Effect of Late Planting Dates on Corn Yield

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Summary

Planting date studies have been conducted for corn over many years. Often the focus has been to determine the optimum planting date for maximizing yield. In some areas, planting early-maturing corn hybrids as early as possible has been a successful strategy for avoiding hot, dry conditions at the critical pollination and early grain fill stages. Planting later can be an alternative strategy that attempts to avoid the most intense heat by moving the critical growth stages for corn centered around pollination to later in the growing season. This strategy has been adopted by some growers in areas that often encounter heat and moisture stress during the growing season. However, crop insurance cutoff dates for planting are earlier than some farmers may want to plant their corn acres. The purpose of these studies was to assess the yield potential for corn planted after the insurance planting cutoff date and to compare corn yields from a wide range of planting dates.

Procedures

Corn planting date studies were conducted at the Kansas River Valley (Topeka) and East Central Kansas (Ottawa) experiment fields in 2018. The experiment at the Topeka site was irrigated with irrigations totaling 9.5 inches applied June 8 through August 13 via an overhead sprinkler irrigation system that applied roughly 0.8 in. of water at each irrigation event. The experiment at Ottawa received no irrigation. A single hybrid was planted at each location at four or five planting dates. Corn was planted every two to three weeks from April 10 to June 11 at Topeka and from April 13 to June 29 at Ottawa. The U.S. Department of Agriculture's 2018 final planting date for corn at both locations was May 25. At Topeka, Pioneer 1197AM (111 CRM) was planted at 32,900 seeds per acre, and at Ottawa Pioneer 1138AM (111 RM) was planted at 26,500 seeds per acre. The experiment utilized a randomized complete block design with four replications. Individual plots had 12 rows and were 30-ft wide × 30-ft long. Yields were determined from the middle two rows of each plot to avoid influence from neighboring plots. Two harvest dates were required at each location to allow the later planted corn to mature and dry sufficiently for harvest. At Topeka, the first two plantings were harvested September 10 and the last two on September 19. The first three plantings at Ottawa were harvested September 25, and the last two plantings were harvested October 30. Yields were corrected to 15.5% grain moisture. Nitrogen and weed control were managed to have no known effects on yields.

Results

The corn growing season started off cool with the first planting date taking more than 16 days to emerge but warmed up quickly, with the second planting date emerging about 3 days after the first planting date emerged. The rest of the growing season continued to be warmer than average with below-average rainfall April through July. Although temperatures remained high in August, rainfall exceeded the 30-year average.

The lowest corn yield at Ottawa was the middle planting of May 18 (Table 1). The fourth planting date of June 8 yielded as well as the first two planting dates, and the fifth date on June 29 produced yields similar to the third date. All corn yields at Ottawa were reduced significantly due to the lack of rainfall, which was more than 8 inches below normal for the growing season, and extended periods of heat (Figure 1). The first two corn planting dates tasseled before the end of June, the third planting (May 18) around July 18, and the last two after August 1. Tasseling occurred in the May 18 planting date during the hottest and driest part of the growing season (Figure 1), likely limiting the effectiveness of pollination. These results demonstrate that later planted corn can yield as well as early planted corn in a year where water is a limiting factor depending on timing of rainfall events and temperature pattern.

At Topeka, the yield-limiting factor of moisture stress was greatly reduced by repeated irrigations (Figure 2), resulting in a more traditional yield response to planting date (Table 2). The highest yield was with the second planting date of April 23, with the first and third planting dates nearly equal, but more than 20 bu/a less than the second. The yield of the fourth planting date of 126 bu/a was slightly more than 50% of the yield from the second planting date. There was no difference between plant populations for the planting dates at Topeka (Table 2).

Grain test weights decreased at both locations after the second planting dates in the last week of April (Tables 1 and 2), however, they were greater than the 56 lb/bu standard at all but the last planting dates. This reduction in grain test weight is likely related to the shorter grain fill period for the later planting dates.

The preliminary results from this single year provide an example of how later planting date can be a viable option to avoid stressing the corn at critical stages when moisture is limiting. The results from the irrigated experiment at Topeka illustrate that if moisture is not limiting and planting is delayed, corn can still produce a substantial yield, though reduced from the potential of the optimum.

Table 1. Effect of planting date on corn under irrigation at the East Central Kansas Experiment Field, Ottawa, in 2018

Planting date	Grain moisture	Grain test weight	Grain yield
	%	lb/bu	bu/a
April 13	15.3 d†	62.0 a	98 a
April 30	15.6 d	62.9 a	93 ab
May 18	18.8 b	60.7 b	60 bc
June 8	18.0 c	58.8 c	96 a
June 29	23.7 a	52.5 d	66 bc
Pr>F	<0.0001	<0.0001	0.05
LSD (0.05)	0.7	1.7	29

†Means followed by the same letter within a column are not significantly different at $\alpha = 0.05$.
LSD = least significant difference.

Table 2. Effect of planting date on corn under irrigation at the Kansas River Valley Experiment Field, Topeka, in 2018

Planting date	Plant population	Grain moisture	Grain test weight	Grain yield
	plants/a	%	lb/bu	bu/a
April 10	30750	17.1 b†	62.1 ab	215 a
April 23	30500	17.4 b	62.3 a	240 a
May 18	30375	17.0 b	61.3 b	219 a
June 11	27875	25.6 a	52.3 c	127 b
Pr>F	0.25	<0.0001	<0.0001	0.0050
LSD (0.05)	NS	1.3	0.9	48

†Means followed by the same letter within a column are not significantly different at $\alpha = 0.05$.
LSD = least significant difference.

