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Corn Yield Response to Plant Populations

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Summary

Corn hybrid development with a focus on drought tolerance has emerged in recent years, and producers have questions about their yield performance across a range of plant populations. A two-year study was conducted to determine the yield of corn hybrids across several plant populations. Corn hybrids responded differently in 2013 and 2014. In 2013, a lower yield environment occurred. The hybrid with drought tolerance had the greatest yield of 95 bu/a at a plant population of 21,500 plants/a, whereas the non-drought-tolerant hybrid's greatest yield was 90 bu/a at a plant population of 13,500 plants/a. In 2014, the yield environment was significantly higher. The hybrid with drought tolerance had the greatest yield of 174 bu/a at the greatest plant population of 35,500 plants/a, and the non-drought tolerant hybrid's greatest yield was 169 bu/a at a plant population of 29,500 plant/a.

Introduction

Corn yield can be affected by many factors in Kansas, including soil quality, fertility, crop production practices (planting date, plant population, and hybrid), and weed and pest management. The most significant factors that affect corn yield in Kansas are often related to moisture and heat stress. Several seed companies have devoted considerable resources to breeding hybrids with improved drought tolerance. Although the method of achieving drought tolerance in corn hybrids may differ among companies, the goal of improving water use efficiency can help increase yields of corn grown in water-limited environments. Producers have many questions surrounding the newer corn hybrids labeled as drought-tolerant, and data comparing yields across a range of plant populations need to be evaluated. A two-year study was conducted at the East Central Experiment Field in Ottawa to evaluate two corn hybrids and their yield responses to various plant populations.

Procedures

The experimental site was located on a Woodson silt loam. Plots were strip-till-fertilized into soybean stubble with a mix of 120 lb nitrogen/a, 40 lb P_2O_5/a, and 15 lb K_2O/a. Corn was planted on 30-in. rows on April 4, 2013, with Channel hybrids 197-30 (non-DroughtGuard) and 198 (DroughtGuard) and on April 9, 2014, with Dekalb hybrids DKC50-48 (non-DroughtGuard) and DKC51-20 (DroughtGuard) (Monsanto, St. Loius, MO). The experiment was a randomized complete block design with four replications in a strip-plot arrangement. Plant population was the main factor, and hybrid was the subfactor. Plots were four rows wide, 35 ft long, and planted

at 36,000 seeds/a. At the V6 growth stage when the growing point was above the soil surface, plots were thinned to several plant populations. In 2013 because of low plant emergence, plots were thinned to five populations: 10,000; 13,500; 17,500; 21,500; and 27,500 plants/a. In 2014, seedling emergence was improved and plant populations were thinned to 17,500; 23,500; 29,500, and 35,500 plants/a. Plots were maintained weed-free throughout the season. Corn plots were harvested by plot combine, plot weights were determined, and yields were adjusted to 13% moisture.

Results

Corn hybrids responded differently in 2013 and 2014 (Figures 1 and 2). In 2013, a lower yield environment occurred because of drier than normal weather. In 2013, only 1.37 in. of rain fell through the month of June and the first three weeks of July. The hybrid with drought tolerance had the highest yield of 95 bu/a at a plant population of 21,500 plants/a, whereas the non-drought-tolerant hybrid's highest yield was 90 bu/a at a plant population of 13,500 plants/a. In 2014, the yield environment was considerably better because of cooler and wetter than normal conditions. The hybrid with drought tolerance had a peak yield of 174 bu/a at the highest plant population of 35,500 plants/a, and the non-drought-tolerant hybrid's highest yield was 169 bu/a at a plant population of 29,500 plants/a. The excellent growing conditions in 2014 resulted in above-average corn yields. The highest plant population of 35,500 plants/a was likely not high enough to maximize yield with the drought-tolerant hybrid in 2014 and may have benefited from an increased seeding rate.

