semidw arf	51.5	33.0	32.7	61.0	44.7	49.5	79.0	57.7	110
Invader	Conventional	55.2	----	33.5	59.9	38.8	----	----	----	----
Krona	Semidw arf	51.7	40.3	26.5	59.6	45.2	----	----	----	----
Kulm	Conventional	46.0	51.4	33.2	63.0	47.3	----	----	----	----
Len	Semidw arf	53.0	40.3	28.7	60.0	42.1	37.8	57.0	45.6	87
McNeal	Semidw arf	53.0	52.8	28.7	59.6	47.4	55.1	87.0	63.2	121
Hamer	Semidw arf	49.0	48.6	28.2	61.7	52.3	----	----	----	----
Lars	Semidw arf	50.2	41.0	25.2	60.1	49.3	----	----	----	----
Norlander	Semidw arf	46.7	53.7	26.5	62.2	40.9	----	----	----	----
ND 673	Conventional	50.0	71.1	33.2	61.1	44.4	47.8	60.0	50.7	97
ND 674	Semidw arf	50.2	40.8	30.2	61.9	44.1	49.5	56.0	49.9	95
ND 677	Conventional	50.5	41.7	33.7	61.9	45.3	50.8	60.0	52.0	99

ND 678	Conventional	50.5	35.7	34.2	62.9	51.8	----	----	----	----
ND 686	Semidw arf	48.5	70.8	29.0	62.1	40.0	51.4	----	----	----
ND 687	Semidw arf	45.0	71.2	27.7	63.6	43.7	41.1	----	----	----
Norm	Semidw arf	49.7	28.9	27.5	61.4	49.3	----	----	----	----
Penew aw a	Semidw arf	50.2	95.5	26.7	60.0	43.2	46.7	----	----	----
Prospect	Semidw arf	50.0	----	29.5	61.7	51.1	----	----	----	----
SBE0437	Semidw arf	51.2	28.3	28.7	60.5	49.6	----	----	----	----
SD8073	Conventional	49.0	65.0	31.7	61.4	41.8	----	----	----	----
Sharp	Conventional	46.0	61.7	32.2	63.6	44.3	----	----	----	----
Sonja	Semidw arf	49.5	45.2	26.5	60.7	44.6	56.8	----	----	----
Stoa	Conventional	50.0	36.2	31.7	60.6	45.3	46.6	56.0	49.3	94
Vance	Semidw arf	49.5	39.8	29.7	61.5	43.6	51.5	80.0	58.4	111
XW398A4	Semidw arf	52.5	70.3	29.2	60.6	50.7	54.3	91.0	65.3	125
Mean		50.1	50.3	30.1	61.2	44.2				
CV(%)		2.0	29.1	6.2	1.2	14.6				
LSD .05		1.1	23.8	2.6	1.0	NS				

Dryland Durum Variety Trial - Fallow -- Dickinson, ND, 1994

Variety	Type[1]	Days to Heading	Height inches	Test w eight lbs/bu	Yield				% of Renville
					1994	1993	1992	Avg	
					bu/ac				
D8460	Med	49.7	26.5	60.0	35.1	----	----	----	----
Voss	Conv	53.5	25.0	60.7	39.8	----	----	----	----
D87130	Med	51.0	29.0	61.9	35.7	----	----	----	----
D87240	Conv	52.5	30.7	59.0	33.6	----	----	----	----
D87450	SD	48.2	24.5	59.9	35.4	----	----	----	----

