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Managing insect pests of canola in Canada

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Canada

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

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

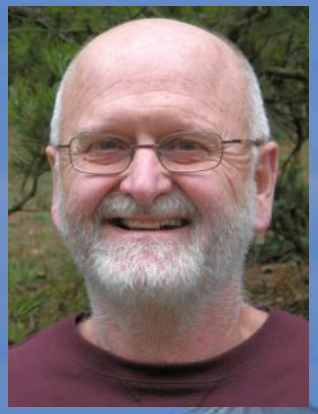
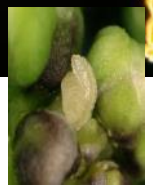


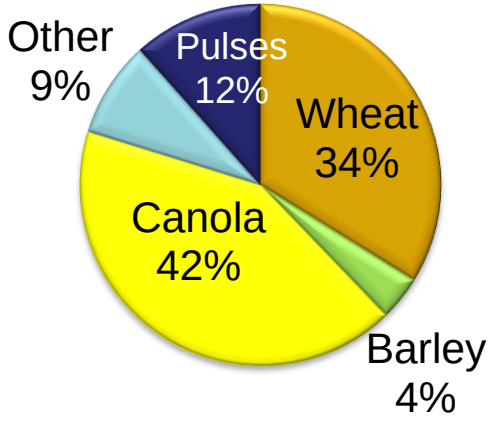
Image courtesy of MIKE DREW / POSTMEDIA

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



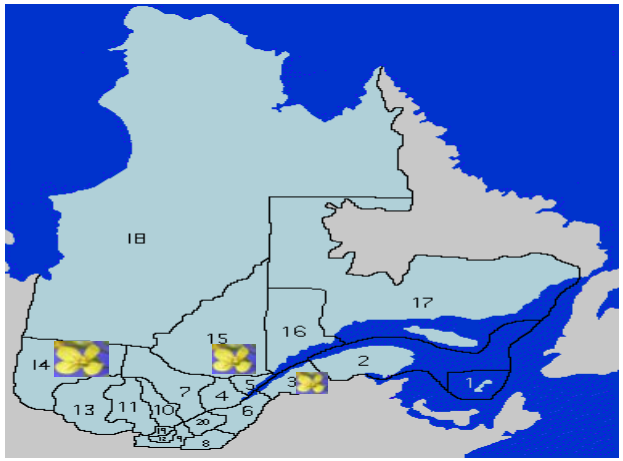


Prairies

$19B to economy

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

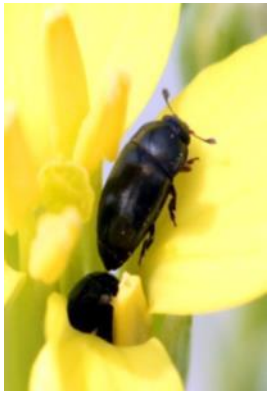


12,000 ha in 2016

New main pest: Swede midge
Contarinia nasturtii

Main pest : striped flea beetle;
Phyllotreta striolata

Secondary pest
Cabbage seedpod weevil
Ceutorhynchus obstrictus



New pest, increasing
Pollen beetle
Brassicogethes viridescens

SEASONAL CANOLA SCOUTING CHART

Revised growth-stage key for *B. campestris* and *B. napus*
(Harper and Berkenkamp 1975, Can. J. Plant Sci. 55: 657-658)

0 – Premergence
1 – Seedling
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

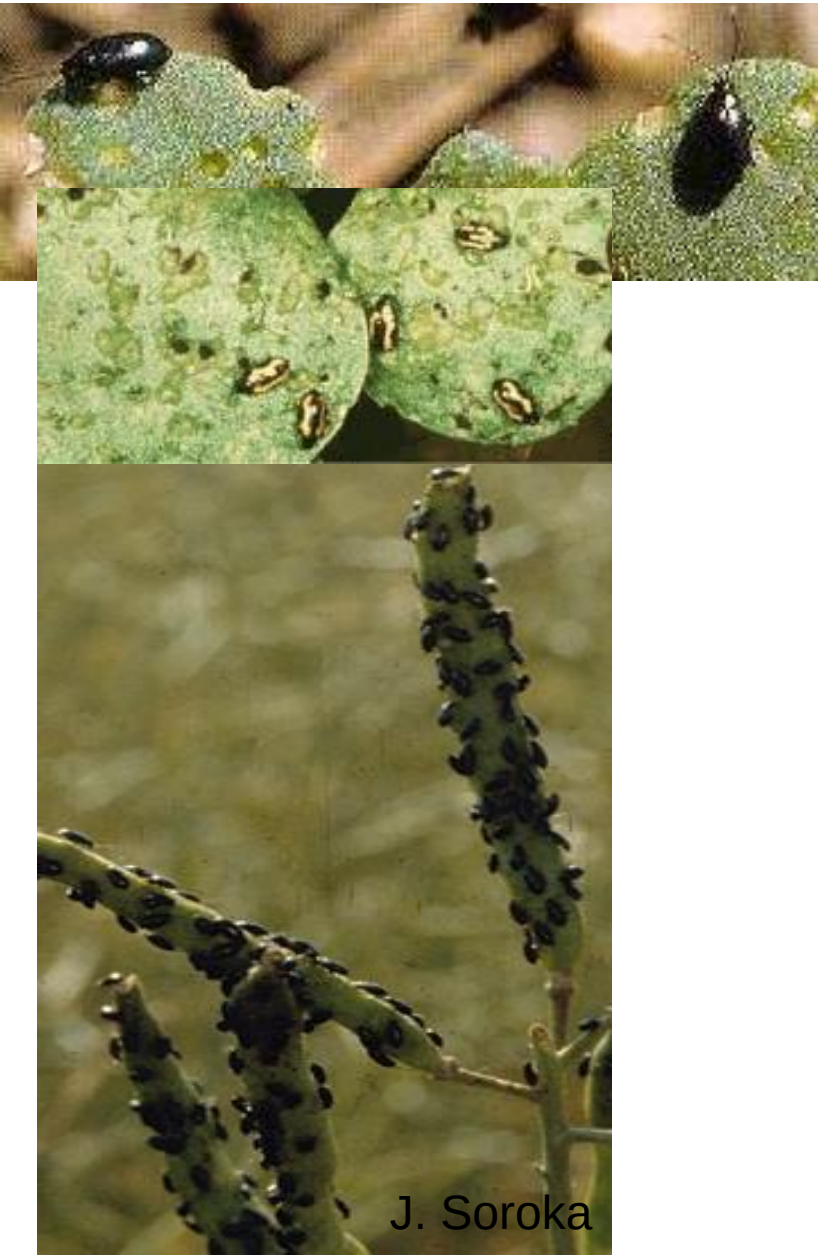
5 – Ripening
- 5.1 Seeds in lower pods full size, translucent
- 5.2 Seeds in lower pods green
- 5.3 Seeds in lower pods green-brown mottled
- 5.4 Seeds in lower pods brown
- 5.5 Seeds in all pods brown, plant senescent

