



Programme

Partie 4

- Le Spinosad pour le contrôle des altises dans le bleuet nain (*Spinosad against flea beetles in low bush blueberry*) [page 68](#)
- Nouvelles variétés de pommes, leur adaptation à la culture biologique (*Variety Research at Kentville*) [page 72](#)
- Le ver fil de fer, diverses stratégies de gestion (*Novel Organic Approaches to the Management of Wireworms (Agriotes spp.)*) [page 82](#)

Spinosad against flea beetles in low bush blueberry

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Research supported by:

Agriculture and Agri-Food Canada Pest Management Centre
Minor Use Pesticides Program

Blueberry and flea beetles

- More than 23000 ha of low bush blueberry grown in Eastern Canada
- “Minor crop”
- Flea beetles (*altises en français*)
 - Larvae eat foliage and buds
- Trichlorfon (Dylox) registered to control flea beetle on blueberry
- No import tolerance for trichlorfon in US





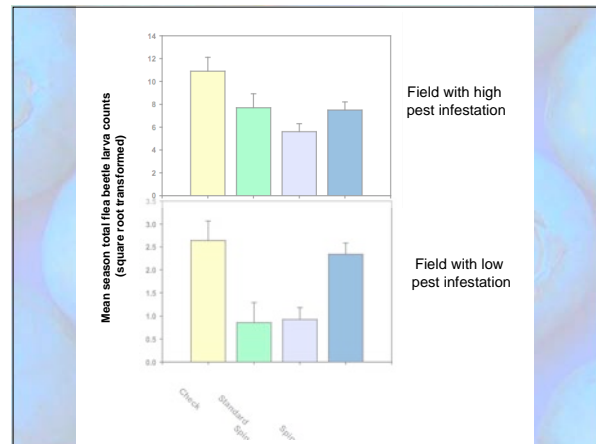
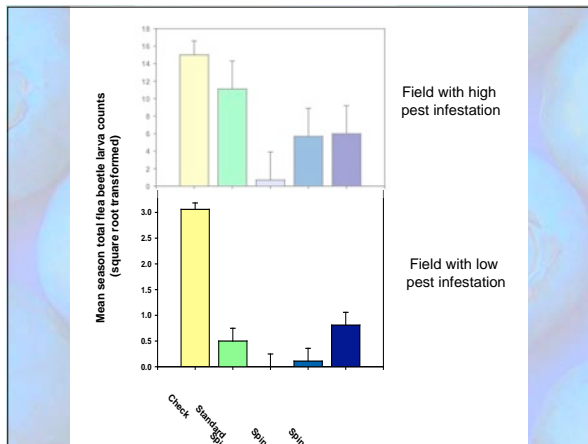
Challenges

- In areas of high infestation, defoliation is patchy
 - Randomization was important
 - Covariate of rating of defoliation was used
- Yield data affected by patchiness of two species with different yields: *Vaccinium angustifolium* and *Vaccinium myrtilloides*
 - Ratings of % coverage by each species
 - Weighting of yields

Treatments

Table 1: Experimental arrangements used to test the effect of defoliation on yield and on the effect of defoliation on yield.

| Treatment | Defoliation | Yield (g m ⁻²) | Yield of <i>V. angustifolium</i> | Yield of <i>V. myrtilloides</i> | Yield of <i>V. myrtilloides</i> |
|---------------------------|-------------|----------------------------|----------------------------------|---------------------------------|---------------------------------|
| Control | Control | 100 | 100 | 100 | 100 |
| Defoliation | Defoliation | 100 | 100 | 100 | 100 |
| Defoliation 0.50 x 0.50 m | Defoliation | 100 | 100 | 100 | 100 |
| Defoliation 0.50 x 0.50 m | Defoliation | 100 | 100 | 100 | 100 |
| Defoliation 0.50 x 0.50 m | Defoliation | 100 | 100 | 100 | 100 |
| Defoliation 0.50 x 0.50 m | Defoliation | 100 | 100 | 100 | 100 |
| Defoliation 0.50 x 0.50 m | Defoliation | 100 | 100 | 100 | 100 |
| Defoliation 0.50 x 0.50 m | Defoliation | 100 | 100 | 100 | 100 |



