2017 IHARF Agronomy Update
Chris Holzapfel, MSc PAg
Presentation Overview

- Varietal Differences in Wheat Response to Manipulator® PGR Applications (2016-17)
- 4R Nitrogen Fertilizer Trials with Wheat & Canola (2017)
- Soybean Response to Combinations of Inoculant Products & Rates (2017)
- Phosphorus Rate & Placement in Faba beans in Contrasting Years (2016-17)
Wheat Variety / Class Effects on Response to PGR Applications
2012: IHARF’s 1st PGR Experience

- Received sample of Manipulator in the spring, treated 2/4 reps of a small unrelated trial being conducted for Engage Agro
- Hot, wet season - major issues with lodging & disease
- Not a replicated trial, but observed an average:
  - 15 cm (14%) height reduction, dramatic reduction in lodging, and 19 bu/ac (57%) yield increase but 1.5% lower protein

(var. Unity VB)
Manipulator PGR Effects on Wheat Height
Indian Head 2013-2017
Manipulator PGR Effects on Wheat Yield
Indian Head 2013-2017

Year | Control | PGR | Change
--- | --- | --- | ---
2013 | 72 | 82 | +14%
2014 | 76 | 85 | +12%
2015 | 70 | 76 | +8%
2016 | 59 | 68 | +15%
2017 | 67 | 74 | +9%
5-yr Avg | 69 | 77 | +12%
Objectives: To investigate differences amongst wheat varieties & classes in responsiveness to Manipulator

- 6 varieties across 3 classes (CWRS, CNHR & CWAD), varieties varied from year-to-year
- 350 seeds/m² seeding rate, 125-36-18-18 lb/ac N-P₂O₅-K₂O-S, foliar fungicide applied at both T2 & T3
- Wet with heavy lodging & disease pressure in 2016, much drier in 2017 with very little lodging but high yield potential
- Targeted GS31-32 for treatment application
PGR x Variety – IH 2016 (wet)  
Effects on Plant Height

Fixed Effects
PGR: $p < 0.001$
VAR: $p < 0.001$
PGR × VAR: $p = 0.723$
Error Bars = S.E.M.

Height (cm)

Variety / Class

-10%  -11%  -11%  -9%  -8%  -8%  -10%
PGR x Variety – IH 2016 (wet)  
Effects on Lodging

Fixed Effects
PGR: \( p < 0.001 \)
VAR: \( p < 0.001 \)
PGR × VAR: \( p < 0.001 \)

Error Bars = S.E.M.

-79%  -58%  -74%  -41%  -42%  -81%  -58%

Variety / Class

Lodging (1-10)

Plentiful CWRS  Uttmost CWRS  Carberry CWRS  Strongfield CWAD  Transcend CWAD  Elgin CNHR  Avg

Variety / Class

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AC Carberry – August 18, 2016

Untreated (0.6)  Treated (0.2)
CDC Utmost VB – August 18, 2016

Untreated (6.9) vs. Treated (2.9)
PGR x Variety – IH 2016 (wet)  
Effects on Grain Yield

**Fixed Effects**

- **PGR:** $p < 0.001$
- **VAR:** $p < 0.001$
- **PGR × VAR:** $p = 0.224$

**Error Bars = S.E.M.**

**Variety / Class**

- Plentiful CWRS +26%
- Utmost CWRS +13%
- Carberry CWRS +8%
- Strongfield CWAD +15%
- Transcend CWAD +16%
- Elgin CNHR +15%
- Avg +15%

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PGR x Variety – IH 2016 (wet) Effects on Grain Protein

Fixed Effects
PGR: $p < 0.001$
VAR: $p < 0.001$
PGR $\times$ VAR: $p = 0.213$

Variety / Class

Plentiful CWRS  Utopmost CWRS  Carberry CWRS  Strongfield CWAD  Transcend CWAD  Elgin CNHR  Avg

-4%  -3%  -3%  -3%  -5%  -3%  -3%

Error Bars = S.E.M.