(courtesy of J. Otani)

Bertha armyworms
Clover cutworms
Alfalfa loopers
Blister beetles
Turnip aphids
Red turnip beetles
Grasshoppers (Two-striped, Clearwinged, Migratory, Packards)
Cabbage seedpod larvae
Cabbage seedpod weevils **
Lygus bugs *
Swede midge larvae
Swede midges ?
Beet webworms
Cabbage root maggots
Diamondback moth
Leafhoppers
Crucifer flea beetles
***
Striped flea beetles
Cutworms
Emerging crucifer FB
Emerging striped FB

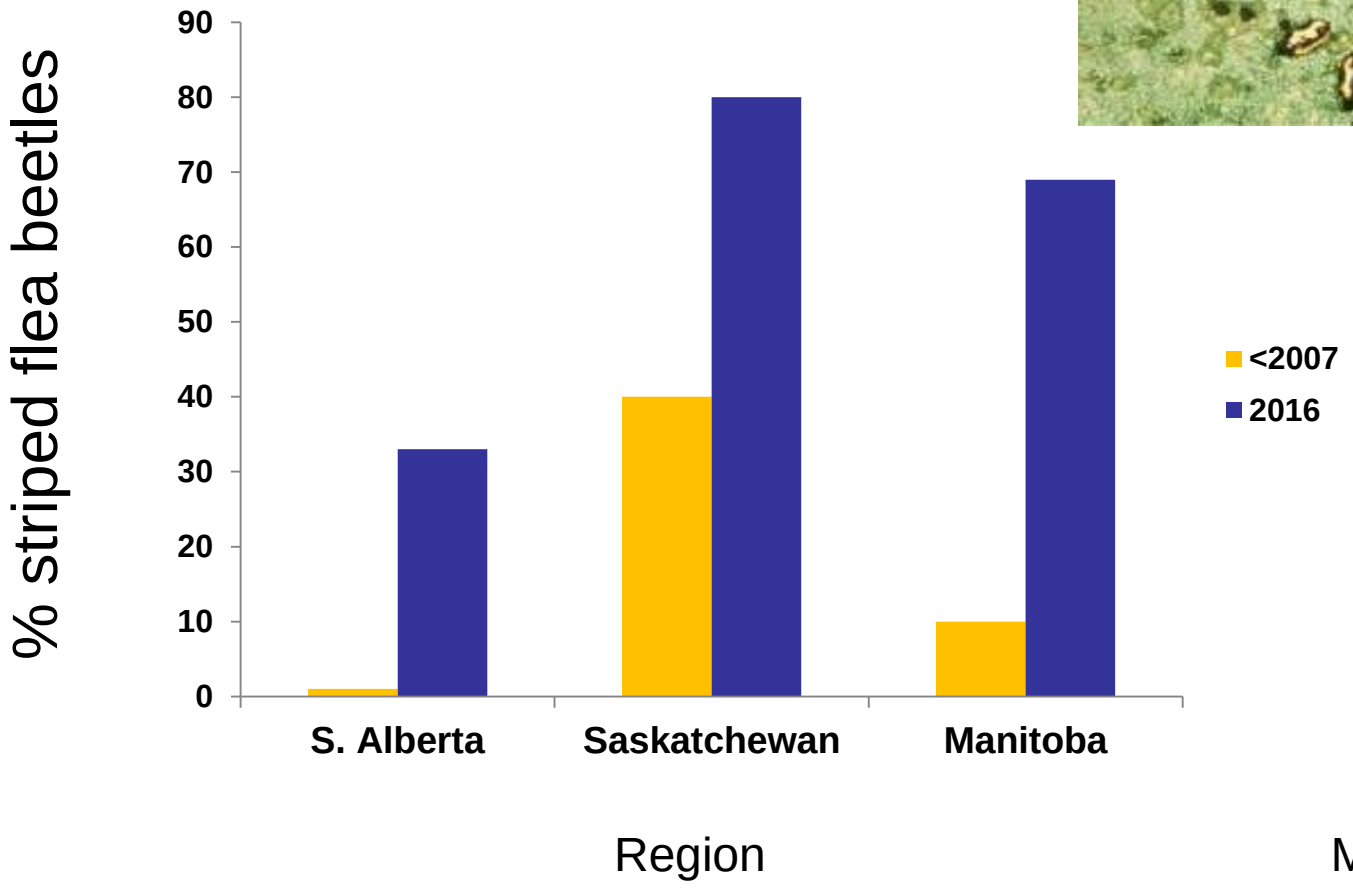
Pre-Seeding
Pre-Seeding
SEEDING
Pre-emergence
SEEDLING (1.1)
Seedling (1.2)
ROSETTE (2.1)
Rosette (2.4)
Rosette (2.6)
Rosette (2.8)
BUD (3.0)
Bud (3.3)
FLOWER (4.1)
Flower (4.2)
Flower (4.3)
Flower (4.4)
RIPENING (5.1)
Ripening (5.2)
Ripening (5.3)
Ripening (5.4)
SWATHING
COMBINING