D88273	Med	50.0	26.5	61.2	34.5	----	----	----	----
D88303	SD	53.5	26.2	60.7	42.5	----	----	----	----
D88450	SD	52.0	25.2	61.6	40.0	----	----	----	----
D89-476	Conv	50.7	28.7	60.6	32.3	----	----	----	----
D89111	Med	52.0	27.2	60.2	34.3	----	----	----	----
D89135	Med	51.0	27.2	60.7	33.5	----	----	----	----
D89172	Med	50.5	26.7	61.7	41.4	----	----	----	----
D89331	Conv	53.2	29.2	61.0	31.2	----	----	----	----
D89424	SD	52.7	26.0	60.7	42.0	----	----	----	----
Laker	SD	54.2	28.5	61.6	40.7	48.8	51.0	46.8	108
Lloyd	SD	51.0	24.0	59.6	38.1	45.7	47.0	43.6	101
Medora	Conv	54.0	28.5	61.9	38.7	40.5	44.0	41.1	95
Monroe	Conv	45.5	28.5	61.1	33.3	41.9	49.0	41.4	96
Plenty	Conv	52.5	32.5	59.6	35.7	51.8	50.0	45.8	106
Regold	Conv	50.7	29.7	61.4	33.4	48.9	----	----	----
Renville	Conv	52.0	32.0	60.2	38.0	44.9	47.0	43.3	100
Rugby	Conv	52.5	32.0	61.5	41.1	54.6	43.0	46.2	107
Sceptre	Med	50.5	29.0	60.4	39.3	52.1	45.0	45.5	105
Vic	Conv	52.7	30.0	61.4	37.8	48.1	43.0	43.0	99
Ward	Conv	51.2	31.0	61.2	42.6	52.0	44.0	46.2	107
Mean		51.2	28.0	60.1	37.7				
C.V.(%)		4.5	6.2	1.5	19.5				
LSD 0.05		2.6	0.9	1.3	NS				

Dryland Hard Red Spring Wheat Variety Trial - No-till Fallow -- Beach, ND, 1994					
		Test weight		Yield	

Variety	Seeds lbs	Test weight lbs/bu	Protein %	1994	1993	1992	Avg	% of Grandin
				bu/ac				
2375	??	61.2	15.5	43.3	53.8	66.0	54.37	1.14
Amidon	??	60.2	16.0	38.3	51.7	61.0	50.33	1.06
Bergen	??	58.9	15.6	37.1	54.8	64.0	51.97	1.09
Butte 86	??	61.2	15.8	40.6	48.1	60.0	49.57	1.04
Grandin	??	59.9	16.4	36.5	43.3	63.0	47.60	1.00
Gus	??	60.6	16.1	37.6	52.9	59.0	49.83	1.05
HiLine	??	59.5	16.0	40.0	----	----	----	----
Kulm	??	62.1	15.7	45.4	----	----	----	----
McNeal	??	57.9	15.9	37.4	58.8	----	----	----
Stoa	??	60.0	15.6	42.8	42.0	62.0	48.93	1.03
XW398A4	??	60.0	16.0	47.6	68.8	----	----	----
Mean	??	60.1	15.9	40.6				
CV(%)	9.92	1.6	2.7	10.7				
LSD .05	NS	1.40	NS	6.3				

Dryland Durum Variety Trial - No-till Fallow -- Beach, ND, 1994							
Variety	Seeds lbs	Test weight lbs/bu	Yield				% of Renville
			1994	1993	1992	Avg	
			bu/ac				
Medora	14,506	59.6	33.3	30.3	60.0	41.20	107.10
Monroe	13,501	58.6	32.9	37.8	65.0	45.23	117.57
Renville	15,941	58.2	35.4	36.6	43.40	38.47	100.00
Vic	13,394	58.0	33.2	35.4	----		
Voss	15,088	57.9	37.4	----	----		

