

Planting Date Effects on Small Grain Varieties at Maricopa Under Full Production Conditions

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Abstract

Planting date can have a tremendous effect on small grain yield. The purpose of this study is to document the interactions of planting date with current small grain varieties. Field studies were conducted at the Maricopa Agricultural Center over the 1988, 1989, and 1990 growing seasons. Six barley, durum and wheat varieties were compared at four planting dates from November to February. WestBred Gustoe was among the highest yielding barleys and WestBred Turbo was among the highest yielding durums regardless of planting date. The highest yielding wheat was WestBred 911 at the November plantings, Klasic at the December and January plantings, and Topaz and Klasic at the February plantings. The varieties also responded differentially to planting date in terms of plant height, kernel weight, heading and maturity date, but not test weight. This study demonstrates the importance of planting date in choosing a small grain variety.

Introduction

A production practice with an enormous influence on grain yield is planting date. Planting dates of small grain are not always under grower control due to timing of the harvest of the previous crop, water availability, farm programs, or other factors. The optimum planting date of wheat and barley depends on location, but is generally November 15 to December 15 in the Salt River Valley and December 15 to January 15 in the Yuma area, for example. The optimum planting date is generally as early as possible, yet avoids frost damage near heading.

The objective of this study was to document the interactions of planting date and varieties in small grain production.

Materials and Methods

Field studies were conducted at the Maricopa Agricultural Center on a Casa Grande sandy loam during the 1988, 1989, and 1990 growing seasons. Six commercial barley, six durum, and six wheat cultivars were planted each year at four dates (November, December, January and February) in a 6x6 latin square experimental design. The experiments were planted in a row spacings of both 6 and 12 inches, except in the 1988 growing season where a row spacing of 12 inches only was planted. The six inch row spacing was achieved by staggering two passes of cone planters spread 12 inches apart. The data is averaged over row spacing.

Fertilizer was applied preplant at a rate of approximately 75 lbs P_2O_5/A and 100 lbs N/A . Nitrogen was also applied in the first two irrigations as UAN 32 at a rate of 50 lb N/A each application. Seed was planted into moisture at a rate of 10 seeds per square foot (ca. 80 lbs seed/A). Pesticide applications were not necessary. Six to seven irrigations were applied. The plots were approximately 6.7 feet wide and 22 feet long. The center 4 feet of the plots were harvested with a small plot combine. Heading date, maturity date, test weight, kernel weight, and plant height were recorded in each trial.

Results and Discussion

The influence of planting date on yield and other crop characteristics is presented in Tables 1 to 6. All main and interactive effects for yield were statistically significant. The optimum planting date averaged over varieties was mid-November or early December in 1988, early November in 1989, and early December or early January 1990. A late frost in 1990 limited yield of the early November planting.

The performance of each variety differed when compared to other varieties at a particular year and planting date. The yield of Barcott and Gustoe relative to the other varieties increased with a delay in planting date. This is expected of Barcott, a short-season cultivar, but not of Gustoe which is late-maturing. Gustoe performed very well compared to other varieties planted. Gustoe was among the highest yielding barleys at any planting date, which is surprising. The differences in the yield of Aldura and WestBred 881 are less with later planting. WestBred Turbo was among the highest yielding durumms at all planting dates. WestBred 911 has a relative advantage over the other varieties if planted in November and Topaz and Klasic have a relative advantage at a February planting date. Klasic was among the highest yielders at the December and January planting dates.

Planting date affected crop characteristics of the varieties differentially. Plant height of Barcott was 10% greater than Gustoe at a November planting date, but 24% less than Gustoe at a February planting date. Plant height of Aldura compared to other varieties decreased with a delay in planting date, while relative plant height of Turbo increased. Grain test weight of the varieties was not significantly altered by planting date, especially for durum and wheat. The kernel weight of Fiesta was 7% less than Sunbar 400 averaged over the November plantings, but was 6% greater than Sunbar 400 averaged over the February plantings.

The varieties exhibited varying photoperiod sensitivity based on heading and maturity dates. Barcott may lack photoperiod sensitivity since at the November planting, Barcott headed 9 days earlier than Fiesta, but headed 2 days before Fiesta at the February plantings. WestBred 911 appears relatively sensitive to photoperiod since it headed 14 days after the average at the November plantings but only 7 days after the average at the February plantings. WestBred 911 reached physiological maturity 12 days after Probred at the November planting dates, but only 4 days after Probred at the February planting dates.