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

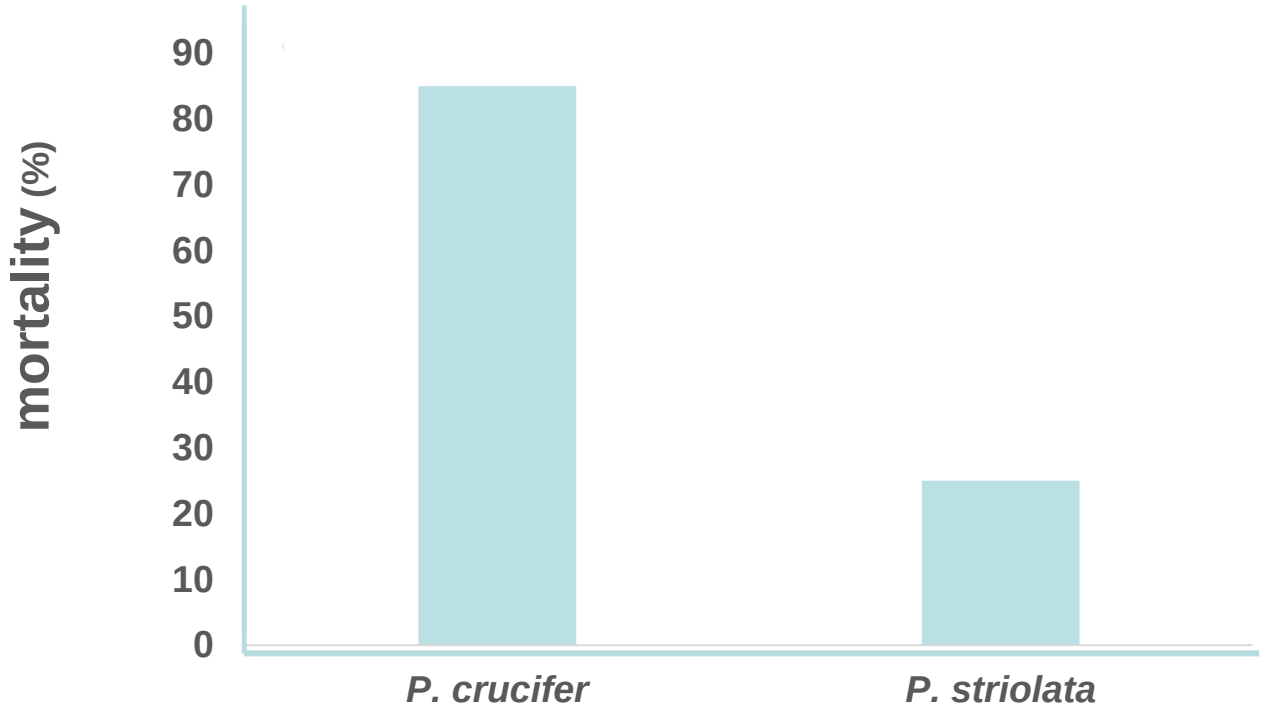
Species shift to more striped flea beetles in the last decade



Management?

Lamb 1983, Turnock et al. 1989, Carcamo et al 2008, Soroka 2012, Costamagna et al. unpublished data

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

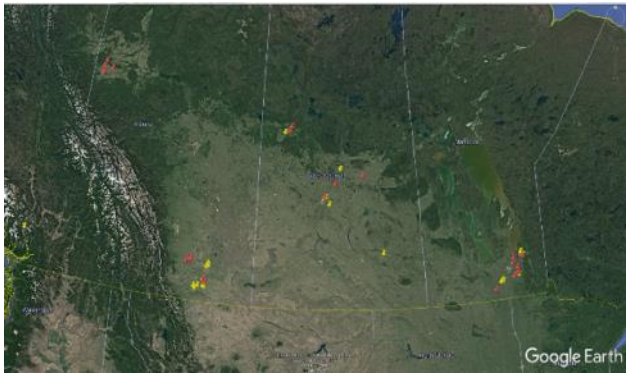


Phyllotreta species exposed to thiamethoxam

Modified from Tansey et al. 2009

Foliar insecticide threshold validation plot study

Costamagna, Nagalingham, Carcamo et al (2015-2017)

