Why Are PULSES so Difficult to GROW??

WEEDS!!!

A GLANCE at what’s in the WORKS and what to AVOID
UTILIZE ALL THREE WEED CONTROL CONCEPTS

1. CHEMICAL
2. MECHANICAL
3. CULTURAL
1. CHEMICAL WEED CONTROL

Herbicide Layering

- Utilizing two to three herbicides in sequence to tackle tough-to-control weeds and to stave off weed resistance
- Research conducted throughout the province
  - volunteer canola, kochia and mustard
- Traditional in-crop weed control vs. herbicide layering PRE-seeding
UTILIZE ALL THREE WEED CONTROL CONCEPTS

1. CHEMICAL
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Mechanical Weed Control Research

Weed Clipping & Weed Wiping

Dr. Steve Shirtliffe – Department of Plant Science, Agronomy

Lena Syrovy- Research Assistant

U of S Agronomy Crew: Shaun Campbell, Taryn Zdunich, summer students

U of S Weeds Crew: Gerry Stuber, Aaron Gerein
In-Crop Weed Seed Management

- Reduce *production* of viable weed seeds
- Reduce HR weed populations over long term
- Can target weeds that mature before the crop
- Taller weed and/or shorter crop
  - Wild oats, kochia, wild mustard, Canada thistle

Weed clipping
Weed wiping
Weed Clipping
Weed Clipping

Mustard Seed Production in Lentil

Saskatoon: $P < 0.0001$

Lacombe: $P < 0.01$

Mustard Seed Production (kg ha$^{-1}$)

2-3 passes recommended
Mustard Seed Production – Clipping Frequency

Mustard seed production = 468.4 + (-256.4 x (Frequency)) + (37.5 x (Frequency)^2)
Both sites: linear \( P < 0.0001 \), quadratic \( P < 0.0001 \)

August 1st
1 clipping: 40%
2 clipping: 77%
3 clipping: 92%
Weed Clipping

Borgault Tillage Tools
50’ weed clipper

http://www.weedclipper.com/about/
1.800.878.7714
Weed Wiping

Weed Wiping
Wild Mustard Seed Yield in Lentil – 4 site-yrs

Herbicide $P < 0.01$

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>WM Seed Production (/5 plants)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2, 4-D Amine</td>
<td>54%</td>
</tr>
<tr>
<td>Control</td>
<td>51%</td>
</tr>
<tr>
<td>Dicamba</td>
<td>51%</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>72%</td>
</tr>
</tbody>
</table>

Note: Comparison letters indicate significant differences among treatments.
## Wild Mustard Seed Yield - Timing

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016 N</th>
<th>2016 S</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbicide</td>
<td>0.06</td>
<td>0.06</td>
<td>0.23</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Timing</td>
<td>0.02</td>
<td>&lt;0.001</td>
<td>0.29</td>
<td>0.08</td>
</tr>
<tr>
<td>Herbicide x Timing</td>
<td>0.33</td>
<td>&lt;0.01</td>
<td>0.08</td>
<td>0.10</td>
</tr>
</tbody>
</table>

**2015**
- Week 1: b
- Week 2: a
- Week 3: a

**2017**
- Week 1: ab
- Week 2: ab
- Week 3: a
- Week 1 & 3: b

**Graphs**
- **Weeks:** Week 1, Week 2, Week 3, Week 1 & 3
- **Y-axis:** WM Seed Production (Prop of Control)
- **X-axis:** Weeks
Wild Mustard Seed Yield - Timing

Key Points:

• Timing is inconsistent
• Recommend TWO applications
• Dicamba resulted significant lentil yield loss
• 2- 4 D varied lentil yield loss
• **Glyphosate is the most recommended** –
  • earlier is better if you only do it once
Wild Mustard Seed Production

Taken 1 month after application

Photos: H.S.N. Duddu
2016 Spring Seedling Recruitment

Cumulative Seedling Recruitment (plants m\(^{-2}\))

