Equidistant Plant Spacing in Corn

In recent years, trends have shown an increase in corn planting populations. If not managed properly, this increase can lead to competition between plants for resources and compromise yield potential. This study was conducted to determine if an alternative row spacing could offer higher yields when compared to commonly used row spacings.

Study Guidelines

In 2011, a study was conducted at the Monmouth Learning Center to evaluate the effect of true equidistant row spacing on corn production. Plants were arranged either in a row or staggered pattern (Figure 1), which allowed each plant one square foot of area for growth and was equal to a plant density of 43,560 plants per acre. Total plot size in this study was 1,500 sq. ft. with 375 sq. ft. allocated to each hybrid by row configuration (Figure 2). 375 seeds were planted in each individual block. Plots were hand planted from May 18-21 and harvested on September 19.

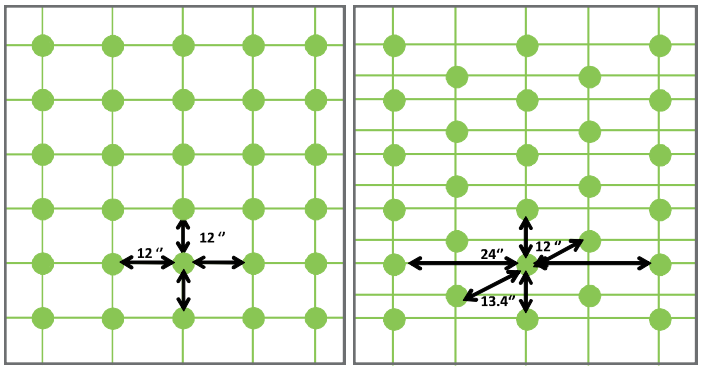

Figure 1. Equidistant plant spacing in a row configuration (left) and a staggered configuration (right).

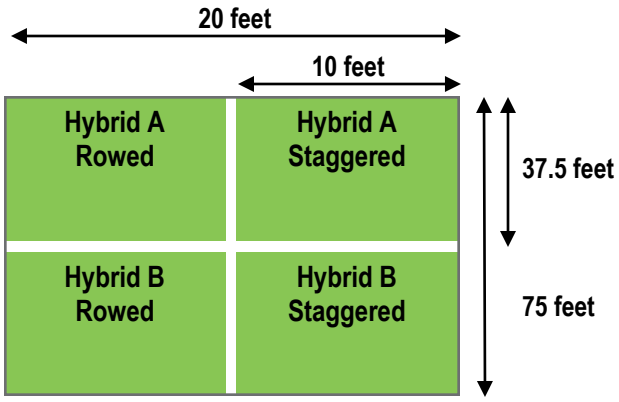

Figure 2. Plot size and square footage for each hybrid and hybrid by row configuration.

The experiment was replicated using two different 112 relative maturity hybrids. The previous crop was corn and no soil insecticide was used in the study. Hybrid A was a Genuity® VT Triple PRO® product; Hybrid B was a YieldGard VT Triple® product. Plots received an application of a stress reducing agent at V6 as well as fungicide applications at V6 and VT. Fertility (on a per acre basis) included 180 lbs of 32% N pre-plant incorporated, 50 lbs of 12-40-0-10S-1Z fertilizer broadcasted at planting, 50 lbs of polycoated urea broadcasted at V6, and 20 lbs of urea broadcasted at V18.

In addition to yield data, information was collected to help identify factors that may affect corn production in equidistant row spacing. Air temperatures were taken within the crop canopy three times throughout the growing season and data was recorded on light penetrating the crop canopy from V8 to R4 in the row configuration of Hybrid B.

Results

Several factors worked to limit yield potential during this study. Cutworm damage reduced plant stands 20-30% in Hybrid A, resulting in stunted plants that did not contribute to yield (Figure 3). Plants were exposed to extreme summer heat during pollination and moisture stress from early July to mid-August. Heavy aphids infestation was a problem late in the growing season at R4-R5 and further reduced yields. Additionally, a hail storm caused severe defoliation at R5.

