Insect Pests of Vegetables in Home Gardens

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Vegetable pests

• Identification?
• Management?
Common pests

• Specialists
  – Cucurbits (4 pests)
  – Cole crops (2+ pests)
  – Tomato etc. (3 pests)
  – Beans (2 pests)
  – Spinach (1 pest)
  – Asparagus (2 pests)
  – Corn (2 pests)

• Generalists
  – Spider mites
  – Aphids
  – Slugs
Cucumber beetles

Striped cucumber beetle  Spotted cucumber beetle
Cucumber beetles

Important damage by adults:
• Chew seedlings
• Transmit bacterial wilt
• Chew on fruit surface

Less critical damage:
• Larvae chew on roots
• Adults chew on flowers
Bacterial wilt of cucurbits

• Vectored by cucumber beetles
  – Transmitted in feces
  – Enters via wound in plant (such as feeding wound)

• Hosts:
  – Well-known killer of cukes & melons
  – Recently adapted to kill squash & pumpkins (but slower)
Cucumber beetle management

• For beginners
  – Mechanical control
    • Screen or row cover (seedlings)
  – Cultural control
    • Delayed planting
  – Chemical control
    • Spray with pyrethrins, carbaryl, or permethrin

• For advanced gardeners
  – Cultural control
    • Early trap crop (Blue Hubbard or buttercup squash)
  – Biological control
    • Conserve parasitoids (by no spray)
Striped cucumber beetle tested on pumpkin leaves, 7/5/05; 4 replicates/treatment, 5 beetles/replicate
Spotted Cucumber Beetle
tested on pumpkin leaves, 9/21/2006
3 replicates/treatment, 3 beetles/replicate

Damage rating after 48 hours

% Mortality after 48 hours

P = 0.0088

P = 0.0001
Squash vine borer

• Infests squash, gourd, pumpkins
• Plants often die by July
Squash vine borer

- Infests squash, gourd, pumpkins
- Plants often die by July

- Larva is a caterpillar that bores into stem
- Adult is a day-flying moth, lays eggs in late June to mid-July
- Wilting leaves are symptom of infestation
- Cocoon in soil overwinter
Squash Vine Borer: Management

• Cultural
  – Till soil to destroy pupae
  – Plant late for main crop
  – Small planting early as trap crop

• Mechanical
  – Row covers (until flowering)

• Chemical
  – Insecticide
Squash vine borer

• **Chemical control:**

  – During egg hatch period, late June - **early July**
  
  – Direct at **base** of stems
  
  – Minimum 2 sprays 1 week apart, start late June
  
  – Maximum 6 sprays 1 week apart, mid-June to late July

  – **permethrin** or esfenvalerate
Squash bug

• **Damage:**
  – Suck sap from stems, leaves, fruit
  – Can kill plants
  – Nymphs can feed in large groups

• **Natural enemies:**
  – 1 fly species attacks adult
  – 2 wasp species attack eggs
Squash Bug: Management

• Cultural control
  – Rotate with non-cucurbit crops
  – Promote early growth of crop
  – * Destroy crop remains

• Mechanical control
  – Row covers (until flowering)
  – Hand picking, especially eggs
  – Shelter traps: board or shingle
Squash bug

*Not registered for use on squash

**Graphs showing the percentage of mortality**

- **Adult Squash Bug:**
  - lambda cyhalothrin: A
  - pyrethrins + PBO: AB
  - malathion: AB
  - esfenvalerate: B
  - permethrin: C
  - pyrethrins + oil: C
  - pyrethrins: C
  - water: C
  - endosulfan: C
  - pyrethrins + soap: C
  - rotenone: C
  - spinosad: C
  - carbaryl: C

- **Nymph Squash Bug:**
  - lambda-cyhalothrin: A
  - esfenvalerate: AB
  - pyrethrins + PBO: ABC
  - spinosad: BCD
  - malathion: BCD
  - pyrethrins: CDE
  - carbaryl: DE
  - permethrin: DE
  - rotenone: DE
  - endosulfan: E
  - water: E

*Graphs with statistical significance levels:* $P < 0.0001$ and $P = 0.0022$. 

