Organic Growing Workshop:
10 Common Garden Insect Pests & How to Control Them Organically

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Utah State University Extension
March 12, 2016
Common Tree Fruit Insect Pests

codling moth, cherry fruit fly, peach twig borer, and aphids
Codling Moth

- Internal “fruit worm” in apple & pear
- Overwinters as a caterpillar within a cocoon under tree bark
- Spring: adult moth emerges beginning at ~ apple bloom time
- Eggs laid on fruit & leaves
- 1st instar larva bores into fruit w/in 24 hr of hatching
- Challenging insect to control with non-chemical tools
Codling Moth Chemical Control

- Target eggs & newly hatched larvae
- Timing based on moth trap catch & degree-days in your area
- Tree Fruit IPM Advisory – provides the proper timing
- Organic insecticides:
  - horticultural mineral oil (1-1.5%)
  - target egg hatch
  - mix with CydX
  - codling moth virus (CydX; 7 d)
  - spinosad (Entrust; 7 d)
Tree Fruit IPM Advisory

In the News
Wasp larvae jump to the dark side
Jan 12, 2016
Zombified caterpillars forced to carb-load by parasitoid wasps
Jan 11, 2016
Self-Medicating Parasitized Bees
Size 11, 2015

In the table, choose either Option A or B when starting your mosquito sprays.

Option A is what most people will do. Apply insecticide at the recommended dose, and repeat. Option B is an alternative that may help to reduce sprays. Liberal application of insecticidal soap (1%) on the first date, and apply your regular insecticide on the last date. The oil kills eggs that have been laid on fruit up to that point.

Please check this table at each advisory as the information may change as the dates get closer. The forecasts use the average temperature for each site. Fruits should remain protected throughout the generation according to interval provided on your pesticide label. Many more locations can be viewed on the Utah Extension Center TRAPS website (select location/select coding moth).
Pheromones for Moth Monitoring

Communication within a species: sex attractant

Pheromone traps are only for monitoring. They are not a control tool. Attract only male moths.
Degree days are a measurement of heat units over time.

\[ t^D = \frac{1}{\pi} \left\{ \left( \frac{t_{\text{max}} + t_{\text{min}}}{2} - T_{L} \right) \left( \theta_2 - \theta_1 \right) + \alpha \left( \cos(\theta_1) - \cos(\theta_2) \right) \right\} \]

\[ \theta_1 = \sin^{-1} \left( \frac{t_{L} - \frac{t_{\text{max}} + t_{\text{min}}}{2}}{a} \right) \]

\[ \theta_2 = \sin^{-1} \left( \frac{t_{U} - \frac{t_{\text{max}} + t_{\text{min}}}{2}}{a} \right) \]
Codling Moth (Cydia pomonella)

Do You Know?
- Codling moth is the major pest of apple and pear in Utah.
- Damaging stage: larva travels into fruit.
- Use of pheromone traps and the degree-day model can reduce codling moth activity. Consult your county Extension office for more information.

The Codling Moth

Fig. 1. Codling moth adult

Fig. 2. Codling moth larvae

Codling moth (Cydia pomonella) is a major pest of apples and pears worldwide. In Utah, codling moth is a major economic pest. The larva travels into the fruit and causes damage by leaving small holes. Adult moths are grayish-brown, about 1 cm long, and have a wingspan of about 2.5 cm. They are attracted to pheromones and can be controlled using pheromone traps.

HOSTS
- apples, pear, crabapple, English walnut, quince, hawthorn, spaldis, plum, peach, cherry.

Degree-day Model

The degree-day model can be used to estimate the time required for codling moth development. The development time is determined by the degree-days accumulated above a specified threshold. The degree-day model is based on the assumption that the development rate is linear and that the development time is inversely proportional to the degree-days.

Timing Sprays
- Timing of sprays is important to control codling moth populations. Sprays should be applied at the appropriate stage of development.

Table 1. Major events in a codling moth management program, based on accumulated degree days.

