Small Grains Variety Evaluation at the Maricopa Agricultural Center, 1994 (Preliminary)

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Introduction

Small grain varieties were tested at the Maricopa Agricultural Center as part of the on-going effort to assess variety productivity and characteristics. Barley, durum, and wheat experimental and commercial cultivars were tested. The purpose of the annual tests at Maricopa is to characterize new varieties in a general way in terms of yield potential, relative maturity, quality, and other characteristics. The variety trials at Maricopa do not substitute for localized on-farm testing of new varieties. Varieties are known to differ in their response to specific management regimes and weather conditions. A summary of small grain variety trials conducted by the University of Arizona is available from your local Cooperative Extension office.

Procedure

Barley, durum, and wheat varieties were evaluated at the Maricopa Agricultural Center on Field 1, borders 49-51. The soil type was a Casa Grande sandy loam. The field was fallow the previous summer. Preplant soil nitrate was 11.5 ppm NO_3-N and preplant soil phosphate was 18 ppm P. The field was pre irrigated and urea (46-0-0) was broadcast and incorporated preplant at a rate of 50 lbs N/A. Seed was planted into moist soil on November 23 and 24, 1993. The seed was planted with a cone planter in seven rows spaced 11 inches apart. The seeding rate was 22 seeds per foot of row or approximately 105 pounds of seed per acre. The plots were 7.5 ft. x 19 ft. The experimental design was a randomized complete block design with 25 entries and 6 replications for the barley and wheat and 30 entries and 5 replications for the durum.

The plots were irrigated on January 24, February 24, March 10, March 21, April 4, April 18, and May 9. Urea ammonium nitrate solution (32-0-0) was applied in the irrigation water at a rate of 50 lbs N/A on January 24 and February 24, 20 lbs N/A on March 10, and 15 lbs N/A on March 21. A total of 185 lbs N/A was applied, 50 lbs preplant and 135 lbs postplant. The plots were harvested with a small plot combine on the following dates: wheat on May 19, barley on May 24 and June 2, and durum on June 2. The following data was collected: grain yield, plant height, lodging, heading date, anthesis date, and physiological maturity date (defined when glumes turn color). Wheat quality was analyzed by the USDA Wheat Quality Lab in Fargo, ND. Durum kernel and milling characteristics are being analyzed by the California Wheat Commision Lab in Woodland, CA and pasta characteristics are being analyzed by the USDA Wheat Quality Lab in Fargo, ND.

Discussion

Yield and plant characteristics are presented in Table 1. This trial represents one set of conditions. No definite conclusions are intended to be made from this data since varieties are known to be greatly affected by environmental conditions. The environmental conditions for this test were unique as usual. The growing season weather was relatively dry and cool at night. Cold night temperatures during the winter seemed to slow barley growth more than wheat or durum. Heading dates were a few days later compared to previous years. Warm weather shortened the grain fill period of the wheat by nearly one week, but not of barley and durum. Growing conditions favored the wheat and durum as grain yields demonstrate. Very high levels of yellow berry were noted in the durum despite adequate nitrogen fertility status indicated by leaf color and past history of nitrogen fertilization. The results of this trial are useful when combined with data from other years.

Acknowledgements

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Table 1. Small grain variety yield results from Maricopa, 1994.