Mean	14,485	58.5	34.4				
CV(%)	5.7	1.9	10.8				
LSD .05	1268.9	NS	NS				

Dryland Hard Red Spring Wheat Variety Trial - Fallow -- Beulah, ND, 1994

Variety	Seeds lbs	Test w eight lbs/bu	Protein %	Yield				% of Grandin
				1994	1992	1991	Avg	
				bu/ac				
2375	12,302	62.4	15.8	59.9	87.0	27.8	58.2	106
Amidon	14,001	61.7	16.0	60.2	100.0	20.9	60.4	111
Bergen	13,325	60.0	14.9	63.7	84.0	28.6	58.8	108
Butte 86	13,088	61.7	16.7	54.5	81.0	22.3	52.6	96
Grandin	12,814	61.9	16.6	56.5	84.0	23.4	54.6	100
Gus	13,938	60.9	16.8	58.6	82.0	23.4	54.7	100
Hi Line	14,111	61.9	15.2	61.2	----	----	----	----
Kulm	14,722	63.2	16.7	58.3	----	----	----	----
McNeal	13,803	57.9	15.7	56.0	----	----	----	----
Stoa	14,224	61.0	15.8	60.1	87.0	23.7	56.9	104
XW398A4	12,054	61.1	15.1	71.0	----	----	----	----
Mean	13,489	61.2	16.0	60.0				
CV(%)	2.8	1.9	1.7	6.7				
LSD(0.05)	543.3	1.7	0.4	5.8				

Dryland Durum Variety Trial - Fallow -- Beulah, ND, 1994							
Variety	seeds lbs	Test weight lbs/bu	Yield				% of Renville
			1994	1992	1991	Avg	
			bu/ac				
Medora	10,979	57.5	59.9	73.0	27.2	53.4	92
Monroe	10,347	61.6	61.4	69.0	34.1	54.8	94
Renville	11,840	60.7	72.4	75.0	27.2	58.2	100
Vic	10,456	58.9	66.6	----	33.6	----	----
Voss	10,881	56.9	64.2	----	----	----	----
Mean	10,901	59.1	64.9				
CV(%)	3.6	2.2	9.1				
LSD .05	603.3	2.0	NS				

Dryland Hard Red Spring Wheat Variety Trial - Fallow -- Glen Ullin, ND, 1994								
Variety	Seeds lbs	Test weight lbs/bu	Protein %	Yield				% of Grandin
				1994	1993	1992	Avg	
				bu/ac				
2375	11,501	58.9	13.6	51.3	50.0	71.0	57.43	102.92
Amidon	11,759	58.6	13.9	49.4	48.5	76.0	57.97	103.89
Bergen	12,529	58.5	13.0	53.9	52.5	75.0	60.47	108.37
Butte 86	12,264	59.5	14.1	48.5	45.0	56.0	49.83	89.30
Grandin	11,619	59.2	14.4	46.5	47.9	73.0	55.80	1.00
Gus	12,368	58.4	14.4	46.0	45.0	68.0	53.00	94.98
Hi Line	12,471	58.6	13.7	48.0	----	----	----	----
Kulm	12,687	59.2	14.1	48.9	----	----	----	----
McNeal	12,329	58.2	13.6	48.2	53.6	----	----	----

Stoa	13,079	58.2	13.4	49.3	42.8	65.0	52.37	93.85
XW398A4	11,042	59.1	13.4	56.0	58.0	----	----	----
Mean	12,150	58.8	13.8	49.6				
CV(%)	6.5	1.4	2.2	4.9				
LSD .05	NS	1.7	NS	5.8				

Dryland Durum Variety Trial - Fallow -- Glen Ullin, ND, 1994

Variety	Seeds lbs	Test weight lbs/bu	Yield				% of Renville
			1994	1993	1992	Avg	
			bu/ac				
Medora	12,330	59.7	38.1	30.3	62.0	43.47	83.48
Monroe	10,866	59.0	42.2	37.8	68.0	49.33	94.74
Renville	13,039	59.7	48.6	36.6	71.0	52.07	100.00
Vic	11,213	59.7	43.7	35.4	----	----	----
Voss	11,309	59.7	47.4	----	----	----	----
Mean	11,751	59.6	44.0				
CV(%)	7.1	0.7	6.4				
LSD 0.05	1294.1	NS	NS				