<table>
<thead>
<tr>
<th>Degree Days</th>
<th>% Adult Emergence</th>
<th>% Egg hatch</th>
<th>Management Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 150</td>
<td>0</td>
<td>0</td>
<td>Plant trees in orchards</td>
</tr>
<tr>
<td>151 - 200</td>
<td>0</td>
<td>0</td>
<td>Check traps every 2 - 3 days until both eggs and larvae are eliminated</td>
</tr>
<tr>
<td>201 - 250</td>
<td>15 - 40</td>
<td>0</td>
<td>Remove eggs and larva</td>
</tr>
<tr>
<td>251 - 300</td>
<td>50</td>
<td>0</td>
<td>Remove eggs and larva</td>
</tr>
<tr>
<td>301 - 350</td>
<td>75</td>
<td>0</td>
<td>Remove eggs and larva</td>
</tr>
<tr>
<td>351 - 400</td>
<td>90</td>
<td>0</td>
<td>Remove eggs and larva</td>
</tr>
</tbody>
</table>

Codling Moth Fact Sheet

Published by Utah State University Extension and Utah State Pest Diagnostic Lab

DHR-12-04 June 2018
Mechanical Control: Sanitation

- Pick up dropped fruit
  - “June drop”
    - green apples
  - July-August
    - don’t wait too long or larvae will have already exited fruit
Mechanical Control: Bands & Bags

“Mass trap” larvae in corrugated cardboard bands on tree trunks

Pupate inside silken cocoons on trunks

Late June to Mid-September

Fruit bags to exclude codling moth eggs

Place bags over 3/4” diameter fruit
Western Cherry Fruit Fly

- Larvae feed inside sweet & tart cherries; female flies lay eggs in ripening fruit; fruit doesn’t become soft enough for egg-laying until it turns salmon colored
- Chemical control:
  - spinosad (Entrust; 7 d)
  - GF-120 NF (spinosad + bait; 7 d)
  - pyrethrin (Pyganic; 3-5 d)
- Mechanical control: Landscape fabric or barrier under tree canopy
  - pupate in soil under trees
- Predation by fowl: chickens, guinea hens, ducks, geese, turkeys
Western Cherry Fruit Fly Fact Sheet

Do You Know?
- Western cherry fruit fly is the primary insect pest of sweet and tart cherries in Utah.
- Eggs are oviposited on the tissue under the skin of the fruit, near the pedicel.
- Pupae form inside the fruit, and adults emerge from the mouth of the fruit.
- Adult flies are attracted to sweet cherries.
- The larvae are found in the flesh of the fruit, and the adults emerge from the mouth of the fruit.

Western Cherry Fruit Fly (Rhagoletis indifferens)

Diane Astone, Entomologist/Extension Specialist, Phipps Project Leader

LIFE HISTORY
Pupa - Overwintering Stage
- Size: about 15% of the adult length (1.0 mm long)
- Color: light to dark brown
- Location: within the pedicel or the mouth of the fruit, and stored in the soil or decaying wood

Adult - Monitoring Stage
- Size: about 15% of the adult length (1.0 mm long)
- Color: dark body with white bands on abdomen
- Location: on the tree or in the fruit

hosts
- Sweet, tart, and wild varieties of cherry

Recommended Insecticides
- Spinosad (SureGuard), Imidacloprid (Talstar), and Pyraclostrobin (Ensystrol)

Cultural Controls
- Ground cover and mulches around the base of trees can prevent larvae from entering the soil and pupating.
- Removing affected cherries from the orchard can help reduce the population.

Sanitation
- Removing dead cherries from the ground can help reduce the population.

Biological Control
- There are several natural enemies that control cherry fruit flies, such as parasitoids.
- Birds and bats also eat the larvae of cherry fruit flies.

Figure 1. Adult flies caught on a fruit fly trap.
Figure 2. Larvae feeding inside a cherry.
Figure 3. Damaged cherries with torn pedicel.
Figure 4. Cherry flies are difficult to control after they have laid their eggs in the cherry fruit.

