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- Coldspring Ventures
- Pickseed
- Diefenbaker Seed
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What is WARC?

• Non-profit producer based organization
  • Board of Directors of local producers
    • Provide insight into current concerns and interests of local producers

• Who Funds Us?
  • Commodity groups
  • Saskatchewan Ministry of Agriculture
  • Canada-Saskatchewan Growing Forward 2 bi-lateral agreement
  • Private industry

• Independent organization that works in harmony with Agriculture and Agri-Food Canada at the Scott Research Farm
• Network of producer-directed applied research organizations
• Eight sites among Saskatchewan
• All operating individually
TYPE OF RESEARCH CONDUCT

• Can Farmer-Saved Seed of Wheat Perform as well as Certified Seed?
• Revisiting N Fertilizer Recommendations for SK: Are we measuring the right soil N pool?
• Peaola vs. Monocrop Seeding Rates and Fungicide Applications
• Dry Bean Inoculation and Fertilizer Strategies for Soil Seeded Production
• Production management strategies to improve field pea root health in aphanomyces contaminated soils
• Layering Pre & Post herbicides for managing Gr. 2 HR kochia and wild mustard in lentils
• Demonstrating new and traditional forage broadleaf and grass forage varieties
ENHANCING CANOLA PRODUCTION WITH IMPROVED PHOSPHORUS MANAGEMENT

Jessica Weber¹, Jessica Pratchler², Stu Brandt², Chris Holzapfel³

¹Western Applied Research Corporation, ²Northeast Agriculture Research Foundation, ³Indian Head Agricultural Research Foundation

Funded by:
CURRENT RECOMMENDATIONS

Safe Rates of $P_2O_5$  
*based on double disc opener*
- 15 to 20 lb $P_2O_5$ / ac
- 25 lb $P_2O_5$ / ac under good moisture

Removal Rates
- 1.3 to 1.6 lb $P_2O_5$ / ac > Safe Rate

Mining soil for available $P$
<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield</th>
<th>P Removal</th>
<th>Seed Limit</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(bu/ ac)</td>
<td>lb P$_2$O$_5$ / ac</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>60</td>
<td>36</td>
<td>50</td>
<td>+14</td>
</tr>
<tr>
<td>Canola</td>
<td>40</td>
<td>40</td>
<td>20</td>
<td>-20</td>
</tr>
<tr>
<td>Soybeans</td>
<td>35</td>
<td>28</td>
<td>10</td>
<td>-18</td>
</tr>
<tr>
<td>Barley</td>
<td>80</td>
<td>38</td>
<td>50</td>
<td>+12</td>
</tr>
<tr>
<td>Flax</td>
<td>32</td>
<td>20</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Peas</td>
<td>50</td>
<td>2038</td>
<td>20</td>
<td>-18</td>
</tr>
<tr>
<td>Oats</td>
<td>100</td>
<td>29</td>
<td>50</td>
<td>+21</td>
</tr>
</tbody>
</table>

Rates are based on solid seeding with disk or knife openers with a 1 in. spread, 6 or 7 row spacing and good to excellent soil moisture.

Safe rates of $\text{SO}_4^-\text{S}$
- 10 lb S / ac

Typical Recommendation
- 13 - 27 lb S / ac

Can ammonium sulphate be seed-placed?
OBJECTIVES

- Are current P fertilizer recommendations adequate for high yielding cultivars?

- Does all fertilizer P need to be seed placed or is side banding equally effective?

- Are current recommendations regarding safe rates of P and S suitable for typical knife or hoe openers in use today?
EXPERIMENTAL DESIGN

3 Sites: Scott, Indian Head, & Melfort
- Trial Period: 2016, 2017, 2018
- RCBD 4 Replicates
- 2-Way Factorial
  - Rate: 0, 18, 36, 53, 71 P$_2$O$_5$ & 13 S lb/ ac
  - Placement: Sideband (SB) & Seed-Placed (SP)
- Data Collection
  - Plant Density: 2,4,6 WAP
  - Biomass: 6 WAP
  - Days to Maturity: 60% SCC
  - Yield
  - Green Seed & TKW
# TREATMENT APPLICATION

<table>
<thead>
<tr>
<th>Treatment #</th>
<th>lb/ ac P$_2$O$_5$</th>
<th>Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>SP</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>SP</td>
</tr>
<tr>
<td>3</td>
<td>36</td>
<td>SP</td>
</tr>
<tr>
<td>4</td>
<td>53</td>
<td>SP</td>
</tr>
<tr>
<td>5</td>
<td>71</td>
<td>SP</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>SB</td>
</tr>
<tr>
<td>7</td>
<td>18</td>
<td>SB</td>
</tr>
<tr>
<td>8</td>
<td>36</td>
<td>SB</td>
</tr>
<tr>
<td>9</td>
<td>53</td>
<td>SB</td>
</tr>
<tr>
<td>10</td>
<td>71</td>
<td>SB</td>
</tr>
<tr>
<td>11</td>
<td>0 &amp; 13S</td>
<td>SP</td>
</tr>
<tr>
<td>12</td>
<td>18 &amp; 13S</td>
<td>SP</td>
</tr>
<tr>
<td>13</td>
<td>36 &amp; 13S</td>
<td>SP</td>
</tr>
<tr>
<td>14</td>
<td>53 &amp; 13S</td>
<td>SP</td>
</tr>
<tr>
<td>15</td>
<td>71 &amp; 13S</td>
<td>SP</td>
</tr>
</tbody>
</table>
**SITE INFORMATION**

