

# EFFECTS OF PLANTING DATE ON CORN EMERGENCE, DEVELOPMENT, AND YIELD

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Multi-year project

## **Justification:**

Missouri farmers have followed the trend in other Midwestern states of early corn planting dates. Few planting date studies conducted in central Missouri have used March planting dates. In addition, modern corn hybrids may be more tolerant to cool soil conditions often associated with early planting dates.

Data from planting date studies are also helpful in developing replant recommendations. An important component of these recommendations is the response of corn yield to planting date.

Planting date studies also offer the ability to determine the effects of planting date on seedling emergence. These studies will help determine if seeding rates should be increased for early corn planting dates.

## **Methods**

Five hybrids were planted on five dates. The five hybrids were Dekalb DKC60-19, Dekalb DKC 61-45, MFA Morcorn MC4173, Asgrow RX752RR/YG, and Pfister 3356RR-Bt. All hybrids were resistant to glyphosate and possessed the Yield Guard Corn Borer trait. Kernels had been treated with one of two insecticides, Poncho or Cruiser. The planting dates were March 30, April 13, April 28, May 19, and June 6.

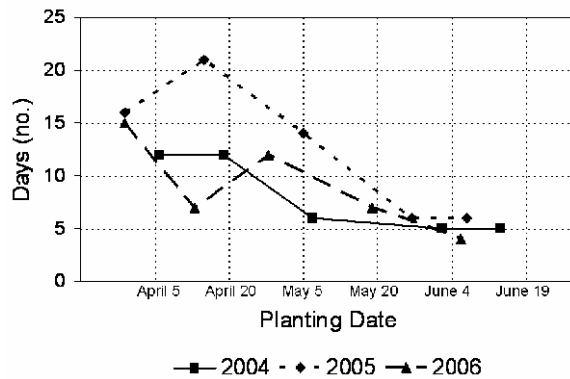
Two planting rate treatments were used. For one treatment (fixed), 26,000 kernels/acre were planted on all planting dates. In the other treatment (thinned), plots were over-planted and thinned to 24,000 plants per acre at the 3-leaf stage. Plots were 25 feet long and four 30-inch rows wide. Dual II Magnum and Aatrex were tank mixed with Roundup WeatherMax and applied on April 21. One additional post emergence application of Roundup WeatherMax was made. Nitrogen fertilizer was top-dressed at 160 pounds/acre as ammonium nitrate. Plots were planted without tillage.

The date for emergence (1-inch coleoptiles visible) was recorded and number of days between planting and emergence was calculated. Mid-silk date was recorded when one-half of the plants in a plot possessed silks that extended 0.75 inch outside the husks. The number of days from emergence to mid-silk was calculated. Stand counts were made at about the 5-leaf stage and percent emergence was calculated for the fixed treatment. Before harvest the two center rows were end-trimmed to 20 feet. These two rows were harvested with a plot combine and yield was corrected to 15% moisture.

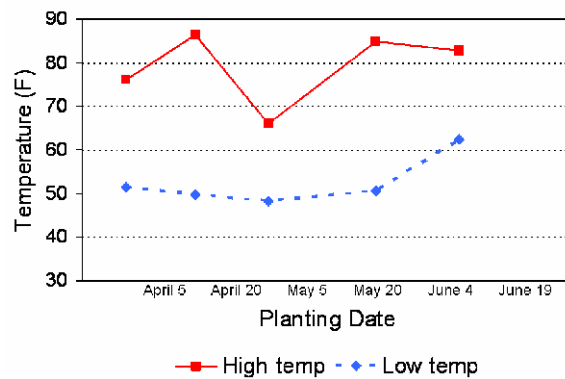
The experimental design was a split plot with planting date as the main plot. Sub-plots were all possible combinations of the five hybrids and the two planting rate treatments. Data for stand density were analyzed using the fixed planting rate treatment only.

## Results

Planting date greatly affected the number of days between planting and emergence (Figure 1). Among the five planting dates, the number of days to emergence was greatest for the March 30 date. Seedlings from this planting date required about two weeks to emerge. The number of days to emergence decreased after March 30 until only four days were required for the last planting date. Soil temperature can greatly affect emergence time. Soil temperatures were not available, but Figure 2 presents air temperatures. Air temperatures were quite warm in 2006, so emergence was faster in 2006 than in 2005.

