DIAGNOSING FRUIT PROBLEMS

Diane Alston and Marion Murray

Master Gardener In-Depth Plant and Pest Diagnostic Training
November 27, 2012
Diagnosing Arthropod Pests of Fruit (Emphasis on Tree Fruit)
Diagnosing arthropods (insects and mites)

- 7 primary types of injury:
  1. Fruit tunneling
  2. Leaf and external fruit chewing
  3. Fruit distortion
  4. Leaf stippling/speckling/distortion
  5. Scales on fruits & limbs
  6. Galls
     - Twigs & roots
     - Blisters on leaves
  7. Trunk & limb boring holes
Fruit Tunneling - Caterpillars

Codling moth (apple & pear)

Peach twig borer (peach/nec & apricot)

- Key diagnostic: “wormy” fruit or “shoot flagging” (PTB only)
- Key management: prevention – kill eggs & young larvae before enter fruit or shoot
- Key timing: pheromone traps & degree day model (temperature)
  *Tree Fruit IPM Advisory*
- Adult is a moth; eggs laid on fruit & leaves
Fruit Tunneling - Fruit Flies

- Key diagnostic: “wormy” fruit; larva has narrow head (maggot)
- Key management: prevention – kill adult flies before they lay eggs in fruit
- Key timing: cherry fruit blush color, yellow sticky traps, DD model

Tree Fruit IPM Advisory
- Adult is a fly; lay eggs under skin of fruit
Leaf & External Fruit Chewing

Leafroller (all tree fruits)

Fruitworm (all tree fruits)

- Key diagnostics: holes chewed in leaves & fruit; “tied” leaves (webbing)
- Key management: kill caterpillars while small; Bt, spinosad
- Key timing: scout for symptoms
- Adult is a moth; eggs laid on leaves or branches
FRUIT CHEWING

- Key diagnostics: holes chewed in fruit; frass contamination
- Key management: reduce populations, exclude, protect fruit
- Key timing: scout ripening fruit for symptoms
- Late-season pests

European earwig
(all fruits)

European paper wasp
(all fruits)
**Pear Sawfly**
AKA Pear and Cherry Slug
(pear & cherry)

- Key diagnostics: skeletonized leaves & slug-like larvae
- Key management: spray, if needed
- Key timing: summer, scout for symptoms & larvae
- Use “soft” insecticides to avoid disrupting biological control of others
**FRUIT DISTORTION – EARLY-SEASON**

**Cat-facing insects:**
- Lygus bug
- Green stink bug
- Consperse stink bug

**Apple**
- Peach
- Nectarine – thrips

Kill cells in developing fruit, lead to scarred, malformed fruit.
**Boxelder bug**

Mass on ripe fruit
All fruits (esp. peach)

**Stink bugs** also injure
fruit late in the season

- Key diagnostics: fruit dimpling & puckering; corky flesh
- Key management: spray, if needed, when observed
- Key management: “Contact” insecticides
Spider mites (all fruits)

Tiny (0.2-0.4 mm)!

Piercing-sucking-like mouthparts
Suck sap (chlorophyll) out of leaf cells

Produce webbing
Dust & debris sticks to leaves
Leaves look dirty
Shake leaves over white paper
Tiny, moving specks are mites

Hort oil & soap kills mites
White apple leafhopper (apple & cherry)

White speckling, heaviest near midrib

White to light yellow leafhoppers on undersides of leaves

Adults have wings and fly quickly when disturbed

“Soft” insecticides target nymphs
Pear Psylla (pear)

Sap feeder
Copious honeydew
Nymphs on undersides of leaves & on fruit

Eggs laid on buds by overwintering adults
Dormant oil kills eggs, spring insecticides
Leaf Distortion - Aphids

Green peach aphid

Rosy apple aphid

Green apple aphid

Black cherry aphid

Over winter as eggs on limbs

Delayed dormant oil spray

Biological control!
**San Jose Scale** (all tree fruits)

Feeding spots & scales on fruits
Scales encrust twigs & limbs

Delayed dormant oil

Insecticides in late spring to early summer when “crawlers” are active

*Tree Fruit IPM Advisory*
GALLS ON TWIGS & ROOTS

Woolly Apple Aphid

“Woolly” clumps of aphids on twigs & pruning scars
Galls on twigs & roots

Scout for early infestations
Insecticide + soap or oil to dissolve waxy covering
**Apple Leaf Blister Mite**

Eriophyid mites (microscopic)

Over winter as adults in buds

Mites burrow into leaves, form blisters

**Pear Leaf Blister Mite**

Blisters are green in spring, turn brown in summer

Spring & fall is time to treat – sulfur or carbaryl
Greater Peachtree Borer
Clear winged moth – caterpillar
Key diagnostics: sap, frass, holes near base of trunk; pupal skins
Key management: trunk spray
Key timing: pheromone traps

Tree Fruit IPM Advisory
**Flatheaded borer** (Buprestid beetle)
Oval-shaped exit holes in limbs
Loose flaking bark, sawdust/frass
Girdle limbs, kill limbs & trees (slow)
Attack stressed, declining trees, June/July

