Canola Insect Pests to Scout for in 2022

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Flea Beetles of Canola

Striped Flea Beetle
Phyllotreta striolata

Crucifer Flea Beetle
Phyllotreta cruciferae

Photograph by P. Beauzay
2018 Canola Flea Beetle Survey
Crucifer Flea Beetle (Phyllotreta cruciferae)

- 45,434 total specimens
- 98.2% of flea beetles collected
- 100% of the fields positive
- 22 counties out of 22

Total number of Flea Beetles Collected per 100 Sweeps

- 0
- 1-50
- 51-100
- 101-500
- 501-1000
- >1000
2018 Canola Flea Beetle Survey
Striped Flea Beetle (*Phyllotreta striolata*)

- 656 total specimens
- 1.4% of flea beetles collected
- 66% of the fields positive
- 18 counties out of 22
Striped Flea Beetle (SFB) Populations in Canola from 2014-2018
Life Cycle of the Crucifer Flea Beetle

**Fall**
- Summer generation of adults July - Oct.

**Winter**
- Overwintering adults emerge

**Spring**
- EGG May - June
- ADULT

**Summer**
- PUPA July - August
- LARVA June - July

Source: Crucifer Flea Beetle: Biology and IPM in Canola, E1234, NDSU Ext.
Canola seedling damage, pitting, caused by flea beetle feeding (top) and undamaged seedling (bottom).

No Insecticide Treatment

Insecticide Seed Treatment
Insecticide Seed Treatments in Canola

- **Neonicotinoids – Group 4A (flea beetles & wireworms)**
  - Thiamethoxam (Helix XTra, Helix Vibrance)
  - Clothianidin (Prosper EverGol)
- **Diamides – Group 28 (flea beetles & cutworms)**
  - Cyantraniliprole (Lumiderm, Fortenza)
- **Butenolides, Group 4D (flea beetles only)**
  - Flupyradiforouone (Buteo Start)

NEW!
Estimated Percentage of Canola Acres in ND Treated with Insecticide Seed Treatments from 1996-2012

Pesticide Resistance

- Over 500 insects worldwide
- Cross-resistance becoming more prevalent
Objective of Greenhouse Bioassays

- Determine the susceptibility of current neonicotinoid and diamide seed treatments for control of spring populations of *P. cruciferae* versus *P. striolata* in canola.
Greenhouse Bioassay – Insecticide Seed Treatment Susceptibility between Crucifer Flea Beetles and Striped Flea Beetles

- RCBD factorial arrangement
  6 reps, ran twice

- Canola Seed Treatment
  - Clothianidin (Prosper FX), 200.8 g ai per 100 kg seed
  - Thiamethoxam (Helix XTra), 400 g ai per 100 kg seed
  - Cyantraniliprole (Lumiderm), 1000 g ai per 100 kg seed
  - Untreated check
Bioassay for Insecticide Seed Treatments

- 10 flea beetles were introduced on 5 plants per cup.
- Conducted live counts and feeding injury ratings at 3, 7 and 10 days after infestation.
Bioassay for Insecticide Seed Treatments

• Feeding injury score was rated on a 0-6 scale based on cotyledon pitting feeding injury (Knodel et al. 2008).

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 pits</td>
</tr>
<tr>
<td>1</td>
<td>1-3 pits</td>
</tr>
<tr>
<td>2</td>
<td>4-9 pits</td>
</tr>
<tr>
<td>3</td>
<td>10-15 pits</td>
</tr>
<tr>
<td>4</td>
<td>16-25 pits</td>
</tr>
<tr>
<td>5</td>
<td>&gt;25 pits</td>
</tr>
<tr>
<td>6</td>
<td>Plant death</td>
</tr>
</tbody>
</table>
Crucifer FB versus Striped FB – Day 7

Significance at $\alpha=0.05$

CLO = clothianidin, CYA = cyantraniliprole, THI = thiamethoxam, UTC = untreated control

Asterisks mean significant differences between paired SFB and CFB plots according to a t-test with equal variances ($P \leq 0.05$) where