Control  PGR

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IHARF AGRO
PGR x Variety – IH 2016 (wet) Effects on Fusarium Damaged Kernels

Fixed Effects
- PGR: $p = 0.398$
- VAR: $p < 0.001$
- PGR $\times$ VAR: $p = 0.884$

Error Bars = S.E.M.
PGR x Variety – IH 2017 (dry)
Effects on Plant Height

Fixed Effects
PGR: $p = 0.002$
VAR: $p < 0.001$
PGR × VAR: $p = 0.198$

Error Bars = S.E.M.

Variety / Class

PGR: -7% Jatharia CWRS: -9% Brandon CWRS: -4% Landmark CWRS: -7% Spitfire CWAD: -10% Transcend CWAD: -6% Avg: -7%

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PGR x Variety – IH 2017 (dry) Effects on Lodging

Fixed Effects
PGR: \( p = 0.300 \)
VAR: \( p = 0.128 \)
PGR × VAR: \( p = 0.128 \)

Error Bars = S.E.M.

Variety / Class

Plentiful CWRS
Jatharia CWRS
Brandon CWRS
Landmark CWRS
Spitfire CWAD
Transcend CWAD
Avg

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PGR x Variety – IH 2017 (dry)
Effects on Grain Yield

Fixed Effects
PGR: $p = 0.002$
VAR: $p < 0.001$
PGR × VAR: $p = 0.438$

Error Bars = S.E.M.

Yield (bu/ac)

Variety / Class

Plentiful CWRS
Jatharia CWRS
Brandon CWRS
Landmark CWRS
Spitfire CWAD
Transcend CWAD
Avg

+12%  +8%  +8%  +7%  +12%  +11%  +10%

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ENGAGE AGRO
**PGR x Variety – IH 2017 (dry)**

**Effects on Grain Protein**

**Fixed Effects**
- **PGR:** $p = 0.008$
- **VAR:** $p < 0.001$
- **PGR x VAR:** $p = 0.005$

**Error Bars = S.E.M.**

**Variety / Class**
- **Plentiful CWRS**
  - +1%
- **Jatharia CWRS**
  - -3%
- **Brandon CWRS**
  - -2%
- **Landmark CWRS**
  - -2%
- **Spitfire CWAD**
  - -3%
- **Transcend CWAD**
  - -4%
- **Avg**
  - -2%

**IHARF Winter Seminar & AGM 07-02-18**
PGR × Variety at Yorkton 2015

Effects on Lodging

-45%  
-70%

<table>
<thead>
<tr>
<th>Lodging (1-9)</th>
<th>Goodeve</th>
<th>Unity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>2.0</td>
<td>1.1</td>
</tr>
<tr>
<td>PGR</td>
<td>1.3</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Effects on Grain Yield

+9%  
+22%

<table>
<thead>
<tr>
<th>Yield (bu/ac)</th>
<th>Goodeve</th>
<th>Unity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>PGR</td>
<td>59</td>
<td>56</td>
</tr>
</tbody>
</table>
PGRs on Wheat Summary

- Manipulator PGR has performed consistently well for wheat under field conditions in SK – reductions in height observed in nearly all trials & yield increases in most cases

- Responses have been quite reliable across entire application window but GS30-32 is optimal for consistency & to buffer against variable crop stages
  - Tank mix opportunities with late herbicide or early fungicide applications may occasionally exist but in most cases a separate application likely optimal

- In general, greatest benefits are likely to be realized in higher input systems & under good (wet) growing conditions where lodging has potential to limit yields & reduce harvest efficiency
  - Interactions with fertility & seeding rates uncommon (for yield in particular) but high N and high seeding rates commonly increase the risk of lodging which can be mitigated by PGR

- Responses occurred across a wide range of varieties & classes but expect greatest overall benefits when combined with varieties that are susceptible to lodging
  - Yield increases can occur even in the absence of lodging but they are smaller when compared to varieties or years where lodging is more severe
  - With PGR option some growers may choose to grow varieties that are higher yielding but have been avoided due to past issues with lodging
4R Nitrogen Management in Canola & Wheat (ADOPT-Fertilizer Canada)
Objectives: To demonstrate crop response to varying rates of N along with different forms, timing & placement relative to side-banded, untreated urea

