EFFECTS OF HIGHER THAN "NORMAL" CORN STAND DENSITY ON YIELD

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Year 2 of 3 year project

Justification:

Corn seeding rates in Missouri have increased during the past two decades. Previous studies performed in central Missouri have shown that grain yield often increases with increasing stand densities up to about 25,000 plants/acre, so farmers have benefited from increasing seeding rates.

Some farmers have asked if increasing stands to greater than 25,000 plants/acre would result in additional increases in yield. This experiment studies the yield potential of seeding rates as high as 40000 kernels per acre.

Method:

A single corn hybrid, Dekalb DKC61-45, was planted at six seeding rates (18000, 22000, 26000, 32000, 36000, and 40000 kernels per acre) at eight locations throughout Missouri. Locations were Novelty, LaGrange, Henrietta, Urich, Lamar, Charleston, and Oran (Figure 1). Planting dates are listed in Figure 1. Plots were 25 feet long and four 30-inch rows wide. The experimental design was a randomized complete block with four replications.

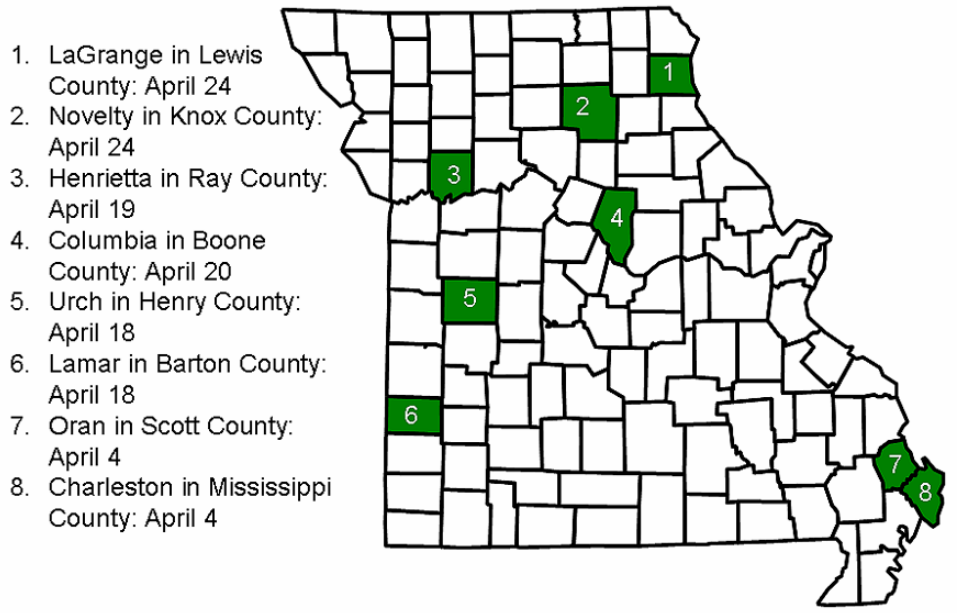

Figure 1. Location and planting dates for eight locations used in corn population study.

Although tillage, fertilizer and herbicides differed slightly among the locations, Dual II Magnum and Aatrex were the most commonly used preemergence herbicides. Roundup WeatherMax was used for post emergence weed control. Oran and Charleston were the only locations to receive irrigation.

Stand counts were made at about the 5-leaf stage, and stand densities were calculated. Before harvest the two center rows were end-trimmed. These two rows were harvested with a plot combine and yield was corrected to 15.5% moisture.

Results:

Corn grain yield responses to stand densities differed considerably among the eight locations (Figure 2, 3, 4, 5, 6, 7, 8, and 9). Much of the difference was related to precipitation amounts and the ability of the soil to store plant available moisture.

Two of our locations, LaGrange and Novelty, are in northeast Missouri. In 2006, northeast Missouri received more rain during critical corn development stages than most other regions of the state and yields were greater than 200 bushels/acre at both northeast locations (Figure 2 and 3). The yield response trend lines were fairly flat so even sparse stand densities of less than 20000 plants/acre produced relatively high yield.