Entry	Source[a]	Grain Yield[b]	Test Weight	Kernel Weight	Plant Height	Lodging	Heading	Anthe-sis[c]	Physio-logical Maturity[d]
		lb/acre	lb/bu	mg	inches	%			
					Barley				
BA 1129	FMC	6241	53.2	42.4	33	33	3/13	3/15	4/24
Madera	WPB	6230	52.9	42.4	32	10	3/16	3/17	4/25
Max	FMC	6220	54.5	43.5	32	0	3/18	3/20	4/26
BA 8055	FMC	6114	53.5	40.3	31	0	3/13	3/15	4/26
DA 587-170	WPB	6035	55.4	40.7	36	0	3/16	3/17	4/24
BA 7128	FMC	5935	53.7	37.2	33	0	3/14	3/16	4/24
Mucho	APB	5791	54.4	40.7	29	10	3/06	3/07	4/19
DA 587-124	WPB	5787	55.3	40.0	30	10	3/13	3/15	4/23
Gustoe	WPB	5766	55.3	38.6	31	4	3/16	3/17	4/24
BA 7139	FMC	5588	54.8	38.8	32	20	3/17	3/18	4/26
Fiesta	WPB	5386	55.7	46.1	31	7	3/06	3/07	4/21
Sunbar BB82	NK	5180	52.8	41.2	35	0	3/13	3/15	4/21
6-13-20	APB	4784	50.9	36.6	32	57	3/11	3/13	4/21
6-1-12	APB	4773	53.6	37.9	33	53	3/11	3/13	4/21
DA 588-10	APB	4673	55.2	43.1	35	10	3/14	3/15	4/22
BA 7021	FMC	4575	59.5	39.8	33	27	3/11	3/13	4/23
Barcott	WPB	4562	52.0	36.9	34	30	3/01	3/04	4/14
AVERAGE		5508	54.3	40.4	32	16	3/12	3/13	4/22
					Wheat				
Delano	APB	8173	64.7	49.5	32	0	3/11	3/17	4/28
Klasic	NK	7679	64.8	44.1	34	0	3/15	3/20	4/30
PH 988-131	WPB	7603	63.8	38.8	36	7	3/14	3/20	4/29
PH 991-87	WPB	7561	63.0	46.5	31	0	3/18	3/24	4/30
BR 7073	FMC	7498	63.0	47.1	36	0	3/16	3/22	4/28
Cavalier	FMC	7434	63.4	44.6	33	0	3/18	3/24	4/29
BR 8631	FMC	7350	63.1	42.7	33	7	3/18	3/24	4/30
PH 989-80W	WPB	7297	62.4	36.5	33	0	3/23	3/30	5/03
Seri 82	CIMMYT	7223	61.9	41.0	40	3	3/24	3/31	5/03
Yecora Rojo	Public	7217	64.2	45.0	33	11	3/14	3/20	4/25
Poco Red	FMC	7170	63.4	40.7	28	0	3/14	3/20	4/25
89-1A-4	APB	7170	61.4	39.2	30	0	3/18	3/23	4/30
PH 991-71	WPB	7160	63.3	38.3	34	0	3/18	3/24	4/30
89-1A-9	APB	7139	62.7	36.9	31	0	3/20	3/25	5/02
PH 990-15	WPB	7096	62.8	36.4	40	3	3/17	3/24	5/01
BR 6053	FMC	7022	63.3	39.2	34	3	3/18	3/25	5/03
BR 1235	FMC	6801	62.3	39.8	32	0	3/20	3/27	5/01
Express	WPB	6473	63.9	29.0	40	10	3/21	3/30	5/03
PH 990-335	WPB	6431	63.3	40.5	37	20	3/08	3/15	4/25
AVERAGE		7237	63.2	40.8	34	3	3/17	3/23	4/29

Table 1 (con'd). Small grain variety yield results from Maricopa, 1994.

Entry	Source[a]	Grain Yield[b]	Test Weight	Kernel Weight	Plant Height	Lodging	Heading	Anthe-sis[d]	Physio-logical Maturity[e]
		lb/acre	lb/bu	mg	inches	%			
					Durum				
D 8869	FMC	7337			37	0	3/16	3/23	5/05
8009	WPB	7236			39	0	3/15	3/22	5/04
D 5317B	FMC	7198			37	3	3/20	3/28	5/06
8005	WPB	7147			37	0	3/23	4/01	5/09
DuraKing	FMC	7033			38	30	3/20	3/28	5/08
D 8940A	FMC	7020			34	0	3/23	3/31	5/06
Aldura	NK	7012			35	0	3/21	4/01	5/08
8012	WPB	6970			37	3	3/17	3/26	5/06
D 8095	FMC	6919			31	0	3/22	3/30	5/09
D 1138	FMC	6906			40	3	3/17	3/25	5/04
Reva	FMC	6830			37	0	3/18	3/28	5/05
D 5318B	FMC	6818			39	3	3/20	3/30	5/04
WestBred 881	WPB	6805			37	0	3/16	3/24	5/05
8011	WPB	6792			37	0	3/17	3/25	5/06
8007	WPB	6729			37	0	3/19	3/28	5/07
8010	WPB	6678			36	50	3/18	3/26	5/06
D-90-22	APB	6665			37	0	3/20	3/30	5/07
8001	WPB	6602			37	0	3/23	4/03	5/09
Turbo	WPB	6589			40	23	3/22	3/31	5/08
D 8241	FMC	6564			38	0	3/22	3/30	5/09
8008	WPB	6501			37	17	3/16	3/23	5/07
Ocotillo	APB	6501			40	17	3/17	3/24	5/04
881-11	APB	6425			37	0	3/19	3/26	5/08
Mexicali	Public	6425			39	60	3/14	3/22	5/04
Kronos	APB	6387			35	67	3/15	3/23	5/04
Durex	FMC	6235			39	0	3/17	3/24	5/05
Minos	APB	5829			39	73	3/21	3/27	5/06
Gem	H&H	5728			39	43	3/20	3/29	5/06
AVERAGE		6710			37	14	3/18	3/27	5/06

