What is WARC?

- Non-profit producer based organization
  - Board of Directors of local producers
    - Provide insight into current concerns and interests of local producers
      - Trevor Scherman, Stu Lawrence, Blaine Davey, Sheldon Stang
      - Ryan Charabin, Jeff Hyland, Stacey Sagon, Rob Jones, Justin Askildt
      - Michael Palmier, Mike Bender, Michael Hicks

- WARC Staff
  - Jessica (Weber) Enns – General / Research Manager
  - Kayla Slind – Research Associate (Maternity leave)
  - Gurtaj Singh- Executive Administrator
  - Sukhdeep Kaur – Operations Assistant
  - Herb Schell – Seasonal Technical
  - Eric Johnson- Consultant
THANK YOU TO OUR EVENT SPONSORS!
THANK YOU FOR THE PRODUCT DONATIONS!

- Herle Seed Farm
- Veikle Agro Inc
- FMC
- BASF
- The Rack
- Novazymes
- Fedoruk Seeds
- Engage Agro
- Landis Nutrien
- Syngenta
- DR Huber Farms Ltd.
- Coldspring Ventures
- Trawin Seeds
- Pickseed
- Diefenbaker Seed
- Rudy Agro Ltd.
- Hemp Genetics International
- Gregoire Seed Farms
Speaker Questions?

Texting QUESTIONS to:

306-361-8703
Survey Evaluation

Survey evaluations available at:

- Morning, Lunch & Afternoon

www.warc.ca
Survey Template

1. What area are you from (Please list RM or town)?

2. Please indicate which group you identify with

- Government employee
- Researcher
- Private industry agronomist/sales rep
- Producer
- Other (please specify)
3. Have you previously attended the Crop Opportunity?
   - Yes
   - No

4. How did you first hear of this event?
   - Word of mouth
   - Facebook
   - Twitter
   - Mail out
   - Newspaper
   - Email notification
   - SIA website
   - Other (please specify):
WHY ARE PULSES SO DIFFICULT TO GROW?

WEEDS? DISEASE?

Combination of Both

Requires a combination of agronomy practices

A GLANCE at what's in the WORKS
WEED CONTROL

- Early weed removal is important with poor competitors such as peas and lentils
- 7/10 early applications > yields over later applications (AAFC AB) with PEAS
- CWFP: up to 4 weeks after emergence (peas) and up to 10 node (lentils) (5-10 node)

Source: AAFC Alberta
Utilizing two to three herbicides in sequence from different herbicide groups to tackle tough-to-control weeds and to stave off weed resistance

- Soil residual products and/or burndown options
- Early weed control
- HR management
- Soil activity provides control into growing season
- Better in crop control because weeds smaller
### Soil Residual Herbicides

<table>
<thead>
<tr>
<th>Product</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authority (sulfentrazone)</td>
<td>14</td>
</tr>
<tr>
<td>Authority Supreme (sulfentrazone + pyroxasulfone)</td>
<td>14 + 15</td>
</tr>
<tr>
<td>Avadex® (triallyte)</td>
<td>8</td>
</tr>
<tr>
<td>Edge® Granular (ethalfluralin)</td>
<td>3</td>
</tr>
<tr>
<td>Fierce® (flumioxazin + pyroxasulfone)</td>
<td>14 + 15</td>
</tr>
<tr>
<td>Focus® (pyroxasulfone + carfentrazone)</td>
<td>14 + 15</td>
</tr>
<tr>
<td>Sencor® (metribuzin)</td>
<td>5</td>
</tr>
<tr>
<td>Heat® Complete (saflufenacil + pyroxasulfone)</td>
<td>14 + 15</td>
</tr>
<tr>
<td>Bonanza® / Rival® / Treflan® (trifluralin)</td>
<td>3</td>
</tr>
<tr>
<td>Valtera® (flumioxazin)</td>
<td>14</td>
</tr>
</tbody>
</table>

### Burnoff Herbicides

<table>
<thead>
<tr>
<th>Product</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aim® (carfentrazone)</td>
<td>14</td>
</tr>
<tr>
<td>CleanStart® (glyphosate + carfentrazone)</td>
<td>9 + 14</td>
</tr>
<tr>
<td>Express® SG (triburon)</td>
<td>2</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>9</td>
</tr>
<tr>
<td>Goldwing® (MCPA Ester + pyraflufen-ethyl)</td>
<td>4 + 14</td>
</tr>
<tr>
<td>Heat® (Saflufenacil)</td>
<td>14</td>
</tr>
</tbody>
</table>