* is $P \leq 0.05$, ** is $P \leq 0.01$, *** is $P \leq 0.001$ and **** is $P \leq 0.0001$. 
Conclusion

• Striped flea beetle (SFB) had **reduced susceptibility** compared to crucifer flea beetle (CFB)
  – Striped flea beetle had **decreased mortality** and **increased feeding injury**
  – Tansey et al. (2008) found similar response for THI and CLO between the two species of flea beetles in Canada

• Mortality on Observation Day 7

<table>
<thead>
<tr>
<th>Treatment</th>
<th>SFB</th>
<th>CFB</th>
</tr>
</thead>
<tbody>
<tr>
<td>THI</td>
<td>38</td>
<td>84</td>
</tr>
<tr>
<td>CLO</td>
<td>55</td>
<td>76</td>
</tr>
<tr>
<td>CYA</td>
<td>37</td>
<td>95</td>
</tr>
</tbody>
</table>
New Insecticide Seed Treatment - Canola

- Bayer Crop Sciences
- Buteo Start, Al – flupyradiflorone, Group 4D (Butenolides)
  - Flea beetles
Field - Buteo Start Seed Treatment 2021

Bayer CropScience in Canola Seed Treatment for Control of Flea Beetles 2021

Injury Rating
0 = 0 pits
1 = 1-3 pits
2 = 4-9 pits
3 = 10-15 pits
4 = 16-25 pits
5 = >25 pits
6 = Plant death

Trt 1 = Prosper Evergo @ 21.5 fl oz/cwt + Buteo Start @ 16 fl oz/cwt
Trt 2 = Prosper Evergo @ 21.5 fl oz/cwt + Buteo Start @ 9.6 fl oz/cwt
Trt 3 = Prosper Evergo @ 21.5 fl oz/cwt
Trt 4 = Untreated Check
Trt 1 = Prosper Evergol @ 21.5 fl oz/cwt + Buteo Start @ 16 fl oz/cwt
Trt 2 = Prosper Evergol @ 21.5 fl oz/cwt + Buteo Start @ 9.6 fl oz/cwt
Trt 3 = Prosper Evergol @ 21.5 fl oz/cwt
Trt 4 = Untreated Check
Buteo Start Field Plots - Canada
Greenhouse - Buteo Start Seed Treatment 2021

### Greenhouse - Crucifer Flea Beetle Percent Mortality

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Percent Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buteo High 7 DAP</td>
<td>71a</td>
</tr>
<tr>
<td>Buteo Low 7 DAP</td>
<td>93a</td>
</tr>
<tr>
<td>Untreated 7 DAP</td>
<td>98a</td>
</tr>
</tbody>
</table>

### Greenhouse - Crucifer Flea Beetle Feeding Injury

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Feeding Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buteo High 7 DAP</td>
<td>1.6c</td>
</tr>
<tr>
<td>Buteo Low 7 DAP</td>
<td>2.1c</td>
</tr>
<tr>
<td>Untreated 7 DAP</td>
<td>2.2c</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate</th>
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<tbody>
<tr>
<td>Buteo Start (low rate)</td>
<td>9.6 fl oz/acre</td>
</tr>
<tr>
<td>Buteo Start (high rate)</td>
<td>16 fl oz/acre</td>
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Greenhouse - Buteo Start Seed Treatment 2021

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From left to right: Untreated check, Buteo Start low rate and Buteo Start high rate assessed at day 10 (7 DAP).
Diamondback Moth (*Plutella xylostella*)

- **Adult**: ½ inch long
- **Egg**: ½ inch long
- **Larva**: Posterior end forked. About ½ inch at maturity
- **Pupa**: Loose, silken cocoon
Using Air Flow Trajectories to Predict Infestations of Diamondback moth in Canola in Northern Great Plains

- **Migratory insect pest**
  - Do not overwinter in ND or MN or Canada

- **Originate primarily from southern U.S.A. or Mexico** when strong winds carry adults northward in spring
  - Dosdall et al. 2001
Diamondback Moth – Life Cycle

- 32 days for complete life cycle
- 2-3+ generations
- 5-6 days hatch
- 150 eggs per female
- 21-30 days
- 5-15 days
- Larva feeds on leaves, buds and flowers
- Eggs laid on lower sides of leaves
- Larva feeds on leaves, buds, flowers and pods
- Adults emerge
- Adults migrate north on winds from the south
- May, June, July, August
Diamondback Moth – Crop Damage

- Larvae may feed on leaves, buds, flowers, seed pods and green outer layer of the stem
- Irregular shaped holes with membranes
Can Canola Compensate for Some Feeding?

