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Effect of Planting Date on Wheat Yield in Yuma, 2013

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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 6517 (Nov 4), 6339 (Dec 6), 6096(Jan 4), 5712 (Feb 1), 4962(Mar 1), and 3590(Apr 5). The late-flowering varieties performed relatively better at the earlier 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.

Procedure

A wheat planting date study was conducted at the Yuma Valley Agricultural Center. The field was Border 23 in Block B and the soil type was a Gadsden clay loam. The previous crop was lettuce. The preplant soil test values were 34 ppm NO_3-N, 16 ppm NH_4-N, and 39 ppm PO_4-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 4 times, and the plot size will be 4.5 ft by 25 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 will be 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 with the exception of test weight and grain protein (Table 1). Grain yield decreased with each successive planting date form a high of 6517 lbs/A for the November 4 planting to a low of 3590 lbs/A for the April 5 planting averaged over varieties and seeding rates. Likewise, plant height decreased in a linear fashion with each planting. Lodging averaged 83% on the December 6 planting, but was 21% or less on average for the other planting dates. 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. We were not able to detect a difference in test weight among planting dates. Seed weight was highest at the November 4 planting, was low at the December 6 planting due to lodging, and was low at the March 1 and April 5 planting dates possibly due high temperatures during grain fill. HVAC was 99% or greater for all planting dates.

Some interactions between variety and planting date were detected, meaning that not all varieties responded to planting date in a similar fashion. Planting date x variety interactions were detected for heading, flowering, maturity, seed weight, and HVAC, but not for grain yield plant height, lodging, test weight, or grain protein. The exact nature of these interactions has not yet been determined.

Seeding rates or 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 December 6 and January 4 plantings, the higher yields were measured at the higher seeding rate, and this effect was statistically significant at the 10% probability level.

The varieties tested in this study differed in yield and every characteristic measured. Duraking and WB-Mead performed better at earlier plantings rather than later possibly since they reach flowering later than the other varieties. Joaquin, one of the earliest flowering varieties, performed relatively better at the later planting dates.

Acknowledgments

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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 2013.

Planting date	Variety	Seeding rate	Grain yield	Plant height	Lodg-ing	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 4	Duraking	Avg	7086	36	0	2/14	2/21	3/22	61.3	41.8	99	15.7	22.2
	Havasu		4742	36	13	1/28	2/05	4/04	62.1	53.3	100	16.8	24.4
	Joaquin		5664	36	0	2/03	2/09	3/11	62.9	42.3	100	15.3	21.7
	Kronos		7804	34	20	2/03	2/09	3/15	60.2	52.9	100	15.5	22.9
	WB-Mead		7470	36	0	3/09	3/16	4/26	61.0	48.5	100	16.3	21.0
	Yecora R.		6334	30	0	1/28	2/05	4/08	62.7	46.2	100	15.8	24.2
Dec 6	Duraking		7785	32	90	3/11	3/18	4/19	57.7	30.5	100	16.0	37.2
	Havasu		6287	33	86	3/05	3/12	4/13	58.9	33.5	100	16.2	31.9
	Joaquin		6379	34	84	3/12	3/17	4/14	59.7	29.5	100	14.9	31.3
	Kronos		5774	32	90	3/05	3/12	4/19	56.2	34.2	100	16.7	32.2
	WB-Mead		5138	34	59	3/18	3/23	4/21	51.3	27.9	100	18.7	28.9
	Yecora R.		6673	28	88	3/09	3/13	4/27	57.4	30.2	100	15.8	36.6
Jan 4	Duraking		6869	33	0	3/25	3/30	4/28	58.6	32.7	100	15.4	20.8
	Havasu		5553	33	0	3/23	3/30	4/28	60.4	36.8	100	15.8	12.8
	Joaquin		7301	33	0	3/22	3/26	4/29	60.0	30.8	100	14.3	24.4
	Kronos		5619	31	40	3/20	3/25	4/29	56.2	34.1	100	15.6	21.4
	WB-Mead		6320	32	0	4/06	4/11	5/03	59.1	37.6	100	15.6	18.9
	Yecora R.		4911	27	0	3/23	3/29	4/26	55.9	27.2	100	14.7	21.7
Feb 1	Duraking		6224	27	0	4/06	4/10	5/05	62.3	41.4	99	15.6	32.9
	Havasu		5884	28	0	4/04	4/10	5/05	61.6	39.6	99	15.5	30.4
	Joaquin		6701	30	8	4/01	4/07	5/06	61.1	32.6	100	15.1	31.0
	Kronos		5035	29	35	3/30	4/07	5/04	58.8	44.4	99	16.9	33.0
	WB-Mead		5162	29	0	4/08	4/23	5/09	60.0	55.3	98	17.5	29.0
	Yecora R.		5265	24	15	3/31	4/06	5/02	58.9	30.5	99	15.0	35.3
Mar 1	Duraking		5211	24	3	4/27	5/06	5/20	57.0	35.1	98	18.3	29.6
	Havasu		4759	26	34	4/20	4/25	5/20	51.3	30.9	100	19.8	30.1
	Joaquin		6210	29	4	4/20	4/25	5/15	55.5	29.3	100	16.7	34.7
	Kronos		5305	27	40	4/20	4/26	5/17	52.8	40.0	100	18.8	27.5
	WB-Mead		4401	26	21	5/06	5/12	5/22	59.3	47.2	99	18.8	31.8
	Yecora R.		3886	24	25	4/21	4/27	5/15	50.6	23.9	99	16.7	30.5
Apr 5	Duraking		3339	25	1	5/25	5/31	6/09	58.1	31.1	100	17.6	28.1
	Havasu		3613	24	14	5/21	5/25	6/01	57.0	37.1	100	17.5	22.4
	Joaquin		4188	23	0	5/22	5/28	6/01	56.6	21.8	100	16.9	25.8
	Kronos		3933	23	6	5/19	5/27	6/08	58.6	42.2	100	17.2	18.8
	WB-Mead		2617	25	1	6/01	6/09	6/11	56.6	33.2	100	18.3	23.5
	Yecora R.		3852	20	0	5/15	5/21	6/03	55.7	30.3	100	16.4	26.9
$LSD_{,05}$			971	2	14	1	1	1	1.6	4.7	1	0.7	5.1
P x V			NS	NS	NS	**	**	**	NS	*	*	NS	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 2013.