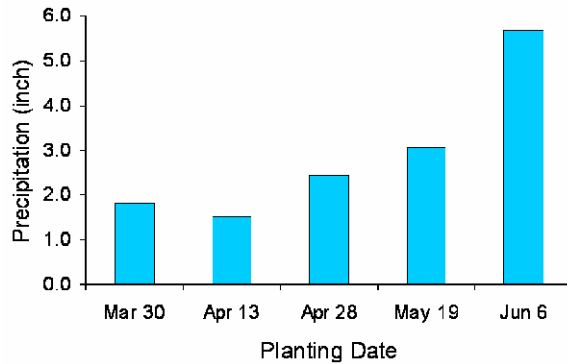


**Figure 1.** Number of days from planting to emergence for five planting dates in 2004, 2005, and 2006. Numbers are averages across all hybrids.

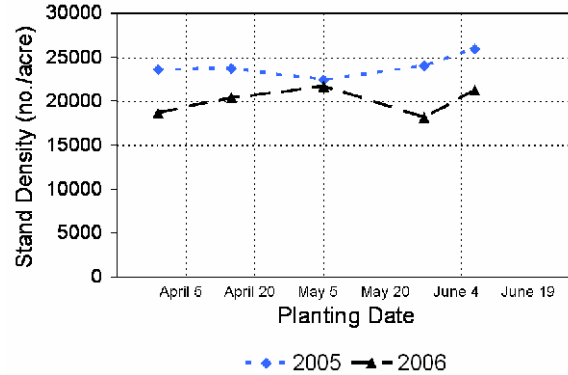


**Figure 2.** High and low air temperatures averaged between two weeks before through two weeks after each of five planting dates.

Excessive soil moisture can affect seedling survival and emergence percentage. Less than 3 inches of rain occurred two weeks before through two weeks after planting for the first three planting dates (Figure 3). So, the soil was not excessively wet during emergence from these early planting dates. Emergence percentages and resulting stand densities were fairly uniform among the five planting dates with a slight increase for the latest planting date when soil was warmer (Figure 4). Emergence percentage for the May 19 planting date was only 70%. Daily low temperatures were less than 45°F for about a week before this planting date and this may have contributed to the lower than expected emergence percentage.

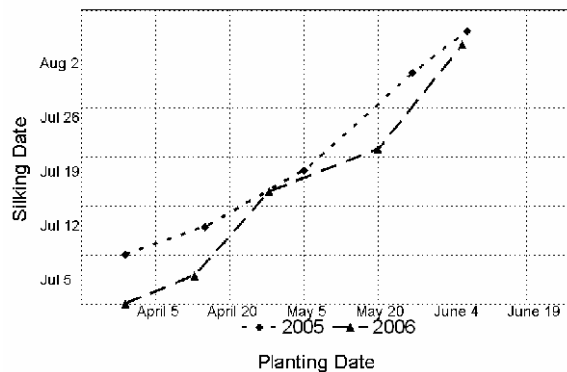


**Figure 3.** Total precipitation between two weeks before planting and two weeks after planting for five planting dates.

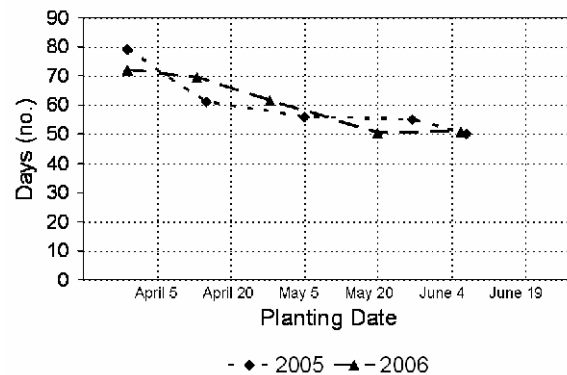


**Figure 4.** Stand densities determined at 5-leaf stage for five planting dates (fixed treatment, only).

Planting date affects the date on which corn plants reach mid-silk stage of development. Weather conditions in late July and early August typically are drier than early July, and this may be one of the reasons that later planting dates often yield less than early planting dates. Also, day lengths and light intensities are reduced. Mid-silk dates for the five



