TCPB Research Final Report – December 23, 2013

Title: Evaluation of Late Corn Planting with Early Maturing Hybrids in Texas High Plains

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Project location: Texas AgriLife Research, Bushland and Etter, TX.

Summary: Field experiment was conducted in the Texas A&M AgriLife Research stations at Etter, TX. The treatments were consisted of 4 hybrids and 4 planting dates (May 15, June 1, June 15 and July 1). The hybrids used in 2013 were 4 Pioneer hybrids, 33D53AM-R, P1151AM, P0365YHR, and P9690AM. Their relative maturity days were 115, 111, 103 and 96, respectively. The actual planting dates were May 20, June 3, June 20, and July 2, 2013. The planting density was 30,000 seeds/ac for all hybrids. The results indicated that high yield (200 bu/ac) still can be achieved with long season hybrid (e.g., 115 d) when planted in late May and early June in the North Texas High Plains. When planting date was delayed to late June and early July, mid- and short- season hybrids showed the yield advantage over long season one. In general, delaying planting to late June or early July reduced yield potential. However, late planting reduced crop water use but did not affect WUE in short season hybrids. As such, late planting potentially can save some irrigation water while maintain the high WUE.

Research background: Interests have been growing into late planting corn in the Texas Panhandle because hot and dry conditions occur frequently during normal planting season (mid-April to May). For example, the severe dry and hot conditions in the month of May in 2011 resulted in significant adverse conditions to corn plants seeded in late April and early May. In this situation, delayed planting to early June ended up to improved corn yield and profits for several local producers. The benefits of late planting may include 1) potentially saving irrigation water; 2) avoiding peak abiotic stresses such as heat; 3) potentially replanting in case early-planted crop failure (e.g. hail). The additional water savings may be from earlier maturing hybrids such as 95-d maturity hybrids. Data already exists for corn planting dates from March to May in the Texas Panhandle. In the past, corn was often planted early to avoid high populations of insects. Since most new hybrids have insect-resistance traits, it may not be necessary to plant corn early to avoid insects. In addition, a crop model analysis using Texas High Plains historical weather data, suggests that the corn yield potential increases as planting date is delayed under dry and hot conditions. Nevertheless, there is little measured field data for late-planted corn performance, especially the early maturity hybrids. Late-planted and early maturing corn hybrids may play an important role in the future of corn production in the Texas Panhandle.

Objective: Investigate the effects of late panting and early maturity on corn yield and water use.

Procedure: Field experiments were conducted in the Texas A&M AgriLife Research stations at Etter and Bushland, TX. The treatments were consisted of 4 hybrids and 4 planting dates (May 15, June 1, June 15 and July 1). The hybrids used in 2013 were 4 Pioneer hybrids, 33D53AM-R, P1151AM, P0365YHR, and P9690AM. Their relative maturity days were 115, 111, 103 and 96, respectively. The experiment design was a split-plot design with three replications. The planting date was whole-plot and hybrid was sub-plot. The plot size is 30 ft long and 10 ft wide (4 30-in rows). The planting density was 30,000 seeds/ac for all hybrids. Soil fertility was assessed before first planting date and established at an adequate rate for full irrigation production level. The actual planting dates in Etter were May 20, June 3, June 20, and July 2, 2013. During the growing season, irrigation was applied to target 100% evapotranspiration (ET) requirement. Weeds were controlled by chemical control at early stage. No insecticides were applied during the season. Field data collection included soil water content, the amount of irrigation and precipitation, and yield. Crop total water use (ET) was calculated using a water balance model, and WUE was calculated as the ratio of yield and ET. Due to the stands issues, the trial plots at Bushland were abandoned. The main reason was the uneven water distribution in a new sub-drip irrigation system. The plots in Etter were harvested in the late October, 2013. Due to heavy field work, the soil water content data collections were just finished in late November.

