Organic Weed Control Research at the University of Saskatchewan
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www.usask.ca
Recent U of S Research

- Combining effective tools:
  
  a) Mechanical weed control – Rotary hoe, harrow, inter-row cultivation
  b) Cultural weed control – ↑ seeding rate

- Weakly competitive crops - flax, lentil, field pea

- Annual weeds eg. wild mustard, lambsquarters, foxtail, wild buckwheat, redroot pigweed
Mechanical Weed Control

Rotary Hoe

Spring Tine Harrow

Inter-row cultivator
Rotary Hoe

- Pre- or early post-crop emergence
- Weed control within and between crop rows

Timing - weeds in white thread stage

https://matronofhusbandry.files.wordpress.com/2011/06/100_7771.jpg
U of S Rotary Hoe Video

- https://youtu.be/AqwfX3zF-t8
Spring Tine Harrow

- Pre- or post-emergence
- Wider window of use than rotary hoe – up to cotyledon stage of weeds
- Weed control within and between crop rows
- Weed (and crop) burial
Inter-row Cultivator

- Later crop growth, prior to row closure
- Larger weeds that were not controlled earlier
- Weed control between crop rows
Inter-row Cultivation

Photos: Oleksandr Alba
Seeding rate – Lentil crop and weed biomass

Higher seeding rates required in organic

Red line: 130 seeds m$^2$ (conventional recommended)

Baird et al. 2009
Integrated weed management in organic field pea and lentil

Oleksandr Alba, MSc Candidate

Supervisor: Dr. Steven Shirtliffe
## Project Description

<table>
<thead>
<tr>
<th>Experimental design</th>
<th>RCBD with factorial design (4 replications)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locations</td>
<td>Kernen Crop Research Farm and Goodale</td>
</tr>
<tr>
<td>Years</td>
<td>2016 and 2017</td>
</tr>
<tr>
<td>Size of plot</td>
<td>2.25 x 6 m</td>
</tr>
<tr>
<td>Factors</td>
<td>Mechanical weed control applied as single treatment, paired and triple treatment combination (Rotary hoe, harrow, inter-row cultivation)</td>
</tr>
<tr>
<td></td>
<td>Seeding rate Conventional (L) and Optimal Organic (H). Field pea: (L) – 90 plants/m², (H)-135 plants/m² Lentil: (L) – 130 plants/m², (H)-260 plants/m²</td>
</tr>
</tbody>
</table>
Weed biomass in Field Pea

Kernen-Pea-Weed-Biomass

Conventional seedrate (L)

Organic seedrate (H)

High seed rate (H) 15% weed biomass reduction
Weed Biomass in Field Pea

Goodale-Pea-Weed-Biomass

Kernen-Pea-Weed-Biomass

Weed Biomass in Field Pea
Field pea yield

**Goodale-Pea-Yield**

Yield (kg/ha)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Yield (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untr</td>
<td>500</td>
</tr>
<tr>
<td>RH</td>
<td>1000</td>
</tr>
<tr>
<td>H</td>
<td>1500</td>
</tr>
<tr>
<td>IT</td>
<td>2000</td>
</tr>
<tr>
<td>RH-H</td>
<td>2500</td>
</tr>
<tr>
<td>H-IT</td>
<td>3000</td>
</tr>
</tbody>
</table>

**Kernen-Pea-Yield**

Yield (kg/ha)

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<tbody>
<tr>
<td>Untr</td>
<td>200</td>
</tr>
<tr>
<td>RH</td>
<td>400</td>
</tr>
<tr>
<td>H</td>
<td>600</td>
</tr>
<tr>
<td>IT</td>
<td>800</td>
</tr>
<tr>
<td>RH-H</td>
<td>1000</td>
</tr>
<tr>
<td>H-IT</td>
<td>1200</td>
</tr>
</tbody>
</table>

Legend:
- Red: Conventional seedrate
- Green: Organic seedrate

Treatments
IT (H) pea

Untreated (left) vs RH-IT (H) pea

RH-H-IT (L) pea
Weed Biomass in Lentil

**Goodale-Lentil-Weed-Biomass**

**Kernen-Lentil-Weed-Biomass**
Lentil Yield

Goodale Lentil Yield

<table>
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<tr>
<th>Seeding Rate</th>
<th>Yield (kg/ha)</th>
<th>Conventional seedrate (L)</th>
<th>Organic seedrate (H)</th>
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<tbody>
<tr>
<td>L</td>
<td>1000</td>
<td>1400</td>
<td>1200</td>
</tr>
<tr>
<td>H</td>
<td>1600</td>
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Kernen Lentil Yield

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<tr>
<td>H</td>
<td>1200</td>
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32% and 26% increase in yield with organic seedrate (H) compared to conventional seedrate (L).
Lentil Yield

Graph 1: Goodale-lentil-Yield

Graph 2: Kernen-Lentil-Yield

Yield (kg/ha) vs. Treatments
Flax mechanical weed control

- Fall Rye Intercrop
- Fall Rye Intercrop + Rotary Hoe
- Hand Weeded
- Rotary Hoe + Inter-row
- Inter-row
- Rotary Hoe
- Weedy Control

Flax Seed Yield (kg/ha)
Flax mechanical weed control

Rotary Hoe + Inter-row, high flax seed rate

No mechanical weed control, low flax seed rate
Flax – winter cereal intercrops

Inter-row seeding fall rye or winter barley between flax rows suppressed weeds BUT…
Flax – winter cereal intercrops

Reduced flax yield by ≥50%, even at lower winter cereal seeding rates