Insect Pests of Vegetables & Fruit in Home Gardens

Celeste Welty
Extension Entomologist
March 2020
Common pests: i.d. & management

• Veg specialist pests
• Generalist pests on veg & fruit
• Fruit specialist pests
• One new pest alert!
Vegetable specialist pests

– Cucurbits (4 pests)
– Cole crops (4 pests)
– Tomato etc. (2 pests)
– Beans (2 pests)
– Spinach (1 pest)
– Asparagus (2 pests)
– Corn (2 pests)
Cucumber beetles

Striped cucumber beetle  Spotted cucumber beetle
Cucumber beetles: key pests

Feeding damage

Vectors of bacterial wilt disease
Bacterial wilt of cucurbits: Vectored by cucumber beetles

- Transmitted in feces
- Enter via plant wound
- Moisture needed
- Cotyledon stage most susceptible
Natural enemy of cucumber beetles

- Parasitoid fly, *Celatoria setosa*
- Looks like a small house fly
- Kills adult cucumber beetles
- Common in Ohio
- We need to encourage its survival!
Cucumber beetle management

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

• For advanced gardeners
  – Cultural control
    • Early trap crop (squash: buttercup or Blue Hubbard or Turks Turban)
  – Biological control
    • Conserve parasitoids (by no spray)
  – Behavioral control
    • Pheromone/Kairomone trap
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:
- Eufenvalerate
- Pyrethrins + PBO
- Carbaryl
- Endosulfan
- Permethrin
- Pyrethrins + oil
- Rotenone
- Spinosad
- Water (control)
- Azadirachtin
- Pyrethrins
- Neem seed oil
- Pyrethrins + soap
- Malathion

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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
Wilting leaves are symptom of infestation
Adult is a day-flying moth, lays eggs in late June to mid-July
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 spray on plant base
  – Minimum 2 sprays 1 week apart early July
  – Maximum 4 sprays 1 week apart, late June to late July
Squash bug

eggs

eggs hatching

young nymphs

older nymphs

adult
Squash bug: Damage

- Suck sap: leaves, stems
  - Patches turn black, die
- Plants wilt
  - Can die
  - Can live but not develop fruit
- Bugs feed on fruit before harvest
Squash bug: natural enemies

- Feather-legged fly
  - *Trichopoda pennipes*
  - lays eggs on adult or large nymph
- Egg parasitoid wasps
  - *Gryon pennsylvanicum*
  - *Ooencyrtus anasae*
Squash bug: Management

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

• Cultural control
  – Promote early growth of crop
  – Destroy crop remains
  – Rotate with non-cucurbits
Squash bug

*Not registered for use on squash
Test question!

- It’s late July and my cucumber plant is dying
  - What is likely cause?
  - What can I do about it?
  - When will I do that?
- It’s late July and my squash plant is dying
  - What is likely cause?
  - What can I do about it?
  - When will I do that?
3 Caterpillars on cole crops

- Imported cabbageworm
- Cabbage looper
- Diamondback moth
3 Caterpillars on cole crops & their parasitoids

- **Imported cabbageworm**
- **Cabbage looper**
- **Diamondback moth**

**Cotesia larvae**
- Spinning cocoons
- Adult wasp

**Copidosoma floridanum** wasps emerging from one cocoon

**Diadegma insulare** oviposits on larvae
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:
- 0
- 1
- 2
- 3
- 4
- 5
- 6

P < 0.0001
9/29/2009
3 reps
3 larvae/dish

% Mortality:
- 0
- 10
- 20
- 30
- 40
- 50
- 60
- 70
- 80

CSCW 2009
P = 0.05
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
Row covers from seeding until harvest, protects from - worms - maggots
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 holes in leaves
• Damage critical to seedlings
• Management:
  – Remove (aspirate) daily
  – Insecticides or repellents
• Similar species on:
  – Cabbage, arugula (2 species)
  – Potato
Beetles on beans

- **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+PBO
## Bean Leaf Beetle