Small grain varieties differ in their performance and characteristics depending on the year and planting date. Planting date should be considered when choosing a small grain variety.

Table 1. Relative grain yield (% of avg. yield) for varieties as influenced by planting date. LSD(.10) = 10.6.

Crop	Variety	1988				1989				1990				Avg.			
		16Nov	14Dec	14Jan	04Feb	05Nov	07Dec	12Jan	14Feb	03Nov	05Dec	12Jan	05Feb	Nov	Dec	Jan	Feb
Barley	Barcott	84	99	96	105	104	112	106	137	103	105	101	102	97	105	101	115
	Piasta	98	104	89	99	111	109	102	134	113	106	95	97	107	106	95	110
	Gustoe	117	114	123	131	108	106	93	126	106	112	105	109	110	111	107	122
	SB 400	99	100	95	86	87	95	99	67	101	87	91	92	96	94	95	82
	SB 458	99	88	91	76	100	89	97	50	102	107	103	95	100	95	97	74
	SB BB82	102	95	107	103	91	89	103	86	74	83	105	106	89	89	105	98
Avg. Yield (lbs/A)		5496	5236	3570	3270	4670	4616	3523	3192	4216	5798	6500	6100	4794	5216	4531	4187
Durum	Aldente	106	109	105	104	93	106	104	106	109	102	99	98	102	106	103	103
	Aldura	100	103	104	97	111	103	97	97	104	102	102	100	105	103	101	98
	Gen	102	94	96	98	107	105	105	89	95	101	106	104	101	100	102	97
	Turbo	110	111	100	114	113	108	112	116	118	104	106	104	114	107	106	111
	WFB 881	83	92	96	92	99	89	91	88	85	96	100	99	89	93	96	93
	Yavaros	100	91	100	94	78	88	91	103	89	95	87	95	89	91	93	97
Avg. Yield (lbs/A)		5609	6062	4517	3630	7467	6185	4195	3690	5201	7798	7297	6510	6092	6681	5336	4610
Wheat	Baker	94	100	98	100	105	99	99	97	88	101	102	99	96	100	100	98
	Klasic	105	109	108	101	111	107	101	102	108	123	109	107	108	113	106	103
	ProBred	106	94	95	100	102	101	98	101	93	98	104	99	101	98	99	100
	Topaz	80	94	103	105	66	97	107	107	100	74	80	104	82	88	97	105
	WFB 911	126	106	100	103	106	98	97	94	125	102	100	94	119	102	99	97
	Yecora R.	90	97	97	91	110	98	97	100	86	102	105	98	95	99	100	96
Avg. Yield (lbs/A)		4710	4648	4393	3676	6832	5368	3665	3108	4401	5905	6438	5402	5314	5307	4832	4062

Table 2. Relative plant height (% of avg. height) for varieties as influenced by planting date. LSD(.10) = 9.9.

Crop	Variety	1988				1989				1990				Avg.			
		16Nov	14Dec	14Jan	04Feb	05Nov	07Dec	12Jan	14Feb	03Nov	05Dec	12Jan	05Feb	Nov	Dec	Jan	Feb
Barley	Barcott	103	100	74	68	94	89	70	76	107	110	88	95	102	100	77	80
	Piasta	98	100	93	98	96	98	95	89	97	86	91	95	97	95	93	94
	Gustoe	92	91	100	108	91	100	85	98	94	98	105	103	92	96	96	103
	SB 400	98	91	109	96	102	105	115	109	104	95	95	95	101	97	106	100
	SB 458	101	107	109	108	105	105	118	111	90	101	109	107	98	104	112	109
	SB BB82	109	110	116	121	113	103	117	118	107	110	112	103	110	108	115	114
Avg. Height (inches)		27.0	22.8	17.0	15.6	31.8	26.7	21.8	22.1	28.4	32.2	29.0	24.8	29.1	27.2	22.6	20.8
Durum	Aldente	104	107	107	115	101	103	116	117	105	103	108	111	104	104	110	114
	Aldura	92	85	88	82	93	84	81	81	94	86	88	86	93	85	85	83
	Gen	103	103	104	104	104	104	102	95	105	103	97	98	104	103	101	99
	Turbo	101	104	102	107	107	115	118	117	100	103	108	117	102	107	109	114
	WFB 881	102	95	96	86	96	90	88	95	97	103	97	92	98	96	93	91
	Yavaros	98	107	102	106	100	103	96	96	100	103	102	95	99	104	100	99
Avg. Height (inches)		32.5	29.5	23.8	23.9	38.0	31.6	28.1	28.6	33.6	36.4	34.6	32.0	34.7	32.5	28.8	28.2
Wheat	Baker	96	94	91	100	94	101	103	93	89	98	98	92	93	98	97	95
	Klasic	95	92	103	93	100	106	99	97	93	101	98	92	96	100	100	94
	ProBred	96	105	93	104	105	94	96	101	100	98	101	100	101	99	97	102
	Topaz	125	107	111	108	106	116	107	115	121	117	115	127	117	113	111	117
	WFB 911	94	98	111	104	100	95	103	97	104	92	94	92	99	95	103	98
	Yecora R.	94	103	91	91	94	89	92	97	93	95	94	96	94	96	92	95
Avg. Height (inches)		29.0	21.7	19.1	18.2	33.4	28.9	23.5	21.8	27.6	31.2	28.2	25.6	30.0	27.3	23.6	21.9