*Not all products registered for both peas and lentils & watch timing restriction (fall vs spring)! Check labels!*
Herbicide Layering Project

• Research conducted throughout the province lead by **Dr. Christian Willenborg**
  • volunteer canola, kochia and mustard

• **Season long-suppression of wild mustard at Scott & Saskatoon:**
  • Metribuzin spring applied
  • Edge (fall) + metribuzin spring applied
  • Pyroxasulfone (fall) + metribuzin spring applied

• **Combined applications were most efficacious**
UNTREATED CHECK

28 DAE

56 DAE
FALL PYROXASULFONE (ZIDUA)

28 DAE

56 DAE
FALL PYROXASULFONE & SPRING METRIBUZIN
ZIDUA & SENCOR

28 DAE

56 DAE
Collaborators: Chris Holzapfel, Michael Hall, Bryan Nybo, Garry Hnatowich, Eric Johnson and Dr. Steve Shirtliffe
Lentil Input Study (small red)

Factor One: Weed Control
- Pre-seed bum off (glyphosate)
- Pre-seed residual (Focus)

Factor Two: Seeding Rate
- 130 viable seeds/m² (40lb/ac ; 0.67 bu/ac)
- 190 viable seeds/m² (60lb/ac ; 1 bu/ac)
- 260 viable seeds/m² (80 lb/ac ; 1.3 bu/ac)

Factor Three: Disease Control
- No Fungicide
- Single
- Dual

2017- 2019
- Saskatoon (2018-2019)
- Yorkton (2017)
SEEDING RATES

Crop | Target plant population (#/m²) | Seed Size (TKW in g)
--- | --- | ---
Lentil | 120 – 130 (190-210 new) | 26 – 73
Pea | 75 - 85 | 150 – 280

Seeding Rate = Target Plant Stand x Seed Size (TKW) (% Emergence)
Lentil Input Study

Factor One: Weed Control
- Pre-seed burn off (glyphosate)
- Pre-seed residual (Focus)

Factor Two: Seeding Rate
- 130 viable seeds/m² (40lb/ac ; 0.67 bu/ac)
- 190 viable seeds/m² (60lb/ac ; 1 bu/ac)
- 260 viable seeds/m² (80 lb/ac ; 1.3 bu/ac)

Factor Three: Disease Control
- No Fungicide
- Single
- Dual

2017-2019
- Saskatoon (2018-2019)
- Yorkton (2017)
<table>
<thead>
<tr>
<th>% Weed control of residual herbicide relative to burnoff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual herbicide was effective 71% of the time</td>
</tr>
<tr>
<td>10 / 14 site years</td>
</tr>
<tr>
<td>• 66% increase in annual weed control</td>
</tr>
<tr>
<td>• Volunteer canola, Kochia, Cleavers</td>
</tr>
<tr>
<td>• Wild oats, Green foxtail</td>
</tr>
<tr>
<td>Residual herbicide not effective 29% of the time</td>
</tr>
<tr>
<td>4 / 14 site years</td>
</tr>
<tr>
<td>• Weeds not in control spectrum</td>
</tr>
<tr>
<td>• Glyphosate provided great control</td>
</tr>
<tr>
<td>• Limited secondary flushes</td>
</tr>
<tr>
<td>• Poor soil activation</td>
</tr>
</tbody>
</table>

*Preliminary Results*
Worst vs. Best Case 72% Reduction

 Glyphosate  |  Seed Rate
----------|----------
  130     |  65%     
  190     |  48%     
  260     |  33%     

*Preliminary Results
5 pl/ft²

Standard (130 seeds/m² & Glyphosate) 5% Yield Loss
Vs.
Enhanced (190 seeds/m² & Focus) 1% Yield Loss
10 pl/ft²

Standard (130 seeds/m² & Glyphosate) 9.5% Yield Loss
Vs.
Enhanced (190 seeds/m² & Focus) 3% Yield Loss
15 pl/ft²

Standard (130 seeds/m² & Glyphosate) 14% Yield Loss

Vs.