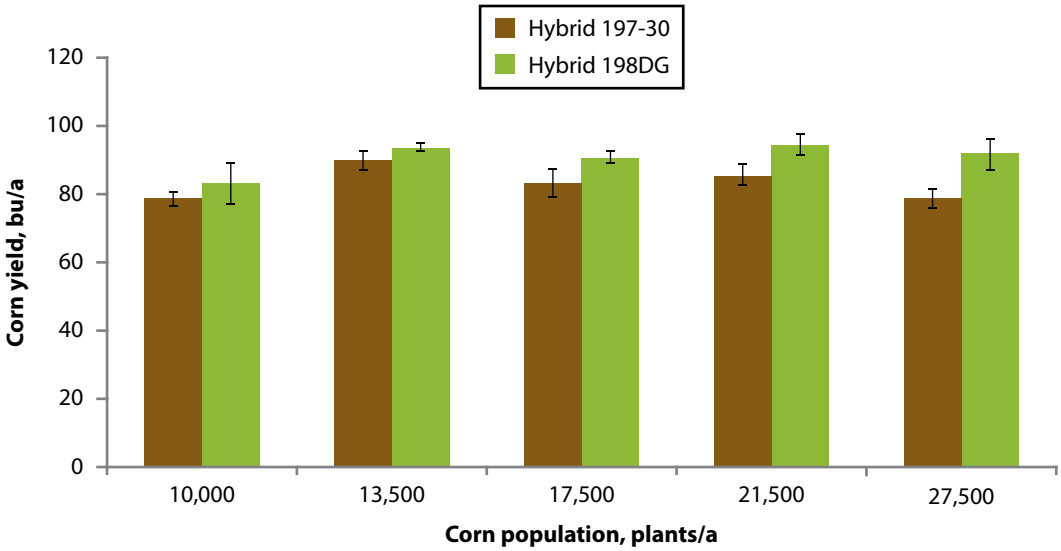

Figure 1. Corn yield response to plant populations in 2013. Corn hybrids included drought-tolerant (Channel hybrid 198; Monsanto, St. Louis, MO) and non-drought-tolerant (Channel hybrid 197-30) traits.

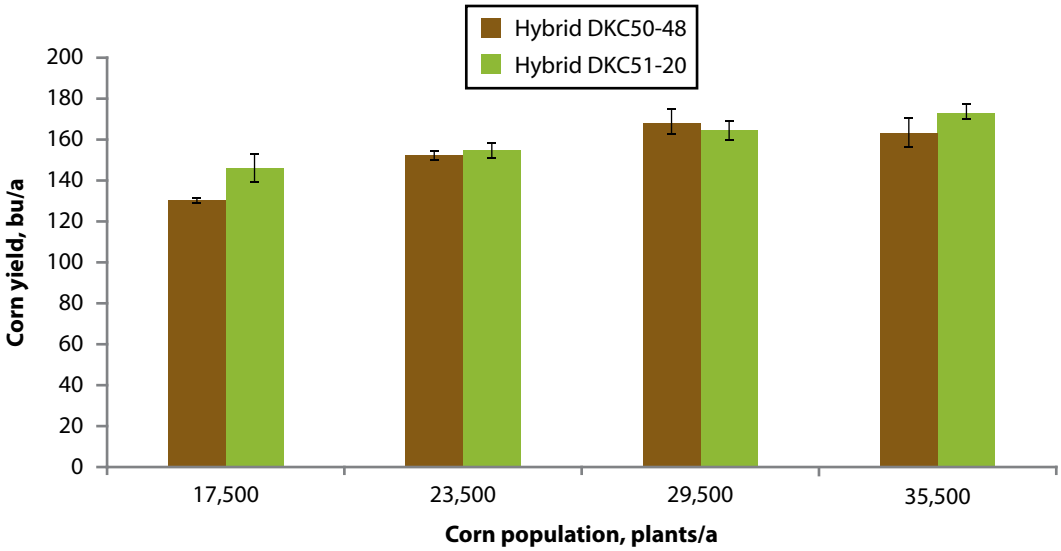

Figure 2. Corn yield response to plant populations in 2014. Corn hybrids included drought-tolerant (Dekalb hybrid DKC51-20; Monsanto, St. Louis, MO) and non-drought-tolerant (Dekalb hybrid DKC50-48) traits.