

2017

Planting Date by Maturity Group in Kansas: 2016 Season and Three-Year Summary

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Recommended Citation

Ciampitti, I. A.; Orteiz, O.; Shoup, D. E.; Adey, Eric; Kimball, J.; Sassenrath, Gretchen; and Cramer, G. (2017) "Planting Date by Maturity Group in Kansas: 2016 Season and Three-Year Summary," *Kansas Agricultural Experiment Station Research Reports*: Vol. 3: Iss. 6. <https://doi.org/10.4148/2378-5977.7434>

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Cover Page Footnote

Thanks to the Kansas State University Crop Production Team (KSUCROPS) for preparing and synthesizing the database analyzed in this report, and to all K-State Research Experimental Stations that contributed with the conduction of this research.

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Summary

Optimal planting should be timed to capture a favorable environment (e.g., fall rains and cooler temperatures during grain filling). Five field studies were conducted during the 2014 growing season (Manhattan, Topeka, Ottawa, Parsons, and Hutchinson); five in 2015 (Manhattan, Rossville, Ottawa, Parsons, and Hutchinson); and three in 2016 (Manhattan, Topeka, and Ottawa). This study explores the impact of planting date (early-, mid-, and late-planted) on yield for soybean cultivars from a range of maturity groups (early, medium, and late groups). For 2016, the overall main factor impacting yield across sites was planting date, which increased yields with early-planted soybeans. Based on all 13 sites (2014, 2015, and 2016), maximum soybean yield potential decreased by 0.5 bushels per day of delay on planting date when soybean is planted after April 15. Comparable yield penalties have been documented for other main production regions. In summary, weather patterns dictate soybean yields, especially under dryland conditions. There is no guarantee that any certain planting date will always work out the best when it comes to soybean yields in Kansas.

Introduction

Planting date is a valuable management practice for achieving maximum yield potential in a specific environment. For the last 30 years, at the state level, planting date has been earlier at a rate of half of one day per year. While early planting dates help maximize soybean growth in a season and potentially increase yield, early plantings may also shift reproductive stages in a hotter and drier environment, negatively impacting yields in some years in Kansas. Correct selection of both planting date and maturity group (MG) are critical for maximizing yield potential. Following this rationale, the main objective of this study was to quantify the effect from a range of planting dates and MGs on the final soybean yields at different sites in Kansas.

Procedures

A total of thirteen field studies were conducted in Kansas during the 2014, 2015, and 2016 growing seasons. Sites evaluated in 2014 were: Manhattan, Topeka, Ottawa, Parsons, and Hutchinson; in 2015: Manhattan, Rossville, Ottawa, Parsons, and Hutchinson; and in 2016: Manhattan, Topeka, and Ottawa. All sites evaluated were under dryland conditions with the exception of Topeka (2014 and 2016) and Rossville (2015) that were irrigated. At all sites, the experimental layout was a split-split plot design with

planting date as main plot and MG as a sub-plot factor. Three planting dates and three MGs were planted for a total of nine combinations per site. In 2016, early-, medium-, and late-planting dates were implemented, and varied from April 14 (earliest) to July 15 (latest) across all sites (Table 1). For the MG selection, an optimal MG was considered to be the medium MG for a particular location (environment), and shorter and longer varieties were used to characterize MGs with differential duration of the growth cycle for soybean. For the irrigated Topeka site, total irrigation during the crop season was 1.8 inches (started from August 10). At all sites, soybean was planted at 30-inch row spacing. Final yield was obtained by harvesting the center two rows in each plot. For the purpose of uniform reporting, all yields were adjusted to 13.5% moisture content. Weather information was downloaded from the Kansas Mesonet website (<http://mesonet.k-state.edu/weather/historical/>).

Results

Weather: 2016

Cumulative precipitation at the Manhattan site favored early season growth for the early-planted time with small differences for the medium- and late-planted scenarios (Figure 1). At the Topeka and Ottawa sites, cumulative precipitation was similar across all planting dates, with a larger separation between medium- and late-planted time for Topeka in comparison to the Ottawa site (Figure 1).

