

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

Four hybrids were planted on five dates. The four hybrids were Dekalb DKC60-19, Ag Source 6693, Mycogen 2T801, and Dyna-Gro 57P69. 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 15, May 5, May 27, and June 7 (Figures 1 and 2).

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. Pre-emergence herbicides were Dual II Magnum, Roundup WeatherMax, and Aatrex. One 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. Stand counts were made at about the 5-leaf stage and percent emergence was calculated. 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.



Figure 1. Side by side comparison of March 30 (left) and April 15 (right) planting dates.



Figure 2. Side by side comparison of May 27 (left) and April 15 (right) planting dates.

The experimental design was a split plot with planting date as the main plot. Sub-plots were all possible combinations of the four 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 3). Among the five planting dates, the number of days to emergence was greatest for the April 15 date. Seedlings from this planting date required three weeks to emerge. The number of days to emergence decreased for each planting date after April 15 until six days were required for the last two planting dates. Soil temperature can greatly affect emergence time. Soil temperatures were not available, but Figure 4 presents air temperatures. Air temperature dropped below freezing just prior to planting on the earliest two planting dates. Figure 4 illustrates that air temperature warmed considerably for the latest two planting dates.

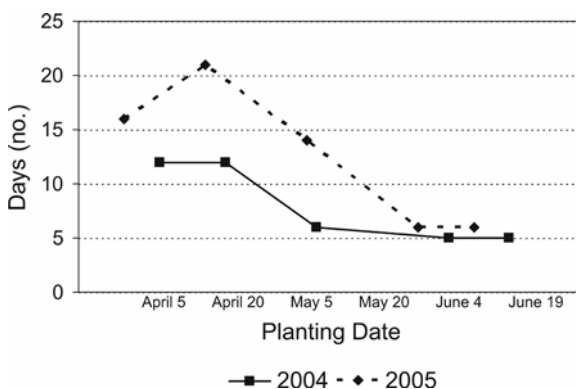


Figure 3. Number of days from planting to emergence for five planting dates in 2004 and 2005. Numbers are averages across all hybrids.

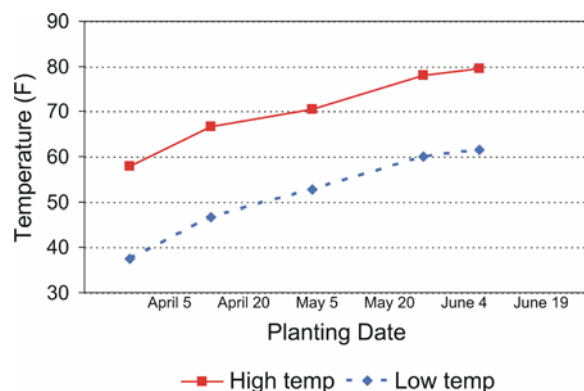


Figure 4. High and low air temperatures averaged between two weeks before through two weeks after each of five planting dates.

Excessive soil moisture can affect seedling survival and emergence percentage. Less than 1.5 inches of rain occurred two weeks before through two weeks after planting for the first two planting dates (Figure 5). So, although the soil was quite cool it was not excessively wet during emergence from these two planting dates. Stand densities resulting from planting 26,000 kernels were fairly uniform among the five planting dates with a slight increase for the later two when soils were warmer (Figure 6). Perhaps the insecticide seed treatments protected the seedlings, especially those from the early planting dates when soils were cool.

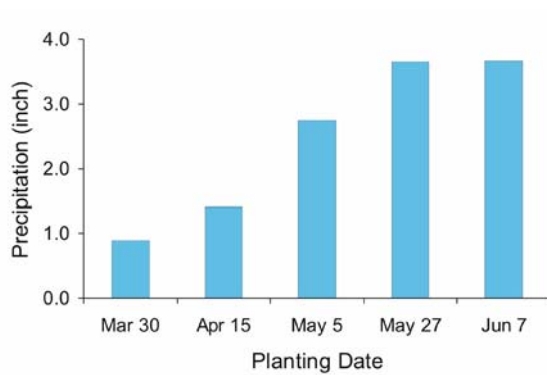


Figure 5. Total precipitation between two weeks before planting and two weeks after planting for five planting dates.