Results: Planting date effect on corn yields was largely related to hybrids. In general, corn yield decreased when planting date was delayed to June 20 and July 2 as compared to planting dates of May 20 and June 3. Nevertheless, corn planted on May 20 and June 3 still had high yield with about 200 bu/ac. Hybrids responded very differently to late planting dates. In a long season hybrid (33D53AM-R, 115 d), yield was about 204 bu/ac when planted on May 20 and June 3 but reduced to 136 and 58 bu/ac when planted on June 20 and July 2, respectively. The yield reduction in this hybrid was as high as 72% on July 2 planting as compared to May 20 planting. In contrast, yield in a short season hybrid (P9690AM, 96 d) only reduced 13% when corn planted on July 2 (Table 1, Fig. 1). The yield responses of the 2 other mid-season hybrids to planting date were in between. In general, yields in the 2 hybrids did not reduce significantly until the planting date was delayed to July 2. In particular, P1151AM yielded 168 bu/ac at June 20 planting date.

Among the 4 hybrids, yield increased linearly as relative maturity increased when they were planted on May 20 and June 3. However, the 96-d hybrid (P9690AM) had highest yield (129 bu/ac) when planted on July 2. The mid- and short-season hybrids yielded 114-129 bu/ac when they were planted on July 2 (Fig. 1). Late planting resulted in a higher grain moisture and lower test weight, particularly for the longer season hybrids (Table 1, Fig. 2). In general, planting date had little effect on the number of day to silking from planting. The number of days from planting to silking was related to hybrid. Therefore, late planted long season hybrids normally matured late or vice versa (Fig. 3).

Planting date and hybrids had significant effects on crop water use and water use efficiency (WUE). The crop water use was the highest either on May 20 or June 3 planting dates,

depending on hybrids. However, water use was reduced on the two late planting dates (June 20 and July 2). On the planting dates of May 20 and June 3, crop water use increased as relative maturity increased from 96 (P9690AM) to 115 d (33D53AM-R). As planting dates were delayed to June 20 and July 2, the difference in water use among hybrids was either small or not significant (Table 1, Fig. 4). For hybrids 33D53AM-R and P1151AM, WUE reduced as planting was delayed to June 20 and July 2. In particular, WUE reduced to 2.8 bu/ac/in in 33D53AM-R on planting date of July 2. For the 2 relatively short season hybrids (P0365YHR and P9690AM), planting date did not affect WUE. The 2 longer season hybrids (33D53AM-R and P1151AM) significantly had higher WUE than the 2 shorter ones (P0365YHR and P9690AM) on the planting dates of May 20 and June 3 (Table 1, Fig. 4).

Conclusion remarks: The results from this study indicated that high yield still can be achieved with long season hybrid (e.g., 115 d) when planted in late May and early June in the North Texas High Plains. When planting date was delayed to late June and early July, mid- and short- season hybrids showed the yield advantage over long season one. In general, delaying planting to late June or early July reduced yield potential. However, late planting reduced crop water use but did not affect WUE in short season hybrids. As such, late planting potentially can save some irrigation water while maintain the high WUE. How to increase the yield potential of short season hybrids with late planting needs further studies. It should be mentioned that we only conducted one year study. The general conclusion cannot be drawn without multiple-year studies. We will continue the study in 2014.

Table 1. Yield, grain moisture, test weight, water use, and water use efficiency (WUE) in four hybrids grown on 4 planting dates at Etter, TX during 2013 growing season.