**Shothole Borer** (bark beetle)
Small (shot) holes in limbs
Galleries (tunnels) with beetles
Limb dieback
Attack stressed, declining trees
Late summer/fall
Online Resources & TRAPs
The Backyard Orchardist
Fruit Pests: Apple
Marion Murray, ULA Project Leader; Diane Aiston, Extension Entomologist

DISEASES

Blight

IMPORTANCE AS A PEST ON APPLES: High

GENERAL INFO: The blight is caused by the bacterium *Streptomyces*.*

SYMPTOMS:
- Brown blossoms and shoots
- Withered shoot in the shape of a shepherd's crook (shown right)
- Infection starts in early deciduous leaves through winter
- Crossing centers in spring

MANAGEMENT: Most importantly, all infected shoots, leaves, or limbs should be pruned out of the tree. Cut 12 inches below the container or plant. It is important to get rid of the blight before the weather turns cold. The disease can spread to the fruit. Use a bacterial spray to prevent the disease from spreading. Prevent infection from infection by applying an antibiotic spray just before or within 24 hours after a potential wetting event (rain, irrigation, dew). Mix streptomycin and a copper pesticide to prevent resistance.

Powdery Mildew

IMPORTANCE AS A PEST ON APPLES: Moderate-high

HOSTS: cherries, strawberries, peaches, berries, and grapes

SYMPTOMS:
- Yellowing
- Distortion
- White powdery residue (visible through the leaves)
- Retardation

MANAGEMENT: Most trees can tolerate light infections. Fungicides (time out: myclobutanil, or propiconazole) are used as preventive measures. Rapidly apply fungicides five times a year up to three weeks after the leaves turn green to prevent infection. They will not "come out" infected tissue. Plant affected leaves may also be helpful.

Series of Backyard Orchardist Fact Sheets for every tree fruit crop

Comprehensive home orchard pest management guide
FRUIT IPM ADVISORIES

Tree Fruit IPM Advisory

Weekly Orchard Pest Update, Utah State University Extension, July 20, 2012

News/What to Watch For:
- Spider mite populations are starting to build
- Second generation San Jose scale crawlers emerging soon
- Damage is evident on new foliage of peach, plum, and pear
- If 6-8 hr rules occur during peach or plum’s sensitive stages, may need to apply fungicide to prevent crown gall infection
- Cool, moist conditions are conducive to spray spraying
- Spraying materials: page 6

Insect and Disease Activity/Info

APPLES/PEARS

Cooling Mist

- Except for the coldest areas (Cache, Wasatch counties) all other areas are in the middle of second generation egg hatch, so maintain protection of fruit. The end of egg hatch for this generation will occur August 11. There will be a full third generation this year, with no real "down time" between the second and third. So basically, in those areas that have high pest pressure, keep fruit protected from now through the middle of September (when you can stop even if harvest has not begun yet).

San Jose Scale

- San Jose scale will have a second emergence of crawlers, coming up soon in many areas. This pest is usually treated primarily with the dormant oil spray and wet treatment of the first crawler emergence. But if you have a heavy infestation, or missed the window for the first emergence, consider a treatment for the timing below. One treatment is all that is necessary with 1% horticultural oil (spraying or early in the flower bud to avoid damage) or Systox.

- Boni Vita: July 22 - 25
- Cache: August 6 - 10
- Davis: July 24 - 28
- Ione: July 16 - August 3
- Salt Lake: July 23
- Tooele: July 21 - 24
- Uinta, Utah: July 15 - 19
- Wasatch: August 17 - 21

White Apple Leathopper

- Where present, leathopper feeding damage on leaves can now be seen. The second generation has begun, and nymphs are active on the undersides of leaves. If you see heavy leathopper earlier, now would be a good time to treat because the nymphs are more susceptible and easier to treat than the adults.

Small Fruits & Vegetables IPM Advisory

Weekly Pest and Production Update, Utah State University Extension, August 21, 2011

Insect/Disease Information

VEGETABLES

Spider Mites

- Ventral condition: spider mites, leafhopper/mites are more spider mites. A complete generation from egg to adult may take as low to 7 days in these conditions, which shows how quickly their numbers can build. Spider mite injury has been found on melon, potato, and potato beetles, and more. They suck the chlorophyll from plant cells, causing stippling on the leaf surface. Severe infestations result in leaf burn, leaf distortion, and reduced yields.

Ideally you should search for spider mites early in the season. Around early to mid June (earlier if the site is dusty). Around early to mid June (earlier if the site is dusty). You should be able to see adult mites, eggs, and webbing. Leaves will also appear dry and from the spider mite excrement.

- Control: (commercial) Kalathone, Alisense, Ameisan (resi- dual), neem oil, horticultural oil, insecticidal soap, malathion

Powdery Mildew on Cucurbits

- Cucurbit powdery mildew is showing up on some crops, especially where plants are crowded or running together. This foliar disease appears as small circular lesions located randomly on the leaf surface or on petals. As the infection continues, leaves turn yellow and become discolored. The disease is usually not directly affected by yield and flavor can be reduced. This disease thrives in humid and shaded environments under moderate temperatures (up to 80 degrees F). Frequent watering is not necessary and can actually inhibit germination, so can be treated with temperatures.