<table>
<thead>
<tr>
<th>#</th>
<th>Form</th>
<th>Timing / Placement</th>
<th>Rate *</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>Urea (untreated)</td>
<td>Side-band (during seeding)</td>
<td>0.5x</td>
</tr>
<tr>
<td>3</td>
<td>Urea</td>
<td>Side-band (during seeding)</td>
<td>1.0x</td>
</tr>
<tr>
<td>4</td>
<td>Urea</td>
<td>Side-band (during seeding)</td>
<td>1.5x</td>
</tr>
<tr>
<td>5</td>
<td>Urea</td>
<td>Pre-seed surface broadcast</td>
<td>1.0x</td>
</tr>
<tr>
<td>6</td>
<td>Urea Ammonium-Nitrate (UAN)</td>
<td>Pre-seed surface dribble-band</td>
<td>1.0x</td>
</tr>
<tr>
<td>7</td>
<td>Agrotain® (AT)</td>
<td>Pre-seed surface broadcast</td>
<td>1.0x</td>
</tr>
<tr>
<td>8</td>
<td>SuperUrea® (SU)</td>
<td>Pre-seed surface broadcast</td>
<td>1.0x</td>
</tr>
<tr>
<td>9</td>
<td>Urea / Urea</td>
<td>50:50 Split Application (^Y)</td>
<td>1.0x</td>
</tr>
<tr>
<td>10</td>
<td>Urea / UAN</td>
<td>50:50 Split Application</td>
<td>1.0x</td>
</tr>
<tr>
<td>11</td>
<td>Urea / Agrotain®</td>
<td>50:50 Split Application</td>
<td>1.0x</td>
</tr>
<tr>
<td>12</td>
<td>Urea / SuperUrea®</td>
<td>50:50 Split Application</td>
<td>1.0x</td>
</tr>
</tbody>
</table>

** 1x = 129 lb N/ac (soil + fertilizer) for canola & 116 lb/ac for wheat **
N Rate Effects on Leaf Chlorophyll in Canola
Indian Head 2017

Error Bars = S.E.M.

N Source = Side-banded Urea
Residual NO₃-N = 31 lb/ac

SB N - linear: p < 0.001
SB N - quadratic: p = 0.001
N Management Effects on Canola Leaf Chlorophyll
Indian Head 2017

Error Bars = S.E.M.

~100 lb N/ac fertilizer N rate in all treatments (1x rate)

SB - Ur 58 58 58 58 56 Split - Ur 58 59 58 58
PSS - Ur 61 58 58 58 58 Split - UAN 58 58 58 58
PSS - UAN b b b b
PSS - AT b b b b
PSS - SU b b b b
Split - SU b b b b

Nitrogen Treatment

SPAD (July 2)
N Rate Effects on Canola Seed Yield
Indian Head 2017

Grain Yield (bu/ac)

Error Bars = S.E.M.

N Source = Side-banded Urea
Residual NO₃ = 31 lb/ac

SB N - linear: p < 0.001
SB N - quadratic: p = 0.001

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N Management Effects on Canola Seed Yield
Indian Head 2017

Error Bars = S.E.M.
~100 lb N/ac fertilizer N rate in all treatments (1x rate)

Grain Yield (bu/ac)

- SB - Ur
- PSS - Ur
- PSS - UAN
- PSS - AT
- PSS - SU
- Split - Ur
- Split - UAN
- Split - AT
- Split - SU

Nitrogen Treatment

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N Rate Effects on Wheat Leaf Chlorophyll
Indian Head 2017

Error Bars = S.E.M.

N Source = Side-banded Urea
Residual NO$_3$-N = 27 lb/ac

SPAD (July 3)

Ib N/ac (soil + fertilizer)

SB N - linear: $p < 0.001$
SB N - quadratic: $p = 0.001$
N Management Effects on Wheat Leaf Chlorophyll
Indian Head 2017

Error Bars = S.E.M.