[a] Source: APB = Arizona Plant Breeders, FMC = Farmers Marketing Corporation, H&H = H&H Seed, NK = Northrup King, and WPB = Western Plant Breeders

[b] Grain yield: LSD (10%) = 646, 474, and 429 lb/acre and cv = 11.1, 6.7, and 6.2% for barley, durum, and wheat, respectively.

[c] Anthesis = first day of pollen shed

[d] Physiological maturity defined as when glumes turn brown.

Table 3a. Wheat quality evaluation: kernel characteristics.

Entry	Source[a]	Test Weight	Seed Weight	Large Kernels	Small Kernels	Kernel Ash	Kernel Protein[b]	Kernel Hard-ness	Kernel Score[c]	General Score[d]
		lb/bu	mg	%	%	%	%			
Delano	APB	64.7	49.5	83	1	1.35	11.5	100	2	2.0
Klasic	NK	64.8	44.1	78	1	1.38	11.3	67	2	2.0
PH 988-131	WPB	63.8	38.8	62	1	1.52	11.9	95	1	1.3
PH 991-87	WPB	63.0	46.5	75	1	1.51	11.4	98	2	1.3
BR 7073	FMC	63.0	47.1	80	1	1.46	11.6	69	2	2.0
Cavalier	FMC	63.4	44.6	72	1	1.44	11.7	91	2	1.7
BR 8631	FMC	63.1	42.7	69	1	1.48	11.6	84	2	1.7
PH 989-80W	WPB	62.4	36.5	63	2	1.57	12.1	91	1	1.3
Seri 82	CIMMYT	61.9	41.0	74	1	1.65	11.3	91	2	1.3
Yecora Rojo	Public	64.2	45.0	72	0	1.48	11.8	82	2	1.7
Poco Red	FMC	63.4	40.7	60	1	1.55	12.5	84	2	2.0
89-1A-4	APB	61.4	39.2	61	2	1.94	11.5	68	1	1.0
PH 991-71	WPB	63.3	38.3	57	3	1.53	11.8	90	1	1.3
89-1A-9	APB	62.7	36.9	58	2	1.56	11.4	88	1	1.0
PH 990-15	WPB	62.8	36.4	62	2	1.51	12.0	89	1	1.3
BR 6053	FMC	63.3	39.2	48	3	1.60	11.3	94	1	1.3
BR 1235	FMC	62.3	39.8	58	1	1.55	11.4	69	1	1.0
Express	WPB	63.9	29.0	80	1	1.49	12.6	97	1	1.3
PH 990-335	WPB	63.3	40.5	68	2	1.52	12.4	87	2	2.0
AVERAGE		63.2	40.8	67	1.4	1.53	11.7	86	1.5	1.5
Minor faulting values		57.9	42.9	–	8	–	13.9	–	–	–
Major fauting values		56.9	39.9	–	18	–	12.9	–	–	–

[a] Source: APB = Arizona Plant Breeders, FMC = Farmers Marketing Corporation, ND = North Dakota, NK = Northrup King, and WPB = Western Plant Breeders

[b] Kernel protein based on 14% moisture.

[c] The kernel score is calculated by subtracting 1 or 2 from a perfect score of 4 due to not meeting minor or major faulting values.

[d] The general score is the average of the kernel, milling , and baking scores from Tables 3a, 3b, and 3c.

Table 3b. Wheat quality evaluation: milling performance.