Hybrid	Planting date	Yield	Moisture	Test weight	Water use	WUE
		bu/ac	%	lb/bu	in	bu/ac/in
33D53AM-R	20-May	204.8	15.4	60.4	34.4	5.9
115-d	3-Jun	203.4	15.3	60.7	33.8	6.2
	20-Jun	136.2	21.2	54.6	29.0	5.5
	2-Jul	57.9	30.5	48.3	23.7	2.8
P1151AM	20-May	191.4	14.1	59.4	32.8	5.9
111-d	3-Jun	194.1	14.1	60.0	33.0	5.9
	20-Jun	167.8	19.5	55.4	28.7	5.8
	2-Jul	122.9	28.8	50.6	24.0	5.2
P0365YHR	20-May	162.8	13.3	60.9	32.1	4.8
103-d	3-Jun	182.2	13.6	60.1	32.4	5.3
	20-Jun	151.8	18.3	56.4	28.8	5.5
	2-Jul	114.2	24.3	50.5	23.4	4.9
P9690AM	20-May	148.6	13.1	58.0	30.3	4.9
96-d	3-Jun	159.8	12.8	57.5	31.6	5.1
	20-Jun	139.0	15.7	54.9	27.8	5.1
	2-Jul	129.0	19.7	52.4	23.4	5.3
CV		**11.2**	**1.1**	**1.4**	**3.0**	**9.3**
LSD (0.05)						
Planting date (PD)		**17.27**	**0.015**	**0.43**	**0.73**	**0.71**
Hybrid (HB)		**12.59**	**0.01**	**0.59**	**0.67**	**0.38**
PD × HB		**25.18**	**0.02**	**1.18**	**1.33**	**0.75**

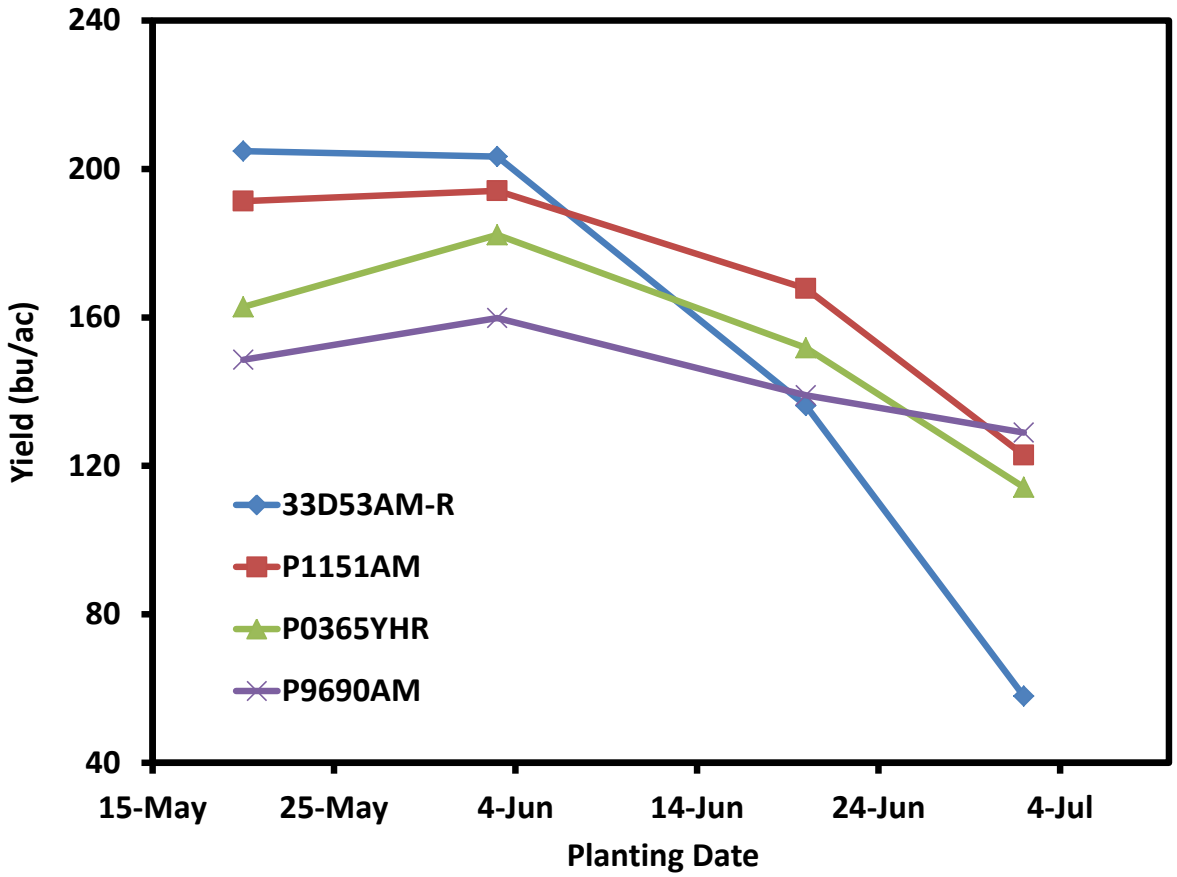

Fig. 1. Yield response to planting date in 4 hybrids at Etter, TX in 2013 season.