It is critical to keep a reasonable number of both insecticide treatments available to control adults after they emerge and before they mate and lay eggs in the fruit. Currently, it is only sold in larger volumes that are practical for most orchards.

Figure 5. Application of spinosad on a cherry tree.
Peach Twig Borer

• Over winter as young larvae on limbs within cocoons
• From bloom to petal fall, brown caterpillars tunnel into new shoots
• 2\textsuperscript{nd} & 3\textsuperscript{rd} generation caterpillars enter fruit, usually at the stem end
• Chemical Control:
  • Delayed Dormant Spray (Bud break)
    • horticultural oil (2%) OR
  • Bloom sprays: 2 Bt sprays (Dipel, Thuricide, Javelin) at early & full to late bloom
• Fruit Protection (Tree Fruit IPM Advisory):
  • spinosad (Entrust) or pyrethrin (Pyganic)
Common Tree Fruit Aphids in Utah

- Apple
  - Rosy Apple Aphid
  - Green Apple Aphid
  - Woolly Apple Aphid
- Cherry
  - Black Cherry Aphid
- Peach
  - Green Peach Aphid
- Plum
  - Mealy Plum Aphid
  - Leaf Curl Plum Aphid

How to identify aphids:
- green, black, pink, purple
- small, soft pear-shaped bodies
- slow moving
- pair of “tailpipes” – cornicles exude defensive fluid
- adults with & without wings
Aphids

- Aphids have “tailpipes”
- Non-winged & winged adults
- Suck fluids from leaves & stems; curl leaves; produce sticky honeydew; black sooty mold growth
- Protect young trees, older trees can tolerate more aphid feeding

Chemical Control:
  - horticultural oil at green tip stage
  - In-season: insecticidal soap, horticultural oil, azadirachtin (neem)

Biological control:
  - lady beetles, lacewings, syrphid flies, parasitic wasps
**Woolly Apple Aphid**

- Can be a severe pest of apple
- Mid- & late-season pest
- Forms galls on roots & twigs
  - reduced tree vigor
  - stunted roots & trees
- Contaminate stem bowl of fruit

- Root galls
- Aphids covered in white woolly wax
- Twig galls disrupt transport of nutrients & water
Aphid Biological Control

- Convergent Lady Beetle
- Syrphid or Hover Fly
- Green Lacewing
- Brown Lacewing
Woolly Apple Aphid Biological Control

Aphid mummies

*Aphelinus mali*
parasitoid wasp of WAA

Aphid Predators:
ladybeetles
lacewings
syrphid flies

Alyssum planted to attract
Syrphid flies to nectar & pollen
Aphid & Spider Mite Mechanical Control

Stiff spray of water every 2-3 days until aphid or mite numbers decline

Best if initiated before leaves are tightly curled (aphids) or extensive webbing & leaf injury occurs (mites)
Common Raspberry Insect Pests
earwigs, grasshoppers, and caneborers
European Earwig

Female European earwig (straight cerci)

Nocturnal – feed on fruits & leaves with chewing mouthparts
European Earwig Traps
Earwig Management – Before Berries are Ripe

- Insecticidal soap + pyrethrin (Pyganic) or neem
  - reapply every 3-5 days
  - suppressive
  - combine with trapping & habitat management
- OR spinosad (Entrust)
- Predation by fowl
  - chicken, turkey, duck

Dense & moist ground covers, such as birdsfoot trefoil, can provide attractive daytime refuge for earwigs

Wheat straw & paper mulch are less attractive

Earwigs prefer dense, moist refuge
Grasshoppers on Berries

Strip the foliage
Some eat fruit: e.g., Differential grasshopper, *Melanoplus differentialis*

Late summer to early fall
Hot, dry conditions
Grasshopper Management

- Floating row cover fabric
- Cultivate around plants in fall and/or spring to disrupt overwintering eggs in soil
- Predation by fowl
- Insecticides
  - pyrethrin or neem
  - Nosema locustae bait
    - treat a larger area around farm/garden
    - target nymphs (young) before adult numbers build up