Yields: 2016

Planting date significantly influenced yields at the Manhattan and Ottawa sites. For the Manhattan site, early planting time (April 14) showed a yield advantage when compared with the late planting (June 2) scenario, with the latter resulting in a 12 bu/a reduction (Figure 2). At the Ottawa site, yield trends from high to low were: early- (63 bu/a) > medium- (57 bu/a) > late-planted (45 bu/a) (Figure 2). For Manhattan and Ottawa sites, MG factor did not present a significant influence in yields, meaning that regardless of the MG selected yields did not differ. For the Topeka site (irrigated), planting date significantly influenced yields, with comparable yields for the early- and medium-planted treatments, averaging 67 bu/a (Figure 2). The late-planted time resulted in a 6 bu/a reduction (average 61 bu/a) as compared with both early- and medium-planted scenarios. In the same location the MG factor significantly affected yields, with early and medium MGs (63 bu/a) outyielding the late variety (54 bu/a).

In summary for 2016, the main factor influencing yield for Manhattan and Ottawa was planting date; increasing yields with earlier planting dates. Later planting time reduced the overall length of the season, which diminished maximum yield potential in addition to other factors that could have limited yields (i.e. insects, disease, etc.). The MG factor reduced yields when the longest MG was used in the irrigated site, with a 15% yield reduction (across all planting times).

Previous Growing Seasons: Yields for 2014 and 2015

For a complete analysis on each individual year, please visit the following resource: https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=900

From our planting date $\times$ maturity group study in 2014 and 2015, late planting did not clearly result in a yield reduction at the dryland sites, and caused only a minimal yield reduction at the irrigated site. Medium maturity groups (ranging from 3.8 to 4.8) yielded better, depending on the site and growing season evaluated (Figures 3 and 5).

Frontier Analysis: All Sites

Based on 13 sites (2014, 2015, and 2016), maximum soybean yield potential decreased by 0.5 bushels per day of delay on planting date when soybean is planted after April 15 (Figure 7). Comparable yield penalties for soybean have been documented for other regions across the primary corn and soybean production areas. Thus, “theoretically,” when soybean is planted 10 days earlier this could provide a benefit on yield potential close to 5 bushels per acre.

In summary, ultimately, weather patterns dictate soybean yields, especially under dryland conditions. There is no guarantee that any certain planting date will always work out the best when it comes to soybean yields in Kansas. In fact, the distribution and amount of rainfall and the day/night temperature variations around flowering and during the grain-filling periods have large impacts in defining soybean yield potential. Thus, when the risk of drought/heat stresses during the growing season is high, diversifying planting dates may be a good approach to consider.

Acknowledgments

Thanks to the Kansas State University Crop Production Team (KSUCROPS) for preparing and synthesizing the database analyzed in this report, and to all K-State Research Experimental Stations that contributed with the conduction of this research.

Table 1. Location, soil type, planting date, soybean maturity group, and variety, 2016

Location	Soil series	Planting date	Maturity group	Variety	Water condition
Manhattan	Reading silt loam	April 14,	3.0	Asgrow 3040	Dryland
		May 5, and	3.7	Asgrow 3731	
		June 2	4.5	Asgrow 4531	
Ottawa	Woodson silt loam	June 3, June 23, and July 15	3.8	Pioneer 38T42R	Dryland
			4.2	Pioneer 42T91SR	
			4.9	Pioneer 49T80R	
Topeka	Eudora silt loam	May 5, May 23, and June 8	3.0	Asgrow 3034	Irrigated
			3.9	Pioneer 39T67R	
			4.5	Asgrow 4531	