### Damage Rating

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Rating</th>
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<tbody>
<tr>
<td>pyrethrins + PBO</td>
<td>D</td>
</tr>
<tr>
<td>pyrethrins + oil</td>
<td>D</td>
</tr>
<tr>
<td>lambda-cyhalothrin</td>
<td>D</td>
</tr>
<tr>
<td>rotenone</td>
<td>D</td>
</tr>
<tr>
<td>permethrin</td>
<td>D</td>
</tr>
<tr>
<td>bifenthrin</td>
<td>D</td>
</tr>
<tr>
<td>carbaryl</td>
<td>D</td>
</tr>
<tr>
<td>esfenvalerate</td>
<td>D</td>
</tr>
<tr>
<td>cyfluthrin</td>
<td>D</td>
</tr>
<tr>
<td>spinosad</td>
<td>C</td>
</tr>
<tr>
<td>malathion</td>
<td>C</td>
</tr>
<tr>
<td>pyrethrins + soap</td>
<td>B</td>
</tr>
<tr>
<td>azadirachtin</td>
<td>AB</td>
</tr>
<tr>
<td>capsaicin</td>
<td>AB</td>
</tr>
<tr>
<td>water</td>
<td>A</td>
</tr>
</tbody>
</table>

| Soybean leaf 7/26/07 | P < 0.0001 |

### % Mortality

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>% Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>pyrethrins + PBO</td>
<td>A</td>
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<tr>
<td>capsaicin</td>
<td>A</td>
</tr>
<tr>
<td>water</td>
<td>A</td>
</tr>
</tbody>
</table>

P < 0.0001
Field trial on snap beans
(bean leaf beetle + spotted cucumber beetle)
Spinach leafminer & beet 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, 3x/week
Common asparagus beetle 

Spotted asparagus beetle
Asparagus beetles: Damage

• **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

[Images of adult, eggs, larvae]
Asparagus beetles: Management

- Hand picking
- Insecticides or repellents
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
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 1\textsuperscript{st} generation borer
  – Oil + BT in ear tip for earworm
  – Spinosad for both pests

• **Biocontrol:**
  – Encourage generalists: *Orius*, ladybugs
  – *Trichogramma* egg parasitoid
Veg & fruit **generalist** pests

- Japanese beetle
- Slugs
- Whiteflies
- Mites
- Aphids
- Brown marmorated stink bug
Japanese beetle

• Adults attack many crops:
  – Grape
  – Raspberry
  – Blueberry
  – Plum
  – Peach
  – Sweet corn
  – Beans

• Emerge in early July
• Larvae: pests of grass roots
Japanese beetle

- Insecticides
  - Sevin (carbaryl)
  - pyrethrins + PBO

- Traps
  - can bring in MORE beetles
  - Do not place close to crop
Results of insecticide tests in laboratory bioassays

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Damage Rating</th>
<th>% Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>rotenone</td>
<td>E</td>
<td>A</td>
</tr>
<tr>
<td>esfenvalerate</td>
<td>DE</td>
<td>A</td>
</tr>
<tr>
<td>pyrethrins + PBO</td>
<td>DE</td>
<td>A</td>
</tr>
<tr>
<td>carbaryl</td>
<td>CDE</td>
<td>A</td>
</tr>
<tr>
<td>lambda-cyhalothrin</td>
<td>CDE</td>
<td>A</td>
</tr>
<tr>
<td>permethrin</td>
<td>CDE</td>
<td>A</td>
</tr>
<tr>
<td>cyfluthrin</td>
<td>CDE</td>
<td>A</td>
</tr>
<tr>
<td>bifenthrin</td>
<td>BCDE</td>
<td>A</td>
</tr>
<tr>
<td>malathion</td>
<td>BCD</td>
<td>A</td>
</tr>
<tr>
<td>pyrethrins + soap</td>
<td>BC</td>
<td>A</td>
</tr>
<tr>
<td>pyrethrins + oil</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>water</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>azadirachtin</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>spinosad</td>
<td>A</td>
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</tr>
<tr>
<td>capsaicin</td>
<td>A</td>
<td>C</td>
</tr>
</tbody>
</table>