Community-Wide Grasshopper Control Fact Sheet
utahpests.usu.edu Fact sheets
Raspberry Cane Borers
Fact Sheets: Insects – Small Fruit

Canes break at girdling site
Remove nearby wild roses
Prune out infested canes
Insecticide applications to target adult flight (May & June)

Entire canes wilt
Clear-wing moth: 2-yr life cycle
Use clean stock
Dig out infested crowns
Entomopathogenic nematodes (July)
Insecticides applied as crown drench (October) for 2-consecutive yrs
Raspberry Cane Borers
Raspberry Horntail

Prune out canes with hole in pith (by early May)

Prune out tips of infested canes (June – July)

Select less susceptible cultivars

Natural biological control from several parasitic wasps
Common Vegetable Insect Pests
squash bug, flea beetles, and cabbage worms
Squash Bugs

- Difficult insect to control
  - Prone to insecticide resistance
- In Utah, primarily a pest of squash & pumpkin
- Plant injury:
  - Leaf necrosis, scarred fruits, rapid plant wilt
- Use preventive & mechanical controls first
- Treatment threshold: 1 egg cluster per plant

Females lay bronze-colored egg clusters near leaf veins

Nymphs have gray bodies with dark legs & antennae
Squash Bug Damage

‘Sudden Wilt’ from heavy feeding that severs xylem vessels

Feeding on fruit rinds causes scars and sunken areas
Squash Bug IPM

- Maintain healthy plants
- Field sanitation
  - destroy crop debris immediately after harvest
  - Remove wood piles & other debris near garden/field where adults seek winter shelter
- Resistant varieties
  - resistant: ‘Butternut’, ‘Royal Acorn’
  - mod resistant: ‘Sweet Cheese’, ‘Green Striped Cushaw’
- Floating row covers (before bloom)
- Hand-pick adults & nymphs, and squish eggs
  - sticky tape method
- Kaolin clay (Surround)
  - cover undersides of leaves and stems
  - Every 1-2 wk during peak activity

Exclude squash bugs with floating row cover when plants are young

Remove eggs & nymphs with sticky tape; cover lower plant with kaolin clay
Utah Pests
Fact Sheet

Insects – Vegetable link
Flea Beetles in Vegetable Crops

- Small black & brown beetles that jump quickly when disturbed
  - enlarged hind legs for jumping
- Adults spend the winter in protected sites:
  - under soil clods & plant debris, under & on weeds
- In the spring, adults fly to attractive crop plants
- Adults feed on seedlings causing stunting & seedling death
- Adult feeding causes small round holes & pits in true leaves & cotyledons
  - young plants are most affected
  - injury to older plants can generally be tolerated

Feeding injury to bean seedlings; note cotyledon damage

Western black flea beetle
Palestriped flea beetle
Plants Preferred by Flea Beetles

- Vegetables in the mustard family (Brassicaceae)
  - mustard greens, arugula, broccoli, kale, cabbage (Chinese), collards
- Vegetables in the tomato family (Solanaceae)
  - potato, tomato, eggplant, pepper
- Many weeds, especially mustards

- Arugula leaf with adult flea beetle 'shot holes'
- Flea beetle adults chew pits in waxy broccoli leaves
Flea Beetle Larval Damage to Vegetable Crops

- Larvae are pale yellow to white with short legs and brown heads
- Chew on small roots & root hairs of host plants
- Larvae of some species feed on potato tubers & carrots
  - winding, shallow grooves on tuber surface
  - pimpled surface with small brown tunnels
Vegetable IPM for Flea Beetles