~90 lb N/ac fertilizer N rate in all treatments (1x rate)

<table>
<thead>
<tr>
<th>Nitrogen Treatment</th>
<th>SPAD (July 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB - Ur</td>
<td>46</td>
</tr>
<tr>
<td>PSS - Ur</td>
<td>43</td>
</tr>
<tr>
<td>PSS - UAN</td>
<td>43</td>
</tr>
<tr>
<td>PSS - AT</td>
<td>42</td>
</tr>
<tr>
<td>PSS - SU</td>
<td>43</td>
</tr>
<tr>
<td>Split - Ur</td>
<td>43</td>
</tr>
<tr>
<td>Split - UAN</td>
<td>43</td>
</tr>
<tr>
<td>Split - AT</td>
<td>43</td>
</tr>
<tr>
<td>Split - SU</td>
<td>43</td>
</tr>
</tbody>
</table>
N Rate Effects on Wheat Grain Yield
Indian Head 2017

Grain Yield (bu/ac)

Error Bars = S.E.M.

N Source = Side-banded Urea
Residual NO$_3$ = 27 lb/ac

SB N - linear: \( p < 0.001 \)
SB N - quadratic: \( p = 0.001 \)
N Management Effects on Wheat Grain Yield
Indian Head 2017

Error Bars = S.E.M.
~90 lb N/ac fertilizer N rate in all treatments (1x rate)

Grain Yield (bu/ac)

SB - Ur  PSS - Ur  PSS - UAN  PSS - AT  PSS - SU  Split - Ur  Split - UAN  Split - AT  Split - SU

Nitrogen Treatment
N Rate Effects on Wheat Grain Protein
Indian Head 2017

Error Bars = S.E.M.

N Source = Side-banded Urea
Residual NO$_3$-N = 27 lb/ac

SB N - linear: \( p < 0.001 \)
SB N - quadratic: \( p = 0.044 \)
N Management Effects on Wheat Grain Protein
Indian Head 2017

Error Bars = S.E.M.

~90 lb N/ac fertilizer N rate in all treatments (1x rate)

Grain Protein (%)

SB - Ur | PSS - Ur | PSS - UAN | PSS - AT | PSS - SU | Split - Ur | Split - UAN | Split - AT | Split - SU

13.6 | 11.6 | 11.8 | 11.8 | 12.1 | 12.4 | 12.4 | 12.4 | 12.1

Nitrogen Treatment

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4R N Management Summary

- Relative economic and agronomic performance of contrasting nitrogen (N) strategies commonly differ within fields, from field-to-field & from year-to-year
  - Varies with timing & quantity of precipitation, soil texture, lower vs upper slope positions, etc.
  - Small plot trial results not always representative of entire fields where certain areas can be more prone to N losses (i.e. we don’t put plots in areas that have potential to drown out)

- Current results are specific to the environmental conditions encountered
  - Good initial moisture & high yield potential but below average growing season precipitation
  - Very little rainfall after surface applications (both pre-seed & in-crop) therefore high potential for volatilization but not denitrification or leaching and risk of all N formulations to be (at least temporarily) stranded at the surface

- For both crops, best overall response when all N banded beneath the soil surface at seeding (higher yield with canola, similar yields but higher protein with wheat)
  - Consistent with previous research showing greater advantage to in-soil placement and higher risk of yield loss (poor response) with in-crop surface applications under dry conditions

- Generally, N placement & time of application is less critical when precipitation is frequent & sufficient (but not excessive) while benefits to denitrification inhibitors (i.e. SuperUrea, N-Serve) & split applications are most likely with excess precipitation (i.e. standing water, saturated soils) when risk of denitrification & leaching is greatest
Soybean Inoculation Strategies & Rescue N Applications
**ADOPT Soybean Inoculation Strategies & Rescue N Applications (Indian Head 2017)**

**Objectives:** To demonstrate the importance of N fixation in soybeans along w/the effectiveness of various inoculation strategies & rescue N applications

