“Creepers n’ Crawlers n’ Fliers”

Insect Pests of Vegetables

ASTER LEAFHOPPER

Aster Leafhoppers

- *Macrosteles quadrilineatus*
- **Hosts**
  - More than 100 plant species in at least 40 families
  - Spring cereals & grasses = preferred hosts
  - Major impact on lettuce, carrots, celery, and other vegetable crops

- Feeding of adults doesn’t cause economic damage
  - Transmission of Aster yellows is more critical

Aster Leafhopper – Life stage timeline

<table>
<thead>
<tr>
<th>Stage</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Larvae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nymph</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Pupa</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Adult</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Monitoring

- Yellow sticky traps can be used starting in early spring
  - Spraying should commence when adults are found on traps
- Sweeping can determine adult numbers & changes in populations
  - Aids the decision-making process
Management Strategies

- **Chemical sprays** should be applied when adults are 1st detected
- Plow fields immediately after harvest to remove infective material and breeding areas
- **Control weeds** which serve as alternative inoculum source
- Reflective materials have been suggested to repel leafhoppers somewhat

Registered Chemicals – Aster Leafhopper

<table>
<thead>
<tr>
<th>Crop</th>
<th>Product</th>
<th>Active Ingredient</th>
<th>Timing / Application Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of crops – artichokes, beets, carrots, parsnips, potatoes, radishes, turnips</td>
<td>Actara 25WG</td>
<td>thiamethoxam</td>
<td>Apply prior to Economic threshold</td>
</tr>
<tr>
<td>Lettuce</td>
<td>Shir 250EC Ripchord 400EC</td>
<td>cypermethrin</td>
<td>When insects or damaged first noted</td>
</tr>
<tr>
<td>Carrots</td>
<td>Sevin XLR</td>
<td>carbaryl</td>
<td>When insects appear</td>
</tr>
<tr>
<td></td>
<td>Malathion 500EC</td>
<td>malathion</td>
<td>When insects appear</td>
</tr>
<tr>
<td></td>
<td>Sivanto Prime</td>
<td>fluopyradifurone</td>
<td>When insects appear</td>
</tr>
<tr>
<td></td>
<td>Admire 240F</td>
<td>imidacloprid</td>
<td>Various</td>
</tr>
</tbody>
</table>

Cabbage (Root) Maggot

- **Delia radicum**
- **Hosts**
  - Cruciferous crops and weeds
- **Typically one generation per season in AB**
Cabbage Maggot – Life stage timeline

Monitoring
- Use sticky traps or sweep nets in spring to watch for adult flies
- Pull sample plants from across the field, ensuring tap root is left intact
- Look for signs of larval tunneling, with channels evident on the outside of the root

Management Strategies
- Make control decisions based on the influence of weather on egg and larval survival – hot, dry weather favours reduced egg/larva survival
- Tillage prior to seeding or winter can reduce survival of pupae

Management Strategies
- Control cruciferous weed species to reduce overwintering sites
- Work under infested crop residues as soon after harvest as possible

Management Strategies
- Use transplants instead of direct seeding
- Drag something behind the seeder to spread out the moist soil raised by the planter
  - Supposedly, adults can locate the crop due to the moisture differential of the newly turned soil

Management Strategies
- Maintain a good crop rotation
  - 3-4 years between host crops
  - Avoid planting susceptible crops near previous fields
- Apply registered chemicals after transplanting – typically a drench application
Registered Chemicals – Cabbage Maggots

<table>
<thead>
<tr>
<th>Crop</th>
<th>Product</th>
<th>Active Ingredient</th>
<th>Timing / Application Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cole Crops (Broccoli, Cabbage, Cauliflower, Broccoli Sprouts, Rutabaga, etc.)</td>
<td>Citadel 480EC Forsban 480EC Warhawk 480EC Pyrifos 15G</td>
<td>chlorpyrifos 480g/L, chlorpyrifos 15%</td>
<td>Varies – generally @ planting or post-planting drenches or in-furrow applications</td>
</tr>
<tr>
<td>Ethnic Cole Crops (registered crops varies with product)</td>
<td>Verimarkcyantraniliprole 200g/L</td>
<td></td>
<td>In-furrow / in transplant water / banded app at transplanting</td>
</tr>
</tbody>
</table>

FLEA BEETLES

Flea Beetles

- **Phyllotreta cruciferae** (crucifer flea beetle)
  - Hosts
    - Canola, mustard, cole crops, radish, rutabaga, turnip
    - Cruciferous weeds
  - Other species occur
  - Specific to other crops

[Photo by B. Elliott] Flea Beetles

Flea Beetle

[Photo by B. Elliott] Flea Beetle damage
Crucifer Flea Beetle – Life stage timeline

Monitoring

- Look for shot hole damage on cotyledons
- Estimate average % damage to cotyledons per 100 plants – control at 25%

Management Strategies

- Later or delayed seeding or use of transplants can help plants to withstand injury
- Control cruciferous weed hosts
- Irrigation during adult activity can reduce populations somewhat
- Fabric covers can protect plants
- Apply registered chemical controls