**Figure 5.** Mid-silk dates for five planting dates.

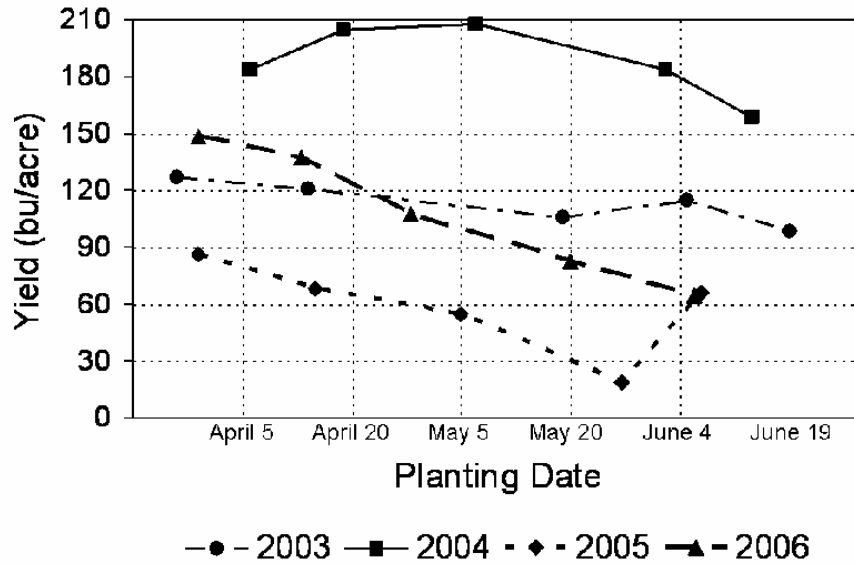


**Figure 6.** Number of days between emergence and mid-silk for five planting dates.

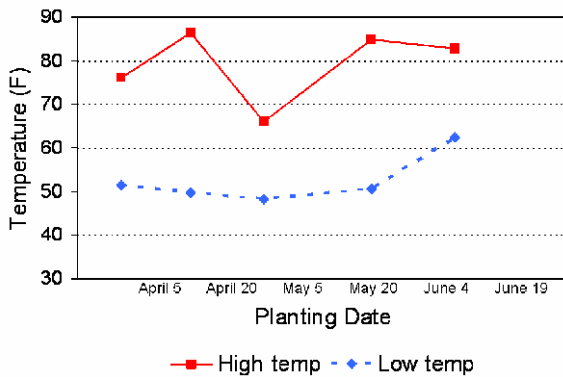
planting dates ranged from late June to early August (Figure 5). The number of days from emergence to mid-silk ranged from 72 to 50 for the five planting dates (Figure 6). Days during early vegetative growth for the early planting dates accumulated fewer growth degree units than for the later planting dates, so more calendar days were required for plants to reach mid-silk.

Grain yields in 2006 were less than normal, but more than yields that occurred in a similar experiment conducted in 2005 (figure 7). The year 2004 produced record yields because of excellent weather. Yields for 2003 were below normal and that year exhibited periods of weather stress during grain-filling. However, weather conditions in 2005 were more extreme than in 2003. The yield for the June 6 planting date in 2006 averaged over all five hybrids was 65 bushels/acre. The lowest average yield in 2005 was only 18

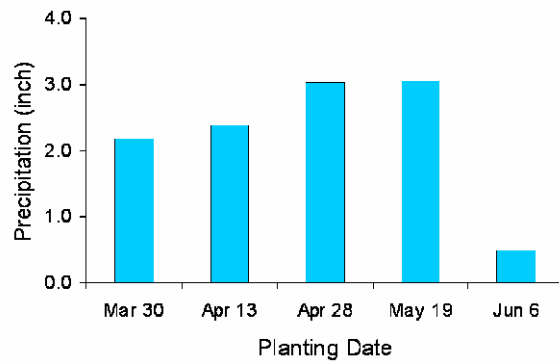
bushels/acre. The average high temperature between two weeks before mid-silk date and two weeks after mid-silk date was never over 90° in 2006 (Figure 8). During silk emergence, about one inch of rain per week is required to produce high yield. In 2006, rain amounts varied from nearly three inches to less than one-half inch in four weeks (Figure 9).



**Figure 7.** Effect of planting date on corn yield. Numbers are averages of all hybrids, hybrids differ among years (fixed treatment only).



**Figure 8.** High and low air temperatures averaged between two weeks before through two weeks after mid-silk for five planting dates.



**Figure 9.** Total precipitation between two weeks before mid-silk and two weeks after mid-silk for five planting dates.

## **Conclusions**

1. The number of days required for seeding emergence was greatly affected by soil temperature at planting with cooler temperatures resulting in delayed emergence.
2. Planting in late May and early June resulted in silk emergence occurring in late July and early August. Temperatures were warmer and rainfall less during silk emergence for the June 6 planting date compared to all other planting dates.
3. Early planting dates required more calendar days between emergence and mid-silk date.
4. The largest yield occurred with the March 30 planting date, but it was not different from the yield of the April 13 planting date. Yield decreased for each of the three later planting dates.
5. Some evidence was found to support the recommendations that corn seeding rates should be increased if planting in late March or early April in central Missouri.