<table>
<thead>
<tr>
<th>#</th>
<th>Seed-applied</th>
<th>Granular Inoculant</th>
<th>In-crop UAN (R3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>None</td>
<td>None</td>
<td>55 kg N/ha</td>
</tr>
<tr>
<td>3</td>
<td>1x liquid (Optimize)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>1x liquid</td>
<td>None</td>
<td>55 kg N/ha</td>
</tr>
<tr>
<td>5</td>
<td>1x liquid</td>
<td>1x <em>B. japonicum</em> (CellTech®)</td>
<td>None</td>
</tr>
<tr>
<td>6</td>
<td>1x liquid</td>
<td>2x <em>B. japonicum</em></td>
<td>None</td>
</tr>
<tr>
<td>7</td>
<td>1x liquid</td>
<td>1x <em>B. japonicum</em> + <em>P. billai</em> (TagTeam®)</td>
<td>None</td>
</tr>
<tr>
<td>8</td>
<td>1x liquid</td>
<td>2x <em>B. japonicum</em> + <em>P. billai</em></td>
<td>None</td>
</tr>
<tr>
<td>9</td>
<td>None</td>
<td>1x <em>B. japonicum</em></td>
<td>None</td>
</tr>
<tr>
<td>10</td>
<td>None</td>
<td>2x <em>B. japonicum</em></td>
<td>None</td>
</tr>
<tr>
<td>11</td>
<td>None</td>
<td>1x <em>B. japonicum</em> + <em>P. billai</em></td>
<td>None</td>
</tr>
<tr>
<td>12</td>
<td>None</td>
<td>2x <em>B. japonicum</em> + <em>P. billai</em></td>
<td>None</td>
</tr>
</tbody>
</table>

**Granular rates:** 1x label rate = 3.6 lb/ac, 2x label rate = 7.1 lb/ac (12” row spacing)
Inoculant Effects on Soybean Height
Indian Head 2017

Overall F-test: $p = 0.648$

Error Bars = S.E.M.

Inoculant Treatment (seed-applied/granular/in-crop N)
Inoculant Effects on Soybean Leaf Chlorophyll
Indian Head 2017

Overall F-test: $p < 0.001$

Error Bars = S.E.M.

Inoculant Treatment (seed-applied/granular/in-crop N)
**Inoculant Effects on Soybean Seed Yield**

**Indian Head 2017**

Overall F-test: $p < 0.001$

Error Bars = S.E.M.

<table>
<thead>
<tr>
<th>Inoculant Treatment (seed-applied/granular/in-crop N)</th>
<th>Seed Yield (bu/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>none-none-55N</td>
<td>11.9</td>
</tr>
<tr>
<td>1x-none-55N</td>
<td>16.2</td>
</tr>
<tr>
<td>1x-1xCT-55N</td>
<td>15.0</td>
</tr>
<tr>
<td>1x-2xCT-55N</td>
<td>17.0</td>
</tr>
<tr>
<td>1x-1xTT-55N</td>
<td>17.9</td>
</tr>
<tr>
<td>1x-2xTT-55N</td>
<td>19.9</td>
</tr>
<tr>
<td>none-1xCT-55N</td>
<td>18.4</td>
</tr>
<tr>
<td>none-2xCT-55N</td>
<td>19.3</td>
</tr>
<tr>
<td>none-1xTT-55N</td>
<td>18.4</td>
</tr>
<tr>
<td>none-2xTT-55N</td>
<td>18.3</td>
</tr>
<tr>
<td>none-55N</td>
<td>17.8</td>
</tr>
<tr>
<td>none-1xCT-55N</td>
<td>17.8</td>
</tr>
<tr>
<td>none-2xCT-55N</td>
<td>18.7</td>
</tr>
</tbody>
</table>