- Remove weeds along field margins (especially mustards)
- Deeply disk plant residue in infested fields after harvest
- Good seedbed preparation to accelerate seedling growth
- Floating row covers to exclude adults
- Trap crops; plant 2-4 wk ahead of cash crop; treat trap crops with insecticides (or vacuum)
  - Chinese southern giant mustard, radish, daikon, pac choi, Pacific gold mustard
- Organic insecticides
  - pyrethrin (PyGanic), spinosad (Entrust), azadirachtin (Aza-Direct, Neem Oil)
- To protect potato tubers & carrot roots
  - diatomaceous earth (organic)
Utah Pests
Fact Sheet
Insects – Vegetable link

Flea Beetles on Vegetables
(Coleoptera: Chrysomelidae)

Bonnie Bunn, IPM Vegetable Associate • Diane Aikin, Entomologist • Marlon Murray, IPM Project Leader

Do You Know?
- There are many species of flea beetles; most adults are small, darkly colored, sometimes shiny or metallic, and jump quickly when disturbed.
- Flea beetles attack foliage of brassicas and other cruciferous crops, and some root crops including potato tubers.
- Young vegetable seedlings are most sensitive to adult feeding injury, which often appears as small punctures and pitting in leaves and cotyledons.
- Key management practices include early monitoring for injury, and using row covers, trap crops, matches, sanitation, and timely insecticide applications.

Flea beetles are common and problematic in Utah. They are present in late spring and early summer on many vegetable crops and ornamental plants. Adult flea beetles are small, shiny insects that have enlarged hind legs, allowing them to jump great distances when disturbed (Fig. 1). They are strong flyers, moving into crops from neighboring fields and weedy borders.

HOSTS
Most species of flea beetles attack only one plant group or closely related groups. Common agricultural and garden hosts include members of the brassica (mustard, broccoli, kale, cabbage, collards, etc.) and cruciferous (broccoli, tomatoes, eggplant, peppers, etc.) families. In these crops, foliage injury from adults is common, and terminal injury to potato tubers is of economic importance. Other hosts include allium, currant, evening primrose, sodium, sunflower, sumac, willow, and a variety of weeds and grasses.

DESCRIPTION AND LIFE HISTORY
Adult: Overwintering and damaging stage
- Typically range from 1/16 to 1/4 inch (1.7 to 4.3 mm) long
- Hind legs are enlarged for jumping
- Range in color from brown, green, metallic-blue to black; may have white or gold spots
- Feed on foliage and can cause severe injury on some host plants (puncturing holes in leaves)

Egg: Laid in the soil at the base of host plants
- Elliptical in shape, 1/64 inch (0.4 mm) long
- White to yellowish-gray

Larva: Feeding stage; feeds on small roots
- Minute, worm-like
- White body with brown head (Fig. 2)
- Usually does not cause significant plant injury, except to potato tubers and possibly carrots (Fig. 2)

Pupa: Resting stage
- Occurs several inches deep in the soil (Fig. 3)
Cabbage Worms

- Caterpillars chew large holes in leaves; produce abundant frass (excrement)
- Bt (Dipel, Thuricide, Javelin), spinosad (Entrust)
- Row cover fabric – cover plants to prevent egg-laying
Utah Pests Online Resources
Utah Pests Online Resources
www.utahpests.usu.edu
Fact Sheets: over 200 fact sheets on pests of ornamentals, turf, fruits, vegetables, field crops, health-related, nuisance, stored products, structural, etc.

Spruce Health in Utah Landscapes

DO YOU KNOW?
- Spruces tend to prefer abundant moisture and may not do well on dry sites.
- Water stress caused by too little water and too much water can be the single most important cause of pest problems in irrigation districts.
- High temperatures and low humidity can reduce water use by trees to about one-third normal.
- Some spruces require high moisture in the growing season to retain the most leaves and to be most productive.

BACKGROUND
Spruces are commonly used in cultivated landscapes in Utah. They have waited shapes, attractive foliage color, and can be long-lived. They have pests, but not overly so, and are not very invasive. Overall, the spruce pests are limited in their geographic ranges.

