

Final Report

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Effect of Planting Date on Wheat Yield in Yuma, 2014

Mike Ottman
University of Arizona

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M. J. Ottman

Summary

Planting dates are known to affect wheat yields. Previous research has shown that the optimum planting date in Yuma is December 15 to January 15. Wheat is sometimes sown later than this in the Yuma area, and earlier planting dates have not been tested. To test a wide range of planting dates, six varieties (Duraking, Havasu, Joaquin, Kronos, WB-Mead, and Yecora Rojo) were planted at two seeding rates (160 and 240 lbs/A) and six planting dates at the beginning of each month from November through April at the Yuma Valley Agricultural Center. Grain yield averaged 5342 (Nov 1), 6372 (Dec 5), 6878 (Jan 9), 4640 (Feb 4), 4451 (Mar 4), and 1812 (Apr 2). The late-flowering varieties performed worse at later planting dates. Seeding rates of 160 and 240 lbs/A had no measureable effect on yield overall.

Introduction

About half the wheat produced in Arizona is grown in Yuma and La Paz counties. Research on planting dates for wheat has not been conducted in this area since the 1970s. Varieties have changed since this time, along with cultural practices including higher rates of fertilizer and water application. Research in the 1970s and earlier has shown that the optimum planting date in Yuma is between December 15 and January 15. However, wheat is being sown later than this optimum window and even as late as March, especially after vegetables. Previous planting date studies have not included March plantings in their treatment regime. We do not have information to provide growers on the effect of these late plantings on yield potential. There is also the possibility that the beginning of the optimum planting season may be earlier than in the past due to warmer temperatures and less chance of frost damage in the spring. This is the second year of this study.

Procedure

A wheat planting date study was conducted at the Yuma Valley Agricultural Center on a Gadsden clay loam. The previous crop was tomato. The preplant soil test values were 47.5 ppm NO₃-N, 11.1 ppm NH₄-N, and 10 ppm PO₄-P. Urea fertilizer was broadcast preplant at 100 lbs N/acre, jointing at 100 lbs N/acre, and flowering at 50 lbs N/acre. Wheat was planted monthly at 6 dates from early November to early April. A total of 6 varieties were planted at each date, at 2 seeding rates, replicated 2 times, and the plot size was 4.5 ft by 20 ft. The varieties included the bread wheat varieties Yecora Rojo and Joaquin and the durum varieties Duraking, Havasu, Kronos, and WB-Mead. The seeding rates were 1.53 and 2.29 million seeds/acre roughly corresponding to 160 and 240 lbs seed/acre depending on seed size. Irrigations were scheduled using AZSCHED, an irrigation scheduling software program. The data collected for each planting date was stand establishment, heading date, flowering date, maturity date, plant height, lodging, test weight, seed weight, HVAC, and grain protein content.

Results and Discussion

Planting date affected yield and all other plant characteristics measured in this study (Table 1). Grain yield was highest at the January planting date and decreased significantly with later plantings averaged over varieties and seeding rates. Plant height was correlated with yield. Lodging was highest at the November planting, and probably affected yield. The lodging that was measured at the March and April planting occurred after physiological maturity and was due to high winds and rain that caused the dry and brittle straw to bend. Heading, flowering, and maturity dates were later with each planting, but the differences between these dates from one planting to the next were less as the plantings progressed, with the exception of the last planting date. Test weight and seed weight were correlated with yield and decreased on either side of the January planting. HVAC was 98% or greater for all planting dates. Initial stand was similar for all the planting dates except the last two where stands were about two-thirds of the other planting dates.

Variety and planting date interactions were detected for all variables measured except for grain protein, meaning that not all varieties responded to planting date in a similar fashion. An example of these interactions is that Duraking and Mead, late maturing varieties, performed relatively better at the November compared to the April planting date.

Seeding rates of 160 and 240 lbs seed/A had no effect on grain yield or any of the other plant characteristics measured in this study, except for initial stand, of course. Also, there was no planting date by seeding rate interactions, meaning seeding rate had no effect on yield at all planting dates. However, at the November planting, the higher yields were measured at the lower seeding rate, and this effect was statistically significant at the 5% probability level.

The varieties tested in this study differed in yield and every characteristic measured except grain protein. The highest yielding variety was Duraking, tallest was WB-Mead, lowest in lodging was WB-Mead, latest maturing was WB-Mead, highest test weight was Duraking, and largest seed was Kronos.

