NO-TILL CORN RESPONSE TO POTASSIUM (K) FERTILIZATION

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Introduction

• Frequent reports of K deficiency.
• More often seen in no-till.
• Do current soil test K recommendations need modification?
• Does starter fertilizer containing K prevent deficiencies?
Procedure

• Long-term plots with wide range of soil test K (VL to EH, 60 to 265 ppm).

• Response to NPK starter (100/9-23-30) across range of soil test K levels.

• Corn yield responses measured over 4 yr.
Soil test K interpretation for corn (Group B soils)

<table>
<thead>
<tr>
<th>Category</th>
<th>Soil test K (ppm)</th>
<th>Recom.* (lb K₂O/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V. low (VL)</td>
<td>&lt; 70</td>
<td>100</td>
</tr>
<tr>
<td>Low (L)</td>
<td>70-90</td>
<td>90</td>
</tr>
<tr>
<td>Optimum (O)</td>
<td>91-110</td>
<td>60</td>
</tr>
<tr>
<td>High (H)</td>
<td>111-150</td>
<td>30</td>
</tr>
<tr>
<td>Ex. high (EH)</td>
<td>&gt; 150</td>
<td>0</td>
</tr>
</tbody>
</table>

* 151-170 bu/acre yield goal.
**Procedure**

- 1993 to 1996.
- P and K broadcast to some plots (1993 & 1995 – spring disked & chisel plowed) to expand the range of soil test levels.
- No-till in 1994 and 1996.
Soil K response relationship relative to current soil test interpretation ranges at Arlington, 1993 to 1996

![Graph showing soil K response relationship with relative yield and soil test K ppm.]
## Growing season characteristics

<table>
<thead>
<tr>
<th>Year</th>
<th>PDRM*</th>
<th>F.F. days</th>
<th>GDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>225</td>
<td>154</td>
<td>2055</td>
</tr>
<tr>
<td>1994</td>
<td>228</td>
<td>189</td>
<td>2293</td>
</tr>
<tr>
<td>1995</td>
<td>227</td>
<td>145</td>
<td>2413</td>
</tr>
<tr>
<td>1996</td>
<td>228</td>
<td>170</td>
<td>2043</td>
</tr>
</tbody>
</table>

* Planting dates: Apr. 30 to May 3; RM=105
Relationship between soil test K level and yield response to starter fertilizer at Arlington, 1995

\[
y = \begin{cases} 
343 - 6.82x + 0.034x^2 & \text{if } x \leq 100 \\
0 & \text{if } x > 100 
\end{cases} 
\]

\[R^2 = 0.52 \quad n = 54\]
Relationship between soil test K level and yield response to starter fertilizer at Arlington, 1996

\[
\text{QRP} \quad y = 145 - 2.04x + 0.0075x^2 \\
\text{if } x \leq 136 \quad y = 6 \text{ if } x > 136 \\
R^2 = 0.32 \quad n = 111
\]
Relationship between soil test K level and yield response to starter fertilizer at Arlington, 1993 to 1996

\[
y = \begin{cases} 
153 - 2.35x + 0.0092x^2 & \text{if } x \leq 128 \\
0 & \text{if } x > 128 
\end{cases}
\]

\[R^2 = 0.34 \quad n = 309\]
Relationship between temperature (GDD and departure – May to September) and maximum soil test K level where yield response to starter fertilizer occurred.

\[ y = 1119 - 0.84x + 0.00017x^2 \]

\[ R^2 = 0.97 \]
Relationship between temperature (GDD and departure – May to September) and maximum soil test K level where yield response occurred.

![Graph showing the relationship between cumulative GDD, critical soil test K level, and air temperature departure. The graph includes data points for 1993, 1994, 1995, and 1996.]
Summary

• Results support the soil test K categories used for current K fert. recommendations.

• Little response to increasing soil test K above 110 ppm.

• Frequency and size of response to starter was influenced by GDD accumulation.

• Response to starter occurred at higher soil test K levels in cooler growing seasons.