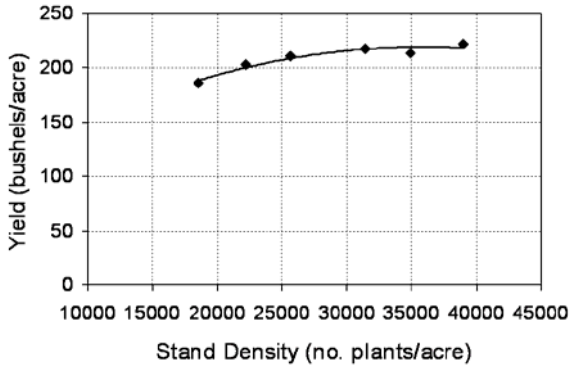

Figure 2. Effects of stand density of corn grain yield at LaGrange. Numbers represent averages of four replications for stand density and yield.

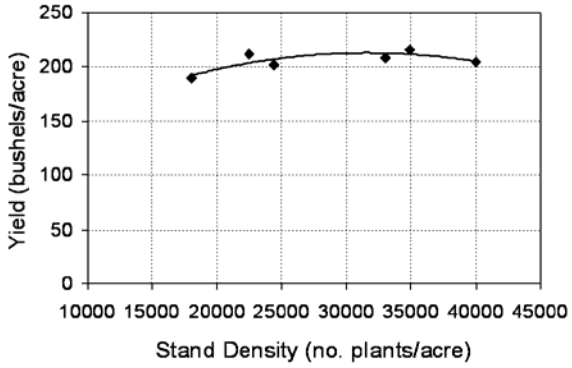

Figure 3. Effects of stand density of corn grain yield at Novelty. Numbers represent averages of four replications for stand density and yield.

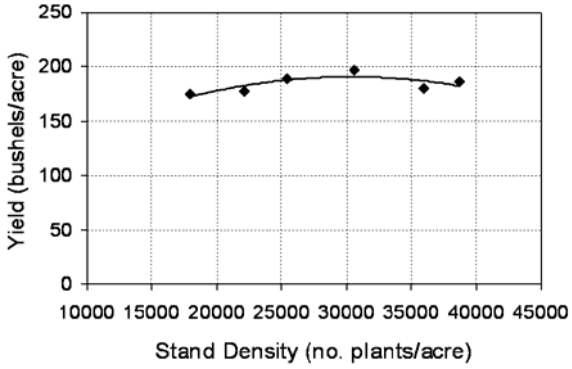

Figure 4. Effects of stand density of corn grain yield at Henrietta. Numbers represent averages of four replications for stand density and yield.

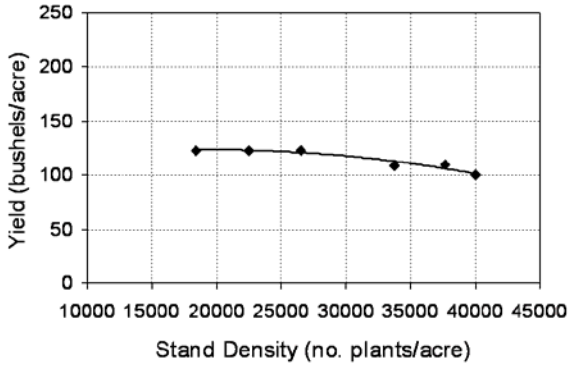

Figure 5. Effects of stand density of corn grain yield at Columbia. Numbers represent averages of four replications for stand density and yield.

Central Missouri experienced significant weather challenges for corn yield production. The Henrietta location is in the Missouri river valley on a Haynie silt loam soil and is often a high yield site. The yield response to stand density curve was flat with less than 30 bushels/acre difference for lowest yield to highest yield (Figure 4). The soil at the Columbia location is a Mexico silt loam with a shallow clay plan. This soil can produce high corn yield if precipitation is frequent during silking and early grain-fill. That was not the situation in 2006 and yield was low. Yield decreased with increasing stand density above 26000 plants/acre (Figure 5).