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Table 1. Planting date effect on yield and other characteristics of wheat varieties in a study conducted at the Yuma Valley Agricultural Center in 2014.

Planting date	Variety	Seeding rate	Grain yield	Plant height	Lodging	Head-ing	Flower-ing	Matur-ity	Test weight	Seed weight	HVAC	Grain protein	Initial Stand
		lbs/A	lbs/A	inches	%				lbs/bu	g/1000	%	%	pl/ft ²
Nov 1	Duraking	Avg	6602	32	65	1/27	2/03	3/13	60.6	42.1	99	15.2	34.3
	Havasu		4850	28	63	1/23	1/28	3/31	61.0	49.7	99	15.3	31.7
	Joaquin		4960	29	83	1/16	1/22	2/27	61.7	44.3	100	15.9	35.4
	Kronos		5343	28	90	1/23	1/28	3/13	58.5	55.1	100	16.1	31.3
	WB-Mead		5411	33	13	3/02	3/10	4/11	56.4	39.8	99	15.5	31.7
	Yecora R.		4884	27	85	1/16	1/22	2/20	63.2	50.2	99	15.8	32.1
Dec 5	Duraking		6747	31	14	3/13	3/18	4/22	63.0	48.3	99	14.7	29.7
	Havasu		6100	32	35	3/06	3/13	4/18	63.2	50.9	99	13.9	30.3
	Joaquin		5734	32	63	3/09	3/13	4/17	62.6	43.8	100	13.9	31.8
	Kronos		6109	32	55	3/02	3/09	4/21	61.3	56.7	100	14.7	33.4
	WB-Mead		7410	33	9	3/19	3/23	5/04	60.6	52.9	100	14.6	28.2
	Yecora R.		6134	30	39	3/09	3/13	4/18	62.1	45.1	99	14.9	34.1
Jan 9	Duraking		7759	30	0	3/25	3/30	5/09	62.7	49.3	99	14.8	31.0
	Havasu		6764	31	6	3/25	3/31	5/07	62.5	53.7	99	15.0	29.6
	Joaquin		5760	32	3	3/26	3/31	5/05	62.4	46.5	100	15.6	33.1
	Kronos		6526	30	5	3/28	4/03	5/06	61.6	61.9	99	15.7	30.7
	WB-Mead		7796	31	0	4/03	4/08	5/14	61.8	55.6	99	14.5	31.3
	Yecora R.		6662	27	1	3/28	4/02	5/04	62.1	46.7	100	15.6	33.0
Feb 4	Duraking		5802	27	0	4/14	4/19	5/18	63.3	47.3	100	14.9	32.8
	Havasu		3590	24	0	4/06	4/11	5/13	61.8	55.4	100	14.5	28.0
	Joaquin		3939	26	0	4/05	4/09	5/11	61.4	44.9	99	15.1	32.8
	Kronos		4492	24	10	4/03	4/07	5/13	60.0	59.7	99	15.1	31.9
	WB-Mead		5496	28	0	4/20	4/25	5/27	62.2	50.9	100	14.6	28.5
	Yecora R.		4518	22	0	4/04	4/10	5/11	61.8	47.2	100	14.4	34.1
Mar 4	Duraking		5045	26	38	5/07	5/10	6/03	59.3	40.9	99	16.2	25.1
	Havasu		4569	26	34	4/26	5/02	5/30	58.4	50.2	98	16.6	28.4
	Joaquin		4365	23	34	4/24	4/29	5/31	59.1	41.3	98	17.3	22.7
	Kronos		4535	25	43	4/26	5/01	5/31	58.9	60.5	99	16.9	22.5
	WB-Mead		4177	27	33	5/09	5/13	6/08	57.1	40.4	99	17.2	18.0
	Yecora R.		4016	19	18	4/23	4/29	5/29	57.7	43.4	99	17.5	16.6
Apr 2	Duraking		936	20	11	6/10	6/15	6/29	55.8	31.0	99	16.6	21.2
	Havasu		2170	21	43	5/23	5/28	6/18	55.1	33.1	98	16.2	15.1
	Joaquin		2706	19	69	5/19	5/25	6/16	53.9	30.3	98	16.1	23.0
	Kronos		2569	21	63	5/23	5/28	6/18	55.8	41.8	99	15.9	18.3
	WB-Mead		610	20	6	6/12	6/16	7/01	55.8	32.9	98	16.4	18.8
	Yecora R.		1880	17	88	5/17	5/22	6/11	54.1	31.5	97	16.4	19.6
LSD _{.05}			946	3	18	3	3	3	2.0	3.2	0.7	1.3	4.7
P x V			**	*	**	**	**	**	**	**	**	NS	*

Table 1 (con'd). Planting date effect on yield and other characteristics of wheat varieties in a study conducted at the Yuma Valley Agricultural Center in 2014.