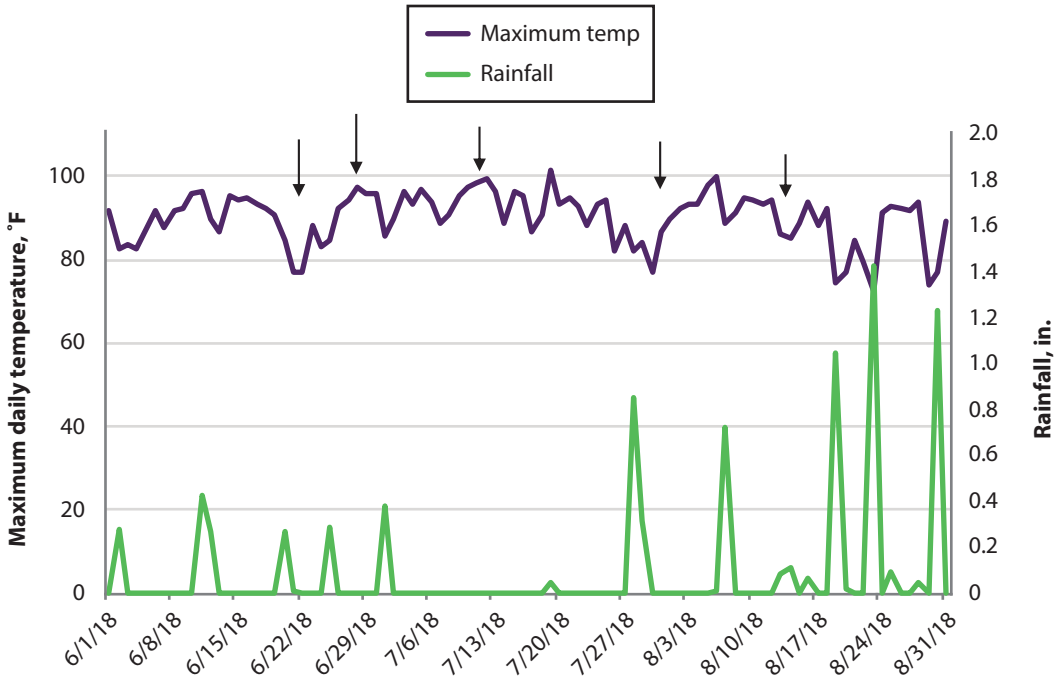

Figure 1. Daily maximum temperatures and daily rainfall at the East Central Kansas Experiment Field, Ottawa. Arrows indicate corn tasseling for successive planting dates.

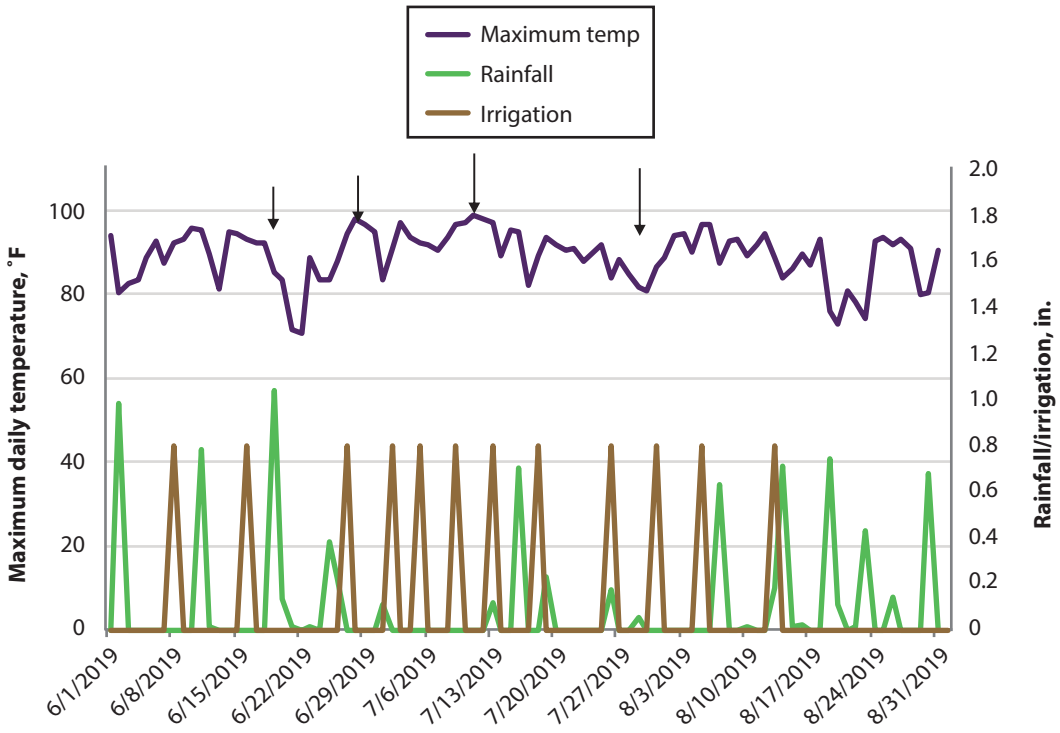

Figure 2. Daily maximum temperatures, daily rainfall and irrigation at the Kansas River Valley Experiment Field, Topeka. Arrows indicate corn tasseling for successive planting dates.