*Graphs with percentage mortality ranging from 0 to 100%.*
Test question

- It’s late July and my **cucumber** plant is dying
  - What caused it?
  - What can I do about it?

- It’s late July and my **squash** plant is dying
  - What caused it?
  - What can I do about it?
3 Caterpillars on cole crops

Imported cabbageworm

Cabbage looper

Diamondback moth
3 Caterpillars on cole crops & their parasitoids

Imported cabbageworm

Caterpillars: "Imported cabbageworm"

Parasitoids:
- **Cotesia** larvae spinning cocoons
- **Copidosoma floridanum** wasps emerging from one cocoon
- **Diadegma insulare** oviposits on larvae

Cabbage looper

Diamondback moth

Adult wasp
Integration of Chemical Control & Biological Control

- Depends on choosing a selective insecticide
  - Kills caterpillars
  - Does not kill parasitoids
  - Use B.T. microbial insecticide
    - ‘DiPel’ etc.
  - Spinosad also easy on parasitoids
- Plant border of sweet alyssum to attract parasitoids
Cross-striped cabbageworm

- Spinosad
- Pyrethrins+PBO
- B.T. spray
- B.T. dust
- Carbaryl
- Bifenthrin
- Silicon dioxide+Pyrethrins
- Water
- Pyrethrins+oil
- Neem oil
- Acetamiprid
- Azadirachtin

**Damage rating**

- E
- DE
- CD
- BC
- BC
- BC
- BC
- BC
- B
- B
- B
- A

**P = 0.0001**

**% Mortality**

- ABC
- ABC
- AB
- BC
- BC
- C
- C
- C

**CSCW 9/29/2009**

**P = 0.05**

3 reps
3 larvae/dish
Row covers
Cabbage maggot

• **Turnip, radish, other cole crops**

• **Symptoms:**
  – Seedlings wilted, stunted
  – Holes or tunnels in roots

• **Life cycle:**
  – Adult fly lays egg at stem base
  – Larvae feed for 3 weeks
  – 3-4 generations per year

• **Control:**
  – Choose planting date to avoid egg peak
  – Cardboard collars on stem
Colorado potato beetle

• **Damage:** chewed leaves
  – By adults & larvae
  – Potato, eggplant, tomato

• **2 generations/year**

• **Control:**
  – Hand pick (knock in bucket)
  – Plant potato early or late but not both
  – Spray larvae with spinosad
Eggplant flea beetle

- Chew many small holes in leaves
- Damage critical to seedlings
- Management:
  - Hand-picking (aspirate) daily
  - Insecticides or repellents
- Similar species on:
  - Cabbage (2 species)
  - Potato
Removal by aspirator: Eggplant flea beetle
Whiteflies

- Suck sap
- Infest tomato
- Life stages:
  - Adult
  - Egg
  - Crawler (1\textsuperscript{st} instar)
  - Sessile nymphs
  - Pupa
- Damage done by nymphs from leaf undersides
- Control by soap sprays
Bean beetles

- **Bean leaf beetle:**
  - Adults chew holes through leaves, pods

- **Mexican bean beetle:**
  - A true lady beetle
  - Larvae skeletonize leaves

- **Cultural control:**
  - Exclusion (row covers)
  - Plow after harvest

- **Chemical control:**
  - Sevin or pyrethrins
Field trial on snap beans
(bean leaf beetle + spotted cucumber beetle)

Beetle Damage on Beans, 9/15/05

- rotenone: D
- pyrethrins: CD
- carbaryl: CD
- permethrin: CD
- azadirachtin: CD
- capsaicin: BC
- neem seed oil: BC
- endosulfan: AB
- spinosad: AB
- garlic: A
- untreated check: A

$P = 0.0001$
Spinach leafminer

- Adult fly lays eggs
  - On leaf underside
  - In early spring
- Maggots feed inside leaf, 1-2 weeks
  - Narrow mine when young
  - Large blister-like mines when older
- Pupate in soil
- Several generations per year
- Hand pick infested leaves, early
Asparagus beetles