Enhanced (190 seeds/m² & Focus) 4% Yield Loss
Standard (130 seeds/m² & Glyphosate) 28% Yield Loss
Vs.
Enhanced (190 seeds/m² & Focus) 8% Yield Loss

30 pl/ft²
EFFECT OF SEEDING RATE & APPLICATION TIMING ON DISEASE INCIDENCE

**21 DAIA**  **14 DAIA**

*Disease Incidence (%)*

Seeding Rate

- None
- 260
- 190
- Single
- Dual

Fungicide

- None
- Single
- Dual

*Preliminary Results*
### HIGH YIELDING (9/15 SITE YEARS)

<table>
<thead>
<tr>
<th></th>
<th>Yield Gains (bu per ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.0</td>
</tr>
<tr>
<td>Single</td>
<td>1.0</td>
</tr>
<tr>
<td>Dual</td>
<td>2.0</td>
</tr>
<tr>
<td>None</td>
<td>0.0</td>
</tr>
<tr>
<td>Single</td>
<td>1.0</td>
</tr>
<tr>
<td>Dual</td>
<td>2.0</td>
</tr>
<tr>
<td>None</td>
<td>0.0</td>
</tr>
<tr>
<td>Single</td>
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</tr>
<tr>
<td>Dual</td>
<td>2.0</td>
</tr>
<tr>
<td>None</td>
<td>0.0</td>
</tr>
<tr>
<td>Single</td>
<td>1.0</td>
</tr>
<tr>
<td>Dual</td>
<td>2.0</td>
</tr>
</tbody>
</table>

- **Glyphosate**: None, Single, Dual
- **Focus**: None, Single, Dual

### Disease Risk

- Preliminary Results

- *Yield Gains (bu per ac) for different treatments: None, Single, Dual.*
LOW YIELDING (6/15 SITE YEARS)

*Preliminary Results
### Revenue (%) impact as weed populations increase

#### Low- Yielding Sites (6/15 Sites)

<table>
<thead>
<tr>
<th>Seeding Rate (seeds/m²)</th>
<th>Herbicide</th>
<th>5 Pl/ft²</th>
<th>10 Pl/ft²</th>
<th>15 Pl/ft²</th>
<th>20 Pl/ft²</th>
</tr>
</thead>
<tbody>
<tr>
<td>130</td>
<td>Glyphosate vs Glyph. + Focus</td>
<td>-2.1</td>
<td>7.8</td>
<td>14.0</td>
<td>20.9</td>
</tr>
<tr>
<td>190</td>
<td>Glyphosate vs Glyph. + Focus</td>
<td>4.2</td>
<td>14.1</td>
<td>20.3</td>
<td>27.2</td>
</tr>
<tr>
<td>260</td>
<td>Glyphosate vs Glyph. + Focus</td>
<td>1.2</td>
<td>12.3</td>
<td>19.2</td>
<td>26.9</td>
</tr>
</tbody>
</table>

#### High- Yielding Sites (9/15 Sites)

<table>
<thead>
<tr>
<th>Seeding Rate (seeds/m²)</th>
<th>Herbicide</th>
<th>5 Pl/ft²</th>
<th>10 Pl/ft²</th>
<th>15 Pl/ft²</th>
<th>20 Pl/ft²</th>
</tr>
</thead>
<tbody>
<tr>
<td>130</td>
<td>Glyphosate vs Glyph. + Focus</td>
<td>-2.9</td>
<td>5.3</td>
<td>10.3</td>
<td>15.8</td>
</tr>
<tr>
<td>190</td>
<td>Glyphosate vs Glyph. + Focus</td>
<td>-2.7</td>
<td>5.5</td>
<td>10.5</td>
<td>16.1</td>
</tr>
<tr>
<td>260</td>
<td>Glyphosate vs Glyph. + Focus</td>
<td>-2.3</td>
<td>6.1</td>
<td>11.2</td>
<td>16.9</td>
</tr>
</tbody>
</table>
SMALL RED LENTIL BEST MANAGEMENT PRACTICE

Seeding Rate:
- 190 > 260 > 130 viable seeds/m² under “good” conditions
- 190 > 130 > 260 viable seeds/m² under “poor” conditions

Residual herbicides:
- was effective 71% of the time
- 65% reduction in weed establishment
- 72% reduction in weed biomass
- $$ Profit at plant densities >5 weeds/ft²

Fungicide:
- 260 < 190 ≤ 130 unsprayed < 130 single/dual
- Dry conditions: 1 pass
- Wet conditions: 2 passes?

