Starter Fertilizer Placement for Row Crops

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Outline

• Fertilizer Placement
• What is a Starter and forms
• Benefits
• Salt injury and tolerance
Placement Options

- **Broadcast**: broadcast on the soil surface.
- **Starter**: placed in band near seed during planting.
- **Pop-up**: placed in contact with seed.
- **Deep Band**: Immobiles placed 4 to 6 inches below.
- **Surface Band**: placed in a band on the surface.
- **Dual Band**: anhydrous and liquid lines attached to shank.

Adapted from University of Minnesota Extension Publication
What is Starter Fertilizer?

• Small amount of a multi-nutrient fertilizer applied in close proximity to or in a seed-row
  • Improved early season growth and establishment
  • Improve yield and or harvestable quality
Forms of Starter Fertilizers

• Granular
  – MAP 11-52-0
  – DAP 18-46-0 (Caution)
  – Blends N, P, K, S, etc. (Urea = Caution)
  – Europe Composite multi-nutrient granules (i.e. 20-10-10-3S)

• Liquid Formulations
  – 10-34-0
  – Designer formulations

• Dry Vs Liquid
Seedling Roots

Figure 1. A seedling root system cannot acquire needed nutrients from the bulk soil.

Figure 2. A well-developed root system can more effectively obtain nutrients from the soil.
Seedling Roots

Figure 3. Diagram of most effective starter fertilizer placement for corn. Seed should be planted about 1.5 inches below the soil surface. The fertilizer band should be placed 2 inches beside and 2 inches below the seed so that developing roots can easily obtain necessary nutrients, but not cause injury to seedling.

Figure 4. Pop-up fertilizer placement in relationship to a germinating corn seed.
The first roots grow from the seed, but the main root system starts from the first node above the seed.

Planting depth affects the depth of the seed roots, but the depth of the initiation of the main root system is the same, regardless of planting depth.
Shown Benefits

- **Sorghum**: increased early growth, reduced grain moisture, No source diff. Lamond, Whitney KSU
- **Soybean**: Mixed reviews
- **Small Grains**: Acid Soils, fall growth
Results with Corn

(G. Rehm U of Minnesota, 2006)

• The fertilizer was placed either in contact with the seed or close to the seed with a planter attachment.

• Results varied with soil texture.
  – For non-sandy soils, reasonable rates of five to 10 gallons per acre had no negative effect on either emergence or yield.
  – But results with sandy soils were quite different. With these soils, fertilizer placed in contact with the seed reduced emergence, and then yield. Rates of five gallons per acre or less caused no problems. But sandy soils dry out fast after planting, and there is a risk of damage when fertilizer is placed close to the seed.

• The traditional 2 x 2 starter band is not necessary. There are good substitutes. Fertilizer can be placed close to the seed if soils are not sandy, and there will be no damage to emergence and yield.
P Placement Can Influence Crop Response

Spring broadcast, 40 lb P$_2$O$_5$/A

Seed-placed, 20 lb P$_2$O$_5$/A
What Role Does P Placement Play in Canola Yield?

- Little difference was recorded between seed row and banded P when N was banded.
- The split of P between 1/3 seed row and 2/3 band shows a minor advantage, and is attributed to those sites with cold soils at seeding.

Western Co-operative Fertilizers Ltd.

75 lb N/A + 25 lb P$_2$O$_5$/A
Proportion of Fertilizer P Taken Up by Canola

Karla and Soper, 1968
Reduced Rates

• Cant Get by with Less N
• P & K 20-40% the OSU

• Secondary and Micros reduce by 20 to 90%.
How Much Starter Fertilizer Should Be Used?

How low can you go and still obtain a benefit?

How high can you go before salt and ammonia toxicity?

• It is both soil and crop dependent
Corn

–Band

• suggest that the rate of nitrogen applied in a band less than 50 pounds per acre
• applications of reasonable rates of phosphate, potash and zinc are effective management practices. However, caution is urged for banded applications of nitrogen. (G. Rehm U of Minnesota, 2006)

–Seedrow

• lower rates
• truly a starter fertilizer
• quite successful even on higher fertility soils
The general sequence of salt tolerance of common crops is: **barley > wheat > grain sorghum >> corn > soybean.** Soil texture can also influence the salt effect.

<table>
<thead>
<tr>
<th>Placement (distance from seed)</th>
<th>Sandy Soils</th>
<th>Loamy Soils</th>
<th>Clayey Soils</th>
</tr>
</thead>
<tbody>
<tr>
<td>In direct contact</td>
<td>6</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>¼ - ½ inch</td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>1 – 2 inches</td>
<td>20</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>&gt;2 inches</td>
<td>25+</td>
<td>38+</td>
<td>50+</td>
</tr>
</tbody>
</table>

Safe levels of fertilizer salt (N + K2O in lbs/acre) to apply as a function of soil texture and placement (adopted from Dr. Jessica Davis, Colorado State University).
UREA in Pop Up

- The effect of urea applied in contact with corn seed on emergence and corn yield.

<table>
<thead>
<tr>
<th>N Applied with Seed</th>
<th>Emerged Population</th>
<th>Grain Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lb./Ac</td>
<td>Plants/acre</td>
<td>Bu./ac</td>
</tr>
<tr>
<td>0</td>
<td>29,968</td>
<td>181</td>
</tr>
<tr>
<td>7.5</td>
<td>21,127</td>
<td>156</td>
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<tr>
<td>15.0</td>
<td>15,246</td>
<td>145</td>
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<tr>
<td>30.0</td>
<td>7,550</td>
<td>96</td>
</tr>
</tbody>
</table>

George Rehm University of Minnesota
Row Cleaners

- Some research has shown reduced impact of starter fertilizer when row cleaners are used.
Acknowledgements

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*(IPNI)*

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