Dryland Hard Red Spring Wheat Variety Trial - Recrop -- Hannover, ND, 1994

				Yield	
		Test weight			

Variety	Seeds lbs	Test weight lbs/bu	Protein %	1994	1993	1992	Avg	% of Grandin
				bu/ac				
2375	12,737	61.0	15.8	39.6	37.8	65.0	47.5	106
Amidon	13,952	60.1	16.5	36.6	29.5	73.0	46.4	104
Bergen	13,756	60.1	15.3	39.5	29.3	68.0	45.6	102
Butte 86	12,880	61.1	16.2	40.4	33.2	58.0	43.9	98
Grandin	12,129	61.2	17.1	35.5	27.3	71.0	44.6	100
Gus	14,006	59.7	16.7	36.5	35.3	67.0	46.3	104
HiLine	14,529	60.0	15.7	42.3	----	----	----	----
Kulm	13,788	61.9	16.5	43.0	----	----	----	----
McNeal	13,661	58.5	15.4	40.9	34.4	----	----	----
Stoa	13,854	60.5	16.0	45.6	30.9	65.0	47.2	106
XW398A4	12,349	60.5	16.1	43.9	34.2	----	----	----
Mean	13,422	60.4	16.1	40.3				
CV(%)	3.5	0.7	3.0	12.0				
LSD .05	686.7	0.6	0.7	NS				

Dryland Durum Variety Trial - Recrop -- Hannover, ND, 1994							
Variety	Seeds lbs	Test weight lbs/bu	Yield				% of Renville
			1994	1993	1992	Avg	
			bu/ac				
Medora	12,272	61.1	31.1	17.1	55.0	34.4	86
Monroe	11,400	60.6	37.8	18.9	56.0	37.6	94
Renville	12,594	60.9	39.1	19.0	62.0	40.0	100
Vic	11,255	60.4	35.5	23.8	----	----	----
Voss	11,116	61.4	33.1	----	----	----	----

Mean	11,727	60.9	35.3				
CV(%)	4.1	0.8	12.2				
LSD .05	745.7	NS	NS				

Dryland Barley Variety Trial - Fallow -- Dickinson, ND, 1994

Variety	Type	Days to heading	Height inches	Protein %	Seed lb	Test w eight lbs/bu	Yield				% of Stark
							1994	1993	1992	Avg	
							bu/ac				
6884-2912	6R	54.0	28.7	13.9	12,981	43.5	90.5	----	----	----	----
Azure	6R	49.0	30.7	13.3	12,237	46.6	94.6	79.2	64.0	79.3	92.64
B 1602	6R	53.0	28.7	14.1	13,481	43.9	95.0	72.6	77.0	81.5	95.21
Bob	2R	49.0	27.0	15.8	11,097	49.2	67.4	----	----	----	----
Bow man	2R	48.0	25.5	13.4	10,387	49.2	81.0	67.2	79.0	75.7	88
Excel	6R	50.0	27.0	13.7	13,096	46.6	95.7	85.3	86.0	89.0	103.97
Gallatin	2R	53.0	26.2	14.3	12,247	46.2	96.9	67.3	80.0	81.4	95.09
Harrington	2R	57.0	25.2	14.2	11,860	44.7	89.8	70.2	88.0	82.7	96.61
Hazen	6R	50.0	31.0	13.6	12,632	44.2	91.2	92.9	69.0	84.4	98.60
M66	6R	49.0	27.2	14.1	12,510	46.9	106.8	----	----	----	----
MT 860756	2R	54.0	23.7	13.8	11,064	47.7	89.9	93.7	----	----	----
Manley	2R	58.0	27.5	14.3	11,336	44.1	88.0	97.2	----	----	----
Morex	6R	49.0	31.5	14.0	12,984	48.1	84.1	66.0	69.0	73.0	85.28
ND 10981	6R	50.0	30.2	13.6	12,203	44.2	91.2	86.2	76.0	84.5	98.72
ND 11055	6R	49.0	28.2	14.1	12,704	45.4	97.8	87.5	73.0	86.1	100.58
ND 11231-11	2R	49.0	26.0	13.1	10,292	48.6	98.1	81.1	----	----	----
ND 11853-3R	2R	48.0	25.0	14.5	9958	47.9	87.8	72.9	----	----	----
ND 12201	6R	50.0	30.2	13.6	12,509	45.5	90.8	87.3	----	----	----
ND 13297	2R	48.0	27.5	13.6	10,076	48.4	104.1	----	----	----	----