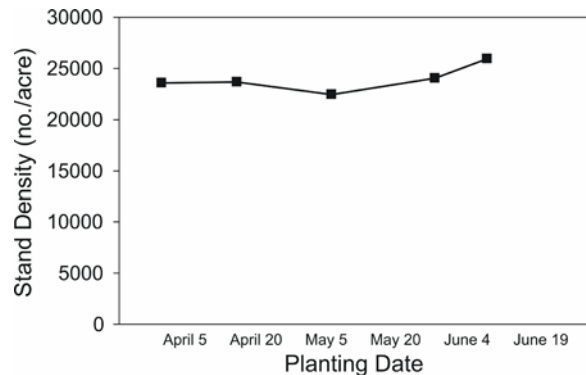


Figure 6. Stand densities determined at 5-leaf stage for five planting dates.

Planting date affects the date on which corn plants produce silks. Weather conditions in late July and early August typically are drier than early July, and this may be one of the

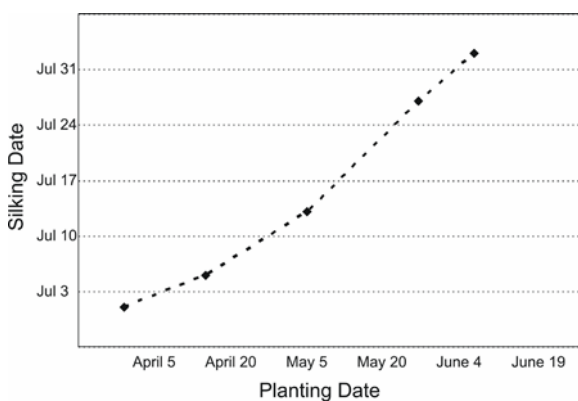


Figure 7. Mid-silk dates for five planting dates.

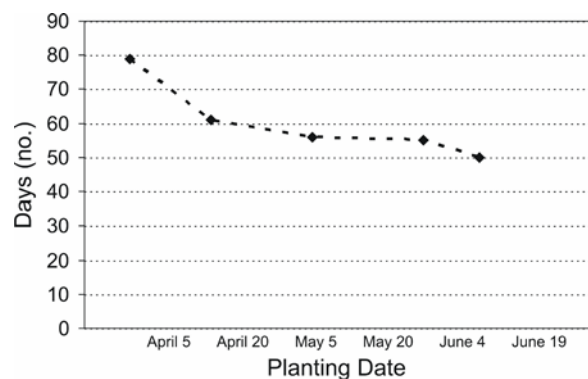


Figure 8. Number of days between emergence and mid-silk for five planting dates.

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 planting dates ranged from July 2 to August 2 (Figure 7). The number of days from emergence to mid-silk ranged from 80 to about 50 for the five planting dates (Figure 8). 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.

Grain yield in 2005 was much less than normal and was less than yields that occurred in similar experiments conducted in 2003 and 2004. 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 May 27 planting date averaged over all four hybrids was only 18 bushels/acre. The average high temperature between two weeks before mid-silk date and two weeks after mid-silk date was over 90° for this planting date (Figure 10). During that same period plots received less than 1 inch of rain (Figure 11). Yield for the June 7 planting date rebounded to over 60 bushels per acre. The total rainfall between two weeks before mid-silk and two weeks after mid-silk for this planting date was about 5 inches. This rain occurred late in that timeframe, but occurred early enough to provide at least some yield benefit.