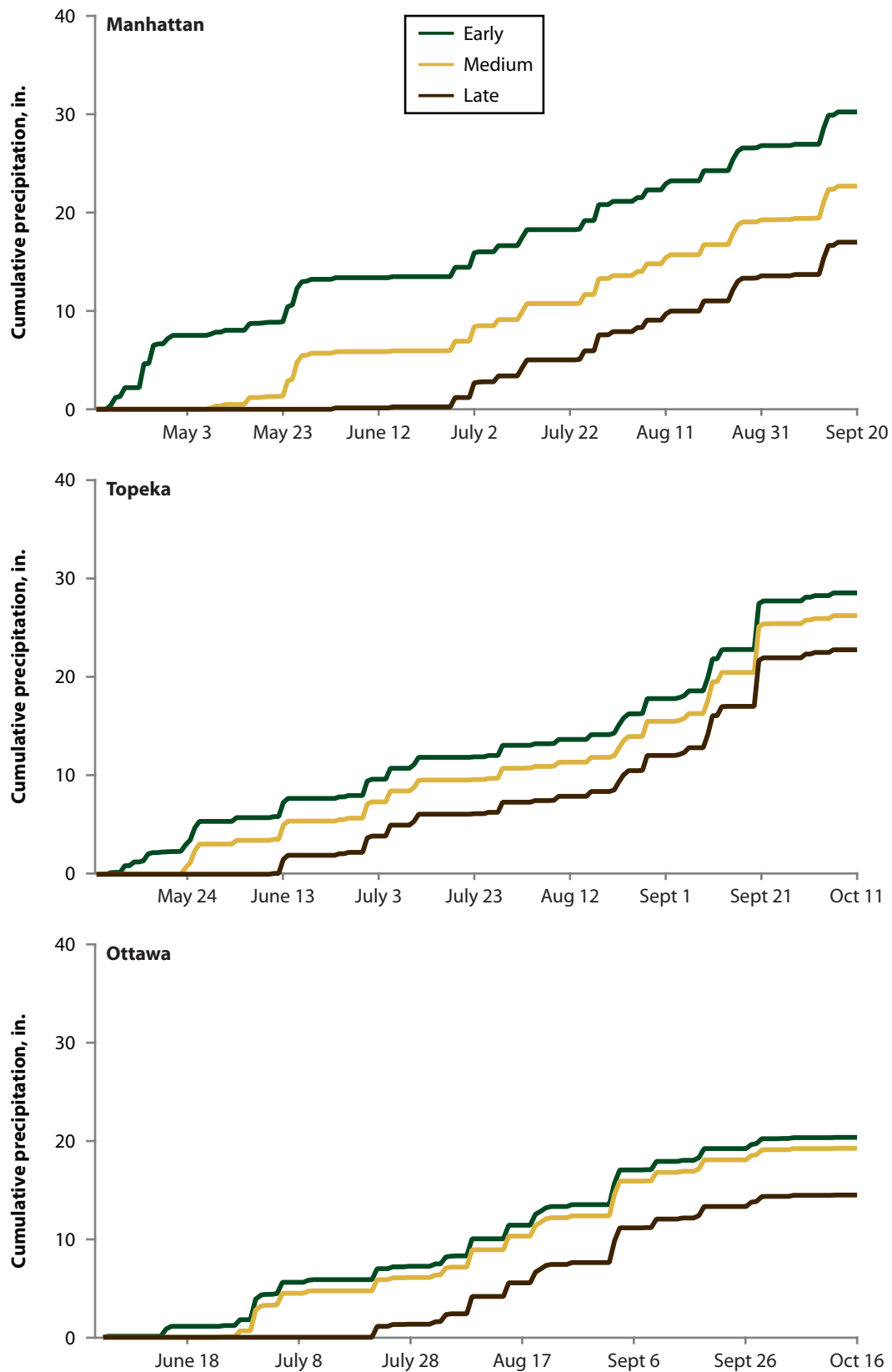


Figure 1. Cumulative precipitation (inches) for all soybean studies with different planting dates (early, mid, and late) at three locations across Kansas during the 2016 growing season. Information related to planting dates per site is presented in Table 1.