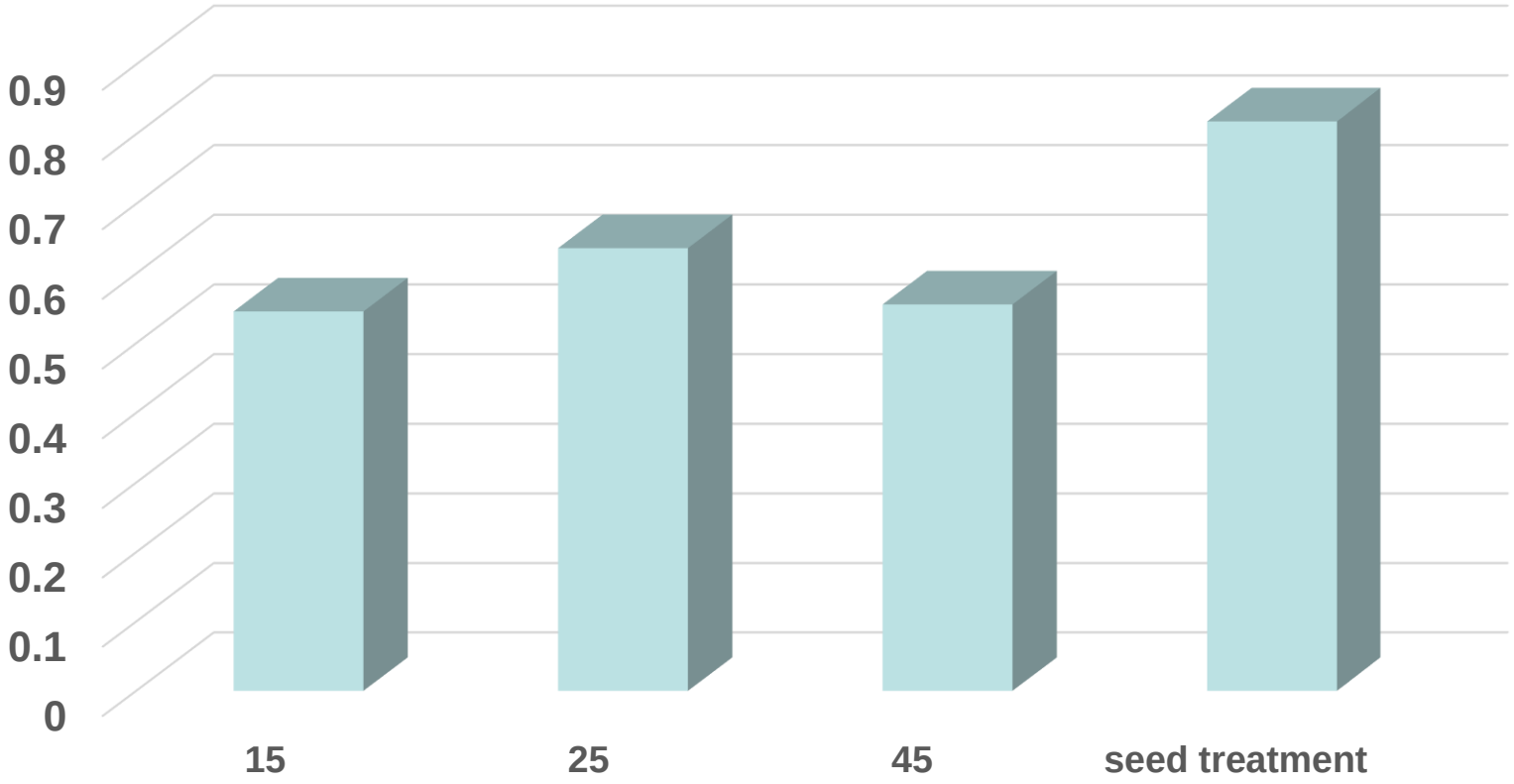


Foliar insecticide sprayed at 15%, **25%**, 45% cotyledon defoliation

- 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



Insecticide treatment

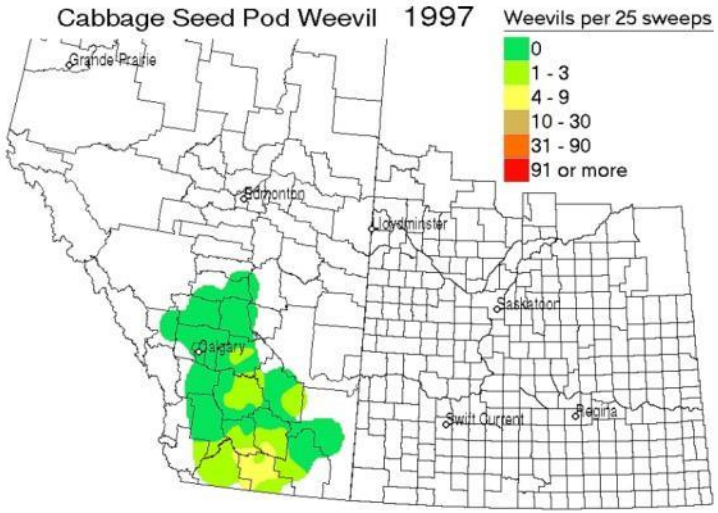
Flea beetles – non chemical strategies

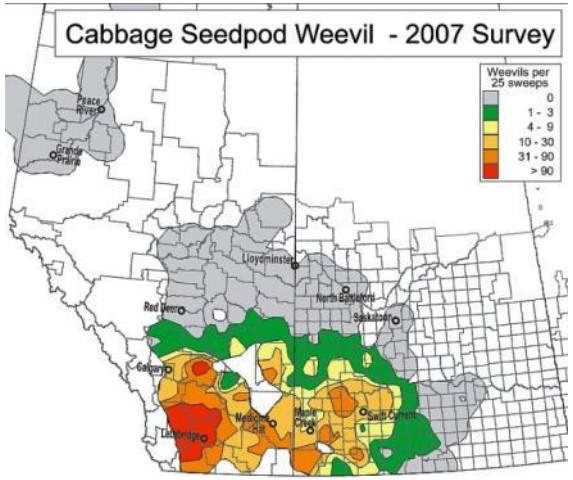
- Reduced tillage and higher densities (e.g. Dosdall et al 1999)