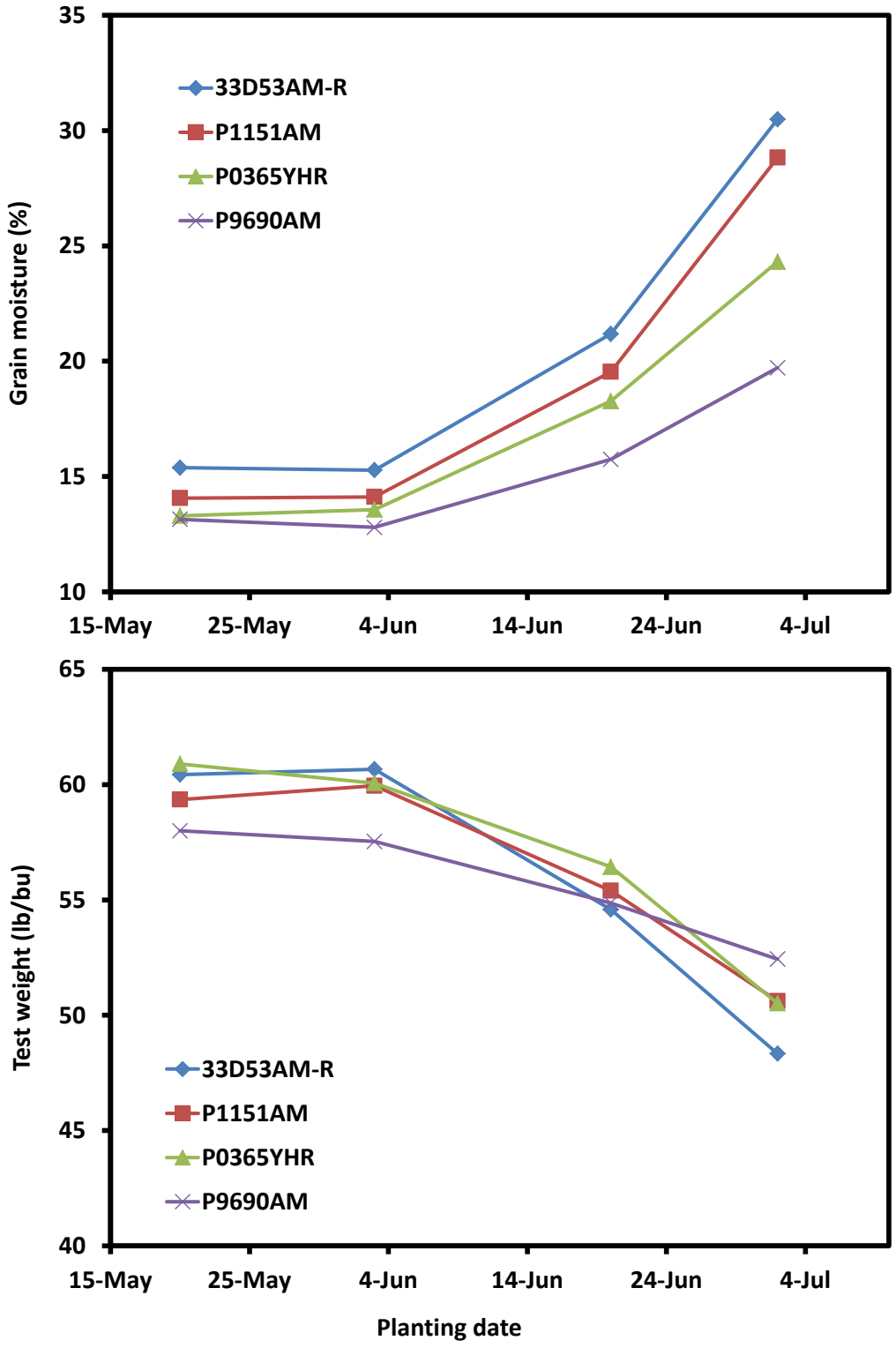

Fig. 2. Effect of planting date on grain moisture and test weight in 4 hybrids at Etter, TX in 2013 season.