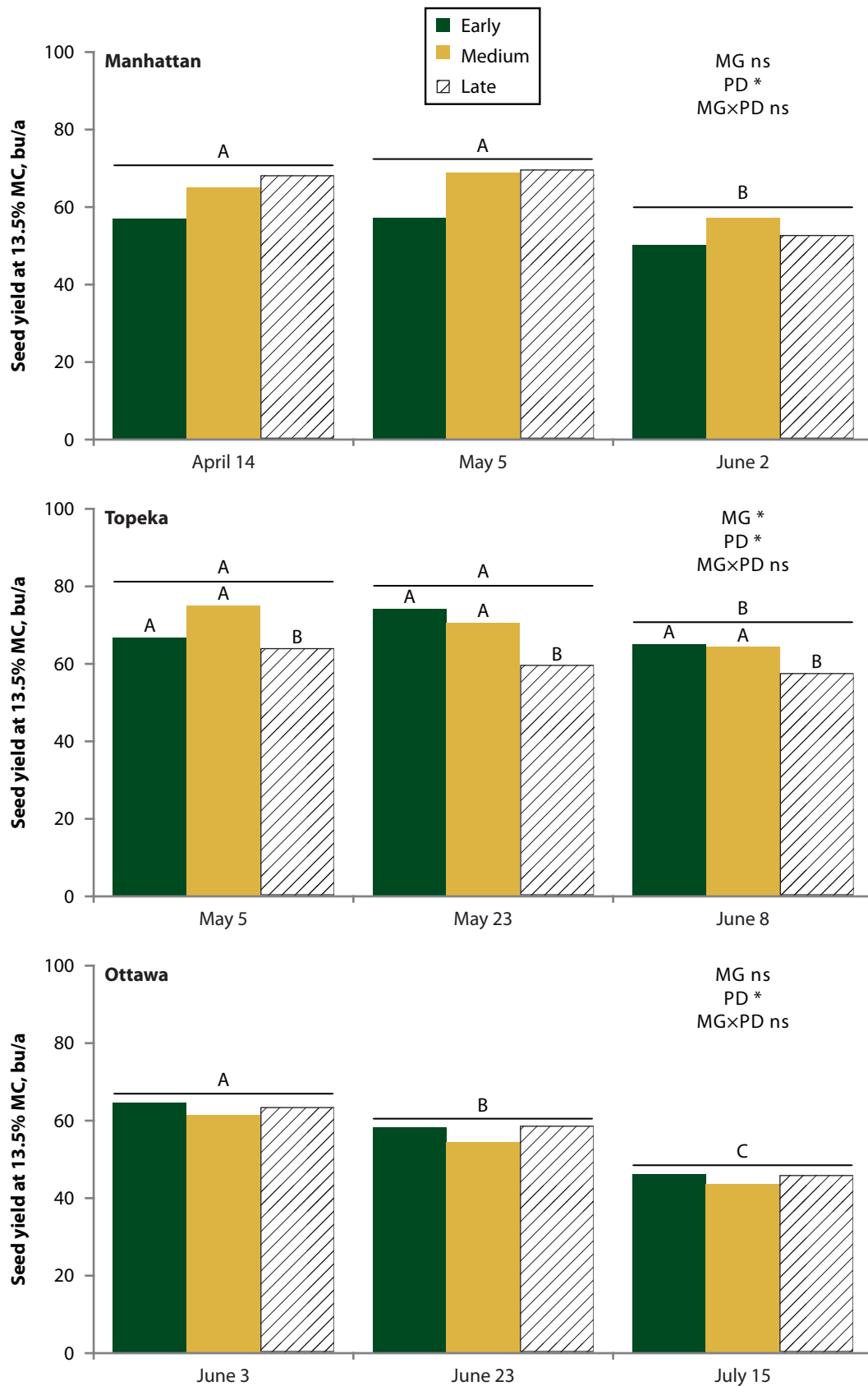


Figure 2. Soybean yields with different planting dates (PD) (early, mid, and late) and maturity groups (MG) at three locations across the state of Kansas for 2016 growing season. MC = moisture content; NS = no significance; * = significance < 0.05.

