Plant Spacing Influence on Sweet Corn Yield and Quality

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Objective:
To evaluate the effect of plant densities between 30,000 and 60,000 plants to the acre on the yield and ear quality of Cabo sweet corn.

Summary:
Yield in tons and dozen per acre were not significantly affected at the plant densities evaluated. The biggest effect was on ear length and above ground plant weight with lower plant populations having longer ears and heavier above ground plant weights. There was also a trend for higher plant populations to produce taller plants.

Methods:
Fertilizer treatments
Prior to planting, 100 pounds 34-0-0, 175 pounds of 0-0-61, 25 pounds of sulfur, and two pounds of actual boron were broadcast and worked into the soil. Nitrogen was applied again when plants were approximately 18 inches tall by broadcasting 150 pounds/acre 34-0-0 followed with 0.5 inches of irrigation. A third application of 28-0-0 was applied just prior to silking through the overhead irrigation at a rate of 50 pounds of nitrogen/acre. pH of the site was 5.9, requiring the addition of 2 tons of lime/acre prior to planting.

Planting
Soil type was Oakville fine sand, 0 to 3% slope with a CEC of 3.6. Cabo (Syngenta Seed Company) sweet corn was planted 30 June 2017 in the following manner:

1. 30,000 plants/acre: Single row 35 inches between rows and 6- inches in the row.
2. 60,000 plants/acre: Double rows, 7 inches between double rows with 35 inches center to center of double rows and 6 inches in each double row.
3. 45,000 plants/acre: Double rows, 7 inches between double rows with 35 inches center to center of double rows and 8-inches in each double row.
4. 36,000 plants/acre: Double rows, 7 inches between double rows with 35 inches center to center of double rows and 10 inches in each double row.
5. 30,000 plants/acre: Double rows, 7 inches between double rows with 35 inches center to center of double rows and 12- inches in each double row.
Planting was done using a Jang precision seeder set at the desired in-row spacing. Previous experience with the planter indicated an insufficient plant stand for the appropriate setting, so the trial was double seeded and plants thinned as needed.

Each plot consisted of eight rows, 50 feet long with the two center rows as data rows. When the plants were approximately 12 inches tall, the best 40 feet of the best inner row was flagged for eventual harvest. The other inner row was used to obtain plant height and weight. Each treatment was replicated four times and the trial planted and analyzed as a completely randomized design.

**Weed control**
After planting, pre-emergent weeds were controlled with an immediate application of Dual Magnum 7.6E and Aatrex 4L at a rate of 1.5 pints and 1 quart per acre, respectively.

**Plant care**
The planting was irrigated as needed with overhead sprinklers. One application of Brigade 2EC (6 ounces/acre) plus Equus 720 SST (1.5 pints/acre) was made just prior to silking to control corn earworm and corn rust, respectively.

**Harvest and data collection**
Plots were harvested when ears were considered mature. Harvest dates were 20 September (Treatments 1 and 5), 25 September (Treatments 3 and 4), and 27 September (Treatment 2). To obtain weight, marketable ears were removed and weighed with husks. Husks were removed for length and diameter measurements. For plant height and weight, 10 plants were cut at the soil line, measured and weighed with ears intact.

**Results:**
The main yield indicators of tons/acre and dozen ears/acre were not significantly different for any of the five treatments evaluated (Table 1). The main differences found were in ear length (Figure 1) and stalk weight, with the lower plant populations of treatment 1 and 5 (~30,000 plants/acre) having statistically similar values for each trait. There was a trend for higher plant populations to have greater stalk height. Ear diameter was largely unaffected by the plant populations evaluated. Harvest date was affected by plant density, with higher population increasing days to maturity.

Several aspects could have influenced plant performance leading to lack of statistical separation. Planting time may not have been the best. The late planting date meant plants were not growing during the highest sun angle of the season. Growth and ear development occurred primarily during July, August and early September when the sun’s angle was on the decline. We also experienced a cooler than normal August. Nutrient values also were not varied proportionality with plant population. Even though there were no apparent visual deficiencies, that does not mean there were not nutrient
limitations. Finally, Cabo may not be the best cultivar for a population trial. It is susceptible to corn rust (Figure 2) which became a significant problem which was enhanced by the increased humidity of a high density planting. It also produces a significant number of ear “bouquets” (Figure 2). These bouquets waste energy and could significantly affect size of the main ear. Pictures of the planting arrangement for the five treatments appear in Figure 3 and 4. Pictures were taken 26 July, nearly four weeks after planting.

The trial will be repeated in 2018 using a different cultivar that is less susceptible to corn rust and having a decreased propensity for bouquet ears. It will also be planted by late May with nutrient levels adjusted for plant density.

Table 1. Yield of Cabo sweet corn at five plant densities at the Southwest Michigan Research and Extension Center in 2017. Bold numbers in the columns are not statistically different from the leader in that column.

<table>
<thead>
<tr>
<th>Approximate plant population</th>
<th>Tons/Acre</th>
<th>Dozen/Acre</th>
<th>Ear Length (inches)</th>
<th>Ear Diameter (inches)</th>
<th>Stalk Wt. (pounds)</th>
<th>Stalk Ht. (inches)</th>
</tr>
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<tbody>
<tr>
<td>30,000 (double row)</td>
<td>8.47</td>
<td>2131</td>
<td>7.56</td>
<td>1.85</td>
<td>1.89</td>
<td>72.75</td>
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<tr>
<td>30,000 (single row)</td>
<td>7.89</td>
<td>2053</td>
<td>7.34</td>
<td>1.85</td>
<td>1.70</td>
<td>76</td>
</tr>
<tr>
<td>36,000</td>
<td>7.98</td>
<td>2092</td>
<td>7.25</td>
<td>1.83</td>
<td>1.40</td>
<td>79</td>
</tr>
<tr>
<td>45,000</td>
<td>6.72</td>
<td>2147</td>
<td>6.95</td>
<td>1.78</td>
<td>1.25</td>
<td>83.25</td>
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<tr>
<td>60,000</td>
<td>7.11</td>
<td>2458</td>
<td>6.8</td>
<td>1.89</td>
<td>1.11</td>
<td>79</td>
</tr>
<tr>
<td>Isd 0.05</td>
<td>ns</td>
<td>ns</td>
<td>0.26</td>
<td>0.08</td>
<td>0.37</td>
<td>8.17</td>
</tr>
</tbody>
</table>
Figure 1. Ear traits of five plant population treatments in 2017 at the Southwest Michigan Research and Extension Center, Benton Harbor. Left to right: 30,000 plants/acre, single row; 60,000 plants/acre, double row; 45,000 plants/acre, double row; 36,000 plants/acre, double row, and 30,000 plants/acre double row.
Figure 2. Rust (*Puccinia sorghi*) on Cabo sweet corn (left). “Bouquet” ears on Cabo sweet corn (right.)
Figure 3. Plant density of Cabo sweet corn planted at the Southwest Michigan Research and Extension Center in 2017. Left: Single row, 30,000 plants/acre; Middle: Double row, 60,000 plants/acre; Right: Double row, 45,000 plants/acre.
Figure 4. Plant density of Cabo sweet corn planted at the Southwest Michigan Research and Extension Center in 2017. Left: Double row, 36,000 plants/acre; Right: Double row, 30,000 plants/acre.