Legend:
- F
- E
- D
- C
- B
- A
## Inoculant Effects on Soybean Seed Size

### Indian Head 2017

<table>
<thead>
<tr>
<th>Inoculant Treatment (seed-applied/granular/in-crop N)</th>
<th>Seed Size (g/1000 seeds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>none-none-none</td>
<td>100</td>
</tr>
<tr>
<td>none-none-55N</td>
<td>100</td>
</tr>
<tr>
<td>1x-none-none</td>
<td>107</td>
</tr>
<tr>
<td>1x-none-55N</td>
<td>104</td>
</tr>
<tr>
<td>1x-1xCT-none</td>
<td>109</td>
</tr>
<tr>
<td>1x-2xCT-none</td>
<td>111</td>
</tr>
<tr>
<td>1x-1xTT-none</td>
<td>110</td>
</tr>
<tr>
<td>1x-2xTT-none</td>
<td>112</td>
</tr>
<tr>
<td>none-1xCT-none</td>
<td>112</td>
</tr>
<tr>
<td>none-2xCT-none</td>
<td>109</td>
</tr>
<tr>
<td>none-1xTT-none</td>
<td>110</td>
</tr>
<tr>
<td>none-2xTT-none</td>
<td>111</td>
</tr>
</tbody>
</table>

- Overall F-test: $p < 0.001$
- Error Bars = S.E.M.
Inoculant / N Effects on Soybean Yield Group Comparisons (IH-17)

![Graph showing seed yield comparison under different conditions.]

- **No Granular Inoculant**: No N (1,3) - 13.4 bu/ac
  - In-crop N (2,4) - 16.6 bu/ac
- **Seed Only**: (3) - 15.0 bu/ac
  - Dual (5,6,7,8) - 18.9 bu/ac

*P < 0.001*
Inoculant / N Effects on Soybean Yield
Group Comparisons

Seed Yield (bu/ac)

<table>
<thead>
<tr>
<th>Gran only (9,10,11,12)</th>
<th>Dual (5,6,7,8)</th>
<th>CellTech® (5,6,9,10)</th>
<th>TagTeam® (7,8,11,12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.3</td>
<td>18.9</td>
<td>18.6</td>
<td>18.6</td>
</tr>
</tbody>
</table>

P = 0.252  

P = 0.878

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07-02-18
Inoculant / N Effects on Soybean Yield Group Comparisons (IH-17)

Seed Yield (bu/ac)

<table>
<thead>
<tr>
<th></th>
<th>1x gran (9,11)</th>
<th>2x gran (10,12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Seed Applied Inoculant</td>
<td>18.1</td>
<td>18.5</td>
</tr>
<tr>
<td>With Seed Applied Inoculant</td>
<td>18.1</td>
<td>19.6</td>
</tr>
</tbody>
</table>

P = 0.551

P = 0.032
Soybean Inoculation Strategies Summary

- Low yield potential at Indian Head in 2017 due to dry conditions but strong overall response to inoculant treatments observed
- 50 lb N/ac at R3 partly mitigated yield loss due to poor nodulation (36% increase with no inoculant, 13% with seed-applied only)
  - Consistent with similar, recent SPG trial results
- Liquid inoculant alone insufficient to optimize yield in fields with no previous soybean history, recommend dual inoculant (similar to past results)
  - Unclear whether seed-applied inoculant over-and-above granular is likely to be beneficial under more typical normal, higher yielding conditions
  - SPG trials indicating that 1x label recommended granular inoculant rate is likely sufficient under most conditions when combined with seed-applied inoculant
- No differences in response to granular forms (*Bradyrhizobium* vs *Bradyrhizobium + P. Billai*) detected (may be field or management specific?)
- Always assess nodulation at R1 stage and, if poor (< ~5 nodules/plant), consider applying approximately 50 lb N/ac at R3 to reduce yield loss
  - Granular formulation (i.e. urea) likely preferable due to potential leaf burn w/UAN
Phosphorus Fertilizer Rate & Placement in Faba Beans
**Objective:** To demonstrate the effects of varying P fertilizer rates & seedrow vs. side-band placement on fababean establishment & yield