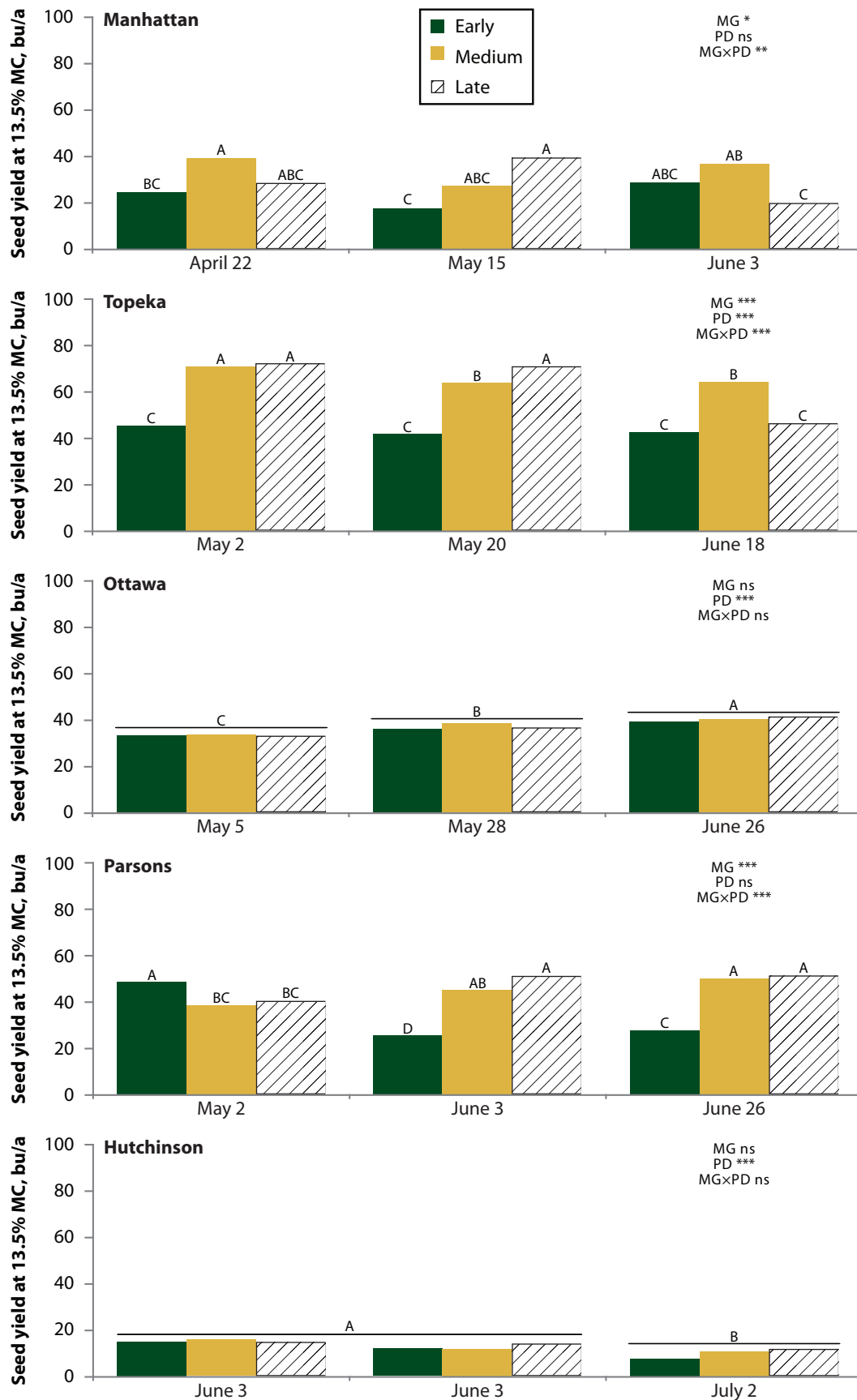


Figure 3. Soybean yields with different planting dates (PD) (early, mid, and late) and maturity groups (MG) at five locations across the state of Kansas for 2014 growing season.

MC = moisture content; NS = no significance; * = significance < 0.05; ** = significance < 0.01; *** = significance < 0.001.