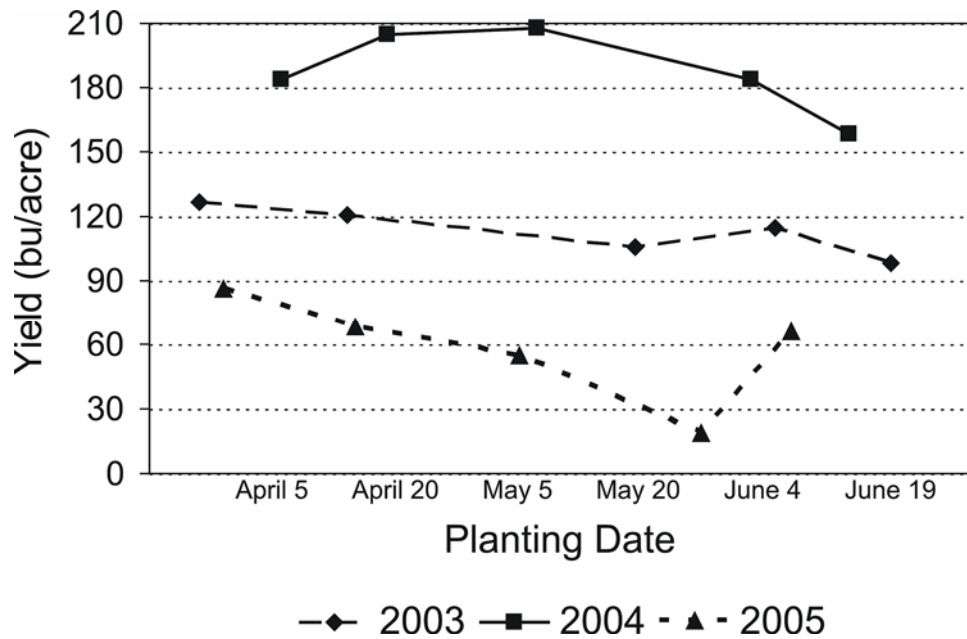


Figure 9. Effect of planting date on corn yield. Numbers are averages of all hybrids, hybrids differ among years.

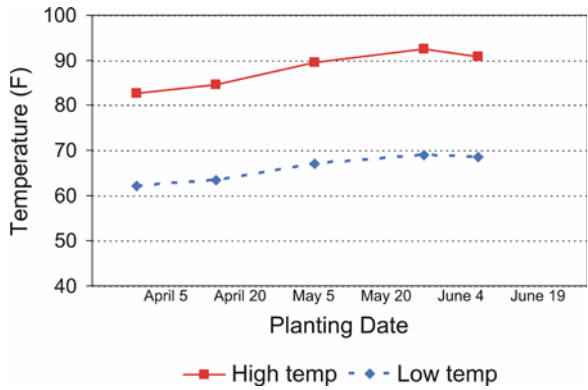


Figure 10. High and low air temperatures averaged between two weeks before through two weeks after mid-silk for five planting dates.

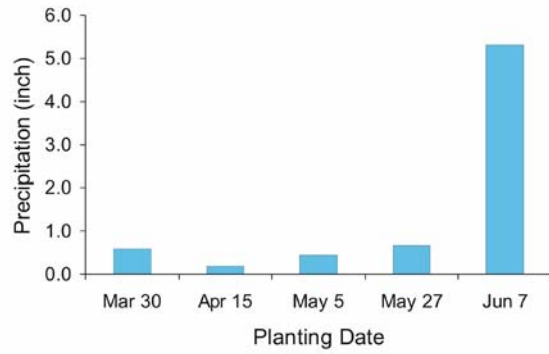


Figure 11. Total precipitation between two weeks before mid-silk and two weeks after mid-silk for five planting dates.

Conclusions

1. The number of days required for seeding emergence was greatly affected by soil temperature at planting.
2. Soil temperature did not appear to affect seeding emergence percentage. Seed applied insecticides may have protected young seedlings.
3. Planting in late May and early June resulted in silk emergence occurring in late July and early August.
4. Early planting dates required more calendar days between emergence and mid-silk date.
5. Timing of rainfall, especially the amount of rainfall during silk emergence, greatly affected corn yield response to planting date.
6. The largest yield occurred with the late March planting date.
7. Second largest yield occurred with the early June planting date because plants received some precipitation shortly after mid-silk date.