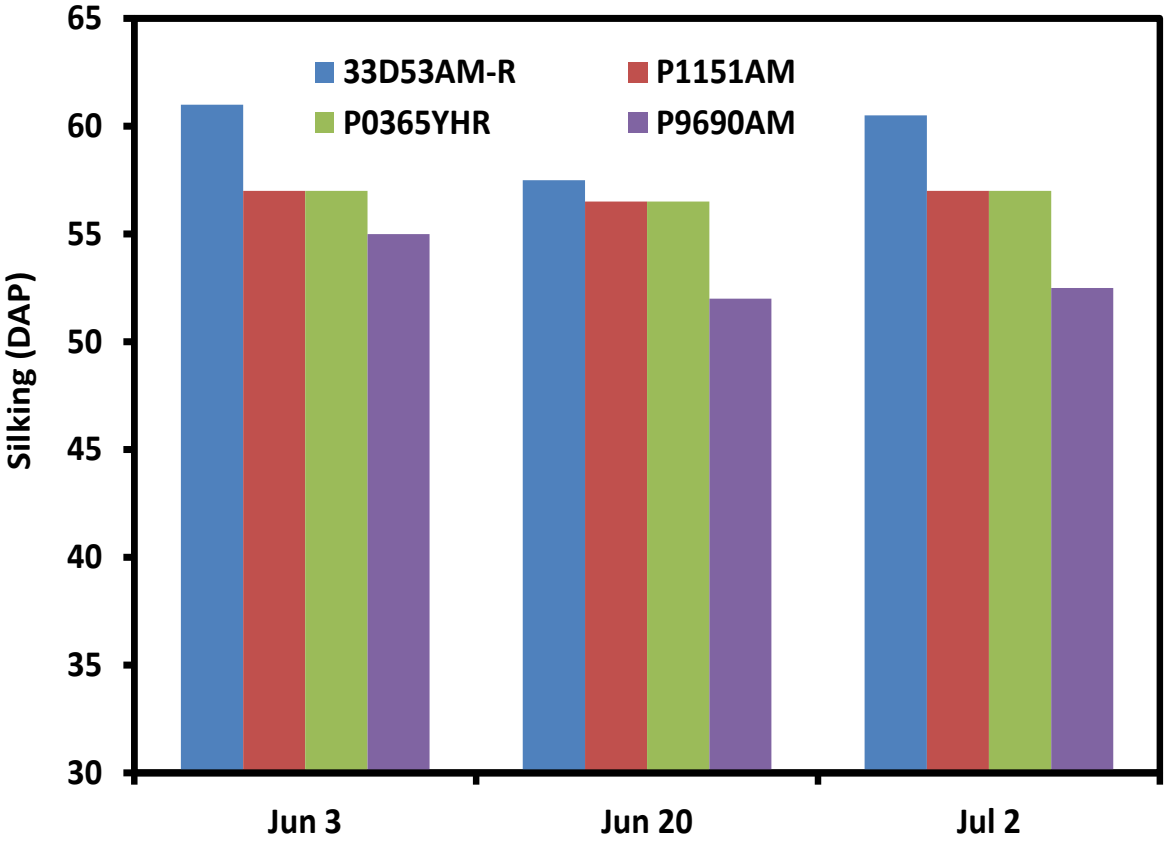

Fig. 3. Effect of planting date on the number of days from planting to silking in 4 hybrids grown at Etter, TX in 2013.