Results

- Spinosad at both rates reduced flea beetle populations
 - below those of the untreated check
 - equivalent to or below populations in plots treated with industry standard, trichlorfon
- Single application is as effective as multiple ones
- Targeting the larval stages is more effective than targeting the adults
- Yield
 - reduction in untreated plots only
 - spinosad and trichlorfon treated plots was comparable

Conclusions

- Spinosad is an effective alternative to trichlorfon
- Spinosad is non-toxic to bees as soon as it is dry
- Organic formulations of spinosad may be available
- Success 480SC (not organic) was registered for flea beetle on blueberry in fall 2007 as a result of this work

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Variety Research at Kentville

Charlie Embree
Sustainable Production Systems
Crop Genetic Enhancement
Theme 223
Atlantic Food & Horticulture Research
Centre
Kentville, Nova Scotia



Canada

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

Top Ten Prospects from Kentville

- S47-24-42
- KAR 97
- KAS 10
- KAS 9
- KAR 27
- KAR 4
- Novaspy
- Novamac
- S56-9-181
- KAR 22



Yum Yum Good!

Canada

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

S47-24-42

Empire X S21-42-69

- A medium sized dark red variety with a greenish yellow background and red striping
- Ripens in early October
- Tart/sweet astringent flavour
- Heavy producer
- Keeps for 3 months in regular storage
- Resistant to Apple Scab




Canada

Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

KAR 97 - S56-6-197

Redfree X Oberle

- Large sized 40-75% red variety on a yellow background
- A very sweet flavour
- Ripens in late August to early September
- Medium producer
- Stores 2-4 weeks
- Resistant to Apple Scab




Canada

KAS 10 - (S23-06-153) NJ32 X (Melba X NJ 12)

- Medium to large yellow apple with a red blush
- Ripens in mid October
- Pleasingly balanced sweet/tart flavour
- Heavy producer
- Keeps for up to 30 days in regular storage



Canada

KAS 9 - (S23-06-52) NJ32 x (Melba x NJ12)

- A large sized dark red to purple variety with an occasional red spot
- Ripens in mid to late October
- A sweet, crunchy, juicy apple
- Heavy producer
- Keeps for 4 months in storage
- Initially the flesh is white to white with pinkish streaks, if left at room temperature the flesh can turn a bright pink



Canada

KAR 27- (S47-23-100) C13-05-01 X S 34-01-19

- Small to medium sized, 80-95% dark red variety on a yellow-green background
- A slightly tart apple with an accompanying sweetness
- Ripens in early to mid October
- Medium producer
- Stores at least 5 months in regular storage
- Resistant to Apple Scab



Canada

KAR 4 – (S47-20-37) Paula Red X Novamac

- A medium to large dark red apple with a yellow green base
- Sweet with a bit of acidity
- Ripens early to mid September
- A heavy producer
- Stores in regular storage for up to two months
- Scab Resistant



Canada

Novaspy

Nova Easygro x (Red Spy x Golden Delicious)

- Medium sized 85% dark red variety with a greenish yellow background
- Ripens early October
- Tart/sweet astringent flavour
- Heavy producer
- Keeps for 4 months in storage
- Nearly equal to Northern Spy for processing
- Resistant to Apple Scab



Canada

Novamac

McIntosh x PRI 1018-3

- Medium sized 40-75% red variety on a green background
- Flavour and appearance resembles McIntosh but not as sweet
- Ripens one week before McIntosh mid to third week in September
- Very heavy producer
- Stores well
- Drops badly in late September
- Resistant to Apple Scab



Canada

S56-9-181

(Paula Red X Novamac) X 8S-70-60

- Medium sized dark red striped and blushed variety with a yellow background
- Ripens mid to late September
- Yellow fleshed, firm to crispy with a refreshing balanced taste
- Keeps for at least 3 months in regular storage

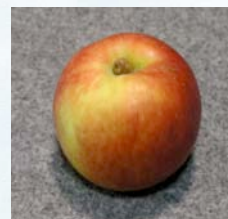


Canada

KAR 22 - (S47-22-44)