Entry	Source[a]	Flour Extraction	Flour Ash	Flour Protein[b]	Milling Character[c]	Milling Score[d]
		%	%	%		
Delano	APB	65.9	0.37	10.2	5	2
Klasic	NK	61.4	0.40	10.2	5	2
PH 988-131	WPB	64.8	0.37	10.3	5	2
PH 991-87	WPB	58.6	0.44	10.2	5	1
BR 7073	FMC	62.9	0.36	10.7	5	2
Cavalier	FMC	62.4	0.38	10.1	5	2
BR 8631	FMC	63.2	0.39	10.0	5	2
PH 989-80W	WPB	60.6	0.45	10.8	5	1
Seri 82	CIMMYT	60.4	0.50	10.0	5	1
Yecora Rojo	Public	63.4	0.40	10.5	5	2
Poco Red	FMC	63.5	0.41	11.0	5	2
89-1A-4	APB	60.0	0.44	10.2	5	1
PH 991-71	WPB	62.3	0.43	10.5	5	2
89-1A-9	APB	61.1	0.50	9.9	5	1
PH 990-15	WPB	62.1	0.44	10.8	5	2
BR 6053	FMC	62.3	0.39	9.7	5	2
BR 1235	FMC	58.9	0.42	10.1	5	1
Express	WPB	64.4	0.40	11.4	5	2
PH 990-335	WPB	63.3	0.36	11.0	5	2
AVERAGE		62.2	0.41	10.4	5	1.7
Minor Faulting Values		61.3	0.57	12.9	3	–
Major Faulting Values		59.3	0.61	12.4	2	–

[a] Source: APB = Arizona Plant Breeders, FMC = Farmers Marketing Corporation, ND = North Dakota, NK = Northrup King, and WPB = Western Plant Breeders

[b] Flour protein based on 14% moisture.

[c] Milling character score: 0 = very soft, 5 = normal.

[d] The milling score is calculated by subtracting 1 or 2 from a perfect score of 4 due to not meeting minor or major faulting values.

Table 3c. Wheat quality evaluation: baking results.

Entry	Source[a]	Mixo-graph Absorp-tion	Mixo-graph Pattern[b]	Bake Absorp-tion	Dough Mixing Time	Dough Handling Score[c]	Crumb Color Score[d]	Crumb Grain Score[e]	Loaf Volume	Bake Score[f]
		%		%	minutes				cubic cm	
Delano	APB	56.2	2	56.2	5.25	7	8.5	8.0	181	2
Klasic	NK	56.9	2	56.9	5.00	9	9.0	8.0	185	2
PH 988-131	WPB	55.5	1	55.5	4.50	7	8.0	8.0	172	1
PH 991-87	WPB	56.5	1	56.5	3.50	7	8.0	7.5	181	1
BR 7073	FMC	56.5	2	56.5	5.00	9	8.0	8.0	183	2
Cavalier	FMC	53.8	1	53.8	5.00	7	8.0	8.5	173	1
BR 8631	FMC	54.3	1	54.3	4.50	7	8.5	8.5	180	1
PH 989-80W	WPB	54.6	2	54.6	4.50	7	8.0	7.5	178	2
Seri 82	CIMMYT	56.2	1	56.2	3.00	5	7.5	7.5	177	1
Yecora Rojo	Public	56.2	1	56.2	4.00	8	8.5	8.0	182	1
Poco Red	FMC	56.9	2	56.9	4.00	7	8.0	8.0	182	2
89-1A-4	APB	54.6	1	54.6	4.75	5	8.0	7.5	173	1
PH 991-71	WPB	55.5	1	55.5	4.00	7	8.0	8.5	174	1
89-1A-9	APB	53.5	1	53.5	4.50	5	8.0	7.5	166	1
PH 990-15	WPB	55.8	1	55.8	4.00	7	8.0	7.5	177	1
BR 6053	FMC	55.0	1	55.0	5.50	5	8.0	8.0	161	1
BR 1235	FMC	53.5	1	53.5	4.50	5	8.5	7.5	164	1
Express	WPB	57.3	1	57.3	2.50	7	8.0	7.5	178	1
PH 990-335	WPB	57.3	2	57.3	4.00	7	8.0	7.5	179	2
AVERAGE		55.6	–	55.6	4.32	6.7	8.1	7.8	176	1.3
Minor Faulting Values		–	2,7,8	61.9	2.75	6	7.5	7.5	161	–
Major Faulting Values		–	1,9-11	60.4	1.75	4	5.0	5.0	151	–

[a] Source: APB = Arizona Plant Breeders, FMC = Farmers Marketing Corporation, ND = North Dakota, NK = Northrup King, and WPB = Western Plant Breeders

[b] Larger numbers for mixograph pattern indicate stronger mixing characteristics.

[c] Dough handling score: 0 = dead, 9 = elastic.

[d] Crumb color: 2.0 = dull, very grey, 10.0 = bright white.

[e] Crumb grain score: 2.0 = irregular, open and large cells; coarse grain and thick walls; rough and soggy texture, 10.0 = close, elongated, and uniform cells; fine grain and thin walls; soft texture.

[f] The bake score is calculated by subtracting 1 or 2 from a perfect score of 4 due to not meeting minor or major faulting values.