- Canola can compensate well for feeding on **buds** and **flowers**, particularly if soil moisture is good.
- **Pod** feeding main concern, especially in dry weather (less leaf material), and larvae feed on pods earlier.
Trap Monitoring for Adult Diamondback Moths

Put traps in field in May - June
Appropriate Use of DBM Trap Data

• Appropriate use of the trap data.
  – Look for high numbers of adults >100 moths per trap per week, **early** in the season.
  – Advise farmers and agronomists to scout for DBM larvae

• Trap counts are not a substitute for regular field scouting, even if trap counts are low.
Field Scouting for Diamondback Moth Larvae

• Remove plants in an area measuring about 1 foot square
• Beat them on a clean surface
• Count the number of larvae that fall or dangle from the plants
• Repeat this procedure in at least five locations in the field
• Common to see all life stage in field
Nominal Thresholds - Diamondback Moth on Canola

- **Seedling stage:**
  - >25% defoliation, larvae still present on plants

- **Immature to flowering plants:**
  - If larvae exceed 10-15 per ft$^2$ of plants

- **Plants with flowers and pods:**
  - If larvae exceed 20-30 per ft$^2$
Foliar Insecticide for DBM in Canola

- **Pyrethroids – Group 3A**
  - Bifenthrin (Helix XTra, Helix Vibrance)
  - Deltamethrin (Delta Gold)
  - Gamma-cyhalothrin (Declare)
  - Lambda-cyhalothrin (Warrior II, Silencer, Lambda-T, etc.)
  - Zeta-cypermethrin (Mustang Maxx)

- **Diamides – Group 28 (Lep pests)**
  - Chlorantraniliprole (Coragen, Prevathon)
  - Cyantraniliprole (Exirel) (Lep pest + flea beetle)

- **Bacteria**
  - *Bacillus thuringiensis* (DiPel DF, Xen Tari DF)

- **Premix** – Chlorantraniliprole 28 + lambda-cyhalothrin 3A (Besiege)
- **Premix** – Sulfoxaflor 4C + Bifenthrin 3A (Ridgeback)

Field Reports of Pyrethroid Failures against DBM
- Spray 2-3 times with low kill
- NE ND

Notify your Extension agent
Mortality Factor of Diamondback Moth

• **Rainfall** can be a major mortality factor of eggs and early growth stages (instars) of larvae

• **Predators, parasitoids and pathogens**
Natural Enemies of Diamondback Moth

**Parasitoids**

*Diadegma insulare*

**Predators**

Damsel Bug

Lacewing larva

Photo courtesy of Lloyd Dosdall, University of Alberta
Natural Enemies of Diamondback Moth

• Disease pathogen, *Zoopathora*, especially if environmental conditions are humid and moist.
Canola Insect & Disease Diagnostic Series

Introduction
General Scouting & Calendar
Root and Surface Feeders
- Wireworms
- Cabbage root maggots
- Cutworms

Foliage and Seed feeders
- Flea beetles
- Grasshoppers
- Aster leafhoppers
- Bertha armyworms
- Lygus bugs
- Cabbage seed pod weevils
Sap Feeders
- Turnip aphids, cabbage aphids and other aphid species

New Insect Pests of Canola
- Canola flower midge
- Invasive Swede midge

Biological Control – Natural Enemies
- Predators
  - Lady beetles
  - Lacewings
  - Orius bug and other true bugs
  - Syrphid fly larva
  - Ground beetles (Carabidae)
- Parasitoids
  - Parasitic wasps
  - Tachinid flies

Beneficial entomopathogens (fungi, bacteria, viruses)

Pollinators