Table 3. Relative grain test weight (% of avg. test wt.) for varieties as influenced by planting date. LSD(.10) = 1.3.

Crop	Variety	1988				1989				1990				Avg.			
		16Nov	14Dec	14Jan	04Feb	05Nov	07Dec	12Jan	14Feb	03Nov	05Dec	12Jan	05Feb	Nov	Dec	Jan	Feb
Barley	Barcott	100	100	99	100	99	102	101	102	97	101	100	100	99	101	100	101
	Piasta	104	105	106	107	97	106	104	105	108	106	107	104	103	106	106	105
	Gustoe	105	106	106	106	105	102	102	107	106	106	105	102	106	105	104	105
	SB 400	96	96	97	94	98	97	95	93	96	93	96	95	97	95	96	94
	SB 458	98	97	98	96	102	98	103	96	98	98	98	102	99	98	100	98
	SB BB42	97	95	96	96	99	95	96	96	94	96	94	97	97	95	95	97
Avg. Test Wt. (lbs/bu)		51.0	50.4	49.2	49.9	46.1	49.1	46.2	48.2	49.8	48.3	49.1	49.1	49.0	49.3	48.2	49.1
Durum	Aldente	100	100	99	99	100	100	100	100	98	99	100	99	100	100	100	99
	Aldura	101	100	100	101	101	100	100	102	101	99	99	98	101	100	100	100
	Gen	101	101	101	101	102	102	101	100	101	102	102	102	101	102	101	101
	Turbo	100	100	99	99	101	100	100	100	100	100	100	100	100	100	100	100
	WFB 881	98	98	99	99	98	99	98	99	99	100	100	101	99	99	99	100
	Yavaros	101	100	101	101	98	100	100	101	100	100	100	99	99	100	100	100
Avg. Test Wt. (lbs/bu)		64.6	63.8	63.3	63.5	63.5	64.3	63.2	64.0	64.1	61.7	62.2	61.6	64.1	63.3	62.9	63.0
Wheat	Baker	101	102	102	101	100	101	101	101	101	101	100	101	101	101	101	101
	Klasic	102	102	102	102	103	103	103	102	101	103	101	104	102	102	102	103
	ProBred	101	99	99	99	100	99	98	99	101	99	100	99	101	99	99	99
	Topaz	97	98	99	98	100	100	102	99	99	97	98	98	99	98	100	98
	WFB 911	98	98	97	97	97	97	97	99	97	99	99	98	97	98	98	98
	Yecora R.	101	102	101	102	100	101	100	100	101	101	101	100	100	101	101	101
Avg. Test Wt. (lbs/bu)		64.1	64.0	63.8	63.7	62.8	63.1	60.5	63.3	63.4	61.1	61.3	60.9	63.4	62.7	61.9	62.6

Table 4. Relative kernel weight (% of avg. kernel wt.) for varieties as influenced by planting date. LSD(.10) = 3.6.