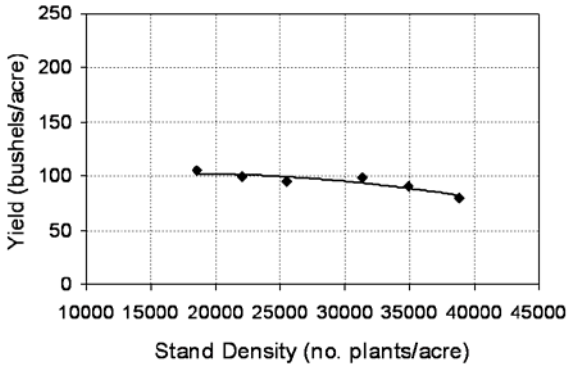

Figure 6. Effects of stand density of corn grain yield at Urich. Numbers represent averages of four replications for stand density and yield.

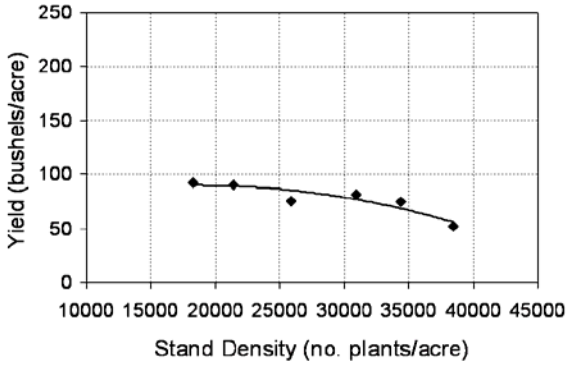

Figure 7. Effects of stand density of corn grain yield at Lamar. Numbers represent averages of four replications for stand density and yield.

Western and southwest Missouri received very little rain during the corn growing season and the dry weather associated with hot temperatures. Yield potential for both Urich and Lamar were very low and increasing stand densities above 20000 plants/acre decreased yield (Figures 6 and 7).

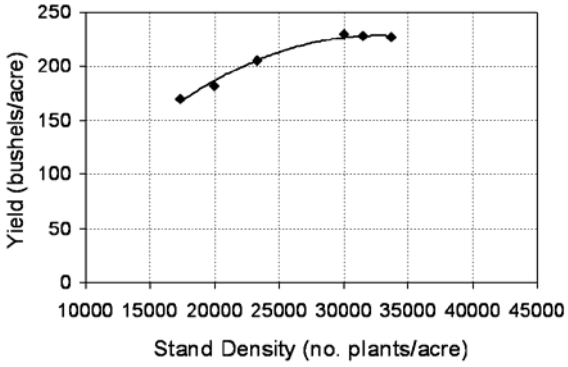

Figure 8. Effects of stand density of corn grain yield at Oran. Numbers represent averages of four replications for stand density and yield.

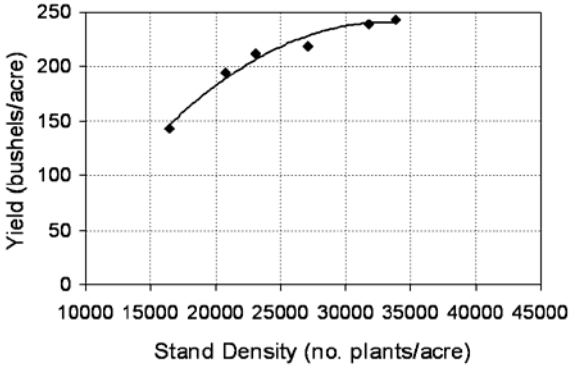

Figure 9. Effects of stand density of corn grain yield at Charleston. Numbers represent averages of four replications for stand density and yield.

Both locations in southeast Missouri, Oran and Charleston, were irrigated (Figures 8 and 9). Maximum yields approached 250 bushels/acre. The response curves at these two locations were the most dramatic with yields increased by nearly 100 bushels/acre as stand density increased from about 18000 to 30000 plants/acre.

Conclusions:

1. Weather conditions including precipitation during silking, temperature during grain-filling and the ability of the soil to store plant available moisture greatly affected yield potential and the shape of the stand density response curve.
2. With irrigation or higher than normal precipitation, corn grain yield was maximized at about 30000 plants/acre.
3. In locations where precipitation was below normal, yield decreased at stand densities greater than 24000 plant/acre, but even under severe weather conditions the yield decrease was small.