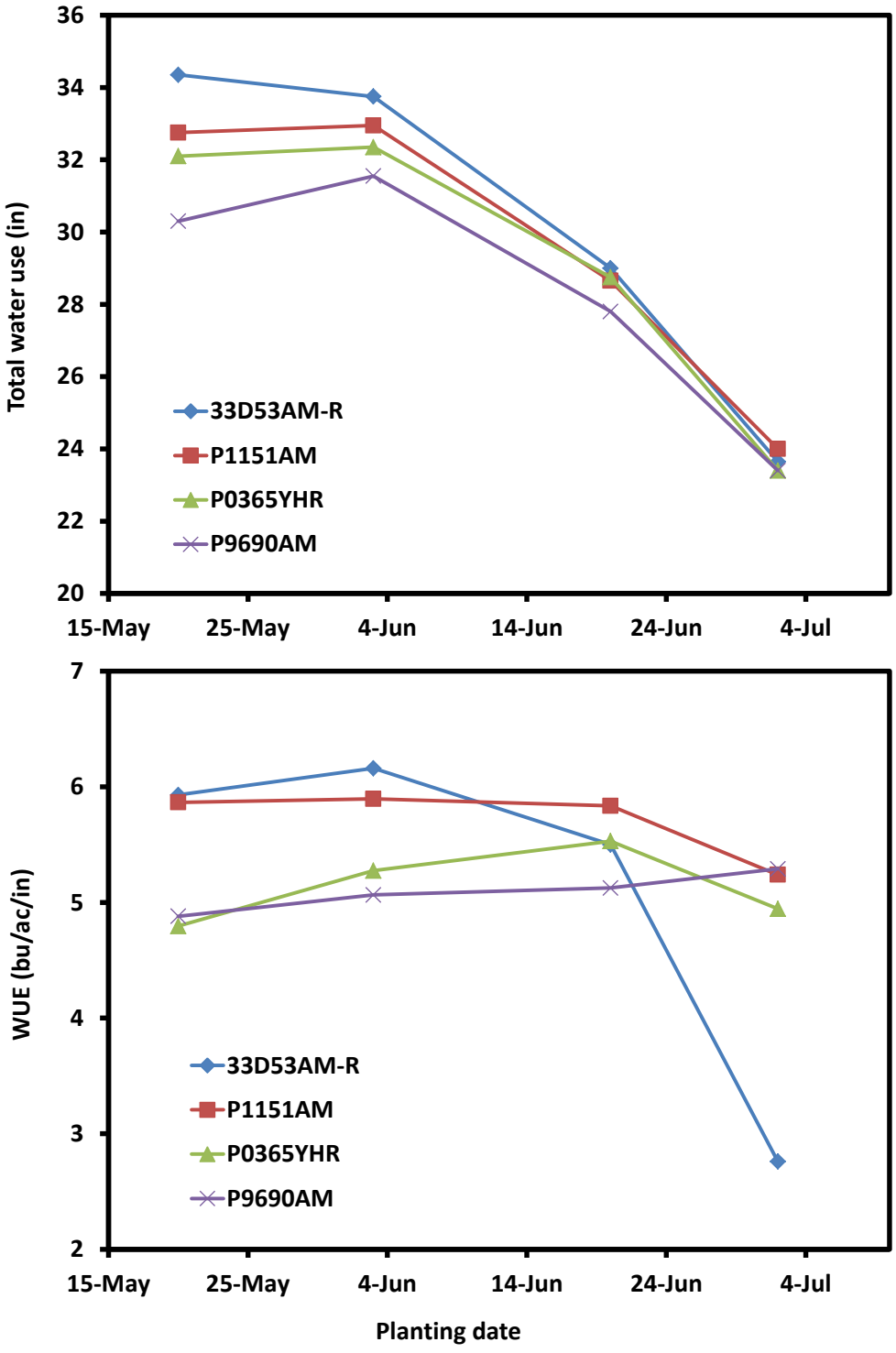

Fig. 4. Effect of planting date on crop water use and water use efficiency (WUE) in 4 hybrids grown at Etter, TX in 2013.