ND 13299	2R	47.0	24.7	13.5	10,466	48.4	94.9	----	----	----	----
ND 13300	2R	49.0	26.7	13.6	11,140	48.7	106.6	----	----	----	----
Robust	6R	50.0	29.2	14.7	12,317	47.5	90.4	72.9	80.0	81.1	94.74
Royal	6R	51.0	23.7	14.4	13,005	45.0	84.5	----	----	----	----
Shonkin	2R	54.0	26.5	14.9	12,502	49.0	81.2	----	----	----	0.00
Stander	6R	51.0	27.0	13.5	11,846	46.9	102.8	87.9	84.0	91.6	107.01
Stark	2R	50.0	27.5	13.5	10,155	49.4	97.0	81.8	78.0	85.6	100.00
Mean		50.9	27.4	14.0	11,811	46.8	92.2				
CV%		2.1	3.5	6.1	4.0	2.6	8.1				
LSD.05		1.2	1.3	1.2	669.3	1.7	10.5				

Dryland Oat Variety Trial - Fallow -- Dickinson, ND, 1994

Variety	Days to Heading	Height inches	Seeds lb	Test Weight lbs/bu	Yield				% of Otana
					1994	1993	1992	Avg	
					bu/ac				
AC Belmont	54.0	36.0	17,841	39.4	134.6	143.0	----	----	----
Bay	53.7	30.2	12,895	33.9	159.1	192.0	----	---	----
Brow n	52.0	31.0	11,482	36.0	143.5	----	----	----	----
Calibre	54.7	38.0	11,383	37.6	180.6	136.0	104.0	140.2	104
Derby	55.0	38.2	11,866	37.2	172.0	130.0	110.0	137.3	102
Dumont	55.7	39.0	11,785	35.9	163.7	144.0	97.0	134.9	100
Hytest	50.0	38.7	12,238	41.7	117.0	116.0	99.0	110.7	82
Jerry	50.2	33.7	12,820	39.0	139.4	149.0	101.0	129.8	96
Kelsey	53.2	38.7	13,693	37.5	159.6	----	----	----	----
Milton	53.0	32.5	13,364	37.7	138.9	163.0	----	----	----
Monida	55.7	36.5	14,435	36.7	174.5	141.0	112.0	142.5	106
ND852107	53.7	37.5	13,516	37.1	170.8	135.0	109.0	138.3	103

ND862095	54.0	36.0	12,800	38.7	161.6	154.0	96.0	137.2	102
ND880107	55.7	40.0	13,127	36.9	144.7	120.0	----	----	----
ND880224	56.5	37.5	12,120	35.6	166.4	174.0	107.0	149.1	111
ND881374	54.5	39.2	12,521	36.2	162.1	150.0	----	----	----
ND881508	55.5	39.5	13,201	38.6	163.5	136.0	----	----	----
ND900117	51.2	31.5	12,317	39.1	131.7	----	----	----	----
New dak	49.2	34.2	12,940	36.4	155.4	132.0	108.0	131.8	98
Otana	54.7	38.5	13,591	38.7	170.6	129.0	104.0	134.5	100
Paul	54.5	37.2	16,843	40.5	107.7	127.0	78.0	104.2	77
Porter	53.5	36.5	13,110	39.2	157.8	184.0	103.0	148.3	110
Prairie	51.0	32.0	12,828	36.0	157.0	143.0	97.0	132.3	98
Riel	54.2	36.7	12,492	36.7	154.1	159.0	109.0	140.7	105
Robert	56.0	37.0	11,289	36.7	148.0	156.0	103.0	135.7	101
Troy	54.0	40.2	14,487	39.1	139.8	133.0	106.0	126.3	94
Valley	51.7	31.5	13,214	39.9	143.5	159.0	97.0	133.2	99
Whitestone	55.7	32.5	13,788	37.9	154.0	130.0	103.0	129.0	96
Mean	53.7	36.1	13,142	37.7	152.6				
CV(%)	3.1	4.4	5.5	2.2	6.3				
LSD(0.05)	1.9	2.2	1025.5	1.2	13.6				

