Some Common Vegetable Insects

Whitney Cranshaw
Colorado State University
Insects Associated with Seedlings/Plant Establishment

- Cutworms
- Flea beetles
- Root maggots
Seedcorn maggot – a bane to the overeager gardener

Affects large seeded crops, particularly warm season vegetables
Adults lay eggs in soil cracks.
Larvae develop in germinating seeds
Warm season, large seeded vegetable crops are at most risk: beans, corn, melons, squash, etc.
Conditions that Favor Seedcorn Maggot Injury

- Presence of decaying organic matter in seed bed
- Wet soils
- Cool conditions that retard seedling growth
Methods to avoid seedcorn maggot injury

- Presence of decaying organic matter in seed bed
  - Organic amendments should be thoroughly decayed
- Wet soils
  - Avoid practices that will prolong soil saturation
- Cool conditions that retard seedling growth
  - Plant into firm, warm seed bed
Fly fungus – a disease of seedcorn maggot flies common following cool, wet springs
Flea Beetles
Shothole injuries typical of adult flea beetles
Crucifer flea beetle, Western black flea beetle

Hosts: Crucifer family plants – cabbage, broccoli, sweet alyssum, canola, etc.
Potato flea beetle, Tuber flea beetle, Tobacco flea beetle

**Hosts:** Nightshade family plants – potato, tomato, etc.
Larvae of most flea beetles feed on plant roots and cause little injury.
Tuber flea beetle injury to potato
Flea Beetle Injuries

- Seedling injuries
  - Death/Stand Loss
  - Retarded Growth
- Defoliation of established plants
- Esthetic damage to leafy vegetables, ornamentals
- Surface tuber blemishing
Seedling damage by crucifer flea beetles

Tomato seedling killed by potato flea beetles
Seedling that is outgrowing flea beetle damage
Cabbage Flea Beetle Lesson Learned #1

Cabbage flea beetles can disperse over very long distance
Crop rotation does not work
Flea Beetle Control

- Seedling Injury
  - Provide conditions for rapid plant establishment
  - Row covers
  - Trap crops
  - Insecticides
Floating Row Covers

Can exclude insects that migrate into crops from outside areas
Cabbage Flea Beetle Lesson Learned

Conditions that favor rapid seedling growth, including transplanting, may be needed to establish adequate stand.
Seedling stages are highly vulnerable to flea beetles
Once established, plants can often outgrow moderate flea beetle infestations.
Plants can tolerate minor injuries
Crucifer Flea Beetle Lesson Learned

Daikon or radish can be used as a diversionary trap crop for these insects
CULTURAL CONTROL

TILLAGE
SANITATION
CROP ROTATION
MIXED CROPPING
STRIP HARVESTING
TIME OF PLANTING & HARVESTING
TRAP CROPS

Diagram:

MAJOR CROP

migration

TRAP CROP

migration

migration

MAJOR CROP

MAJOR CROP

TRAP CROPS
Flea Beetle Control

- Provide conditions for rapid plant establishment
- Row covers
- Trap crops
- Insecticides
Flea Beetle Insecticides

- Carbaryl/Sevin
- Permethrin (many formulations)
- Spinosad (Bull’s-Eye, etc.)*

*Allowed in organic food production.
Slugs and Snails
Class: Gastropoda
Slugs leave slime trails
Slug trails on pavement
Slugs and snails lay eggs in soil cracks
Management of Slugs in a Garden

• Reduce humidity in the planting
• Encourage natural enemies
• Slug baits
• Contact sprays
• Repellents
• Traps
Some Vertebrate Predators of Slugs and Snails
A common predator of slugs in backyards
Fireflies are predators. Larvae feed on slugs, snails and other soft-bodied animals in moist soils.
Molluscicides

- Metaldehyde
- Iron Phosphate
Some Metaldehyde-based Slug Baits
Iron Phosphate Slug Baits

KILLS SNAILS & SLUGS

Use around pets and wildlife

Active Ingredient:
Iron Phosphate 1.0%
Inert Ingredients: 99.0%
TOTAL 100.0%

Can Be Used Around Pets and Wildlife

Net Weight 1 1/2 lb. (.68 kg)

KEEP OUT OF REACH OF CHILDREN

CAUTION

(See Back Panel for Additional Precautionary Statements)
When Using Slug Baits....