**Scott**
- SBU 10%
- Loam

**Indian Head**
- SBU 6%
- Clay Loam

**Melfort**
- SBU 8%
- Clay Loam

---

**SOIL TEST NUTRIENT LEVELS**

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>NO$_3$-N</th>
<th>P</th>
<th>K</th>
<th>SO$_4$-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6</td>
<td>13</td>
<td>&gt;30</td>
<td>261</td>
<td>11</td>
</tr>
<tr>
<td>6-12</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-24</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SOIL TEST NUTRIENT LEVELS**

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>NO$_3$-N</th>
<th>P</th>
<th>K</th>
<th>SO$_4$-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6</td>
<td>10</td>
<td>6</td>
<td>&gt;540</td>
<td>9</td>
</tr>
<tr>
<td>6-24</td>
<td>11</td>
<td></td>
<td>&gt;740</td>
<td></td>
</tr>
</tbody>
</table>

**SOIL TEST NUTRIENT LEVELS**

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>NO$_3$-N</th>
<th>P</th>
<th>K</th>
<th>SO$_4$-S</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6</td>
<td>39</td>
<td>22</td>
<td>700</td>
<td>10</td>
</tr>
<tr>
<td>0-12</td>
<td>68</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

"low-med"

"very low"

"low"
Plants per sq. ft

2 WAP  4 WAP  6 WAP  Post Harvest

P <0.0001  P=0.0083  P= 0.0033     P= 0.0025

SCOTT, SK 2016-2018
71 lb/ac Side Band

71 lb/ac Seed Placed

71 lb/ac + 13 AS Seed Placed
MELFORT & INDIAN HEAD, SK
2016-2018
Plants per sq. ft

MELFORT & INDIAN HEAD, SK
2016-2018

Fertilizer Placement

P <0.0001  P=0.0007  P <0.0001  P= 0.0419
Plants per sq. ft

- 2 WAP
- 4 WAP
- 6 WAP
- Post Harvest

Interaction is Not Significant

Rate (lb/ac)

Placement

MELFORT & INDIAN HEAD, SK
2016-2018
MELFORT & INDIAN HEAD, SK
2016-2018

Yield (bu per acre)

Rate (lb/ac)

A
A
AB
AB
B

+4 bu

53
71
36
18
0

P = 0.0019
MELFORT & INDIAN HEAD, SK
2016-2018

Interaction is Not Significant

+4 bu /ac

Yield (bu / ac)

53 SP
71 SPAS
71 SB
36 SP
53 SPAS
53 SB
36 SP
71 SP
36 SPAS
18 SPAS
0 SP
18 SB
18 SP
0 SB
0 SPAS

Rate (lb/ac)

Placement
Effects of P & S were Site Dependent

Scott

Side banding > Seed placed

Plant Density
• >5 pl/ ft² SB (all rates) > SP (0, 18, 36 lb/ ac)
• < 5 pl/ ft² SP (53 & 71 lb/ ac) & all SP P₂O₅ & S

Yield
• SB @ 53 & 71 lb/ac greatest yields
• SB @ 71 lb/ac lower yields than 20 lb/ac
• SP P₂O₅ & AS always resulted in lowest yields

Melfort & Indian Head

Plant Density
• SB > SP > SP/ AS

Yield
• Rate effect on yield
  • > 40 P₂O₅ greatest yield
  • P₂O₅ alone > S applications
• Are current P fertilizer recommendations adequate for high yielding cultivars?
  • >36 lb/ ac $P_2O_5$

• Does all fertilizer P need to be seed placed or is side banding equally effective?
  • Location dependent? Scott > Melfort > Indian Head

Factors to Consider: SOIL TEXTURE

• Are current recommendations regarding safe rates of P and S suitable for typical knife or hoe openers in use today?
  • 15 to 20 lb $P_2O_5$ / ac VS. >36 lb $P_2O_5$ / ac

SOIL MOISTURE
Best Case Scenario:

1. Side band rates targeted to replenish $P_2O_5$ reserves & seed place $P_2O_5$ for early season vigor
What are the consequences of dual banding at these high rates?

- $\text{P}_2\text{O}_5$ availability is increased by ammonium in the band
- $\text{P}_2\text{O}_5$ availability is delayed when banded with high rates of N
- Typical rates of N will delay P uptake for several weeks due to band toxicity
  - Greater than 75 lb/ ac of N
- Some starter P should be placed in seed row when “dual banding” N & P
  - Enables early season access to P
WHAT DOES THIS MEAN FOR YOU?

Best Case Scenario:

1. Side band rates targeted to replenish $P_{2}O_{5}$ reserves & seed place $P_{2}O_{5}$ for early season vigor
2. Side- band at higher rates (71 lb /ac)
Higher P Rates = Gradual Soil P Increase

- Most soils are largely depleted of P
- Target Olson P 15 ppm is a healthy goal for your soils to maintain
  - Build levels in cereal years with side or mid-row band applications
  - Apply sufficient P in side-band or midrow bands to match crop removal on annual basis

WHAT DOES THIS MEAN FOR YOU?

Best Case Scenario:

1. Side band rates targeted to replenish $P_{2}O_{5}$ reserves & seed place $P_{2}O_{5}$ for early season vigor
2. Side-band at higher rates (71 lb/ac)
3. Seed place do not exceed < 36 lb/ac
   • At this rate you will not rejuvenate soil P levels
EXCESS SEED-PLACED MONOAMMONIUM PHOSPHATE CAN CAUSE SEEDLING DAMAGE IN CANOLA

- Toxicity is related to salt effect from N portion of MAP fertilizer
- Toxicity is affected by soil characteristics and weather
- Seed bed utilization affects concentration and therefore toxicity
  - Wider SBU = higher rates
- Reducing concentration in soil solution will reduce toxicity

FUTURE RESEARCH

• Examine higher rates of P side banded
• Look at struvite alternatives (slow release P) and coated MAP
• Triple shoot opener capacities?