**Corn Yield Response to Relative Maturity and Plant Population**

**Background**
Corn product selection is normally within the relative maturity (RM) for the geographic location. This is due to the duration of the growing season which affects the growing degree units (GDUs) required by the product for flowering and reaching physiological maturity (black layer). Yield potential is hampered if products are placed outside their optimal GDU requirements and is typically more variable among corn products within the same RM than between RMs. Within a given location, yield potential generally increases as RM increases from Early- to Mid- to Late- (full) season corn products; although Late-RM corn products do not consistently out-yield mid-RM corn products. This yield trend is in direct relation to GDU accumulation/availability during the growing season.¹

Of great importance after product selection is the seeding rate (plant population) at which corn products are planted. Corn yield potential increases with increasing plant population until reaching a threshold beyond which yield decreases with further increases in plant population. Modern breeding efforts are raising this population threshold, resulting in corn products that are better capable of withstanding stresses at higher populations and can produce an ear on every plant. With adequate kernel number and weight, modern corn products can provide higher yields at higher populations.²,³ This study was established to determine yield (and profit) disparities of corn products within and between different RMs planted at different seeding rates.

**Study Guidelines**
Corn products from several brands were included for each RM group and had Bacillus thuringiensis (B.t.) traits that ranged from above ground only, to both above and below ground insect protection. Study was planted April 29, 2015 into a field that was previously soybean. The 47 corn products were planted at 32,000 (K), 35K, and 38K seeds/acre. Field was conventional tillage with chisel plow in the fall followed by soil finisher in the spring. Standard weed control was applied across the study and consisted of a pre-emergence and post-emergence herbicide program. The study was a one replication strip trial consisting of 30-inch row spacing, 3 rows/corn product, and 200-ft long strips. Plots were harvested on October 7, 2015 and yield was adjusted to 15% moisture content.

<table>
<thead>
<tr>
<th>Maturity Group</th>
<th>Number of Products in Maturity Group</th>
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<tbody>
<tr>
<td>Early-RM (99 to 104 days)</td>
<td>14</td>
</tr>
<tr>
<td>Mid-RM (105 to 110 days)</td>
<td>15</td>
</tr>
<tr>
<td>Late-RM (111 to 115 days)</td>
<td>18</td>
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**Results and Discussion**
Corn Products EG, EH, EJ, EK, and EN should not be planted at populations greater than 35K. Within the Early-RM group, 32K was the lowest yielding seeding rate for most of the corn products but was the highest yielder for ED. For other corn products, such as EA and EM, there was not much difference between 35K and 38K (Figure 1). Within the Mid-RM group, corn products such as MD, MM, and MO showed large differences between populations, whereas corn products like MH, had less yield difference. MA and MO did not respond positively to increased populations but MB, MG, and MI did (Figure 2).

An inconsistent corn product response to plant population was observed within the Late-RM group. Some corn products, such as LH, yielded nearly the same at 32K and 38K populations but approximately 10 bu/acre higher than at 35K. Corn products such as LK, yielded approximately 18 bu/acre higher at 35K compared to 32K and 38K, which yielded 225 bu/acre each (Figure 3). Corn product LH’s response, as also seen in LD, LF, LN, and LR, make it difficult to make a population prescription for them. For LK and others like it, such as LE, LI, LM, and LP; approximately 35K is their optimal seeding rate. Corn products LA, LB, LG, and LJ should be planted at higher seeding rates, but LL and LQ products should be planted at 32K.
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In general, 35K or higher seeding rate is required for consistent higher yields within the Early-RM group as shown by the win rates in Figure 4. Late-RM corn products should be planted at higher (38K) populations for the best chance of realizing the highest yield potential. Within the Mid-RM group, more research is needed to determine the best population for each corn product as no consistent pattern was observed. When in doubt, a corn product could be planted at 32K for the best chance of providing the highest yield potential.

Figure 5 indicates a stair-step increase in yield and profitability as RM increases. Within the Early-RM group, the highest yielding population (38K) doesn’t translate into the most profit; whereas in the Late-RM group, profit is linearly correlated with yield. For the Mid-RM corn products, for the most profit, plant at 32K as yields may not be significantly different at the different seeding rates and profit margin could depend only on seed cost.

Relative maturity affects grain moisture content at harvest. On average, grain moisture content at harvest increases by 0.25-0.44% with each one-day increase in RM. Products should reach maturity at least 10 days before the first frost (32°F) to allow time for grain dry-down.

Takeaways

In some situations, additional cost could be incurred to dry wet grain. Thus, the economic picture captured in Figure 5 could be affected. Selecting corn products of appropriate maturities is important for a balance between yield potential and grain moisture content at harvest. There were differential corn product responses to plant population within and between RM groups (Figures 1-3 and 6). Across plant populations, only one corn product (EF) out of 14 made more than 220 bu/acre among the Early-RM group, whereas 9 out of 15 and 14 out of 18 among the Mid- and Late-RM corn products, respectively, yielded more than 220 bu/acre. Three corn products yielded 240 bu/acre or higher among the Mid-RM group versus 5 corn products among the Late-RM group (Figures 1-3).
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This trial confirmed a known phenomenon that Mid- to Late/Full-season corn products generally have higher yield potential than Early-maturing corn products. This is because they utilize more of the GDUs available during the growing season.\(^1\) In all geographic locations, it is advised that multiple corn products of varying maturities be selected. If planted at their optimal planting dates, such a strategy will help spread risk and, when needed, widen harvest interval. Several other factors, including agronomic characteristics and trait package, also affect product selection. Local crop advisors or agronomists should therefore be consulted to help make the best product selections.

Sources


Websites verified on December 30, 2015.

Legal Statement
The information discussed in this report is from a multiple site, single year, non-replicated 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.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

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Figure 2. Yield response of Mid-RM corn products to plant population (K = 1,000 seeds/acre).
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Figure 3. Yield response of Late-RM corn products to plant population (K = 1,000 seeds/acre).

Figure 4. The probability* of a plant population out-yielding the others within a relative maturity group.

*The percentages in Figure 4 were obtained by dividing the number of times a plant population was the highest yielder by the total number of entries in the group and then multiplying by 100. There were 14 Early-corn products, 15 Mid-corn products, and 18 Late-corn products. Win rates should not be compared between maturity groups. K = 1,000 seeds/acre.
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Figure 5. Economic effect of relative maturity and plant population on corn productivity.*

* Average gross income was adjusted for seed cost using an estimated $300 for a bag of seed across all brands and corn products, and corn price at $3.80/bu. Yield values are the averages from the data shown in Figures 1, 2, and 3 above. K= 1,000 seeds/acre.

Figure 6. Samples of ears from the different populations. Yield increased with population for EF but was nearly the same for LC. Picture shows three ears per population.