Crop	Variety	1988				1989				1990				Avg.			
		16Nov	14Dec	14Jan	04Feb	05Nov	07Dec	12Jan	14Feb	03Nov	05Dec	12Jan	05Feb	Nov	Dec	Jan	Feb
Barley	Barcott	95	94	89	87	93	95	90	89	91	100	88	83	93	97	89	86
	Piasta	103	108	106	119	88	106	104	100	108	105	107	111	100	106	106	110
	Gustoe	100	100	97	93	100	89	80	104	97	100	101	92	99	96	92	96
	SB 400	107	109	108	108	109	113	102	101	106	100	102	104	107	107	104	104
	SB 458	96	94	94	96	105	100	111	101	96	97	102	106	99	97	102	101
	SB BB42	99	96	107	97	105	98	112	104	102	98	100	105	102	97	106	102
Avg. Kernel Wt. (mg)		45.7	46.5	45.8	45.2	35.1	43.5	39.0	44.0	39.8	40.9	44.1	43.4	40.2	43.7	43.0	44.2
Durum	Aldente	99	104	103	102	98	101	102	97	103	105	107	103	100	104	104	101
	Aldura	94	92	94	96	97	92	89	97	98	90	90	93	96	92	91	95
	Gen	107	99	107	102	107	101	97	107	101	107	104	102	105	103	103	104
	Turbo	104	105	105	102	104	97	97	94	97	101	99	103	102	101	100	100
	WFB 881	96	105	98	100	106	105	106	106	106	108	107	103	103	106	104	103
	Yavaros	99	94	93	98	87	103	108	99	96	89	92	96	94	95	98	97
Avg. Kernel Wt. (mg)		61.6	56.9	58.6	55.3	51.2	52.5	49.1	55.1	49.9	51.3	50.6	49.8	54.2	53.6	52.7	53.4
Wheat	Baker	95	96	99	99	97	98	101	94	100	100	95	103	97	98	98	99
	Klasic	103	99	99	103	100	100	102	98	104	106	96	100	102	102	99	100
	ProBred	99	99	102	103	101	95	95	102	98	103	102	98	99	99	100	101
	Topaz	115	117	105	109	117	120	118	114	105	109	114	109	112	115	112	111
	WFB 911	89	93	95	86	90	85	81	93	93	85	97	87	91	87	91	89
	Yecora R.	99	96	99	101	95	103	104	98	101	97	96	104	98	99	100	101
Avg. Kernel Wt. (mg)		55.2	48.3	47.3	45.7	42.6	41.8	35.5	45.5	42.9	43.0	42.4	41.8	46.9	44.4	41.7	44.4

Table 5. Relative heading date (days from avg. heading date) for varieties as influenced by planting date. LSD(.10) = 2.6.

Crop	Variety	1988				1989				1990				Avg.			
		16Nov	14Dec	14Jan	04Feb	05Nov	07Dec	12Jan	14Feb	03Nov	05Dec	12Jan	05Feb	Nov	Dec	Jan	Feb
Barley	Barcott	-10	-9	-5	-7	-17	-11	-7	-4	-18	-10	-7	-5	-15	-10	-6	-5
	Fiesta	-6	-7	-6	-7	-9	-7	-7	-6	-3	-5	-6	-7	-6	-6	-6	-7
	Gustoe	8	7	5	6	11	8	7	3	8	8	6	9	9	8	6	6
	SB 400	-1	-1	-3	-1	0	0	-2	2	4	0	-1	-2	1	0	-2	0
	SB 458	5	6	5	7	9	6	5	4	5	3	5	5	6	5	5	5
	SB BB42	3	3	4	2	6	4	4	2	5	2	3	-1	5	3	4	1
Avg. Heading Date		04Mar	22Mar	02Apr	12Apr	27Feb	16Mar	01Apr	13Apr	28Feb	20Mar	04Apr	14Apr	01Mar	20Mar	02Apr	13Apr
Durum	Aldente	-1	-1	0	0	-4	-2	-3	-2	1	1	1	1	-1	-1	-1	0
	Aldura	1	3	2	2	1	2	1	1	2	3	3	1	1	2	2	1
	Gen	1	3	2	2	3	2	2	1	2	0	1	1	2	1	1	1
	Turbo	2	3	2	2	9	6	7	5	5	3	2	4	5	4	4	3
	WFB 881	-5	-2	-2	-1	-4	-2	-2	-1	-3	-3	-1	-1	-4	-2	-2	-1
	Yavaros	1	-5	-6	-3	-5	-5	-5	-4	-5	-5	-4	-4	-3	-5	-5	-4
Avg. Heading Date		13Mar	27Mar	04Apr	11Apr	04Mar	18Mar	28Mar	14Apr	10Mar	27Mar	06Apr	13Apr	09Mar	24Mar	02Apr	12Apr
Wheat	Baker	-4	-2	-2	-2	-4	-3	-1	-2	-4	-1	0	-1	-4	-2	-1	-2
	Klasic	-4	-1	-2	-1	-4	-3	-3	-2	-4	-2	-3	-4	-4	-2	-3	-2
	ProBred	2	0	0	2	2	1	0	1	2	-1	0	0	2	0	0	1
	Topaz	-5	-3	-2	-3	-6	-4	-3	-2	-2	-4	-3	-2	-4	-4	-3	-2
	WFB 911	13	7	7	8	16	13	9	5	13	9	7	9	14	10	8	7
	Yecora R.	-4	-2	-2	-2	-5	-3	-2	0	-4	-2	-2	-2	-4	-2	-2	-1
Avg. Heading Date		10Mar	23Mar	05Apr	11Apr	03Mar	18Mar	29Mar	12Apr	11Mar	25Mar	04Apr	13Apr	08Mar	22Mar	03Apr	12Apr

