Managing insect pests of canola in Canada

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– Alejandro Costamagna and Tharshi Nagalingham, southern Manitoba (University of Manitoba)

– Geneviève Labrie, Centre de recherche sur les grains, south western Quebec
Outline

• Canola growing regions of Canada and cash value
• Overview of insect pests by crop stage
• Key insects:
  – Flea beetles: seedling stage
  – Cabbage seedpod weevil: (flower-pod)
  – Lygus and others
• Surveillance: Prairie Pest Monitoring Network
• Future challenges and opportunities…
Canola production in Canada and cash receipts

9.2 M ha in 2017
Farmers like it: profitable
Bugs also like it…
e.g. swede midge in Ontario

Prairies
$19B to economy

Wheat 34%
Canola 42%
Pulses 12%
Barley 4%
Other 9%

Prairies

9.2 M ha in 2017
Farmers like it: profitable
Bugs also like it…
e.g. swede midge in Ontario
Insect pest species in Québec

Main pest: striped flea beetle; *Phyllotreta striolata*

Secondary pest
Cabbage seedpod weevil
*Ceutorhynchus obstrictus*

New main pest: Swede midge
*Contarinia nasturtii*

New pest, increasing
Pollen beetle
*Brassicogethes viridescens*

12,000 ha in 2016
SEASONAL CANOLA SCOUTING CHART

Revised growth-stage key for *B. campestris* and *B. napus*  

0 = Pre-emergence  
1 = Seeding  
2 = Rosette  
2.1 First true leaf expanded  
2.2 Second true leaf expanded  
(add 0.1 for each additional leaf)  
3 = Bud  
3.1 Inflorescence visible at centre of rosette  
3.2 Inflorescence raised above level of rosette  
3.3 Lower buds yellowing  
4 = Flower  
4.1 First flower open  
4.2 Many flowers opened, lower pods elongating  
4.3 Lower pods starting to fill  
4.4 Flowering complete, seeds enlarging in lower pods  
5 = Ripening  
5.1 Seeds in lower pods full size, translucent  
5.2 Seeds in lower pods green  
5.3 Seeds in lower pods green-brown mottled  
5.4 Seeds in lower pods brown  
5.5 Seeds in all pods brown, plant senescent

(courtesy of J. Otani)
Flea beetles

- Crucifer: *Phyllotreta cruciferae*
- Striped: *P. striolata*
- Main chronic pest
- Widespread in North America
- Ecoregion differences in species composition changing
  - Striped was rare in the south
Species shift to more striped flea beetles in the last decade

*P. striolata* survives neonicotinoids better than *P. crucifer*

Phyllostreta species exposed to thiamethoxam

Modified from Tansey et al. 2009
Foliar insecticide threshold validation plot study

Foliar insecticide sprayed at 15%, 25%, 45% cotyledon defoliation
- In 2017 all plots without neonics had over 40% defoliation soon after emergence!
2015-2016: 11 trials total
proportion with numerically higher yield than control

Defoliation level

Insecticide treatment
Flea beetles – non chemical strategies

- Reduced tillage and higher densities (e.g. Dosdall et al. 1999)
- Early seeding used to be recommended in southern Alberta (Carcamo et al. 2008)
- Large seed (Soroka and Elliott 2011)
Flea beetles – future

• Host Plant Resistance: Hairy canola being developed… (Soroka et al 2011)

• Border management, trap crops, intercrops need research

• Biocontrol? no effective parasitoid so far
  – Conservation of endemic predators as part of IPM (Silva-Guimaraes PhD in progress with Costamagna)
Cabbage seedpod weevil

Weevil advances ~ 30 km/yr
- westerly winds…

Olfert et al unpublished data
Sampling and Management

• Sample 1 week after first flowers appear and take 10, 180 degree walking sweeps

• Minimum sampling:
  – Stop at two opposite corners
  – Take two samples 50 m apart
  – One along the edge and another inside field