- 2,4-D
- Dicamba
- Untreated
- Glyphosate

50%
Mechanical Weed Control Research

Rotary Hoe, Harrow & Inter-row Cultivation

Dr. Steve Shirtliffe – Department of Plant Science, Agronomy
Alba Oleksandr- MSc. Graduate
Lena Syrovy- Research Assistant
U of S Agronomy Crew: Shaun Campbell, Taryn Zdunich, summer students
Mechanical Weed Control in Lentil

76%-79%

P<0.0001

RH- Rotary Hoe
H- Harrow
IT- Inter-row Cultivator
From 4 to 10 node stage

Pre-emergence up to cotyledon stage

Pre-emergence up to 5 node stage

From 4 to 10 node stage
Weed Control in Field Pea

![Graph showing weed biomass in Field Pea](chart)

Weed Biomass (g/m²)

Untr | RH | H | IT | RH-H | H-IT | RH-IT | RH-H-IT | HW

- 73-86%
- P<0.0012
Untreated

Rotary Hoe & Inter-Row Cultivation
44ft Unit
RTK camera vision

6.0” row spacing
Key Findings

• Multiple passes are required to provide great weed control

• Early season weed control paired with in-crop is most effective
  • glyphosate for early control

• Followed by inter-row cultivator to remove any remaining weeds
  • Inter-row cultivator wide range of use
  • Can be used as early as camera can detect plants
  • Ideally between 4 and 10th node stage
Harvest Weed Seed Control

Dr. Breanne Tidemann- Research Scientist AAFC

AAFC Lacombe Crew: Larry Michielsen, Jennifer Zuidhof, Patty Reid, Shane Sroka

U of S Weeds Crew: Gerry Stuber, Aaron Gerein
Harrington Seed Destructor

Cage mill to impact/grind the chaff

All residue placed back on the field

Integrated Harrington Seed Destructor (iHSD)

- Used in various combine models

http://www.ihsd.com/product-features
Seed Terminator

Multi-stage hammer mill

Australian & Canadian

Seed Terminator in action

www.seedterminator.com.au
<table>
<thead>
<tr>
<th>Species</th>
<th>1000-seed weight (g)</th>
<th>Control (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kochia</td>
<td>0.95</td>
<td>98</td>
</tr>
<tr>
<td>Green foxtail</td>
<td>1.58</td>
<td></td>
</tr>
<tr>
<td>False Cleavers</td>
<td>2.19</td>
<td></td>
</tr>
<tr>
<td>Volunteer</td>
<td>3.80</td>
<td></td>
</tr>
<tr>
<td>Wild oat canola</td>
<td>17.02</td>
<td></td>
</tr>
</tbody>
</table>

The equation for the curve is:

\[ y = -0.0001x^2 + 0.027x + 97.87 \]

Adj. \( R^2 = 0.81 \)
Volunteer Canola this Fall – ONLY 1 FIELD
UTILIZE ALL THREE WEED CONTROL CONCEPTS

1. CHEMICAL
2. MECHANICAL
3. CULTURAL
Cultural Concepts

Don’t count out cultural control

Seeding Rates

- Lentils: Current 130 seeds/m² vs. 260 seeds/m²
- Field peas: Current 90 seeds/m² vs. 135 seeds/m²
Literature Findings


Don’t Remove Pulses From Your ROTATION

Reasons why to keep pulses:

1. Use for a 3-yr rotation
   • Reduce spore load of clubroot

2. Use less fertilizer

3. Better flax crops
   • Establish levels of mycorrhiza

4. Long-term soil health benefits
   • Improve total soil microbial population
   • Improve soil organic levels

5. Rejuvenate soil N levels
   • Reduce fertilizer requirements for next season
UTILIZE ALL THREE WEED CONTROL CONCEPTS

A few options to consider...

1. CHEMICAL
   ◦ Herbicide Layering

2. MECHANICAL
   ◦ Weed Wiping
   ◦ Weed Clipping
   ◦ Inter-row cultivation
   ◦ Weed Seed (HSD/ST)

3. CULTURAL
   • Seeding Rates
   • Crop Rotation