S28-18-36 X Stark Splendor

- A large red apple with red blotching
- Yellow fleshed, sweet, juicy and crunchy
- Pleasing and appetizing to the taste, filled with flavour, not too sweet and not too acidic
- Heavy cropper
- Early to mid October
- Stores 3-4 months in regular storage



Canada

Top Ten Organic Prospects

-  **Honeycrisp**
-  **Crimson Crisp**
-  **Novaspy**
-  **Novamac**
-  **Saturn**
-  **KAR 97**
-  **Pristine**
-  **Redfree**
-  **S47-24-42**
-  **Liberty**



Canada 

Honeycrisp

Macoun x Honeygold

- Large sized 50-90% red variety with a yellow background
- Ripens early October
- Very crisp and juicy with mild flavour
- Keeps 5 months in storage
- Moderate resistance to apple scab
- Susceptible to powdery mildew



Canada 

Crimson Crisp (Co-op 39)

PCFW2-134 x PRI 669-205

- Medium sized 75-100% red with a yellow background
- Ripens mid-October
- Rich, spicy moderately acid flavour
- Stores well
- Moderate resistance to powdery mildew
- Susceptible to fireblight



Canada 

Novaspy

Nova Easygro x (Red Spy x Golden Delicious)

- Medium sized 85% dark red variety with a greenish yellow background
- Ripens early October
- Tart/sweet astringent flavour
- Heavy producer
- Keeps for 4 months in storage
- Nearly equal to Northern Spy for processing



Canada 

Novamac

McIntosh x PRI 1018-3



- Medium sized 40-75% red variety on a green background
- Flavour and appearance resembles McIntosh but not as sweet
- Ripens one week before McIntosh mid to third week in September
- Very heavy producer
- Stores well
- Drops badly in late September
- Resistant to Apple Scab

Saturn

PRI 1235 X Starkspur Golden Delicious



- England
 - Smooth, rounded, medium sized
 - Lime green skin that is largely covered in a deep red flush
 - Sweet with a dollop of juicy acidity
 - Firm to bite, but flesh snaps cleanly and is very juicy
 - Very heavy cropping
 - Scab and mildew resistant

KAR 97- (S56-6-197)

Redfree X Oberle

- Large sized 40-75% red variety on a yellow background
- A very sweet flavour
- Ripens in mid to late August
- Medium producer
- Stores 2-4 weeks
- Resistant to Apple Scab



Pristine

Camuzat x PRI 1659-10

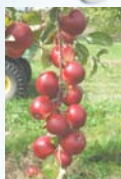
- Medium sized yellow variety with occasional blush
- Ripens mid-August
- Slightly spicy flavour, crisp, good blend of acidity and sweetness
- Moderate resistance to fireblight and powdery mildew
- Lasts up to six weeks in refrigerated storage
- Fruit drops at maturity



Redfree

Raritan x PRI 1018-101

- Large sized 90% full red variety
- Flavour similar to Empire
- Stores well for 2 months
- Ripens mid-August
- Moderate resistance to fireblight and powdery mildew
- Resistant to apple scab
- Thinning required to obtain good fruit size



Canada

S47-24-42

Empire X S21-42-69

- A medium sized dark red variety with a greenish yellow background and red striping
- Ripens early October
- Tart/sweet astringent flavour
- A heavy producer
- Keeps for 3 months in regular storage
- Resistant to Apple Scab



Canada

Liberty











Macoun x PRI 54-12

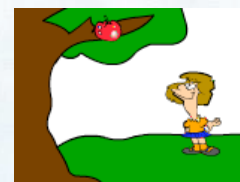
- Medium sized dark red variety with a yellow background
- Ripens early October
- Resistant to fireblight, scab and powdery mildew
- Flavour improves in storage
- Thinning required for optimum fruit size
- Very productive and annual



Canada

Top Ten Prospects from Around The World

-  **Snowsweet**
-  **Delbush**
-  **Jazz**
-  **Eden**
-  **Greenstar**
-  **Kanzi**
-  **Katy (Katya)**
-  **Modi**
-  **Sonya**
-  **Rubens**