Overall - Increased seeding rate (190) + residual herbicide + single fungicide

*Preliminary Results*
MANAGEMENT STRATEGIES TO IMPROVE FIELD PEA ROOT HEALTH IN APHANOMYCES CONTAMINATED SOILS

Evaluating combinations of various management strategies to reduce the impact

1. Pre-seed herbicides- application of a dinitroaniline herbicide inhibited the production of motile zoospores to delay infection

2. Increased available nutrients- to boost early development & improve growth through to improve tolerance

3. Seed treatments- targets root rot complexes to improve tolerance
<table>
<thead>
<tr>
<th>TRT #</th>
<th>Herbicides</th>
<th>Starter Fertilizer</th>
<th>Seed Treatment</th>
<th>Foliar nutrient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Glyphosate</td>
<td>4N, 20 P</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>2</td>
<td>Glyphosate</td>
<td>4N, 20 P</td>
<td>vibrance maxx + intego</td>
<td>no</td>
</tr>
<tr>
<td>3</td>
<td>Glyphosate + trifluralin</td>
<td>4N, 20 P</td>
<td>vibrance maxx</td>
<td>no</td>
</tr>
<tr>
<td>4</td>
<td>Glyphosate + trifluralin</td>
<td>4N, 20 P</td>
<td>vibrance maxx + intego</td>
<td>no</td>
</tr>
<tr>
<td>5</td>
<td>Glyphosate + trifluralin</td>
<td>4N, 20 P</td>
<td>vibrance maxx + intego</td>
<td>yes</td>
</tr>
<tr>
<td>6</td>
<td>Glyphosate</td>
<td>20 N, 50 P, 20 K, 10 S</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>7</td>
<td>Glyphosate</td>
<td>20 N, 50 P, 20 K, 10 S</td>
<td>vibrance maxx + intego</td>
<td>no</td>
</tr>
<tr>
<td>8</td>
<td>Glyphosate + trifluralin</td>
<td>20 N, 50 P, 20 K, 10 S</td>
<td>vibrance maxx</td>
<td>no</td>
</tr>
<tr>
<td>9</td>
<td>Glyphosate + trifluralin</td>
<td>20 N, 50 P, 20 K, 10 S</td>
<td>vibrance maxx + intego</td>
<td>no</td>
</tr>
<tr>
<td>10</td>
<td>Glyphosate + trifluralin</td>
<td>20 N, 50 P, 20 K, 10 S</td>
<td>vibrance maxx + intego</td>
<td>yes</td>
</tr>
</tbody>
</table>

Trifluralin = Treflan/Rival/Bonanza

www.warc.ca
Gly = Glyphosate, Tri = Trifluralin, ST = Seed Treatment, VM = Vibrance Maxx, I = Intego, Fn = Foliar Nutrient
Scott, 2019 @ 8 Weeks After Planting

Gly + 20 P, No, ST/FN  vs  TRI + 50 P, 20K, 10S, VM+ I + FN
Most common factors that influenced yield: **Fertility, herbicide, & seed treatment**

Inconsistent responses among sites

- **Fertility (low vs high)**
  - available P can increase early season vigor and improve tolerance to disease
    - Great extent at Scott and to a lesser extent at Melfort, Swift Current, Outlook

- **Herbicide (glyphosate vs. trifluralin)**
  - delay infection and improved plant tolerance
    - 2 highest yields at Scott & highest at Swift Current
    - third & fourth highest yields at Outlook & Melfort

- **Seed treatment** (none vs. Vibrance Maxx vs. Vibrance Maxx + Intego)
  - Only positive benefit noted at Swift Current
    - Limited efficacy could be attributed to dry spring

2 or more inputs most effective
Scott Significant (P=0.0132)  
Other Sites = NS

Preliminary Data

3/ 5 Vs.  5/5
9 bu/ac avg. gain

Gly= Glyphosate, Tri= Trifluralin, ST= Seed Treatment, VM= Vibrance Maxx, I= Intego, Fn= Foliar Nutrient
Basic Strategy
- Glyphosate
- 20 P lbs/ac
- No Seed Treatment
- No Foliar Nutrients

Intensive Strategy
- Glyphosate + Trifluralin
- 20N, 50 P, 20 K, 10 S lbs/ac
- Seed Treatment
  (Vibrance Maxx + Intego)
- Foliar Nutrients
Effective and profitable management strategies:
(1) proper fertilization (higher than the current standard of 20 lb/ac of P$_2$O$_5$)
(2) applications of trifluralin to reduce disease and weed pressure
(3) the application of seed treatments in a wet, cold spring

Combining multiple techniques may prove useful as the combination of delayed infection and improved disease tolerance may result in more robust plants.

Most Profitable:
• Gly+ high fertility (50 P, 20 K, 10 S)
• Trifluralin + high fertility (50 P, 20 K, 10 S) + Vibrance Maxx *most promise