ROW CROP STARTER FERTILIZER – DOES IT MATTER IF, WHERE AND WHEN YOU PLACE IT?

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NDSU Corn Starter Fertilizer Recs

- goal: HIGH testing soil for P & K
  ✓ >12 ppm P (Olsen) and >200 ppm K
- apply starter as band near seed (≤2”)
  ✓ 3 gpa 10-34-0
- apply zinc if <1 ppm
Corn GRAIN YIELD response to soil P levels (3-year average), Univ. of Minnesota

\(\text{bu/acre} \quad 100 \quad 125 \quad 150 \quad 175 \quad 200\)

- low-P soil: 162.6
- high-P soil: 192.1

\(^a\)25 or 50 lb P2O5/A applied to low-P soil and 20 or 40 lb P2O5/A applied to high-P soil.

G. Randall
Strip-till corn GRAIN YIELD among 10-34-0 fertilizer placement methods, Carrington, 2013*

*P: 5 ppm (low); deep band = 5-6” depth; 10-34-0 at 12 gpa (broadcast at 18 gpa). LSD (0.05) = NS.
Fertilizer (10-34-0) placement methods:
Deep band (during strip tilling)
Strip-till corn stand among fertilizer placement methods, Carrington, 2008-10 and 2012 (4 site-years)*

*10-34-0 rates = 5,6 or 12 gpa. Statistically significant (LSD 0.05): 2012 (NS other years). IF=10% lower stand vs utc (2008-10: 5-6 gpa = 6%; 2012: 12 gpa = 27%).
Strip-till corn GRAIN YIELD among fertilizer placement methods, Carrington, 2008-10, 2012 (4 site-years)*

*P: 2008=20 ppm, 2009=9 ppm, 2010=10 ppm, 2012=6 ppm; 5-12 qpa 10-34-0. LSD (0.05) = NS each year.
Strip-till corn plant development differences among fertilizer placement methods, Carrington, 2010, 2012-13 (3 site-yr)*.

*10-34-0 rates: 2010=6 gpa; 2012-13=12 gpa.
Statistically significant (LSD=0.05): 2012=emergence and silk dates.
Strip-till corn GRAIN YIELD among fertilizer placement methods, Carrington, 2008-10, 2012-13 (5 site-years)*

*P: 2008=20 ppm, 2009=9 ppm, 2010=10 ppm, 2012=6 ppm, 2013=5 ppm; 5-12 gpa 10-34-0; LSD (0.05) = NS each year.
Deep band fb in-furrow starter fertilizer?

DB/IF untreated check
(July 3, 2012)
Strip-till corn GRAIN YIELD among fertilizer placement methods, Carrington, 2010 and 2012-13*

*P: 2010=med (10 ppm), 6 or 3/3 gpa 10-34-0; 2012-13=low (5-6 ppm); 12 or 6/6 gpa 10-34-0. LSD (0.05) = NS each year.
Strip-till corn GRAIN YIELD among fertilizer placement methods, Carrington, 2010 and 2012-13*

*P: 2010=med (10 ppm), 6 or 3/3 gpa 10-34-0; 2012=low (5-6 ppm); 12 or 6/6 gpa 10-34-0. LSD (0.05) = NS each year.
Strip-till corn TW and harvest seed moisture differences among fertilizer placement methods, Carrington, 2010, 2012-13 (3 site-yr)*.

*Statistically significant (LSD=0.05): 2012=TW and moisture.
CREC Corn Research Summary: YIELD response

- Starter fertilizer (10-34-0) placement
  - Use in-furrow as starter but not as soil P builder (≤6 gpa)
  - At higher app rates (6-12 gpa)
    - 2” band = deep band/IF > deep band > check
## Corn YIELD response to in-furrow K, CREC, 2008 and 2013

<table>
<thead>
<tr>
<th>Soil K (ppm)</th>
<th>Treatment</th>
<th>Rate (product/A)</th>
<th>2008</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>164 (high)</td>
<td>check</td>
<td>x</td>
<td>26,890</td>
<td>100.2</td>
</tr>
<tr>
<td>164 (high)</td>
<td>0-0-60</td>
<td>10 lb</td>
<td>23,240</td>
<td>107.6</td>
</tr>
<tr>
<td>142 (med)</td>
<td>check</td>
<td>x</td>
<td>39,180</td>
<td>84.9</td>
</tr>
<tr>
<td>142 (med)</td>
<td>KTS</td>
<td>1 gpa (+ 4 gpa water)</td>
<td>42,170</td>
<td>84.8</td>
</tr>
<tr>
<td>LSD (0.05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Zinc deficiency symptoms in corn
Corn YIELD with zinc, Carrington, 2007.*

LSD (0.05) = NS

* untreated check
* PPI zinc sulfate (10 lb/A)
* zinc seed trts (4)
* foliar zinc (3)

*zinc soil test = 0.51 ppm (low).
Corn YIELD response to foliar zinc, Carrington, 2013*

*Zinc: soil test=0.62 ppm; 1 qt/A chelated product [9.5%N, 10% Zn and 4% S (NW Chemical)] applied at V6 stage. LSD (0.05) = NS.
Soybean yield response to soil P levels, Univ. of Minn. (3-year average).\textsuperscript{a}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{soybean_yield_response_graph.png}
\caption{Soybean yield response to soil P levels, Univ. of Minn. (3-year average).}
\end{figure}