- Early seeding used to be recommended in southern Alberta (Carcamo et al. 2008)
- Large seed (Soroka and Elliott 2011)

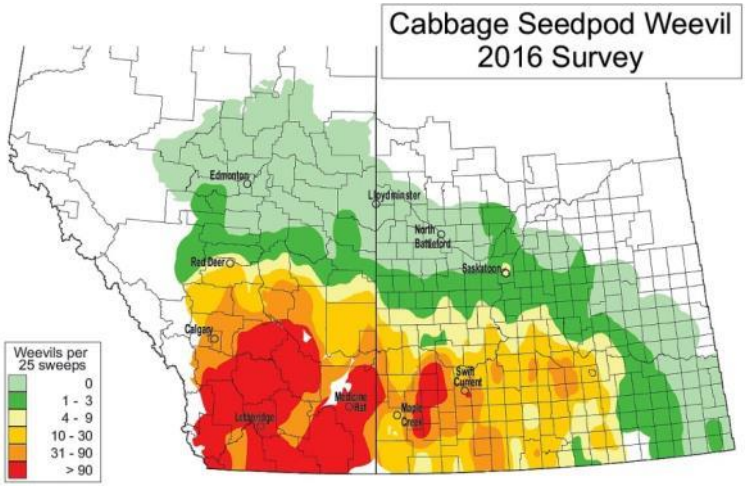
Flea beetles – future

- 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

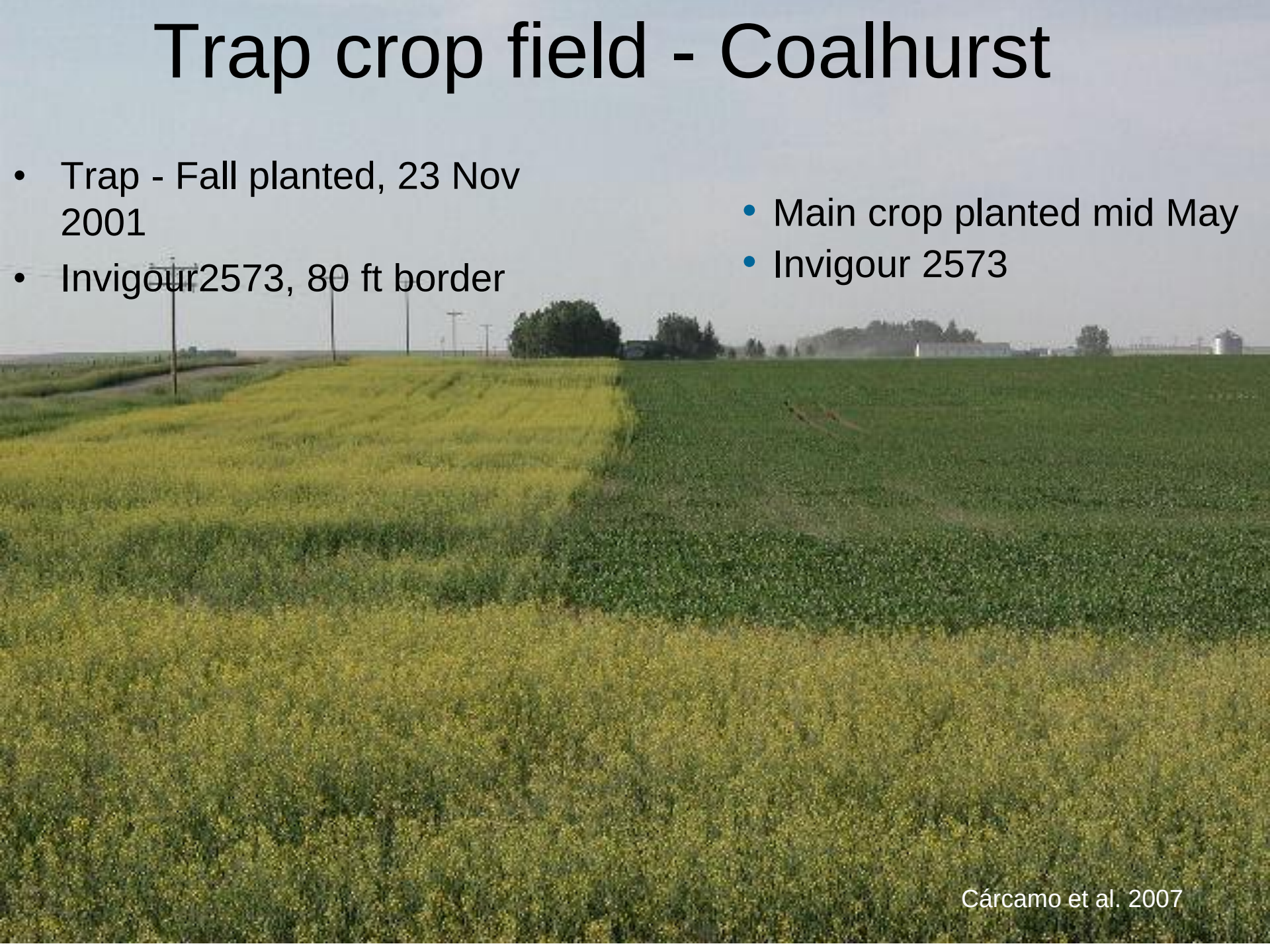
Seeding date affects abundance of weevils and lygus