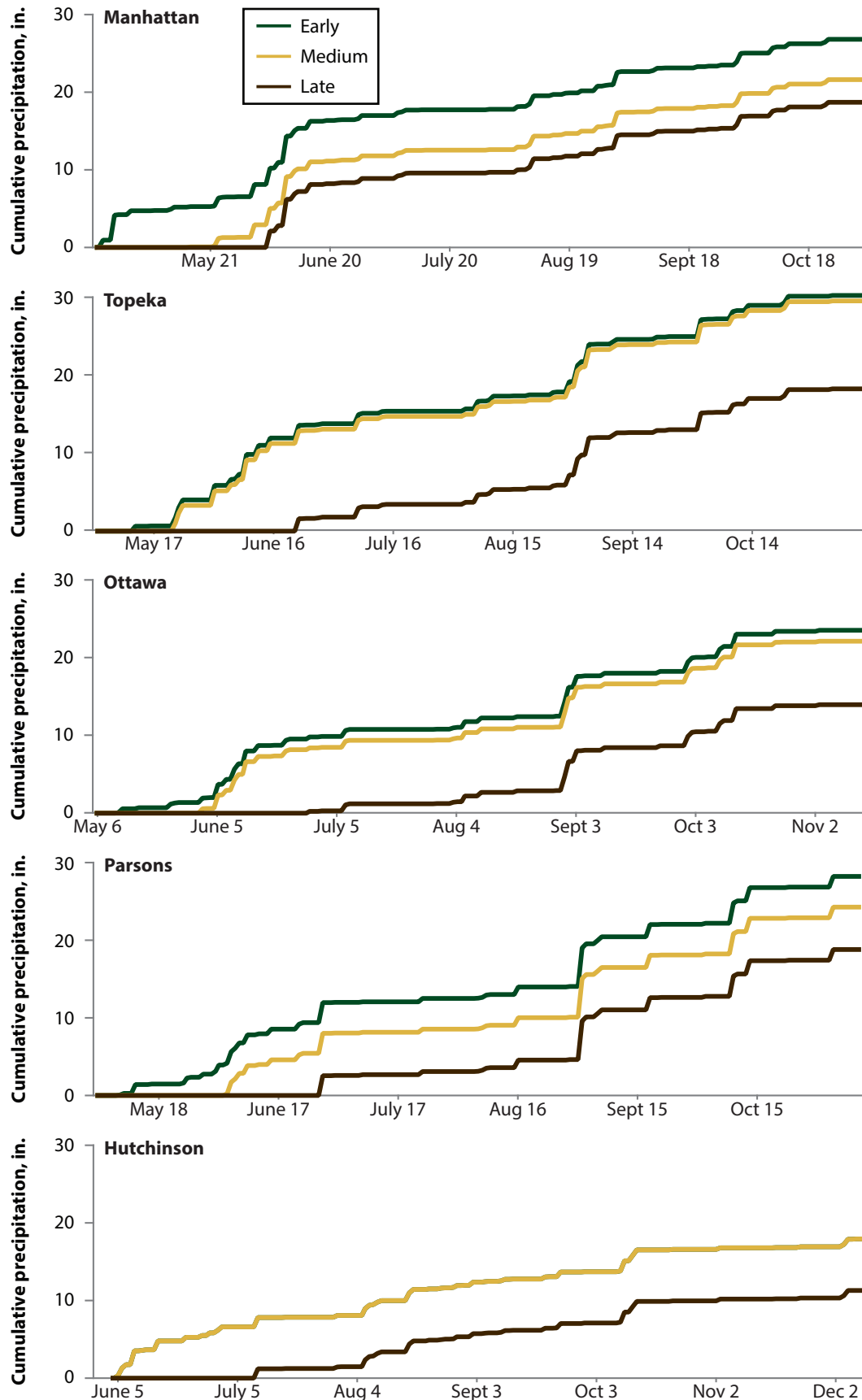


Figure 4. Cumulative precipitation (inches) for all soybean studies with different planting dates (early, mid, and late) at five locations across Kansas during the 2014 growing season.