**Treatments**

- **P₂O₅ rates:** 0, 18, 36, 53, or 71 lb P₂O₅/ac
- **Phosphorus Placement:** Seed-placed or Side-band
  - P₂O₅ source was commercial grade monoammonium phosphate (11-52-0)
  - Snowbird faba-beans direct-seeded into spring wheat stubble (SeedMaster, 12” spacing) during the 1st week of May at ~55 seeds/m²
  - Nitrogen not balanced across treatments (15 lb N/ac at highest P rate), seed inoculated with 2x label rate of seed-applied peat based inoculant
Phosphorus Effects On Fababean Emergence (Indian Head 2016-17)

F-test Results
Yr: \( p < 0.001 \)
Trt: \( p = 0.168 \)
Yr × Trt: \( p = 0.126 \)

Measured 30-32 days after seeding
Sp – seed placed; Sb – side-band

Error bars are S.E.M.

Rates are lb P\(_2\)O\(_5\)/ac
Phosphorus Effects On Fababean Emergence (Indian Head 2016-17)

OP Control versus Fertilized

<table>
<thead>
<tr>
<th>Year</th>
<th>Control (plants/m²)</th>
<th>Fertilized (plants/m²)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>A</td>
<td>A</td>
<td>0.187</td>
</tr>
<tr>
<td>2017</td>
<td>A</td>
<td>A</td>
<td>0.448</td>
</tr>
<tr>
<td>AVG</td>
<td>A</td>
<td>A</td>
<td>0.420</td>
</tr>
</tbody>
</table>

P = 0.187
P = 0.448
P = 0.420
Phosphorus Effects On Final Fababean Emergence (Indian Head 2016-17)

Seed-Placed versus Side-banded

<table>
<thead>
<tr>
<th>Year</th>
<th>Seed-Place</th>
<th>Side-band</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>A</td>
<td>A</td>
<td>0.524</td>
</tr>
<tr>
<td>2017</td>
<td>A</td>
<td>A</td>
<td>0.800</td>
</tr>
<tr>
<td>AVG</td>
<td>A</td>
<td>A</td>
<td>0.660</td>
</tr>
</tbody>
</table>

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Seed-placed P Effects on Fababean Emergence (30-32 days after planting)

Sp-16-lin: $p = 0.634$
Sp-16-quad: $p = 0.029$
Sp-17-lin: $p = 0.156$
Sp-17-quad: $p = 0.680$
Sp-AVG-lin: $p = 0.791$
Sp-AVG-quad: $p = 0.035$

Nov. 8, 2017
Saskatoon, SK
Pulse & Soybean Agronomy Workshop
Phosphorus Effects On Faba Bean Yield (Indian Head 2016-17)

F-test Results
Yr: $p < 0.001$
Trt: $p < 0.001$
Yr × Trt: $p = 0.153$

Error bars are S.E.M.
Sp – seed placed; Sb – side-band

Rates are lb P$_2$O$_5$/ac
Phosphorus Effects On Seed Yield (Indian Head 2016-17)

![Graph showing the comparison of fababean seed yield between OP Control and Fertilized treatments.](image)

### Fababean Seed Yield (bu/ac)

- **2016:**
  - Control: 60 (A)
  - Fertilized: 66 (A)
  - Difference: +6% (ns)
  - P = 0.062

- **2017:**
  - Control: 35 (B)
  - Fertilized: 45 (A)
  - Difference: +10%
  - P = 0.014

- **AVG:**
  - Control: 47
  - Fertilized: 56
  - Difference: +7.4%
  - P = 0.004
Phosphorus Effects On Fababean Yield
(Indian Head 2016-17)

Seed-Placed versus Side-banded

<table>
<thead>
<tr>
<th>Year</th>
<th>Seed-Place</th>
<th>Side-band</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>A</td>
<td>A</td>
<td>0.827</td>
</tr>
<tr>
<td>2017</td>
<td>A</td>
<td>A</td>
<td>0.192</td>
</tr>
<tr>
<td>AVG</td>
<td>A</td>
<td>A</td>
<td>0.344</td>
</tr>
</tbody>
</table>
Seed-placed P Effects on Fababean Yield
Indian Head 2016-17