Cárcamo et al, in review

Trap crop field - Coalhurst

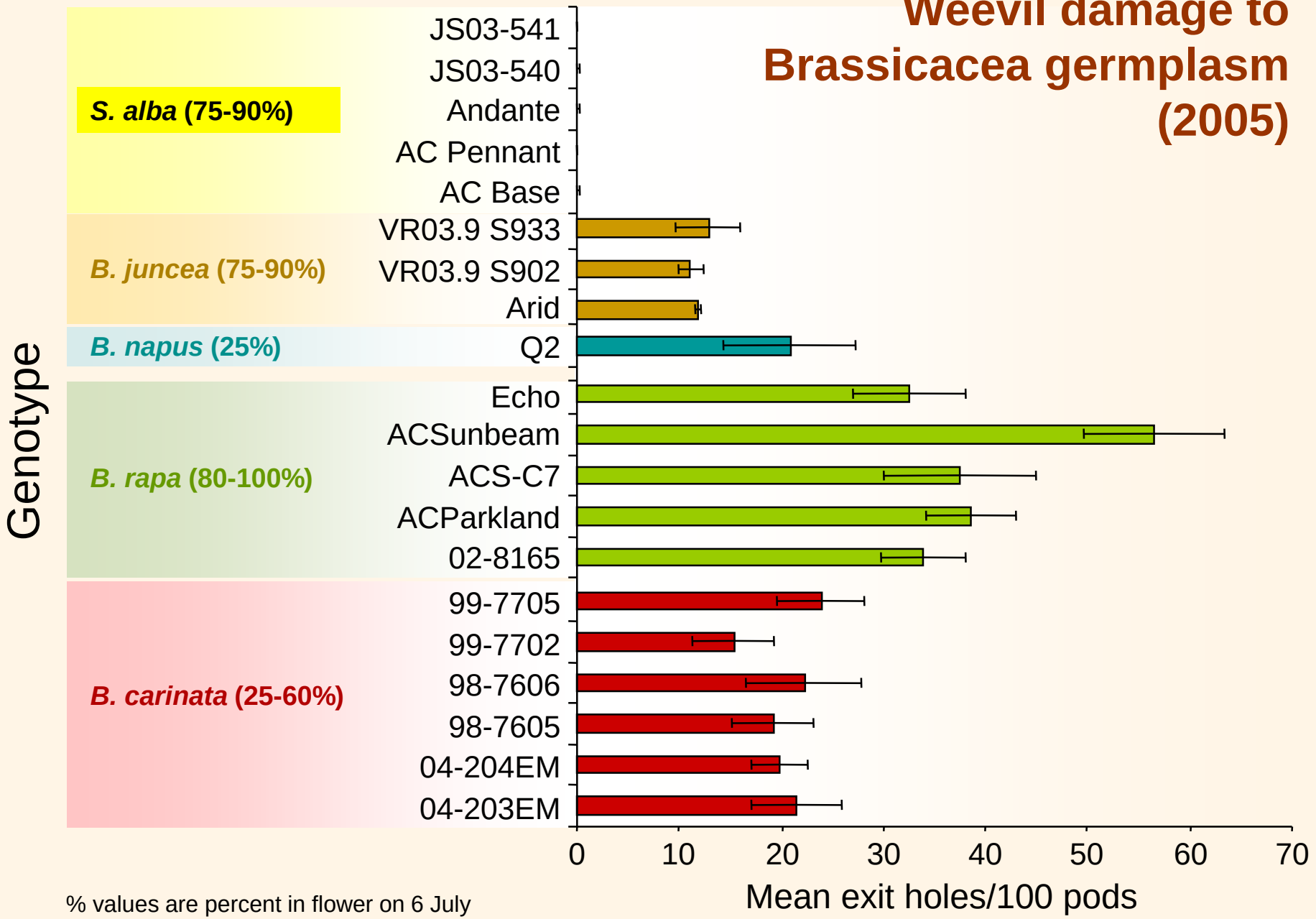
- Trap - Fall planted, 23 Nov 2001
- Invigour2573, 80 ft border

