CANOLA: ARE SAFE RATES OF P CHANGING?
Current Recommendations

Safe Rates of $P_2O_5$
- 17 to 22 kg $P_2O_5$ / ha
- 28 kg $P_2O_5$ / ha under good moisture

Removal Rates
- 1-1.2 kg $P_2O_5$ / bu > Safe Rate

Safe rates of $SO_4^-$ - S
- 11 kg S / ha

Typical Recommendation
- 15- 30 kg S / ha
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
- RCBD 4 Replicates
- 2-Way Factorial
  - Rate: 0, 20, 40, 60, 80 kg/ha $P_2O_5$ & 15 S
  - 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>kg/ha 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>20</td>
<td>SP</td>
</tr>
<tr>
<td>3</td>
<td>40</td>
<td>SP</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
<td>SP</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>SP</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>SB</td>
</tr>
<tr>
<td>7</td>
<td>20</td>
<td>SB</td>
</tr>
<tr>
<td>8</td>
<td>40</td>
<td>SB</td>
</tr>
<tr>
<td>9</td>
<td>60</td>
<td>SB</td>
</tr>
<tr>
<td>10</td>
<td>80</td>
<td>SB</td>
</tr>
<tr>
<td>11</td>
<td>0 &amp; 15S</td>
<td>SP</td>
</tr>
<tr>
<td>12</td>
<td>20 &amp; 15S</td>
<td>SP</td>
</tr>
<tr>
<td>13</td>
<td>40 &amp; 15S</td>
<td>SP</td>
</tr>
<tr>
<td>14</td>
<td>60 &amp; 15S</td>
<td>SP</td>
</tr>
<tr>
<td>15</td>
<td>80 &amp; 15S</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

**Scott**

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>NO₃-N</th>
<th>P</th>
<th>K</th>
<th>SO₄-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>5-12</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>12-24</td>
<td>5</td>
<td></td>
<td>“low”</td>
<td>2</td>
</tr>
</tbody>
</table>

**Indian Head**

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>NO₃-N</th>
<th>P</th>
<th>K</th>
<th>SO₄-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>“very low”</td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>

**Melfort**

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>NO₃-N</th>
<th>P</th>
<th>K</th>
<th>SO₄-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>“low”</td>
<td>15</td>
</tr>
</tbody>
</table>
# Preliminary Results: Scott

<table>
<thead>
<tr>
<th></th>
<th>Yield (kg/ha)</th>
<th>TKW (g/1000s)</th>
<th>Green Seed (%)</th>
<th>Dry Weight (kg/ha)</th>
<th>DTM -</th>
<th>PPMS (plant/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fertilizer Rate (Rt)</strong></td>
<td>0.026</td>
<td>0.489</td>
<td>&lt;0.0001</td>
<td>0.003</td>
<td>0.0004</td>
<td>0.003</td>
</tr>
<tr>
<td><strong>Placement (Pc)</strong></td>
<td>0.005</td>
<td>0.872</td>
<td>0.013</td>
<td>&lt;0.0001</td>
<td>0.085</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Rt * Pc</strong></td>
<td><strong>0.004</strong></td>
<td><strong>0.518</strong></td>
<td><strong>0.05</strong></td>
<td><strong>0.014</strong></td>
<td>0.360</td>
<td><strong>0.0008</strong></td>
</tr>
</tbody>
</table>
**PLANT DENSITY**

![Graph showing plant density over time with different placement types and P2O5 levels.]

- **r = > 0.87**
- 2 WAP
- 4 WAP
- 6 WAP
- Post

Plant Density (plants/m²)

<table>
<thead>
<tr>
<th>Placement</th>
<th>0</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB</td>
<td>SB</td>
<td>SB</td>
<td>SP</td>
<td>SP</td>
<td>SB</td>
</tr>
<tr>
<td>SP</td>
<td>SP</td>
<td>SP</td>
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<td>SP</td>
<td>SP</td>
</tr>
</tbody>
</table>