2016 – 9 ppm Olsen-P, 6% O.M., pH = 7.4
2017 – 4 ppm Olsen-P, 5% O.M., pH = 7.8

\[
\begin{align*}
\text{Sp-16-lin: } & p < 0.001 \\
\text{Sp-16-quad: } & p = 0.218 \\
\text{Sp-17-lin: } & p = 0.005 \\
\text{Sp-17-quad: } & p = 0.171 \\
\text{Sp-AVG-lin: } & p < 0.001 \\
\text{Sp-AVG-quad: } & p = 0.663
\end{align*}
\]
**P₂O₅ Effects On Pea, Lentil & Faba Bean**
(Henry et al. 1995. CJPS 75:395-398)

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**Saskatoon (3-yr average)**

<table>
<thead>
<tr>
<th></th>
<th>Pea</th>
<th>Lentil</th>
<th>Faba bean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergence (plants/m²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

**Melfort (3-yr average)**

<table>
<thead>
<tr>
<th></th>
<th>Pea</th>
<th>Lentil</th>
<th>Faba bean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergence (plants/m²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

* Averaged across MAP rates ranging from 16-100 kg P₂O₅/ha *

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07-02-18  IHARF Winter Seminar & AGM
**P₂O₅ Effects On Pea, Lentil & Faba Bean**
(Henry et al. 1995. CJPS 75:395-398)

* Averaged across MAP rates ranging from 16-100 kg P₂O₅/ha *

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**Saskatoon (3-yr average)**

- **Pea**: A
- **Lentil**: A
- **Faba bean**: A

**Melfort (3-yr average)**

- **Pea**: A
- **Lentil**: B
- **Faba bean**: A
Theoretical Phosphorus ($P_2O_5$) Exports at Varying Fababean Yields

Calculated from Canadian Fertilizer Institute removal estimates of 1.1-1.3 lb $P_2O_5$/ac

<table>
<thead>
<tr>
<th>Expected Fababean Yield (bu/ac)</th>
<th>P Exports (lb $P_2O_5$/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>40</td>
<td>48</td>
</tr>
<tr>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>60</td>
<td>72</td>
</tr>
<tr>
<td>70</td>
<td>84</td>
</tr>
<tr>
<td>80</td>
<td>96</td>
</tr>
<tr>
<td>90</td>
<td>108</td>
</tr>
<tr>
<td>100</td>
<td>120</td>
</tr>
</tbody>
</table>

IHARF Winter Seminar & AGM
Faba beans are large users of P, removing 1.1-1.3 lb P$_2$O$_5$/bu
- ~84 lb P$_2$O$_5$/ac for a 70 bu/ac crop, total uptake of ~140 lb/ac (1.8-2.2 lb P$_2$O$_5$/bu)
- Not likely practical to fertilize for replacement under high yielding conditions

No evidence of seedling toxicity associated with seed-placed P detected
- High rates of seed-placed P still not generally recommended, results may vary depending on seeding equipment, soil properties & environmental conditions
- Uncertainty regarding effects of high rates of seed-placed P on inoculant & nodulation

Reasonably strong yield response to high rates of P fertilizer observed both years at Indian Head; residual soil test P was always low
- 6% overall average yield increase with P in 2016 & 15% (9 bu/ac) at 71 lb P$_2$O$_5$/ac
- 10% overall average yield increase in 2017, 12% (4 bu/ac) at 71 lb P$_2$O$_5$/ac
- Consistent with results from a similar trial conducted in 2015 (data not shown)

No difference between emergence or yield between placement methods when averaged across rates in current trial

Previous research in AB did not show a consistent response to P fertilizer across 6 site-yr but earlier U of S research found faba beans more responsive & less sensitive to seed-placed P than pea or lentil
Chris Holzapfel, MSc PAg
Phone: 306-695-4200
Email: cholzapfel@iharf.ca
Website: www.iharf.ca
Twitter: @CBHolz13, @IHARF_SK