Registered Chemicals – Crucifer Flea Beetles

<table>
<thead>
<tr>
<th>Crop</th>
<th>Product</th>
<th>Active Ingredient</th>
<th>Timing / Application Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cole Crops (Broccoli, Cabbage, Cauliflower, Brussels Sprouts, Rutabaga, etc.)</td>
<td>Sevin SL / RP2 / JXR</td>
<td>carbaryl</td>
<td>When insects or damage appear</td>
</tr>
<tr>
<td></td>
<td>Excel</td>
<td>Verimark</td>
<td>cyantraniliprole</td>
</tr>
<tr>
<td></td>
<td>Malathion 50EC</td>
<td>Malathion</td>
<td>When insects appear</td>
</tr>
<tr>
<td></td>
<td>Ripcord 400EC</td>
<td>lamoxyn</td>
<td>When insects appear</td>
</tr>
<tr>
<td>Ethnic Cole Crops</td>
<td>Segesto 75WS</td>
<td>clothianidin / emidacloprid</td>
<td>Seed treatment</td>
</tr>
<tr>
<td></td>
<td>Actara 240Sc / 120Sc</td>
<td>thiamethoxam</td>
<td>In-furrow / Transplanting band at seeding</td>
</tr>
<tr>
<td></td>
<td>Minesto DUO 40WG</td>
<td>thiamethoxam / cyantraniliprole</td>
<td>In-furrow at seeding</td>
</tr>
</tbody>
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Registered Chemicals - Crucifer Flea Beetles

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<tbody>
<tr>
<td>Cole Crops (Broccoli, Cabbage, Cauliflower, Brussels Sprouts, Rutabaga, etc.)</td>
<td>Entrust / Entrust 80W</td>
<td>spinosad</td>
<td>When insects appear</td>
</tr>
<tr>
<td></td>
<td>Concept Liquid</td>
<td>amidoaclorpid / deltamethrin</td>
<td>When reach ET</td>
</tr>
<tr>
<td>Ethnic Cole Crops</td>
<td>Matador 120EC</td>
<td>Lambda-cyhalothrin</td>
<td>When significant population reached</td>
</tr>
<tr>
<td></td>
<td>Pounce 384EC</td>
<td>Permethrin</td>
<td>When insects appear</td>
</tr>
</tbody>
</table>

Guideline only
CATERPILLARS

Symptoms / Damage

- Larvae chew holes in the leaves and render heads unmarketable
- Larval frass (poop) is notable and is a contaminant of leaves and flower heads
- Presence of larvae is unacceptable in marketed product

Caterpillars

- **Imported Cabbageworm**
  - *Pieris rapae*
- **Cabbage looper**
  - *Trichoplusia ni*
- **Diamondback moth**
  - *Plutella xylostella*

**Hosts**

- Cruciferous crops and weeds
- Other host crops depending on the pest
- More than one generation will occur in all areas
- Not known to overwinter on the prairies (but does as a pupa everywhere else)

Imported Cabbageworm – adult butterfly

Imported Cabbageworm – larvae, feeding damage & frass

Cabbage Looper adult moth
Management Strategies

- Natural predators and viruses will reduce populations

- Biological and chemical controls are registered for control – adhere to application timings and rates for effective control

Registered Chemicals – Caterpillars

<table>
<thead>
<tr>
<th>Crop</th>
<th>Product</th>
<th>Active Ingredient</th>
<th>Timing / Application Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cole Crops</td>
<td>Sevin XLR / RP2 / SL</td>
<td>carbaryl</td>
<td>When insects appear</td>
</tr>
<tr>
<td></td>
<td>Exirel</td>
<td>cyantraniprole</td>
<td>When ET reached</td>
</tr>
<tr>
<td></td>
<td>Success 480SC Naturalyte / Entrust 80W Naturalyte / Entrust</td>
<td>spinosad</td>
<td>When ET reached</td>
</tr>
<tr>
<td>Ethnic Cole Crops</td>
<td>Pounce 384EC</td>
<td>permethrin</td>
<td>When insects appear</td>
</tr>
<tr>
<td></td>
<td>Ambush 500EC</td>
<td></td>
<td>Guideline only</td>
</tr>
<tr>
<td></td>
<td>Dragnet FT Perm-UP EC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**registered crops vary with product**
Registered Chemicals – Caterpillars

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<tr>
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<th>Active Ingredient</th>
<th>Timing / Application Method</th>
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</thead>
<tbody>
<tr>
<td>Cole Crops (Broccoli, Cabbage, Cauliflower, Brussels Sprouts, Rutabaga, etc.)</td>
<td>Ripcord 400EC U-P-Cycle 5.5EC</td>
<td>cypermethrin</td>
<td>When insects appear</td>
</tr>
<tr>
<td></td>
<td>Dibrom</td>
<td>naled</td>
<td>When insects appear</td>
</tr>
<tr>
<td>Ethnic Cole Crops</td>
<td>Monitor 480 Liquid</td>
<td>methamidophos</td>
<td>When insects appear</td>
</tr>
<tr>
<td>(Registered crops varies with product)</td>
<td>Dylox 800SC / 420</td>
<td>trichlorfon</td>
<td>When insects appear</td>
</tr>
<tr>
<td></td>
<td>Monitor 10EC</td>
<td>oxamaphos</td>
<td>When insects appear</td>
</tr>
<tr>
<td></td>
<td>Concept Liquid</td>
<td>dinidacloprid / deltamethrin</td>
<td>When ET reached</td>
</tr>
<tr>
<td></td>
<td>Minecto DUO 40WG</td>
<td>thiamethoxam / cyantraniliprole</td>
<td>In-furrow or surface band @ seeding</td>
</tr>
</tbody>
</table>