- Conditions should not be highly moist
  - Moist conditions allow recovery from metaldehyde poisoning

- Make applications late in the day
  - Slug baits degrade in sunlight
CLEAR
Ammonia
and SLUG KILLER
64 FL OZ (2 QT)
Proposed Barriers/Repellents

- Copper
- Salt
- Wood ashes
- Some soaps
- Diatomaceous earth
- Ground egg shells
Copper as a repellent/barrier for slugs and snails
Effective Barriers/Repellents

- Copper
- Salt
- Wood ashes
- Some soaps
Management of Slugs in a Garden

• Reduce humidity in the planting
• Encourage natural enemies
• Slug baits
• Contact sprays
• Repellents
• Traps
Traps for Slugs

• Traps that provide for cover/protection sought by slugs
  – Moistened newspapers
  – Citrus rinds

• Traps that include attractant food-based baits
  – Beer
  – Some products of fermentation
Table 1a. Rankings of beverages for attractiveness to slugs, Ft. Collins, CO 1987. (Summary of 5 trials).

<table>
<thead>
<tr>
<th>Beverage</th>
<th>Attraction index*</th>
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<tbody>
<tr>
<td>Kingsbury Malt Beverage</td>
<td>1.14</td>
</tr>
<tr>
<td>Michelob</td>
<td>1.04</td>
</tr>
<tr>
<td>Budweiser</td>
<td>1.00</td>
</tr>
<tr>
<td>Bud Light</td>
<td>0.89</td>
</tr>
<tr>
<td>Old Milwaukee</td>
<td>0.81</td>
</tr>
<tr>
<td>Coors Light</td>
<td>0.79</td>
</tr>
<tr>
<td>Schaefer</td>
<td>0.69</td>
</tr>
<tr>
<td>Miller</td>
<td>0.68</td>
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* Expressed as ratio of slug capture in comparison with Budweiser standard.
Table 1b. Rankings of beverages for attractiveness to slugs, Ft. Collins, CO 1987. (Summary of 5 trials).

<table>
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<tr>
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<th>Attraction index*</th>
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</thead>
<tbody>
<tr>
<td>Strohs</td>
<td>0.67</td>
</tr>
<tr>
<td>Lite</td>
<td>0.57</td>
</tr>
<tr>
<td>Sugar water/yeast</td>
<td>0.57</td>
</tr>
<tr>
<td>Coors</td>
<td>0.56</td>
</tr>
<tr>
<td>Pabst Blue Ribbon</td>
<td>0.44</td>
</tr>
<tr>
<td>Rainier</td>
<td>0.36</td>
</tr>
<tr>
<td>Gallo Pink Chablis</td>
<td>0.09</td>
</tr>
<tr>
<td>Ft. Collins tap water</td>
<td>0.06</td>
</tr>
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Constituents of beer identified as being attractive to slugs (Selim 1973)

diacetyl
acetoin
dihydroxyacetone
The Ugly Slug
by Allan G. Peterson

The slug is quite a loathsome creature;
It has not a single attractive feature;
So it becomes very depressed I fear,
And drowns its sorrows in stale beer!
The “cabbage worm” complex

Imported cabbageworm

Cabbage looper

Diamondback moth
Direct Injury to Cabbage Head by Caterpillars
“Cabbage worms” can cause both indirect injuries and direct injuries of the marketable produce.
Imported Cabbageworm*  

*Adults are known as “cabbage butterflies” or the “cabbage white”

Pieris rapae  

Lepidoptera: Pieridae
Cabbage butterfly unable to successful lay eggs through a loose mesh barrier
Eggs are laid singly, often on the underside of the leaf edge.