- Main crop planted mid May
- Invigour 2573



Cárcamo et al. 2007

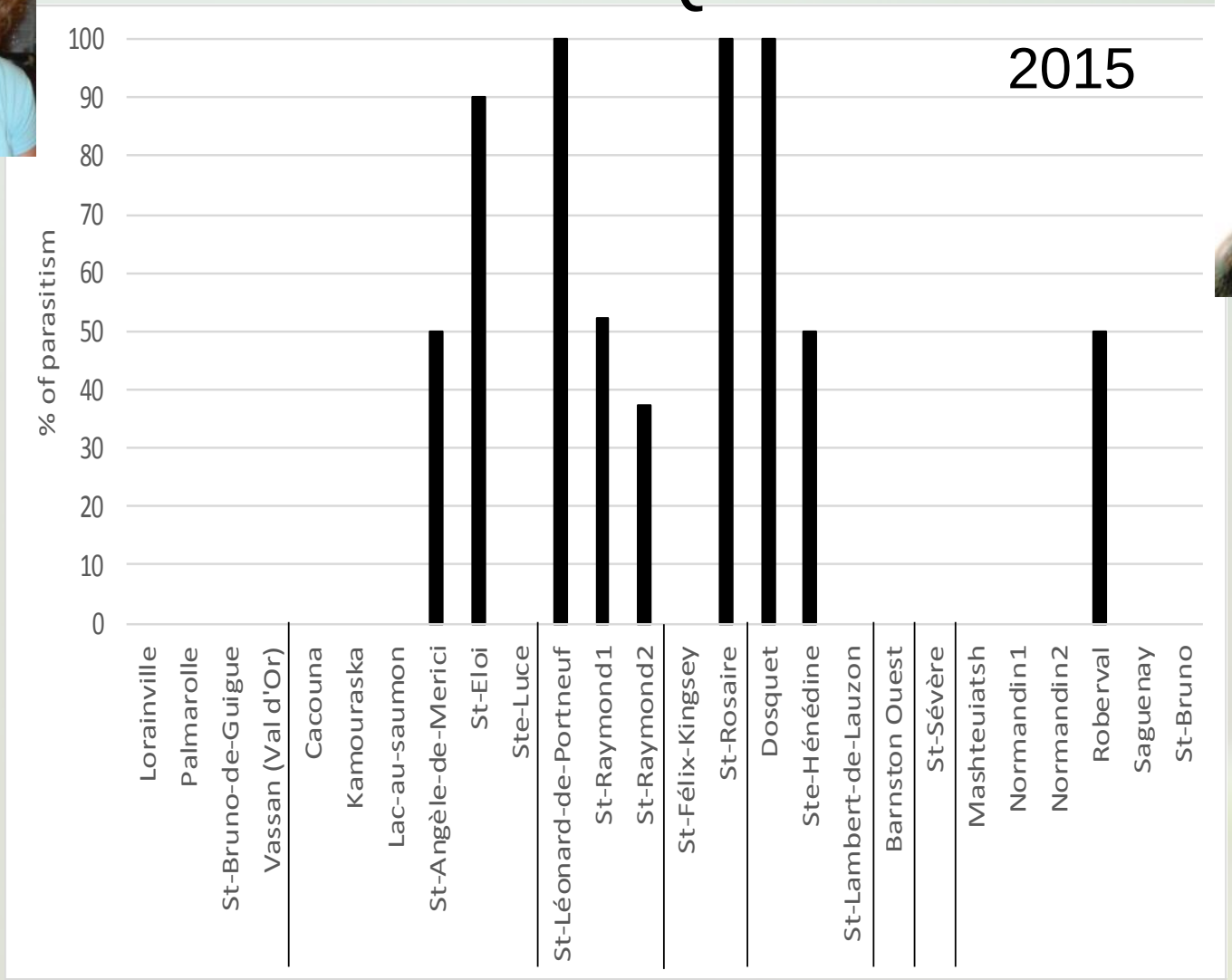
Weevil damage to Brassicacea germplasm (2005)



% values are percent in flower on 6 July

Cárcamo et al. 2007

Parasitism of cabbage seedpod weevil in Quebec

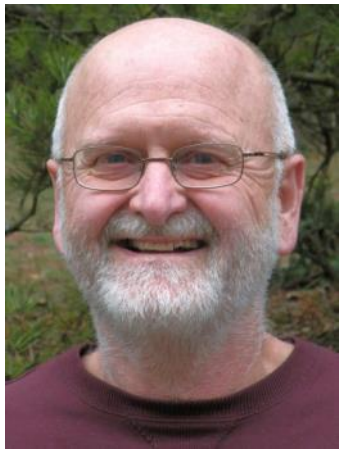


46% of fields with parasitism (38-100% parasitism rate)

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.blogspot.ca/

Prairie Pest Monitoring Network

- Well supported by grower organizations and government
- Allows wide spatial & temporal coverage of field crops in a vast region

