Clubroot Management

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Canola Council of Canada
Outline

• Dan’s tales
• What doesn’t work
• What does work
• What you need to do
  > Grower
  > Retail/agronomist staff
  > County/municipality staff
  > Oil & gas / construction
Why is clubroot spreading?
Why is clubroot spreading?

Finding the disease too late
Clubroot – What Does Not Work
1. Fungicides

Effects of chemical soil treatments on canola growth in clubroot-infested soil – Leduc, 2008
Clubroot – What Does Not Work

1. Fungicides
   • Terraclor applied at 90 kg/ha reduces the severity of clubroot, promotes growth, and improves yield.
     • At 90 kg/ha it costs $1100/ac
   • Ranman (7.5 L/ha) improved plant height in 2007 and plant cover and yield in 2008.
2. Seed Treatments

- Seed treatments increased yield but did not reduce disease.
Clubroot – What Does Not Work

3. Boron

- greenhouse and field testing revealed that boron could reduce both the incidence and severity of clubroot
- phytotoxic effects were also observed, even at moderate rates of application
Clubroot – What Does Not Work

4. Liming Soil
5. Other Soil Amendments

![Graph showing seed yield (t/ha) for different treatments.]

- Untreated
- Terraclor
- Calcium carbonate
- Wood ash
- Terraclor + Calcium carbonate
- Terraclor + wood ash

Legend:
- Edmonton 2009
- Edmonton 2010
- Leduc 2010
Clubroot – What Does Not Work

6. Bait Crops

Effect of repeated cultivation of bait crop (B. rapa cv. Reward) on the subsequent clubroot on canola

<table>
<thead>
<tr>
<th></th>
<th>St. Albert</th>
<th>Leduc</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>June 2008</td>
<td>May 2009</td>
</tr>
<tr>
<td>Index of disease severity (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crop for entire season</td>
<td>43</td>
<td>61</td>
</tr>
<tr>
<td>Crop seeded for 4 cycles</td>
<td>34</td>
<td>61</td>
</tr>
<tr>
<td>Crop seeded for 3 cycles</td>
<td>35</td>
<td>65</td>
</tr>
<tr>
<td>Crop seeded for 2 cycles</td>
<td>45</td>
<td>70</td>
</tr>
</tbody>
</table>

Means in a column were not significantly different based on a protected LSD at $P \leq 0.05$
Clubroot – What Does Not Work

7. Tillage
Clubroot – What Does Not Work

8. Crop Rotation

- Crop rotation will not eliminate *P. brassicae*.
- Crop rotation will not prevent *P. brassicae* from arriving in a field.
- Crop rotation will not prevent *P. brassicae* from spreading to another field.
- Movement of *P. brassicae* is the same risk in canola crop as in other crops.
Clubroot – What Does Work!
Clubroot – What Does Work!

1. Crop Rotation
Clubroot – What Does Work!

1. Crop Rotation

Effect of cultivar and rotation on yield of canola - Quebec 2012

<table>
<thead>
<tr>
<th>Canola cultivar</th>
<th>0-year break</th>
<th>1-year break</th>
<th>2-year break</th>
<th>3-year break</th>
<th>4-year break</th>
</tr>
</thead>
<tbody>
<tr>
<td>45H26 (S)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5030 (MR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45H29 (R)</td>
<td></td>
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Yield - grams/plot

0 500 1000 1500 2000 2500
1. **Crop Rotation**

   - A >2-year break from canola reduced *P. brassicae* resting spores in the soil substantially.
   - Long rotation is not enough for S or MS varieties to reach yield potential in heavily infested fields.
   - A resistant cultivar, in conjunction with a >3-year crop rotation may allow maximum yield potential in heavily infested fields, as well as reducing the pathogen inoculum loads in the soil.
Clubroot – What Does Work!

2. Clubroot Resistance

45H29 (R)  45H26 (S)
Clubroot – What Does Work!