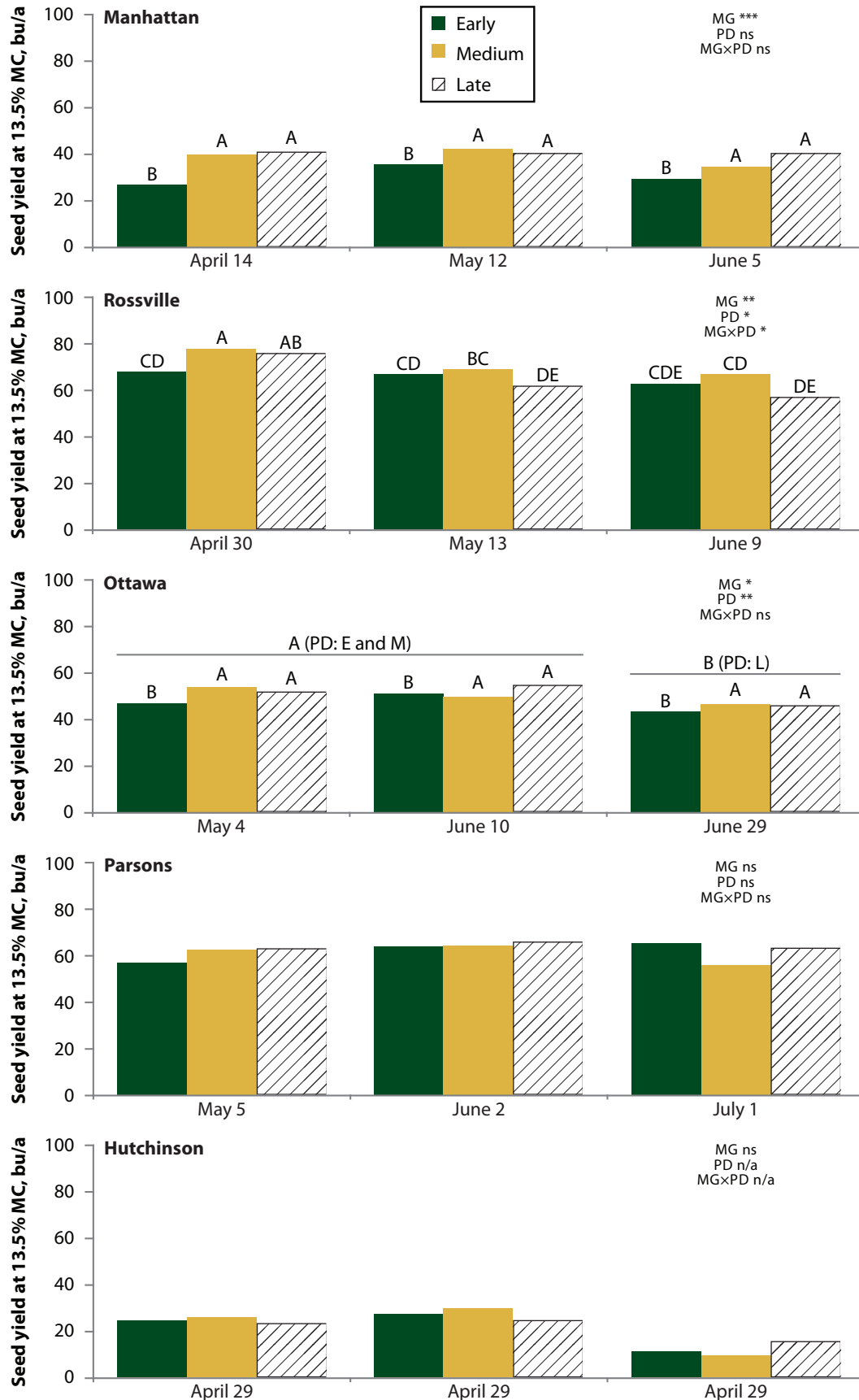


Figure 5. Soybean yields with different planting dates (PD; early, mid, and late) and maturity groups (MG) at five locations across the state of Kansas for the 2015 growing season.

MC = moisture content; NS = no significance; n/a = no available; * = < 0.05; and ** = significance < 0.01.