Newly hatched larva
Pupa of the cabbageworm— a type of chrysalis

Photograph courtesy of Ken Gray Collection, Oregon State University
Cabbage looper

*Trichoplusia ni*

Lepidoptera: Noctuidae
The adult of the cabbage looper is a moth.

It almost always flies at night and is rarely observed.

Cabbage looper adult feeding on nectar of rabbitbrush flowers.
Cabbage loopers have only 3 pairs of prolegs, and walk in a looping manner.
Looper pupae within a cocoon of silk
Adults of the cabbage looper – like most moths – predominantly fly at night.
Diamondback moth

*Plutella xylostella*

Lepidoptera: Plutellidae
Diamondback moth is a small moth. They are active very early in the year and first develop on winter annual mustards.
Diamondback moth larvae
Pupation occurs in a loose cocoon.
“Cabbage Looper Equivalent”

One Cabbage Looper =

1.5 Cabbageworms

30 Diamondback Moth Caterpillars
The “cabbage worm” complex

Imported cabbageworm

Cabbage looper

Diamondback moth
When disturbed a cabbage looper will often rear back
Diamondback moth caterpillars often respond vigorously to being disturbed and will wriggle and even drop from the plant in response.
Touch a cabbageworm, and you will get little obvious response
Direct injuries to the marketed produce are most serious
Plants can well tolerate injuries caused by feeding caterpillars
## Effect of Defoliation on Broccoli Yield

<table>
<thead>
<tr>
<th>Percent Defoliation</th>
<th>Treatment date after transplanting</th>
<th>Avg. Head Weight (grams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td>20 days</td>
<td>426 a</td>
</tr>
<tr>
<td>25%</td>
<td>45 days</td>
<td>424 a</td>
</tr>
<tr>
<td>50%</td>
<td>20 days</td>
<td>433 a</td>
</tr>
<tr>
<td>50%</td>
<td>45 days</td>
<td>279 b</td>
</tr>
<tr>
<td>Untreated Check</td>
<td></td>
<td>410 a</td>
</tr>
</tbody>
</table>
Some natural enemies to watch for:

- Tachinid flies
- European paper wasp
- Parasitic wasps
Potato/Tomato Psyllid

*Bactericera cockerelli*

Hemiptera: Triozidae

…..and psyllid yellows disease
Potatoes and tomatoes are susceptible. Other plants that this insect feeds on (e.g., peppers, tomatillo) do not seem to be seriously injured.
The potato/tomato psyllid annually migrates northward from overwintering areas in the southwestern US and Mexico.

Incidence of potato/tomato psyllid in northern areas varies greatly from year-to-year.
Adult potato psyllids

Note: They jump when disturbed
Eggs are laid on leaves. They have a tiny stalk.
Young nymphs tend to be light brown; older nymphs green
Psyllid nymph in end stage of a molt
Newly emerged adult
Late stage nymph

Old nymphal skin

Adult
“Psyllid sugar” is a unique and diagnostic excrement it produces.
Psyllid sugar collected on leaves of hoop house-grown tomatoes
Psyllid Yellows

A plant disease produced from the effects of toxic saliva introduced by the potato/tomato psyllid. (Plant toxemia)
Color change (yellowing, purpling) is a common symptom.
New growth is slowed producing a plant that is more compact/rosetted in growth habit
Internode thickening and ‘aerial tubers’ are a common symptom
Treated for psyllid

Not treated for psyllid
Yields can be greatly reduced from effects of psyllid yellows
Chain tubers – belowground symptom induced from above ground feeding
Premature Sprouting
Symptoms to new growth of tomato
Effects on tomato yield

Dull color of fruit. Often associated with reduced flavor.

Reduced fruit size
Potato Psyllid Management

- Monitoring to detect incipient infestations
- Biological controls
- Chemical controls
Psyllids often show some edge effects during early stages of infestation.
Yellow and Bright Orange are attractive colors
Natural Enemies of Potato Psyllid

Minute pirate bugs
Damsel bugs
Green lacewing larvae
Chemical Controls for Potato Psyllid

• Several products available for commercial producers
• Home garden options limited
  – Spinosad
  – Permethrin
  – Sulfur dusts