• EIL: 2 per sweep,
  – action threshold 3-4/sweep
  – from commercial large farm scale studies
Seeding date affects abundance of weevils and lygus

Seeding Period

- Early (15-30 April)
- Normal
- Late After 15 May

Average number of insects / 10 sweeps

- weevils
- lygus

 Cárcamo et al., in review
Trap crop field - Coalhurst

- Trap - Fall planted, 23 Nov 2001
- Invigour2573, 80 ft border

- Main crop planted mid May
- Invigour 2573

Cárcamo et al. 2007
Weevil damage to Brassicacea germplasm (2005)

Genotype

**S. alba (75-90%)**
- JS03-541
- JS03-540
- Andante
- AC Pennant
- AC Base

**B. juncea (75-90%)**
- VR03.9 S933
- VR03.9 S902
- Arid

**B. napus (25%)**
- Q2

**B. rapa (80-100%)**
- Echo
- ACSunbeam
- ACS-C7
- ACParkland
- 02-8165

**B. carinata (25-60%)**
- 99-7705
- 99-7702
- 98-7606
- 98-7605
- 04-204EM
- 04-203EM

% values are percent in flower on 6 July

Cárcamo et al. 2007
Parasitism of cabbage seedpod weevil in Quebec

46% of fields with parasitism (38-100% parasitism rate)

Labrie unpublished data
Pest Surveillance: Prairie Pest Monitoring Network

• An informal network of entomologists from all levels of government, academia, grower groups and industry

• Prairie Provinces: Alberta, Saskatchewan, Manitoba

Owen Olfert
Jennifer Otani
Meghan Vankosky
Prairie Pest Monitoring Network

- Meets every March to review pest status and identify priorities
- Includes near real time maps for some insects (e.g. cabbage seedpod weevil) through industry scout participation
- Weekly updates through blog http://prairiepestmonitoring.blogs.pot.ca/
Prairie Pest Monitoring Network

• Well supported by grower organizations and government
• Allows wide spatial & temporal coverage of field crops in a vast region
Prairie Pest Monitoring Network

Numbers of Insect Survey Stops - 2016

<table>
<thead>
<tr>
<th>Insect</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bertha Armyworm</td>
<td>561</td>
</tr>
<tr>
<td>Cabbage Seedpod Weevil</td>
<td>828</td>
</tr>
<tr>
<td>Diamondback Moth</td>
<td>155</td>
</tr>
<tr>
<td>Grasshopper</td>
<td>3763</td>
</tr>
<tr>
<td>Pea Leaf Weevil</td>
<td>252</td>
</tr>
<tr>
<td>Wheat Midge</td>
<td>753</td>
</tr>
<tr>
<td>Wheat Stem Sawfly</td>
<td>102</td>
</tr>
</tbody>
</table>
Prairie Pest Monitoring Network

• Data applications
  – Eco-climatic (CLIMEX) analysis
  – Validation of models
Closing comments

• The key pests of canola in Canada are still managed primarily with insecticides
  – Thresholds, at least nominals, are available and being validated
  – There are no documented cases of insecticide resistance for canola

• The Prairie Pest Monitoring Network is a great success story and plays a key role
  – Surveillance and sampling protocols are available to determine thresholds

• We have made progress researching some alternative management strategies
  – Trap crops, seeding dates, rates
    • Integration into large farming operations with short growing seasons a challenge
  – Host plant resistance: e.g. hairy canola for flea beetles
Future Opportunities

• Novel technologies: gene silencing for flea beetle
  – Ongoing research at University of Manitoba (S. Whyard)

• Greater emphasis on biological control
  – Seedpod weevil with *T. perfectus*; relocation to western Canada

• Large scale research using farmers’ yield data
  • Potential to improve threshold validation studies; more realistic results on alternative methods

• Landscape and temporal analysis of Prairie Pest Monitoring Network data
  – Effect of landscape structure (A. Costamagna)
  – More CLIMEX modelling

• Integration: IPM packages for farmers
  – farmers want it - they are the ultimate integrators
THANK YOU!