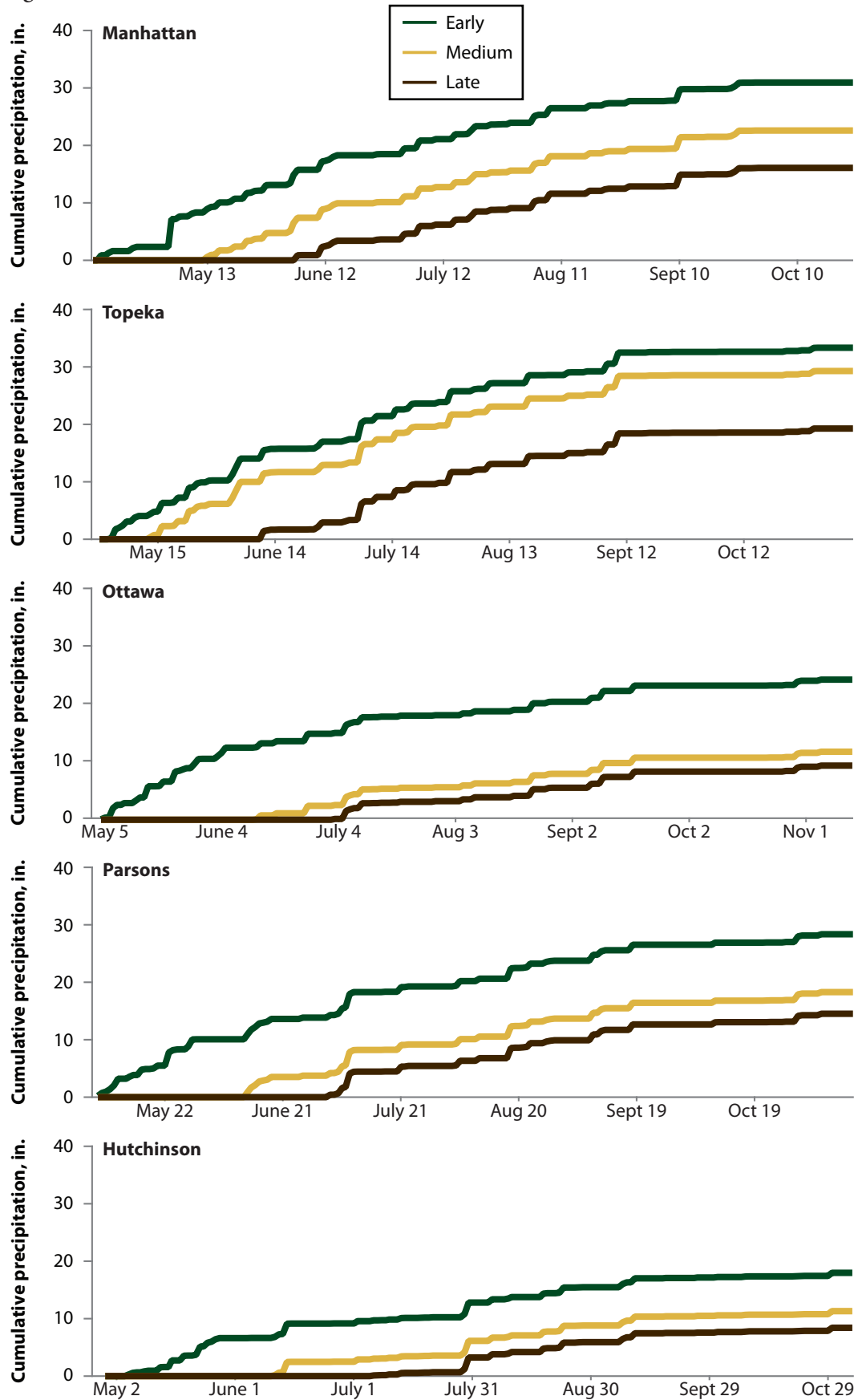


Figure 6. Cumulative precipitation (inches) for all soybean studies with different planting dates (early, mid, and late) at three locations across Kansas during the 2015 growing season.

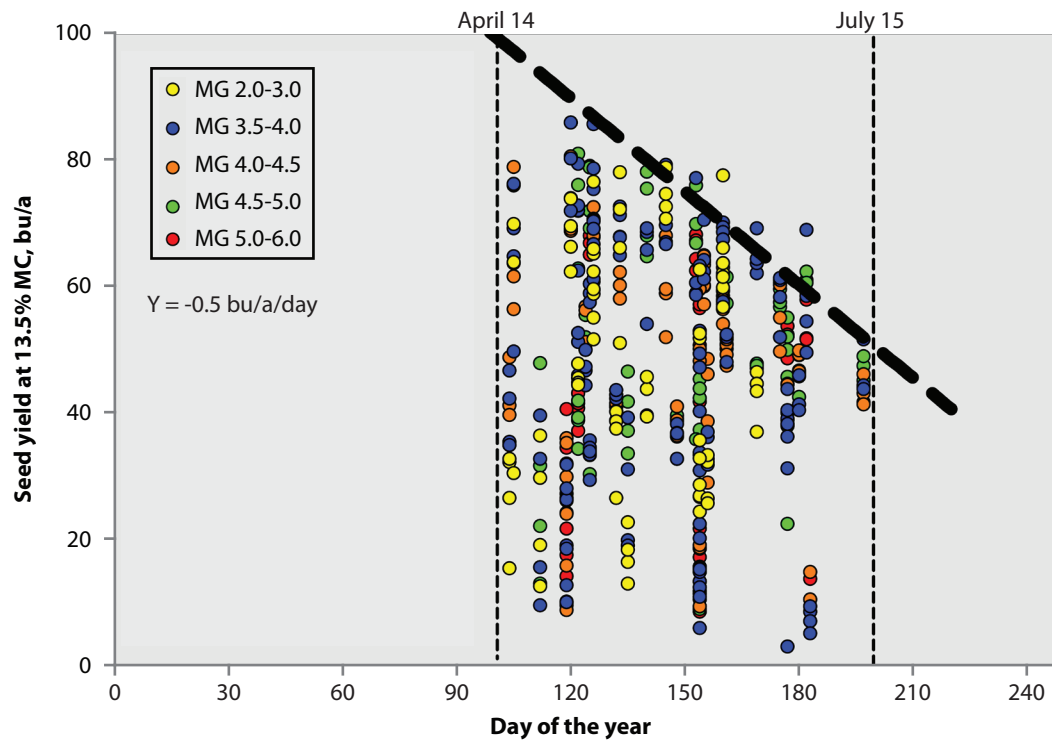


Figure 7. Soybean yield (bushels per acre) for all soybean studies with different planting dates (early, mid, and late) and maturity groups (MG) at 13 sites across Kansas during the 2014, 2015, and 2016 growing seasons. A frontier line was determined for the points with high yield. MC = moisture content.