Grape leaf 6/28/07  
P < 0.0001
Slugs

- Not insects!
- No wings or legs
- Move around plants by sliding
- Feed mostly at night
- Hide during daytime
- Favored by moisture, thick mulch
- Can not swim
Slug damage

- Strawberries, lettuce, tomato
- Mouth with tooth-like radula
- Injury:
  - Scraped surface
  - Chewed leaves & stems
  - Ragged holes & tunnels
  - Defoliation
- Evidence:
  - Slime trails
- Often in protected sites, like under strawberry cap
Slug appearance

Common species: grey garden slug

- Slimy
- 1-2 inches (25-50 mm) when fully extended
- Grey to pale yellow with light mottled markings
- Eyes are rounded knobs on stalks, can be retracted
Slug eggs

- Clear, round
- In clusters of about 5 eggs
- Laid in the fall
- Laid under mulch or plant debris
- Easily seen under straw in spring
Slug management

• Cultural tactics
  – Reduce plant density
  – Delay fall mulching
  – Remove debris around field
  – Border mulch of sweetgum balls

• Mechanical removal tactics
  – Board traps
  – Beer traps

• Chemical tactics
  – Border of diatomaceous earth
  – Baits on soil around plants

OMAFRA (Ontario)
Slug control by baits

– Spread around base of plants, not on the plants themselves
– Best if applied to moist soil
– If dry, irrigate just before spreading bait, to stimulate slug activity
– Avoid watering for 3-4 days after application
– Ideal to apply in late afternoon or evening
Slug control by bait

• **Option 1: metaldehyde (Bug-Geta)**
  – Kill slugs by over-stimulating mucous
  – Prevents damage
  – Toxic to dogs
  – Works best at warm temperature
Slug control by bait

- **Option 2: iron phosphate (Sluggo, etc.)**
  - Safe to humans, dogs, natural enemies
  - Less rapid toxic effect than metaldehyde
  - Stop the slugs from feeding
  - Eventually leads to their death
Whiteflies

• Suck sap
• Damage done by nymphs from leaf undersides
• Need magnifier to see nymphs
Whiteflies: damage

- Cause scorch
- Sooty mold can follow
Whiteflies: hosts

tomato

beans

squash

lettuce
Whiteflies: insecticides

• Best controlled by neonicotinoids
  – acetamiprid
  – imidacloprid
  – be sure to know pre-harvest interval

• Insecticidal soap: soft option
Two-spotted spider mite

- Often overlooked
- Often mistaken for disease
- Hot dry weather
- Tiny (1/60 inch)
- White with 2 black spots
- 8 legs
Two-spotted spider mite: hosts

- Tomato
  - Yellow blotches
- Bean
  - White stippling
- Watermelon
  - Yellow blotches
  - Brown lesions
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

Mean % Mortality after 24 hours

- Dicofol: A
- Soap: B
- Oil (Mite-X): B
- Pyrethrins + PBO: BC
- Permethrin: CD
- Water (control): D

TSSM 10/26/05
Aphids

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

• **Damage:**
  – Suck sap
  – Cause leaf puckers
  – Deposit honeydew
  – Transmit viruses
Aphids: common species

• Potato aphid (tomato, lettuce)
• Green peach aphid (lettuce, pepper)
• Melon aphid (cucurbits)
• Rosy apple aphid (apple)
• Green apple aphid (apple)
Aphid management

• 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

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% Mortality after 24 hours</th>
</tr>
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<tbody>
<tr>
<td>soap</td>
<td>A</td>
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<tr>
<td>pyrethrins+PBOr</td>
<td>AB</td>
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<td>esfenvalerate</td>
<td>ABC</td>
</tr>
<tr>
<td>lambda-cyhalothrin</td>
<td>BCD</td>
</tr>
<tr>
<td>oil (Mite-X)</td>
<td>BCD</td>
</tr>
<tr>
<td>malathion</td>
<td>BCD</td>
</tr>
<tr>
<td>carbaryl</td>
<td>BCD</td>
</tr>
<tr>
<td>pyrethrins</td>
<td>BCD</td>
</tr>
<tr>
<td>endosulfan</td>
<td>BCD</td>
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<td>neem seed oil</td>
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</tr>
</tbody>
</table>