kg/ha P2O5 Placement
## Preliminary Results: Indian Head

<table>
<thead>
<tr>
<th></th>
<th>Yield (kg/ha)</th>
<th>TKW (g/1000s)</th>
<th>Green Seed (%)</th>
<th>Dry Weight (kg/ha)</th>
<th>DTM -</th>
<th>PPMS (plant/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fertilizer Rate (Rt)</strong></td>
<td>0.335</td>
<td>0.202</td>
<td>0.331</td>
<td>0.008</td>
<td>0.523</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Placement (Pc)</strong></td>
<td>0.862</td>
<td>0.310</td>
<td>0.392</td>
<td>0.024</td>
<td>0.087</td>
<td>0.455</td>
</tr>
<tr>
<td><strong>Rt*Pc</strong></td>
<td>0.704</td>
<td>0.838</td>
<td>0.310</td>
<td>0.669</td>
<td>0.401</td>
<td>0.516</td>
</tr>
</tbody>
</table>
Plant Density

$r = > 0.72$

Plant Density (plant/m²)

2 WAP
4 WAP
6 WAP
POST

kg/ha $P_2O_5$
DRIY WEIGHT

Biomass (kg/ha) 2

Biomass (kg/ha) 1

Placement

kg/ha P₂O₅

kg/ha P₂O₅
SEED YIELD & GREEN SEED

Yield (kg/ha)

Green Seed (%)

kg/ha P₂O₅

80 S  60 S  40 S  20 S  0 S  80  60  40  20  0

A A A A A A A A A

+- 3 bu/ac

3000  3200  3400  3600  3800

3000  3200  3400  3600  3800

0.00  0.20  0.40  0.60  0.80  1.00  1.20  1.40

3000  3200  3400  3600  3800

0.00  0.20  0.40  0.60  0.80  1.00  1.20  1.40

P₂O₅
## PRELIMINARY RESULTS: MELFORT

<table>
<thead>
<tr>
<th></th>
<th>Yield (kg/ha)</th>
<th>TKW (g/ 1000s)</th>
<th>Green Seed (%)</th>
<th>Dry Weight (kg/ha)</th>
<th>DTM</th>
<th>PPMS (plant/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilizer Rate (Rt)</td>
<td>0.0004</td>
<td>0.316</td>
<td>0.0002</td>
<td>0.003</td>
<td>-</td>
<td>0.573</td>
</tr>
<tr>
<td>Placement (Pc)</td>
<td>0.265</td>
<td>0.987</td>
<td>0.992</td>
<td>0.709</td>
<td>-</td>
<td>0.967</td>
</tr>
<tr>
<td>Rt*Pc</td>
<td>0.937</td>
<td>0.639</td>
<td>0.656</td>
<td>0.196</td>
<td>-</td>
<td>0.065</td>
</tr>
</tbody>
</table>
Biomass (kg/ha)
SEED YIELD & GREEN SEED

Yield (kg/ha) vs. kg/ha P₂O₅

- A
- AB
- ABC
- AC
- BC
- C

Green Seed (%)

r = -0.77

kg/ha P₂O₅

0 500 1000 1500 2000 2500 3000 3500 4000

0 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520 540 560 580 600 620 640 660 680 700 720 740 760 780 800 820 840 860 880 900 920 940 960 980 1000

0 1 2 3 4 5 6 7 8 9 10
IMPLICATIONS

Effects of P & S were Site Dependent

▪ Scott:
  ▪ Placement & Rate Interaction
    ▪ Side-banding higher rates effective
    ▪ >40 kg/ ha
    ▪ S above recommended rate negative effects

▪ Indian Head
  ▪ Placement & Rate
    ▪ Early season effect
    ▪ Yield & GS unaffected : 3 bu/ac difference

▪ Melfort
  ▪ Rate significant effect on yield and GS
    ▪ > 40 P₂O₅ greatest yield
    ▪ S applications < P₂O₅ alone
Are current P fertilizer recommendations adequate for high yielding cultivars?
- >40 kg/ha $\text{P}_2\text{O}_5$ > 15 kg S/ha

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

Are current recommendations regarding safe rates of P and S suitable for typical knife or hoe openers in use today?
- 17 to 22 kg $\text{P}_2\text{O}_5$ / ha
- 11 kg S / ha
ACKNOWLEDGEMENTS

SaskCanola

AgriARM

Government of Saskatchewan

Ministry of Agriculture

Agriculture and Agri-Food Canada

Agriculture et Agroalimentaire Canada
QUESTIONS