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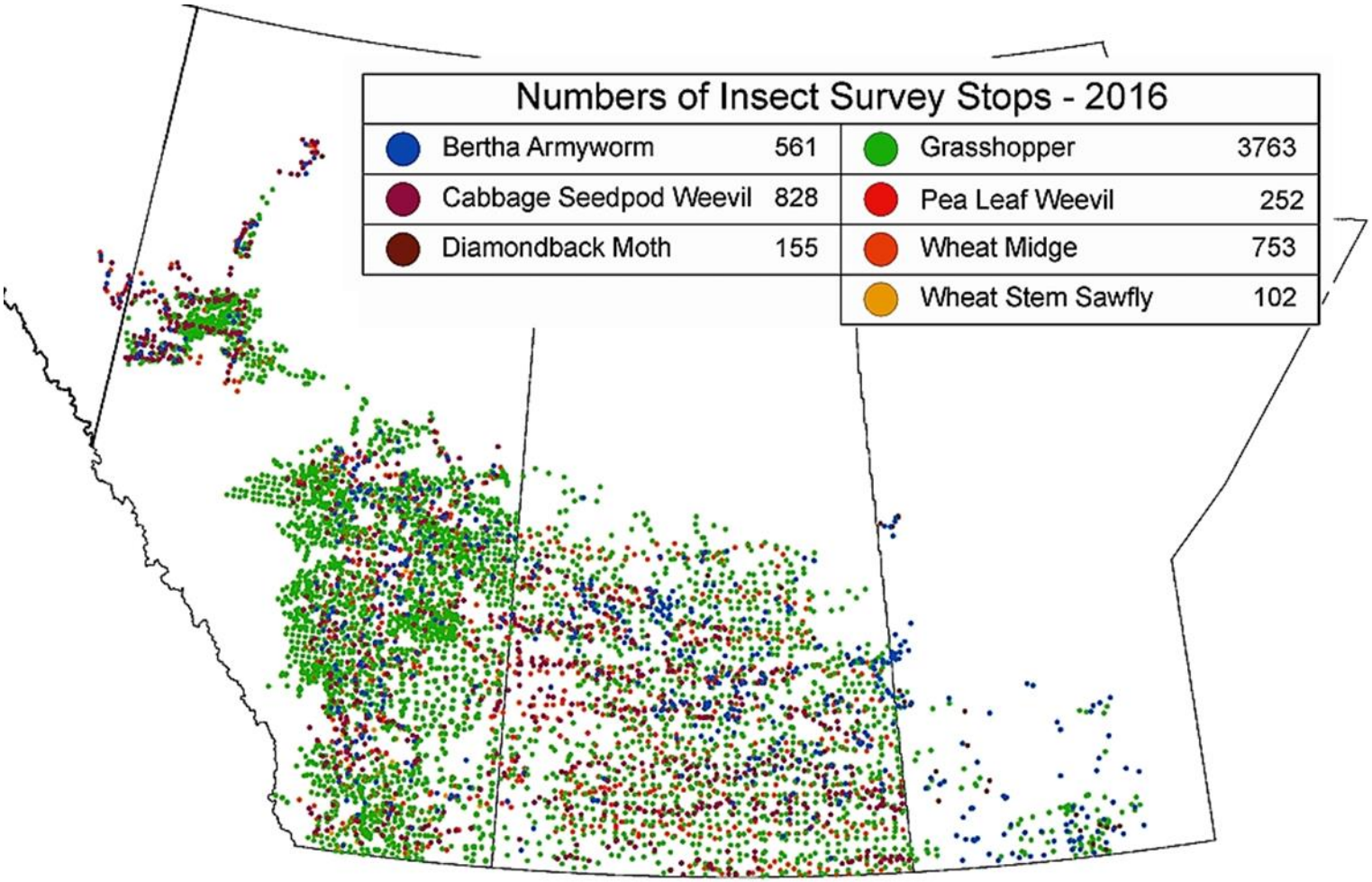
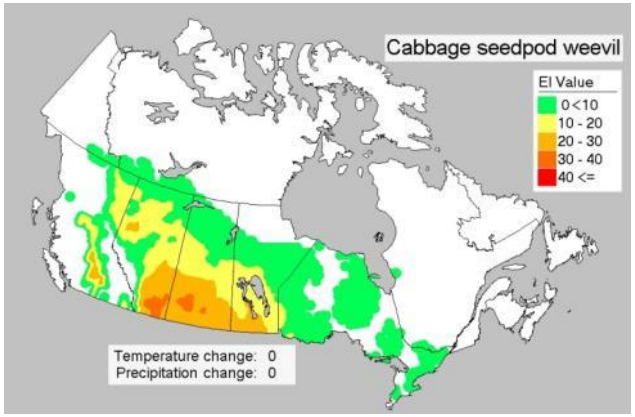
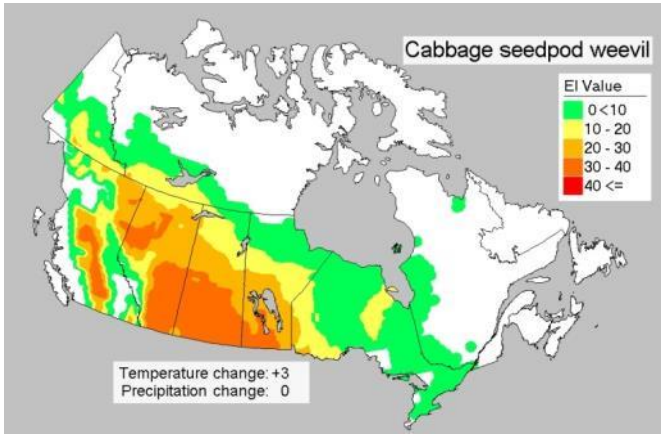
Prairie Pest Monitoring Network



Prairie Pest Monitoring Network

- Data applications
  - Eco-climatic (CLIMEX) analysis
  - Validation of models





Olfert et al. unpublished

Prairie Pest Monitoring Network

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

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THANK YOU !

Western Grains Research Foundation

Agriculture and Agri-Food Canada

SCIC Saskatchewan Crop Insurance Corporation

Canada

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Saskatchewan Pulse Growers

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