Hybrids A and B differed in their yield response (Figure 4). Hybrid A did not perform well in the heat and plants were physiologically mature by late August. Plants were also subject to severe stalk lodging. Hybrid B handled stress well and had exceptional late season plant health (Figure 5). Final yield of Hybrid B averaged across both row configurations was 310 bu/acre, close to 100 bu/acre greater than the average yield of Hybrid A at 211 bu/acre. The average yield across both hybrids in the row configuration was slightly higher than in the staggered configuration with average yields being 265 bu/acre and 256 bu/acre, respectively.

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Summary Comments

Plants must intercept large amounts of sunlight in order to maximize yield potential. Corn planted in equidistant row spacing had early and thick canopy closure (Figure 6), which led to increased sunlight capture and helped provide the plant the energy needed to produce higher yields. Canopy closure was achieved at V4 and from V14 to R3, 95% of the light was captured by the canopy. This increased to 98% light capture at reproduction (Figure 7).

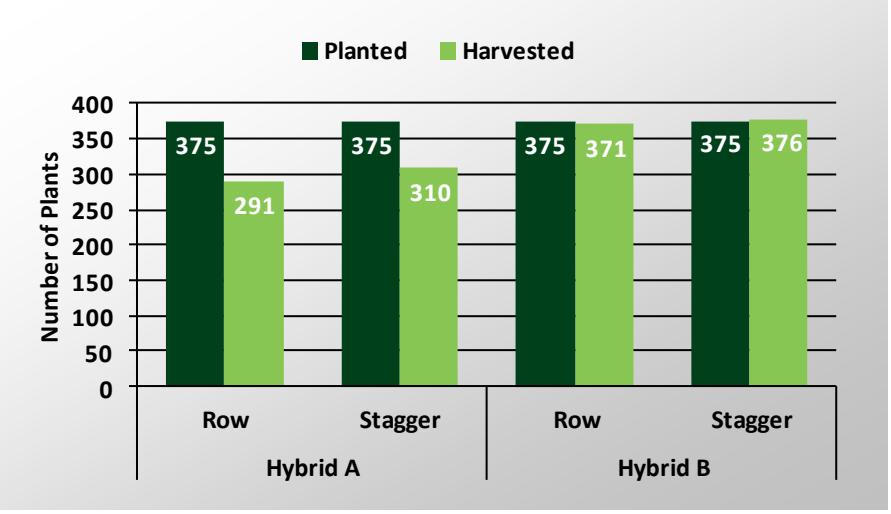

Figure 3. The number of kernels planted and ears harvested per treatment and per hybrid.

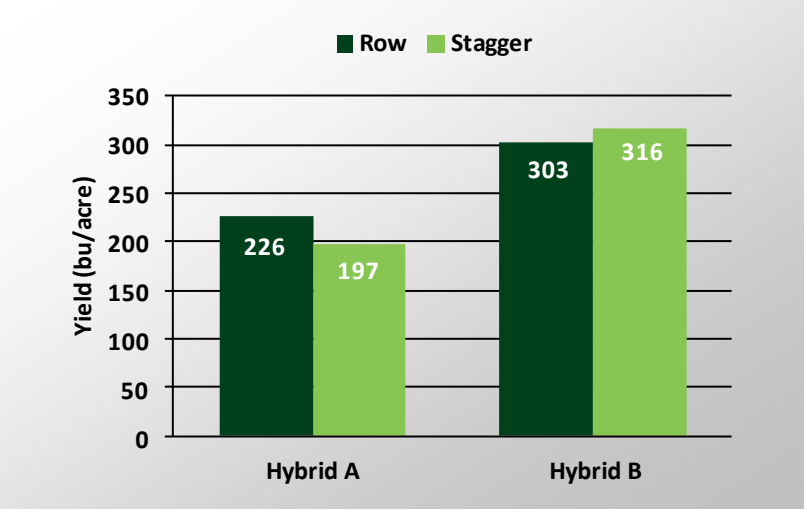

Figure 4. The effects of hybrid and equidistant row spacing configurations on corn yield.

Figure 5. Hybrid B had good late season plant health and good yield.