Planting date	Variety	Seeding rate	Grain yield	Plant height	Lodg-ing	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 4	Avg	160	6471	34	8	2/08	2/15	3/30	61.9	47.9	100	15.9	20.2
		240	6563	35	3	2/08	2/15	3/30	61.5	47.1	100	15.9	25.3
Dec 6		160	6172	32	83	3/10	3/15	4/19	56.6	30.9	100	16.4	29.6
		240	6507	32	83	3/10	3/15	4/19	57.1	31.1	100	16.3	36.5
Jan 4		160	5825	31	7	3/25	3/30	4/29	58.0	32.8	100	15.2	16.1
		240	6366	32	7	3/25	3/30	4/29	58.7	33.6	100	15.3	23.9
Feb 1		160	5746	28	8	4/03	4/10	5/05	60.8	41.3	99	15.9	25.1
		240	5677	28	12	4/03	4/10	5/05	60.3	39.6	99	15.9	38.7
Mar 1		160	5031	26	17	4/24	4/30	5/18	54.2	34.8	99	18.2	25.8
		240	4893	26	25	4/24	4/30	5/18	54.2	34.0	99	18.1	35.6
Apr 5		160	3648	24	3	5/22	5/28	6/05	57.5	31.0	100	17.2	20.3
		240	3532	23	5	5/22	5/28	6/05	56.7	34.2	100	17.5	28.2
$LSD_{,05}$			561	1	8	1	1	1	0.9	2.7	1	0.4	2.9
P x S			NS	NS	NS	---	---	---	NS	NS	NS	NS	**
Avg	Avg	160	5482	29	21	3/31	4/06	5/03	58.2	36.5	100	16.5	22.9
		240	5590	29	22	3/31	4/06	5/03	58.1	36.5	100	16.5	31.4
S rate			NS	NS	NS	---	---	---	NS	NS	NS	NS	**
Avg	Duraking	Avg	6086	29	16	4/03	4/09	5/02	59.2	35.4	99	16.4	28.5
	Havasu		5140	30	24	3/27	4/02	5/02	58.6	38.5	100	16.9	25.3
	Joaquin		6074	31	16	3/29	4/03	4/28	59.3	31.0	100	15.5	28.2
	Kronos		5579	29	39	3/27	4/02	4/30	57.1	41.2	100	16.8	26.0
	WB-Mead		5185	30	14	4/12	4/20	5/10	57.8	41.6	99	17.5	25.5
	Yecora R.		5153	25	21	3/27	4/01	5/03	56.9	31.4	100	15.7	29.2
$LSD_{,05}$			807	1	13	2	2	3	1.7	3.0	1	0.8	2.7
Variety			*	**	**	**	**	**	*	**	*	**	**
Nov 4	Avg	Avg	6517	34	5	2/08	2/15	3/30	61.7	47.5	100	15.9	22.7
Dec 6			6339	32	83	3/10	3/15	4/19	56.9	31.0	100	16.4	33.0
Jan 4			6096	31	7	3/25	3/30	4/29	58.4	33.2	100	15.2	20.0
Feb 1			5712	28	10	4/03	4/10	5/05	60.5	40.5	99	15.9	31.9
Mar 1			4962	26	21	4/24	4/30	5/18	54.2	34.4	99	18.2	30.7
Apr 5			3590	23	4	5/22	5/28	6/05	57.1	32.6	100	17.3	24.3
$LSD_{,05}$			1653	2	18	6	6	5	7.4	8.2	1	2.9	4.8
Planting			*	**	**	**	**	**	NS	**	*	NS	**