Canada

Snowsweet Sharon X Connell Red

- Minnesota
 - Oblate, 70-85% bronze-red blush
 - Firm to crisp fruit
 - Sweet with a slight tart balance and rich overtones
 - Moderate vigour
 - Average to above average resistance to scab and fireblight
 - Stores 1.5-2 months in regular storage



Canada

Delblush Golden Delicious X Grifer (Blushing Golden)

- France
 - A medium sized Orange-yellow apple
 - Delicious, very crisp, sweet and acidic
 - Abundant producer
 - A firm apple that stores for up to 6 months
 - Picked in mid October at Guelph Ontario



Canada

Jazz™ Royal Gala X Braeburn

- New Zealand
 - bright red Gala/Braeburn cross.
 - Developed in partnership with Hort Research.
 - Exclusive variety to ENZA, with controlled plantings in New Zealand, North America and France.
 - Very crisp and juicy.
 - Unique aromatic zing flavour.
 - Harvested from early March to early April in New Zealand.



Canada

Eden (SJCA38R6A74) Linda X Jonamac

- Canada
 - solid dark red apple over a yellowish-green ground
 - Medium to large, globose, oblate and sometimes lopsided and irregular fruit
 - Very aromatic sweet and acidic
 - A non-browning apple used in fruit salads, slices and in processing
 - Stores 4-5 months in standard storage



Canada

Greenstar

Granny Smith X Delcorf

- Belgium
 - Similar in appearance to Granny Smith but more conical
 - In the UK matures in early October
 - A sweet, crispy and juicy apple with a slight acid flavour
 - High in Vitamin C
 - Does not brown easily



Canada

Kanzai

Braeburn X Gala

- Belgium
 - A medium sized apple with an extensive pink blush against a green background
 - Quite acid without being tart
 - Flesh is very crisp and dense
 - Fantastic firmness and shelf life
 - Requires several weeks in store prior to storage in CA conditions



Canada

MN 1914



Canada

Katy (Katya)

James Grieve x Worcester Pearmain

- Sweden
 - A medium sized apple, deep red on a yellow background
 - Flesh is pale cream in colour, crunchy, very juicy, with a bit of acidity and a hint of strawberry flavour
 - A heavy cropper, ripening the end of August to early September
 - Used in the lunch box program in England
 - Stores only for a few weeks, tastes best either right off the tree or cooled



Canada

Modi Gala X Liberty

- Italy
 - Conical, tastes like a Gala
 - Scab and pest resistant like a Liberty
 - 80-100% dark red
 - Suitable for conventional as well as organic production
 - Matures in mid September
 - Shelf life 2-4 weeks

Sonya Royal Gala X Red Delicious

- New Zealand
 - Sweet with no trace of acidity
 - Excellent straight from the fridge
 - Now growing in Washington State
 - Requires covering from direct sunlight



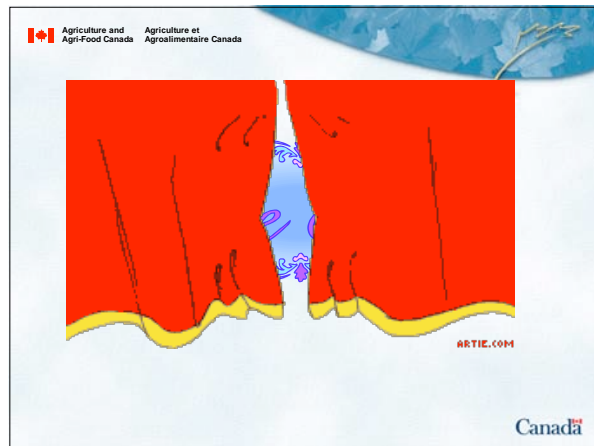
Rubens Elstar X Gala



- Italy (Holland)
 - Sweet like a Gala with the sparkling flavour of an Elstar
 - Conical in shape, red skinned with a yellowish-orange background
 - Discovered in the Po Valley in Italy in 1998
 - Ripens 10-15 days after Gala
 - Moderately resistant to apple scab, mildew and canker