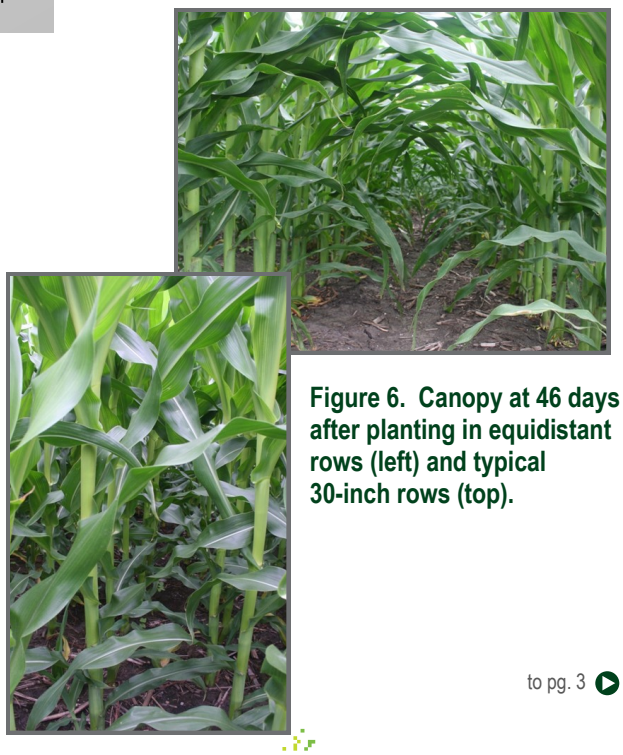

Figure 6. Canopy at 46 days after planting in equidistant rows (left) and typical 30-inch rows (top).

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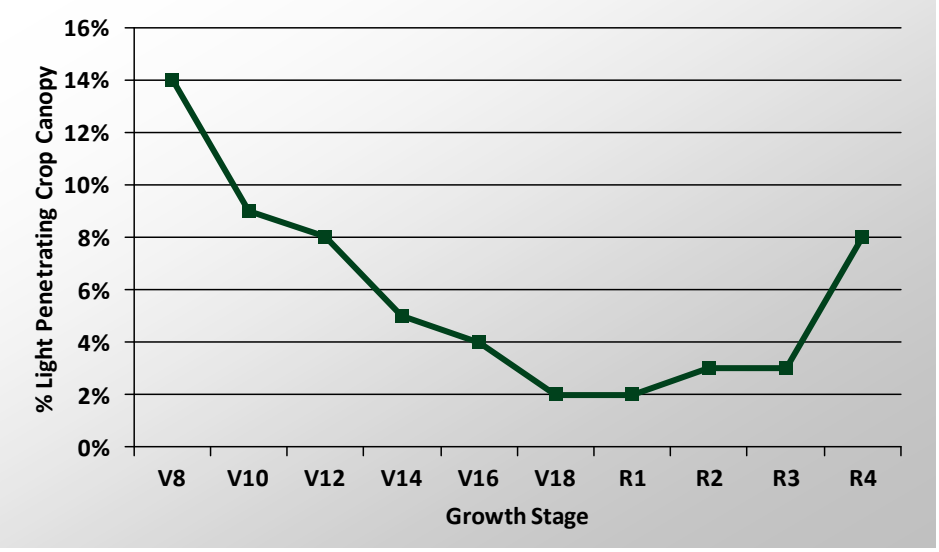

Figure 7. Percent light penetrating crop canopy during different growth stages of Hybrid B in the row configuration.

Equidistant row configurations may also create a microclimate within the canopy that helps to speed plant growth by maintaining plant respiration. Although temperatures were only recorded three times during the growing season, temperatures inside the canopy ranged from 12° to 21° F warmer than temperatures outside the canopy.

The yields of Hybrid A and Hybrid B in equidistant row configurations are in stark contrast to the yield of Hybrid C, which was used in the plot border rows. Border rows were planted at 44,000 plants per acre in 30-inch rows and received the same treatments as Hybrids A and B. The resulting yield was 124 bu/acre. While it must be noted that this hybrid is different from the two used in the experiment, the results still shed light on the effects of overplanting in 30-inch rows.

While large-scale equidistant plant spacing may not be possible with current technology, these results suggest there is untapped yield potential that can be realized by altering row configurations.

The information discussed in this report is from a single site, non-replicated, one-year demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.