• **Common asparagus beetle**
  – Adults feed on spears
  – Adults lay eggs on spears
  – Larvae feed on leaves

• **Spotted asparagus beetle**
  – Adults feed on spears
  – Larvae feed in berries
Asparagus beetles

• Management
  – Hand picking
  – Insecticides or repellents
Corn worms

1. European corn borer
   - Damage at tip or shank or side
   - Two generations per year
   - Damage in June & August
   - Worm appearance:
     - dark brown head
     - body with rows of flat spots
     - body without microspines
Corn worms

2. Corn earworm

- Damage at ear tip only
- Damage usually mid-August & later
- Worm appearance:
  - light brown head
  - body with long stripes
  - body covered with short microspines
Trap to Monitor Corn Earworm

- Pheromone lure
- Attracts male moths
- Highly effective
- Reports posted on web
Organic Alternative for Earworm & Borer on Sweet corn: B.t. + Oil
(Ruth Hazzard, Univ. Mass.)

• ‘Zea-later II’ applicator
  – Hand-held
  – $100 (Johnny’s Selected Seeds)

• Mix:
  – 900 ml food-grade corn oil
  – Lecithin 5% (emulsifier)
  – 28.6 grams DiPel DF (a B.t.)
  – 100 ml water

• Treat:
  – Once, 5 days after silking begins
  – Squirt 0.5 ml of oil mix into each ear tip
Corn Worm Management

- **Planting date:**
  - Early & late plantings difficult
  - Middle plantings easiest

- **Traps for monitoring**
  - Excellent for corn earworm
  - Good for European corn borer

- **Chemical control:**
  - BT for 1st generation borer
  - Oil + BT in ear tip for earworm
  - Spinosad for both pests

- **Biocontrol:**
  - Encourage generalist predators
  - New *Trichogramma* egg parasitoid
Generalist pests

– Mites
– Aphids
– Slugs
Two-spotted spider mite

- Often overlooked
- Often mistaken for disease
- Build up in hot dry weather
Two-spotted spider mite: identification

- Tiny (1/60 inch)
- White with 2 black spots
- 8 legs
Two-spotted spider mite: hosts

- Tomato
  - Yellow blotches
- Bean
  - White stippling
Two-spotted spider mite: hosts

- Watermelon
  - Yellow blotches
  - Brown lesions
Two-spotted spider mite: symptoms

• Sweet corn!!
  – Flag leaf
Two-spotted spider mite: diagnosis

- Fine webbing on leaf underside
- Scout by tapping leaf over paper, look for moving specks
- Early diagnosis for good control
Spider mite management

• Tolerable at low density
• Conserve natural predators
• Overhead irrigation can help
• Soft control:
  – Insecticidal soap
  – Hort. Oil
Two-spotted spider mite tested on snap bean leaves, 10/26/05; 3 replicates/treatment, 30 mites/replicate
Aphids

• **Appearance:**
  – Small, soft, 2 ‘tailpipes’
  – Every species with winged & wingless forms

• **Damage:**
  – Suck sap, cause leaf puckers
  – Deposit honeydew
  – Transmit viruses

• **Common species:**
  – Potato aphid (tomato)
  – Green peach aphid (lettuce, pepper)
  – Melon aphid (cucurbitas)
How aphids colonize plants

Winged female adult → Nymphs (wingless) → Wingless female adults → Nymphs (wingless)
Aphid control

• Encourage natural enemies by avoiding use of broad-spectrum insecticides

• Suffocate with spray of insecticidal soap

• Reflective mulch to prevent colonization by winged aphids
Potato Aphid
tested on tomato leaves, 10/3/2006
3 replicates/treatment, 10 aphids/replicate
Slugs

- Not insects!
- Chew leaves, stems
- Leave slime trails
- Hide during the daytime

Cultural control:
- Delay mulching until soil warm
- Border garden with dry scratchy material

Chemical Control:
- Baits on soil around plants
- Iron phosphate or metaldehyde
The end

Info on veg. & fruit pest management
u.osu.edu/pestmanagement/

Questions?

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