Planting date	Variety	Seeding rate	Grain yield	Plant height	Lodging	Heading	Flowering	Maturity	Test weight	Seed weight	HVAC	Grain protein	Initial Stand	
		lbs/A	lbs/A	inches	%				lbs/bu	g/1000	%	%	pl/ft ²	
Nov 1	Avg	160	5507	29	66	1/28	2/03	3/15	60.3	46.8	100	15.5	27.7	
		240	5176	30	66	1/28	2/03	3/15	60.2	46.9	99	15.8	37.8	
Dec 5		160	6429	31	36	3/10	3/15	4/21	61.8	49.3	99	14.3	27.1	
		240	6316	32	35	3/10	3/15	4/21	62.5	49.9	100	14.6	35.4	
Jan 9		160	6907	30	2	3/28	4/02	5/07	62.1	52.5	99	15.3	27.0	
		240	6848	30	3	3/28	4/02	5/07	62.2	52.0	99	15.1	35.9	
Feb 4		160	4708	25	1	4/08	4/13	5/15	61.9	51.5	100	14.8	26.4	
		240	4572	25	2	4/08	4/13	5/15	61.6	50.3	99	14.7	36.3	
Mar 4		160	4336	24	33	4/29	5/04	6/01	58.4	46.0	99	16.6	20.3	
		240	4566	24	33	4/29	5/04	6/01	58.4	46.2	99	17.2	24.1	
Apr 2		160	1712	20	46	5/28	6/02	6/20	54.8	33.4	98	16.4	15.8	
		240	1911	20	47	5/28	6/02	6/20	55.1	33.5	98	16.1	22.9	
LSD ₀₅			305	1	4	0	0	0	1.2	1.1	0.5	1.0	3.1	
P x S			NS	NS	NS	---	---	---	NS	NS	NS	NS	NS	
Avg	Avg	160	4933	27	31	4/01	4/07	5/09	60.0	46.6	99	15.5	24.1	
		240	4898	27	31	4/01	4/07	5/09	60.1	46.5	99	15.6	32.1	
S rate			NS	NS	NS	---	---	---	NS	NS	NS	NS	*	
Avg	Duraking	Avg	5482	27	21	4/06	4/11	5/11	61.0	43.1	99	15.4	29.0	
			Havasu	4674	27	30	3/29	4/03	5/09	60.3	48.8	99	15.2	27.2
			Joaquin	4577	27	42	3/27	4/01	5/03	60.2	41.8	99	15.7	29.8
			Kronos	4929	26	44	3/28	4/02	5/07	59.3	56.0	99	15.7	28.0
			WB-Mead	5150	29	10	4/16	4/21	5/21	59.3	45.4	99	15.5	26.1
			Yecora R.	4682	23	38	3/27	4/01	5/01	60.2	44.0	99	15.8	28.3
LSD ₀₅			386	1	7	1	1	1	0.8	1.3	0.3	0.5	1.9	
Variety			**	**	**	**	**	**	**	**	*	NS	**	
Nov 1	Avg	Avg	5342	29	66	1/28	2/03	3/15	60.2	46.9	100	15.7	32.8	
			Dec 5	6372	32	36	3/10	3/15	4/21	62.1	49.6	99	14.5	31.3
			Jan 9	6878	30	2	3/28	4/02	5/07	62.2	52.3	99	15.2	31.5
			Feb 4	4640	25	2	4/08	4/13	5/15	61.7	50.9	100	14.8	31.4
			Mar 4	4451	24	33	4/29	5/04	6/01	58.4	46.1	99	16.9	22.2
			Apr 2	1812	20	46	5/28	6/02	6/20	55.0	33.4	98	16.2	19.3
			LSD ₀₅			1998	4	24	1	2	2	1.3	3.1	0.5
Planting			*	**	**	**	**	**	**	**	**	*	**	