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- Walter Wojtas - Research Technician
- Joan Hebb – Research Assistant
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Novel Organic Approaches to the Management of Wireworms (*Agriotes spp.*)





Joanna MacKenzie and Andrew Hammermeister
Contact jmackenzie@nsac.ca

European *Agriotes spp.* wireworms






- Damage caused by larval stages.
- Adults known as click beetles
- Feed on a wide range of crops
- Cause reductions in crop yield and/or quality
- In North America, potato crop losses due to wireworms range from 5-25%

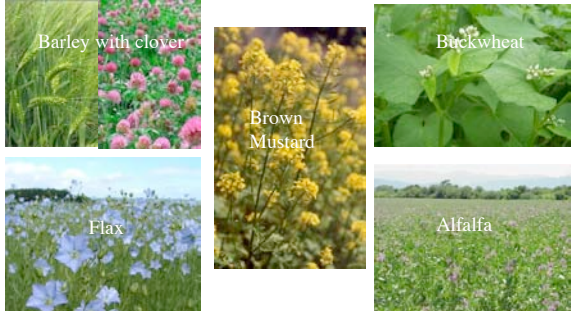
Research Questions

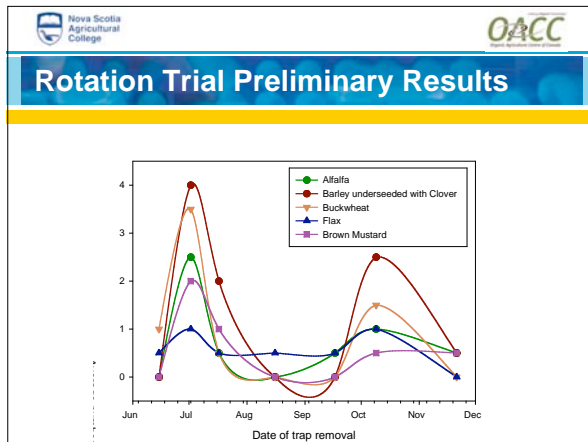
- Can the incorporation of certain crops into a crop rotation reduce wireworm population levels?
- Can a push-pull-immobilize strategy be developed using organic management practices to reduce the incidence of wireworm damage to cash crops?



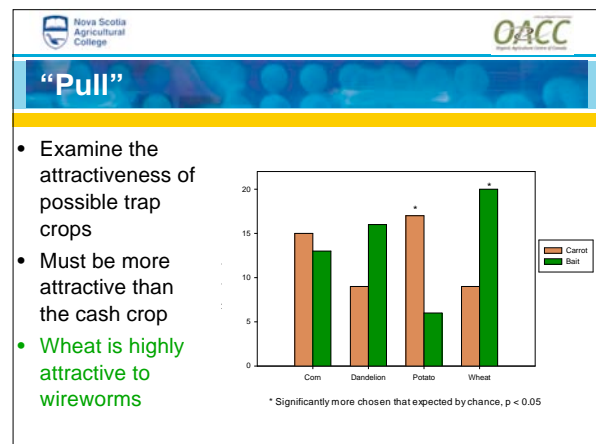
Crop Rotation Trial





- Nova Scotia Agricultural College OACC
- ### Push-Pull-Immobilize
- **Push** wireworms away from the cash crop (deterrents, unattractive varieties)
 - **Pull** wireworms away from the cash crop (attractive trap crop)
 - **Immobilize** wireworms (control)

- Nova Scotia Agricultural College OACC
- ### “Push”
- Examine potential feeding deterrents
 - Neem oil
 - Marigold extract
 - Brown mustard extract
 - Examine the relative attractiveness of cash crop (carrot) varieties
 - Of 4 varieties tested, there were no significant differences in relative attractiveness



Immobilize

- Explore the use of soil amendments to immobilize or kill wireworms
- May act through a number of mechanisms
 - Scratch cuticle causing dessication
 - Interfere with feeding or digestion
 - Interfere with development
- We will examine diatomaceous earth, wood ash, and neem

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