*P = 0.0037*
Brown marmorated stink bug

- Invading Ohio since 2007
- Attacks fruits & seed pods
- Also nuisance pest: invades homes in autumn
BMSB detected in at least 63 of Ohio’s 88 counties as of 2019

First reports:
- 2008-2011
- 2012-2014
- 2015-2017
- 2018-2019
Injury by stink bug
Brown marmorated stink bug: injury

corn

pepper

beans

tomato
Note differences in size & shape in pinned specimens side-by-side
Mechanical control of stink bugs

- Lightweight row covers
- The preferred tactic in small plantings
# Stink bug control in gardens

<table>
<thead>
<tr>
<th>Category</th>
<th>Ingredient</th>
<th>Representative brand name</th>
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<tbody>
<tr>
<td><strong>pyrethroids</strong></td>
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<td></td>
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<tr>
<td></td>
<td>bifenthrin + zeta-cypermethrin</td>
<td>Ortho Bug B Gon Insect Killer for Lawns &amp; Gardens</td>
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<tr>
<td></td>
<td>gamma-cyhalothrin</td>
<td>Spectricide Triazicide Insect Killer for Lawns &amp; Landscapes</td>
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<tr>
<td></td>
<td>lambda-cyhalothrin</td>
<td>Bonide Eight Insect Control Garden &amp; Home</td>
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<tr>
<td></td>
<td>cyfluthrin</td>
<td>Spectricide Triazicide Insect Killer for Lawns &amp; Landscapes Long Lasting Formula</td>
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<td></td>
<td>esfenvalerate</td>
<td>Bio Advanced Vegetable &amp; Garden Insect Spray</td>
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<tr>
<td><strong>neonicotinoid</strong></td>
<td>acetamiprid</td>
<td>Ortho Flower Fruit &amp; Vegetable Insect Killer</td>
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<tr>
<td><strong>deterrent</strong></td>
<td>kaolin</td>
<td>Monterey Bug Buster II</td>
</tr>
<tr>
<td><strong>for nymphs, not adults</strong></td>
<td>spinosad</td>
<td>Bonide Captain Jack’s Deadbug Brew</td>
</tr>
</tbody>
</table>
Fruit specialist pests

- Raspberry (1 pest)
- Strawberry (1 pest)
- Apple (2 pests)
- Peach (2 pests)
- Apple + peach (2 pests)
- Cherry (1 pest)
Spotted-wing Drosophila

• Looks like common vinegar flies on overripe, fallen, decaying fruit

• But the new species attacks healthy ripening fruit

• Invading mainland USA since 2008
Fruit injury by Spotted-wing Drosophila

- raspberry
- blueberry
- strawberry
- grape
- cherry
- peach
Management of spotted-wing Drosophila

• **Sanitation**
  – Strongly recommended!
  – Destroy leftover fruit
  – Easier said than done
  – Do every 2 days
  – Culls in clear plastic bags in sun, 1 week
  – Or bury culls 2 ft deep
## Insecticides for SWD in garden raspberries & blackberries

<table>
<thead>
<tr>
<th>Rating</th>
<th>Active ingredient</th>
<th>PHI</th>
<th>Representative brand name</th>
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</thead>
<tbody>
<tr>
<td>Very effective</td>
<td>spinosad</td>
<td>3-day</td>
<td>Captain Jack’s Deadbug Brew (Bonide)</td>
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<tr>
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<td>bifenthrin + zeta-cypermethrin</td>
<td>3-day</td>
<td>Ortho Bug B Gon Insect Killer for Lawns &amp; Gardens</td>
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<tr>
<td>Effective</td>
<td>malathion</td>
<td>1-day</td>
<td>Bonide Malathion</td>
</tr>
<tr>
<td>Moderately effective</td>
<td>acetamiprid</td>
<td>1-day</td>
<td>Ortho Flower Fruit &amp; Veg Insect Killer Concentrate</td>
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<tr>
<td>Uncertain, likely good</td>
<td>pyrethrins + PBO</td>
<td>0-day</td>
<td>FoxFarm Don’t Bug Me</td>
</tr>
</tbody>
</table>
REQUEST!