SPECIES IN UTAH
Five species of spruce are commonly found in Utah, and are listed below in order of their importance in the landscape. A few other species can be found but are less important. Examples include Brewer's spruce (Picea breweriana), Blue spruce (Picea pungens), and Colorado blue spruce (Picea pungens) Blue Spruce: Brewer spruce

Yellowjackets, hornets and paper wasps

DO YOU KNOW?
- Yellowjackets, hornets, and paper wasps are commonly found in Utah.
- Yellowjackets are social insects and are known for their aggressiveness.
- Paper wasps are known for their nests made of paper-like materials.

INTRODUCTION
Social wasps, including yellowjackets, hornets, and paper wasps, are common pests in Utah. They can cause significant damage to crops, gardens, and structures.

BILOGY
Adults of the first generation emerge in early summer. Eggs of the second generation generally hatch in the fall, and the adults develop in early to mid fall. Adults of the second generation are usually not observed.
Video Fact Sheets

Paper Wasp Traps
Entomologist Diane Alston discusses the difference between native paper wasps and European paper wasps, and how to make your own traps to combat them.

Billbug Identification and Detection in Turf
Entomologist Ricardo Ramirez discusses the identifying characteristics of billbugs in turf, and demonstrates how to detect the damaging larval stage.

Using a Beating Tray
A beating tray is a large cloth frame that is used to catch insects that fall from a shaken branch. It is helpful for monitoring a large area, such as an orchard, quickly.

Tips for avoiding bed bugs while traveling
Entomologist Ryan Davis discusses safe travel techniques to avoid falling prey to bed bugs, and how to minimize the chances of bringing bed bugs back to the home.
IPM Advisories:
ornamentals, turf, fruits, vegetables
www.utahpests.usu.edu/ipm

Free subscription
Timely info on pest activity
- insects
- mites
- diseases
- nutrient deficiencies
- environmental stress
Lots of images!
IPM recommendations
- mechanical, cultural, biological
Effective pesticides
- organic products

All you need to sign up for the advisories is an email address
IPM Advisories (2015 Examples)

IPM Advisories (2015 Examples)

DECIDUOUS TREES

Insect/Disease Information

Dead Ash Borers

Trees: Ash and elm occasionally green and mountain elm

- insect damage (tree trunk and limbs)

Dead ash borers have been observed to emerge in early spring on the bark of trees and elms. Green ash and white ash thrives are the most susceptible. Sometimes, oaks, maples, and oaks are also attacked.

Dead ash borers do not directly kill trees, but repeated infestations can cause branch dieback and can cause trees to succumb to stress even in vigorous situations. Infected white elms have been found to die near the trunk, while silver leaf tree near the trunk or at the base of these trees and rough, western elm, and tree near tree near the trunk branches.

This insect overwinters in a tree’s base near the base of the trunk and roots in spring and can reach adult stage in late spring to early summer. Emergence and egg laying continues for about 6 to 8 weeks.

Treatment

Nematodes, bacteria, and other treatments are now available in ash borers, while oral control of white elms are more susceptible to attack and deaths. It is common to see brown, blackened, and darkened leaves, and dead trees, as a result.

Insecticides target the adults. Small trees can be treated by the homeowner, but it is easier to get through coverage on large trees. Insecticides should be applied to a licensed pesticide applicator.

Landscape IPM Advisory

Utah State University Extension

Weekly News Update for Woody Ornamentals, Utah State University Extension, April 28, 2015

Landscape IPM Advisory

Utah State University extension

Seasonal Turfgrass Pest Update, Utah State University Extension, Winter 2014

Turfgrass IPM Advisory

Utah State University

Orchard Pest Update, Utah State University Extension, October 3, 2015

Peachal Qincta Information

Insect and Disease Information

Insect and Disease Information
Utah Pests News
Quarterly newsletter on all things “insects and plant diseases” in Utah
Pest Diagnostics
Utah Plant Pest Diagnostic Lab
www.utahpests.usu.edu/uppdl

Sample Submission
Find this slideshow and others at www.utahpests.usu.edu

thank you...

for your attention...

Contact us