Table 6. Relative maturity date (days from avg. maturity date) for varieties as influenced by planting date. LSD(.10) = 2.9.

Crop	Variety	1988				1989				1990				Avg.			
		16Nov	14Dec	14Jan	04Feb	05Nov	07Dec	12Jan	14Feb	03Nov	05Dec	12Jan	05Feb	Nov	Dec	Jan	Feb
Barley	Barcott	-10	-11	-9	-4	-11	-4	-6	-5	--	--	--	--	-11	-8	-7	-5
	Fiesta	-2	-6	-1	-4	-7	-2	-3	-5	--	--	--	--	-4	-4	-2	-5
	Gustoe	7	12	6	3	5	6	6	8	--	--	--	--	6	9	6	6
	SB 400	-2	-3	-1	-2	2	-3	-3	-4	--	--	--	--	0	-3	-2	-3
	SB 458	2	6	2	5	4	1	7	7	--	--	--	--	3	3	5	6
	SB BB42	4	4	1	3	6	3	-1	-1	--	--	--	--	5	3	0	1
Avg. Maturity Date		10Apr	28Apr	09May	13May	09Apr	18Apr	30Apr	11May	--	--	--	--	10Apr	23Apr	05May	12May
Durum	Aldente	5	-1	4	3	1	1	2	4	--	--	--	--	3	0	3	3
	Aldura	6	2	4	2	0	1	0	2	--	--	--	--	3	2	2	2
	Gen	-5	-2	0	-2	-1	-1	2	-1	--	--	--	--	-3	-1	1	-2
	Turbo	6	1	1	4	6	4	4	4	--	--	--	--	6	3	3	4
	WFB 881	-6	-1	-3	-1	-3	-2	-1	0	--	--	--	--	-4	-1	-2	-1
	Yavaros	-5	-1	-5	-5	-4	-5	-7	-9	--	--	--	--	-4	-3	-6	-7
Avg. Maturity Date		01May	14May	20May	22May	21Apr	26Apr	02May	19May	--	--	--	--	26Apr	05May	11May	21May
Wheat	Baker	-3	0	-1	-2	-2	-3	-1	-2	--	--	--	--	-2	-1	-1	-2
	Klasic	-2	-1	-1	-1	-1	1	-1	-2	--	--	--	--	-2	0	-1	-1
	ProBred	-1	-1	0	-1	-1	-1	0	-1	--	--	--	--	-1	-1	0	-1
	Topaz	-5	-1	-1	-3	-1	-2	0	0	--	--	--	--	-3	-1	-1	-1
	WFB 911	15	6	5	8	7	9	4	7	--	--	--	--	11	7	4	8
	Yecora R.	-4	-3	0	-3	-3	-5	-3	-3	--	--	--	--	-3	-4	-2	-3
Avg. Maturity Date		21Apr	09May	15May	18May	16Apr	24Apr	02May	12May	--	--	--	--	18Apr	01May	08May	15May