• Anyone with a planting of raspberries or blackberries nearby in Columbus?

• Need a site to put a trap for SWD, to be checked by my crew once per week

• Please let me know of any potential sites
• Causes fruit deformities:
  – Strawberry: apical seediness
  – Peaches: ‘catfacing’
  – Apples: ‘dimples’

• Cultural control by weed management

• Chemical control before & after bloom
  – permethrin
  – pyrethrins + PBO
Codling moth

- The key pest in apple & pear fruit
- Young larva enters fruit, tunnels to seeds at core
Codling Moth
Life cycle

1\textsuperscript{st} generation
in May/June

2\textsuperscript{nd} generation
in July/August
Mechanical controls of codling moth

- Trunk bands
- Fruit bagging
Trunk bands: the idea

- Larva exits fruit
- Crawls under bark scale to pupate
- Bands offer shelter
- Destroy the shelter!
Trunk bands:
4 - 6” corrugated cardboard on trunk & main branches

<table>
<thead>
<tr>
<th>Target</th>
<th>Install</th>
<th>Remove &amp; destroy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1\textsuperscript{st} generation</td>
<td>mid-May</td>
<td>Late June</td>
</tr>
<tr>
<td>2\textsuperscript{nd} generation</td>
<td>mid-July</td>
<td>November</td>
</tr>
</tbody>
</table>
Fruit bagging

• Supplies:
  – 2-layer Japanese bags
  – Or brown paper bags + twist ties
Fruit bagging

• Install on fruit ½ - ¾” diameter (~2 – 3 weeks after petal-fall)
• Remove 2 weeks before harvest
• Labor intensive!
Cultural controls of codling moth

- Sanitation:
  - Scrape cocoons from picking crates, fences
- Host reservoir elimination:
  - Cut down abandoned trees
Insecticide for codling moth?

• Calendar approach:
  – Spray every 2 weeks from petal-fall until harvest (= 9 sprays)

• IPM approach:
  – Use 2 sprays @ 2 generations
  – 1st spray at 1st egg hatch
    • Memorial Day +/- 1 to 2 weeks
    • 250 degree-days (base 50°F) after moths begin sustained flight
    • Use pheromone trap for moth flight
  – 2nd spray 14 days later
kaolin: ‘Surround At Home’
Apple maggot

- A key pest in northern USA
- Not a pest in southern USA
- Variable in latitude of Ohio
Apple maggot: mechanical control

• Adult female fly attracted to round red object

• **Sticky ball trap:** 1 trap per 100 real fruit

• ‘**Tanglefoot**’

• Clean with **mineral spirits**

• Optional: fruit volatile lure
Apple maggot: chemical control

- Spray **every 2 weeks** in July & August
- **Products:**
  - acetamiprid
  - carbaryl
  - esfenvalerate
  - spinosad
Oriental Fruit Moth

• 1\textsuperscript{st} & 2\textsuperscript{nd} broods: tunnel in terminal shoots
• 2\textsuperscript{nd} & 3\textsuperscript{rd} broods: tunnel in fruit
Oriental Fruit Moth in Peaches

Control Options:

• Prune flagged terminal shoots in spring

• Insecticide
  – permethrin, malathion, or Sevin
  – Most important to apply at petal-fall
  – Additional applications in all remaining cover sprays
Borers in peach trees

- **Peachtree borer**
  - Attack healthy tree at soil line
  - One generation per year

- **Lesser peachtree borer**
  - Attack injured scaffold branches
  - Two generations per year
Control of peach borers