Registered Chemicals – Caterpillars (Biological)

<table>
<thead>
<tr>
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<th>Product</th>
<th>Active Ingredient</th>
<th>Timing / Application Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cole Crops (Broccoli, Cabbage, Cauliflower, Brussels Sprouts, Rutabaga, etc.)</td>
<td>Bioprotec 3P DF / CAF / ECO / PLUS</td>
<td>Bacillus thuringiensis</td>
<td>Apply at first sign – when larvae are small</td>
</tr>
<tr>
<td></td>
<td>Dipel 2x DF / WP</td>
<td>B. thur.</td>
<td>Apply at early instars</td>
</tr>
<tr>
<td>Ethnic Cole Crops</td>
<td>XenTari WG</td>
<td>B. thur. aizawai</td>
<td>Treat early instars</td>
</tr>
</tbody>
</table>

Guideline only

CUTWORMS

Cutworms

- Range of species
- Affect a wide range of vegetable crop hosts
- Adults = moths
- Subterranean caterpillars
- Feed above ground at night
  - Feed on plant parts and stems at or near ground level
- Overwinter as eggs on plant debris

Red-backed Cutworm
Distinctive “C” shape
Red-backed Cutworm

**Cutworms – Life stage timeline**

**Monitoring**
- Found by nighttime walks or shallow digging
- Watch for plants that collapse or have signs of feeding damage

**Management**
- Naturally occurring predators, parasites or pathogens can reduce populations
- **Apply registered chemical controls in the late evening or at night**
  - Contact with pest is typically required
  - Ensure good canopy penetration

**RADAR PESTS**

**SWEDE MIDGE**
**Swede Midge**

- *Contarinia nasturtii*
- Tiny, light-brown flies
  - Larval feeding causes gall formation = unmarketable plants
- Affects cruciferous crops
  - Cole crops – cabbage, broccoli, etc.
  - Canola
  - Mustard
  - Cruciferous weeds

**Why are we concerned?**
- Serious pest in other areas of the world
- Increasing across Canada
  - 1st found in 2000 in ON, now (MAYBE) found up to Saskatchewan
  - Vegetable crop losses reported to be as high as 85%
- We have a over 6 MILLION acres of one of the host crops in Alberta
- Whether SM was actually found is in question

**Swede Midge – Life stage timeline**

<table>
<thead>
<tr>
<th>Eggs</th>
<th>Larvae</th>
<th>Nymphs</th>
<th>Pupae</th>
<th>Adults</th>
<th>All Stages</th>
</tr>
</thead>
<tbody>
<tr>
<td>APRIL</td>
<td>MAY</td>
<td>JUNE</td>
<td>JULY</td>
<td>AUGUST</td>
<td>SEPTEMBER</td>
</tr>
</tbody>
</table>

**What Swede Midge does...**

- Larvae feed near growing points & between tightly compressed leaves and petioles
- Secretions break down tissues
  - Secretions = toxic to the plant
- Tissues react causing misshapen plants and plant parts
Swede Midge – Management

- Select less susceptible plant types (e.g. cabbage vs broccoli)
- Buy/use clean transplants
- Maintain a crucifer-free rotation for 2+ years
  - Crop hosts AND weeds
- Avoid growing very near other host crops
- Destroy infested crops to reduce potential to harbour SM
- Systemic insecticides would be effective at controlling larvae and adults

Brown Marmorated Stink Bug (BMSB)

- *Halyomorpha halys*
- Wide host range (over 300 species)
  - Fruit, vegetable, ornamental and agricultural crops
- Feeding by nymphs and adults = necrotic spots at feeding sites

BMSB – Why are we concerned?

- Invasive alien species
  - Native to Asia
- Serious pest of fruit, veg and agriculture crops in the mid-Atlantic region of the USA
- Has been found in most of the United States
  - Not necessarily established and causing issues in every state
- Has been found in RVs coming from United States to Alberta
  - Hitchhikers from milder areas

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Pheromone traps

- Monitor for early detection
- Ensure clean, pest-free plant material
- Pesticide applications = limited efficacy

Questions???

Handouts!!!
(on memory stick)

Pheromone-Based Monitoring
- Companies likely producing traps include AgBio/Chen-Tec, EcoScout, Topo, and Alphascents.
- In 2014 trials, all traps performed as well as our experimental standard, but Treco traps were superior.

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Alberta Ag-Info Centre
310-FARM