\textsuperscript{a}25 or 50 lb P2O5/A applied to low-P soil and 20 or 40 lb P2O5/A applied to high-P soil.
### Soybean Phosphate Rate x Placement x Tillage, Minnesota (3-yr average)*

<table>
<thead>
<tr>
<th>Tillage</th>
<th>P rate</th>
<th>Band (not with seed)</th>
<th>Broadcast</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>lb/A</td>
<td>Bushels/A</td>
</tr>
<tr>
<td>chisel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>29.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>44.1</td>
<td>44.9</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>44.2</td>
<td>44.3</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>46.1</td>
<td>50.3</td>
<td></td>
</tr>
<tr>
<td>92</td>
<td>51.5</td>
<td>52.1</td>
<td></td>
</tr>
<tr>
<td>average</td>
<td>46.5</td>
<td></td>
<td>47.9</td>
</tr>
<tr>
<td>no-till</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>29.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>39.4</td>
<td>41.8</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>43.4</td>
<td>45.8</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>45.2</td>
<td>46.2</td>
<td></td>
</tr>
<tr>
<td>92</td>
<td>43.7</td>
<td>48.3</td>
<td></td>
</tr>
<tr>
<td>average</td>
<td>42.9</td>
<td></td>
<td>45.5</td>
</tr>
</tbody>
</table>

*low soil P level; 30-inch rows*
Soybean Establishment Study, CREC, 2011:
SEED YIELD WITH TILLAGE SYSTEMS AND METHODS OF FERTILIZER APPLICATION.

P = med (8 ppm) and K = high (216 ppm). 6-24-6 broadcast PRE applied at 14.5 gpa and 2x0 band at planting at 10 gpa.
Soybean Establishment Study, CREC, 2011-13:

SEED YIELD WITH PLANTING-TIME FERTILIZER

P = low-med and K = high-VH. 6-24-6 applied as band at planting or broadcast PRE (not mechanically incorporated). Averaged across planting dates and tillage systems.
Soybean yield with IN-FURROW P placement, Carrington, 8 site-yr (1998, 2005-10)*.

*In-furrow rates: 45-50 lb/A 11-52-0 or 4-8 gpa 10-34-0; various soil P levels and row spacings.

G. Endres, P. Hendrickson and B. Schatz
Soybean response to low rates of in-furrow liquid fertilizer, CREC, 2011

<table>
<thead>
<tr>
<th>Fertilizer</th>
<th>Rate (gpa)</th>
<th>Stand</th>
<th>Seed yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis</td>
<td>x</td>
<td>148,100</td>
<td>44.8</td>
</tr>
<tr>
<td>Untreated check</td>
<td></td>
<td>131,100</td>
<td>44.1</td>
</tr>
<tr>
<td>10-34-0</td>
<td>2</td>
<td>114,900</td>
<td>41.2</td>
</tr>
<tr>
<td>Untreated check</td>
<td></td>
<td>102,300</td>
<td>41.2</td>
</tr>
<tr>
<td>6-24-6</td>
<td>3</td>
<td>114,900</td>
<td>41.2</td>
</tr>
<tr>
<td>LSD (0.05)</td>
<td></td>
<td>30,700</td>
<td>NS</td>
</tr>
</tbody>
</table>

Spring soil analysis: $P = 17 \text{ ppm (high)}$; $K = 235 \text{ ppm (high)}$. Soybean planted in 30-inch rows.
Pinto Bean Starter Fertilizer Research, 2009-13

- strip till (fall, except spring in 2013)
- spring P soil analysis: 5-10 ppm (L-M)
- 3-8 gpa of 10-34-0 at planting:
  1. untreated check
  2. in-furrow (single-disk opener)
  3. 2” band (from seed)
  4. mid-row band (2009-11; 30” plus 22” rows in 2011)
  5. broadcast (2013)
Strip-till pinto bean yield among fertilizer placement options, Carrington, 5 site-yr (2009-13)*

*spring soil tests: P=5-10 ppm (low-med); 10-34-0 rates: 2010=4 gpa; 2013=5 gpa; and 2009, 2011-12=6 gpa,
Strip-till pinto bean response among rates of in-furrow 10-34-0, Carrington, 2012-13*

*soil P=5-6 ppm (low). Data averaged across two row spacings.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Stand (%)</th>
<th>Yield (cwt/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>untreated</td>
<td>100</td>
<td>30.2</td>
</tr>
<tr>
<td>IF 2.5-3 gpa</td>
<td>97</td>
<td>34.0</td>
</tr>
<tr>
<td>IF 5-6 gpa</td>
<td>86</td>
<td>31.0</td>
</tr>
</tbody>
</table>

*yield (cwt/A)
Pinto bean response to *in-furrow* 10-34-0, Carrington, 2013* (Zilahi-Sebess and Teboh)

*10-34-0 applied with water at 4 gpa. Plant stand counts taken 39 DAP.
Strip-till pinto bean yield among fertilizer placement options, Carrington, 2009-11*.

*spring soil tests: P=7-10 ppm (low-med); 10-34-0 rates: 2010=4 gpa, 2009 and 2011=6 gpa. 30-inch row spacing plus 22-inch rows in 2011.
Yield response

- **Starter fertilizer placement** (5 site-yr)
  - 2” band > IF > untreated check
Questions or Comments?