• **Cultural**
  – Train trees to form wide angles
  – Avoid practices that injure bark

• **Mechanical**
  – ‘Worming’ Insert knife into entry hole

• **Chemical**
  – Dip bare roots before planting new trees
  – Bark drench with permethrin (start year 2)
Plum curculio

- External damage from egg-laying
  - Apples
  - Plum, peach, cherry, blueberry
- Internal damage from larvae
  - Plum, peach, cherry, blueberry
  - Not in apple
- Adults hide by day, feed at night
Plum curculio: control

- Not many effective tactics
- Mechanical:
  - Limb jarring (‘beating’) on first warm humid nights near petal-fall
- Chemical:
  - permethrin at petal-fall
  - kaolin (‘Surround’) at petal-fall & weekly for 2 more weeks
San Jose scale

- Apple & peach
- Sucking pest
- Injures fruit & bark
- Overwinters on bark
- Disperses to fruit in crawler stage
San Jose scale: control

• At dormant stage in early spring
  – Use oil to smother scales on bark
  – Or use lime sulfur

• Post-bloom insecticide
  – Target crawler stage (~mid-June)
  – Detect with black sticky tape
  – insecticidal soap, malathion, carbaryl
Cherry Fruit Fly

• Similar to apple maggot
• Female fly lays eggs on fruit for 3-4 weeks in June and July
Cherry Fruit Fly

- **Mechanical control by traps**
  - Yellow sticky traps baited with ammonium
- **Chemical control**
  - Insecticide targets adult flies
  - carbaryl or spinosad or permethrin
  - Apply within 1 week of first fly emergence
  - Every 10 days from June to harvest
Potential new pest of fruit crops in Ohio: Spotted lanternfly

- Native to China
- First find in USA:
  - Sept. 2014
  - S.E. Pennsylvania
Spotted lanternfly: what is it?

- *Lycorma delicatula*
- A planthopper
- Sucks sap
- 1” long
- Poor flier
- Strong jumper (1 - 3 m!)
Damage

- Suck sap
- Weeping wounds of sap on bark
- Excrete large amounts of sweet fluid (honeydew)
- Sooty mold grows on sweet fluid
Host plants

• Major hosts:
  – Tree of Heaven
  – Grape

• Other crops:
  – Apple
  – Cherry
  – Peach
  – Blueberry
  – Hops

• Forest & ornamental trees:
  – Oaks
  – Walnuts
  – Poplars
  – Maples
  – Willows
Life stages

- Adult
- Eggs
- Young nymphs: black with white spots
- Older nymphs: red with white spots
Behavior

- Nymphs on leaves, stems
- Adults on branches, trunks
- **Aggregate** on trunk at base
- Lift forewings to flash red hindwings
# Origin & spread

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of counties in PA</th>
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<tbody>
<tr>
<td>2014</td>
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<tr>
<td>2015</td>
<td>4</td>
</tr>
<tr>
<td>2016</td>
<td>5</td>
</tr>
<tr>
<td>2017</td>
<td>6</td>
</tr>
<tr>
<td>2018</td>
<td>14</td>
</tr>
<tr>
<td>2020</td>
<td>26</td>
</tr>
</tbody>
</table>

- [Map showing spotted lanternfly spread](https://example.com/map)
Recent find near Ohio

• Egg masses at rail yard
• Conway in Beaver County, PA
  – 23 miles NW of Pittsburgh PA
  – 15 mi from Ohio state line
  – Near East Liverpool in Columbiana County, OH
Where to look, Sept. - May?

- Egg masses, on smooth vertical surfaces:
  - tree trunks, stones, fence posts, vehicles, buildings, furniture

Characteristic ‘tire tread’ pattern left after eggs scraped off

Brown corky appearance of old egg mass after eggs hatched
Info on fruit & veg. pests
u.osu.edu/pestmanagement

Questions?
e-mail: welty.1@osu.edu
office phone: 614 292 2803
cell phone: 614 746 2429