Dryland Barley Variety Trial - No-till Fallow -- Beach, ND, 1994

Variety	Seeds lbs	Test w eight lbs/bu	Protein %	Yield				% of Stark
				1994	1993	1992	Avg	
				bu/ac				
Azure	13,215	47.7	14.4	67.7	45.3	----	----	
Bow man	10,941	51.1	14.5	77.8	71.5	81.0	76.77	95.64

Excel	15,505	45.5	14.7	80.3	57.5	106.0	81.27	101.25
Gallatin	12,682	48.0	14.8	75.3	67.2	99.0	80.50	100.29
Manley	14,034	46.2	16.1	63.0	----	----	----	
Robust	13,968	48.2	14.7	73.0	36.2	----	----	
Stark	10,613	50.6	14.6	73.9	72.9	94.0	80.27	100.00
Mean	12,994	48.2	14.9	73.0				
CV(%)	3.2	1.9	1.7	5.6				
LSD .05	621.6	1.4	0.4	6.0				

Dryland Oat Variety Trial - No-till Fallow -- Beach, ND, 1994

Variety	Seeds lbs	Test w eight lbs/bu	Yield				% of Otana
			1994	1993	1992	Avg	
			bu/ac				
Bay	16,624	33.2	94.9	----	----	----	----
Dumont	14,831	36.2	81.1	105.7	143.0	109.93	93.08
Jerry	14,167	36.9	84.5	129.9	----	----	----
Kelsey	16,398	37.0	95.6	101.6	----	----	----
Milton	16,443	34.9	75.2	----	----	----	----
Otana	15,845	37.7	94.9	112.4	147.0	118.10	100.00
Paul	20,598	44.1	57.6	----	----	----	----
Whitestone	16,426	36.6	107.3	----	----	----	----
Mean	16,417	37.1	86.4				
CV(%)	4.9	2.5	5.2				
LSD .05	1180.5	1.4	6.7				

Dryland Barley Variety Trial - Fallow -- Beulah, ND, 1994								
Variety	Seeds lbs	Test w eight lbs/bu	Yeilds					% of Stark
			Protein %	1194	1992	1991	Avg	
Azure	---	49.1	---	90.6	---	54.3	---	---
Bow man	---	51.7	---	75.5	102.0	60.2	79.2	88
Excel	---	50.0	---	111.5	141.0	---	---	---
Gallatin	---	52.7	---	91.9	129.0	61.2	94.0	105
Manley	---	50.4	---	95.9	---	---	---	---
Robust	---	50.9	---	86.7	---	---	---	---
Stark	---	52.2	---	86.6	122.0	60.5	89.7	100
Mean		51.0		91.2				
CV (%)		1.7		4.8				
LSD .05		1.3		6.5				

Dryland Oat Variety Trial - Fallow -- Beulah, ND, 1994							
Variety	Seeds lbs	Test w eight lbs/bu	Yield				% of Otana
			1994	1992	1991	Avg	
			bu/ac				

Bay	15764	33.0	116.7	---	---	---	---
Dumont	14426	36.0	101.7	135.0	82.5	108.7	95
Jerry	13966	38.5	108.3	---	---	---	---
Kelsey	16353	35.2	115.1	---	---	---	---
Milton	15550	36.0	106.6	---	---	---	---
Otana	16222	35.9	108.9	150.0	78.4	114.2	100
Paul	19129	42.6	86.6	---	---	---	---
Whitestone	15809	35.4	121.4	---	---	---	---
Mean	15902	36.6	108.2				
CV(%)	5.7	2.5	7.6				
LSD .05	1334.1	1.3	12.0				