2. Clubroot Resistance

![Bar chart showing emergence and seed yield for cultivars resistant and susceptible to clubroot. The chart indicates that cultivar A is resistant and shows higher emergence and seed yield compared to cultivar B, which is susceptible.]
Protect your resistant varieties

Clubroot resistance does break down

> Happens in all areas of the world
> Has been broken in the lab at the University of Alberta

Prevent resistance breakdown by:

> Using a long rotation
> Rotate between Pioneer and Monsanto’s clubroot resistance source varieties

<table>
<thead>
<tr>
<th>Pioneer Hi-Bred source</th>
<th>Bayer source</th>
<th>Monsanto source</th>
<th>DL Seeds source</th>
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</thead>
<tbody>
<tr>
<td>45H29 (Pioneer)</td>
<td></td>
<td>74-47 CR (Dekalb)</td>
<td>L135C</td>
</tr>
<tr>
<td>9558 GC (Viterra)</td>
<td></td>
<td>1960 (Canterra)</td>
<td>6056 CR</td>
</tr>
<tr>
<td>D3152 (DuPont)</td>
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</tbody>
</table>
3. Seeding Date

![Graph showing seeding date impact on severity and gall weight]

- **Severity (0-3)**
  - Early: A
  - Mid: A
  - Late: A

- **Gall Weight (g)**
  - Early: 0.5
  - Mid: 1
  - Late: 1.5

Legend:
- Blue: Severity
- Red: Gall Weight
Clubroot – What Does Work!

4. Sanitation
Clubroot – What Does Work!

5. Early Identification
Clubroot – What Does Work!

6. Tillage

- Reduced tillage
Clubroot – What Does Work!

7. Quarantine / Isolation

![Diagram showing field entrance and points with distances and Clubroot impact values.]

- Field Entrance
- Points 1, 2, 3, 4, 5, 6, 7, 8, 9 with distances and Clubroot impact values.
Clubroot – What Does Work!

8. Eradication?
Clubroot – What Does Work!

8. Eradiction? Fumigation

No Vapam

Vapam @ 100 mL/m²
Clubroot – What Does Work!

8. Eradication? Fumigation

Effects of different Vapam concentrations on growth of canola in clubroot-infested soil under greenhouse conditions
Clubroot – What Does Work!

9. Brassica weed control
Clubroot – What Does Work!

10. Planning

• Clubroot is not only a canola problem
Clubroot – What Does Work!

11. Clean inputs

• Cleaned and treated seed is essentially no risk
Clubroot – What Does Work!

11. Developing a clubroot management plan

Plan should include

• How will you quarantine a field?
• How will you plan your field work?
• When will you sanitize your equipment?
• When will you use resistant varieties?
Assessing risk – what are the main factors involved introduction?

- Normal farm operations (high risk regions)
- Used equipment
- Custom operators
- Construction/petroleum/utilities
- Recreational traffic
- Livestock
- Hay/manure
- Common/untreated seed (potatoes especially)
- Wind/water erosion
- Vegetable/nursery
What you need to do - FARMER

1. Prevention
   > Know risks of introduction
   > Base sanitation on risk
2. Identify clubroot early
3. Develop a clubroot management plan
4. Work with your municipality
What you need to do - RETAIL

1. Develop a clubroot management plan
2. Prevention – do not spread clubroot
   > Know risks areas/fields
   > Know risks of transmission
   > Base sanitation on risk
What you need to do - COUNTY

1. Consult with rate payers
   > Regulate on basis of provincial clubroot management plans

2. Develop local clubroot management plan
   > Provide support to local growers to develop theirs

3. Education / awareness programs
What you need to do – PETROLEUM / UTILITIES

1. Consult with land owners
   > Contract your responsibilities

2. Prevention – do not spread clubroot
   > Know risks areas/fields
   > Know risks of transmission
   > Base sanitation on risk

3. Eradication?
   > Soil fumigation?