Dryland Barley Variety Trial - Fallow -- Glen Ullin, ND, 1994

Variety	Seeds lbs	Test w eight lbs/bu	Protein %	Yield				% of Stark
				1994	1993	1992	Avg	
				bu/ac				
Azure	10,919	46.6	14.1	84.7	59.0	----	----	----
Bow man	9558	48.6	14.3	68.8	48.7	91.0	69.50	84.76
Excel	11,372	45.9	13.3	96.6	58.6	106.0	87.07	106.18
Gallatin	10,582	49.2	13.8	91.2	48.0	113.0	84.07	102.52
Manley	10,126	46.4	13.6	92.5	----	----	----	----
Robust	10,697	47.5	14.1	86.3	54.6	----	----	----
Stark	8700	49.7	14.1	84.6	51.4	110.0	82.00	100.00

Mean	10,279	47.7	13.9	86.4				
CV(%)	4.1	1.9	1.5	3.9				
LSD .05	631.6	1.4	0.3	4.9				

Dryland Oat Variety Trial - Fallow -- Glen Ullin, ND, 1994

Variety	Seeds lbs	Test w eight lbs/bu	Yield				% of Otana
			1994	1993	1992	Avg	
			bu/ac				
Bay	14,302	30.9	102.9	----	----	----	----
Dumont	12,767	34.7	118.7	119.4	134.0	124.03	97.28
Jerry	14,781	36.0	107.6	107.6	----	----	----
Kelsey	14,396	35.4	116.1	99.7	----	----	----
Milton	20,221	33.7	100.9	----	----	----	----
Otana	14,124	36.1	122.3	123.2	137.0	127.50	100.00
Paul	12,748	41.0	77.4	----	----	----	----
Whitestone	14,783	34.4	99.2	----	----	----	----
Mean	14,765	35.3	105.6				
CV(%)	6.2	2.8	10.7				
LSD.05	1357.9	1.4	16.6				

Dryland Barley Variety Trial - Recrop -- Hannover, ND, 1994

Variety	Seeds lbs	Test w eight lbs/bu	Protein	Yield				% of Stark
				1994	1993	1992	Avg	

				bu/ac				
Azure	10,862	48.7	15.2	55.2	47.6	----	----	----
Bow man	9545	51.6	14.7	55.3	34.8	100.0	63.4	89
Excel	11,700	49.2	14.3	70.7	50.0	111.0	77.2	108
Gallatin	11,168	50.6	15.3	57.9	34.5	109.0	67.1	94
Manley	11,618	48.7	16.1	50.2	----	----	----	----
Robust	11,471	50.6	15.1	54.3	49.4	----	----	----
Stark	9010	52.5	15.2	57.0	48.6	109.0	71.5	100
Mean	10,768	50.3	15.2	57.2				
CV(%)	3.1	1.1	1.8	11.8				
LSD .05	499.8	0.8	0.4	10.1				

Dryland Oat Variety Trial - Recrop -- Hannover, ND, 1994

Variety	Seeds lbs	Test w eight lbs/bu	Yield				% of Otana
			1994	1993	1992	Avg	
			bu/ac				
Bay	16,429	35.4	54.5	----	----		
Dumont	13,875	38.4	59.0	99.1	130.0	96.2	93
Jerry	15,033	39.7	60.3	98.0	----	----	----
Kelsey	17,039	38.1	78.4	106.8	----	----	----
Milton	15,355	37.9	61.4	----	----	----	----
Otana	15,892	39.1	71.3	105.2	134.0	103.5	100
Paul	24,207	43.6	54.1	----	-----	----	----
Whitestone	15,840	38.2	61.8	----	----	----	----
Mean	16,709	38.8	62.6				

CV(%)	4.9	1.7	18.4				
LSD .05	1209	1.0	NS				

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