Spray for the disease by flushing on mature leaves in the middle of the field or the flowers, powdery lesions. In general, if you find one lesion per 50-100 leaves, begin a regular, 7-14 day protective fungicide program. Fungicide applications are most effective when applied after the disease has become established.

When planting next spring, shaw seed for resistance. There are some pumpkin and melon varieties that are at least partly resistant. Also, rotate the location of your cucurbit crops each year. The fungus overwinters on plant debris left in the soil.

continued on reverse
Utah TRAPs (Timing Resource Appraiser Program) is a degree-day calculator, insect phenology tracking tool for Utah. The Utah TRAPs website is evolving, and more locations will be added soon.

Using degree days and insect phenology is a key feature of Utah TRAPs. Degree days predict an insect's emergence or flowering date. For example, a degree-day model for the peach borer, codling moth, and western cherry fruitworm can be used to predict the timing of these insect pests.

For biofix dates from previous years, refer to the biofix page.

TRAPs HELP FILE

Please select a station from the map or enter a location in the search bar.
Payson

Pest:
- Codling Moth
- Fire Blight
- GDD (base 50)
- Greater Peachtree Borer
- Peach Twig Borer
- San Jose Scale
- Western Cherry Fruit Fly

Latitude: -111.5012  Longitude: 39.5479
# Payson Codling Moth: 05-17-2011 - 06-30-2011

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**Management Actions**

- **Date:** 2011-06-09
- **Degree Days:** 150 - 200
- **Action:** First moths expected
**Payson**

**Fire Blight: 05-09-2011 - 06-14-2011**

Select your Blight history: Fire Blight is now active in your neighborhood.

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**Management Actions**

**Date:** 2011-06-05

**Blight Potential:** EXTREME

**Action:** Outbreak may occur if blossoms are wetted, no matter the blight history of your orchard. Apply antibiotic within 24 hours before or after the wetting event. Biological products should already be present on flowers and may not work as well if only applied at this risk period.
Disease Overview
CAUSES OF PLANT DISEASES

- Fungi
- Bacteria
- Viruses
- *Nematodes*
Fungi - Terminology

- Grow via fungal threads = hyphae
  - mass of hyphae = mycelium
- Reproduce via spores
  - spores borne within fruiting body
chasmothecium; chasmothecia
Diagnosing Diseases on FRUIT
POWDERY MILDEW - PEACH

- Peach powdery mildew - *Podosphaera pannosa*
- overwinters on peach buds or on roses
- mostly fruit is affected (rarely see infections on foliage)
POWDERY MILDEW - PEACH

- Peach rusty spot
- Caused by apple powdery mildew – *Podosphaera leucotricha*
- no visible mycelium on fruit or leaves
POWDERY MILDEW - APPLE

[Images of powdery mildew on apples]
Coryneum Blight

- Caused by a fungus – *Wilsonomyces carpophilus*
- Primarily apricot, peach/nectarine, and occasionally plum and cherry
- Active in fall and spring; fungal spores are spread by rain and water splash
Coryneum Blight
Coryneum Blight Management

- Monitor trees and prune out dead twigs
- Prevent wetting of canopy with irrigation
- Apply copper at 50% leaf drop to prevent new infections
Diagnosing Diseases on FOLIAGE
POWDERY MILDEW ON APPLES OR CHERRIES

- Caused by a fungus: *Podosphaera leucotricha* on apple, and *Podosphaera clandestina* on cherry and plum

- Apple powdery mildew overwinters in terminal buds

- Cherry powdery mildew overwinters in buds, on bark of twigs and branches, and in fallen leaves
Powdery Mildew Management

- Remove cherry leaves from under trees.
- Monitor for the disease in spring by looking for whitish patches on the underside of leaves and prune out those twigs.
- If necessary, apply fungicide applications at pink stage (apple) or at shuck fall (cherry) to prevent secondary infections.
Coryneum Blight (Shothole)
Peach Leaf Curl

- *Taphrina deformans*
- peach/nectarine only
- overwinters as spores on tree surfaces
- new infections only occur in early spring during cool (<68 F), wet weather over 12.5 hours
- infections stop after rains stop and temps increase
Peach Leaf Curl
Diagnosing Diseases Affecting PART or ALL of TREE
FIRE BLIGHT

- Caused by a bacterium – *Erwinia amylovora*
- Becomes active when temperatures are consistently above 60 degrees and with moisture.
- Primarily enter through flowers
  - existing cankers ooze and rain-splashed to flowers
  - stigma is colonized; moisture washes bacteria to floral cup
FIRE BLIGHT MANAGEMENT

- Monitor trees for cankers and prune/remove 8-12 inches beyond visible damage
  - Dormant season: stem cankers and old shoot infections
  - Early summer: new infections

- Prevent wetting of tree canopy during irrigation

- Copper just at leaf emergence

- Antibiotics only when necessary on high risk (rain after several warm days)
Gummosis

- (True “gummosis” does not occur in Utah)

- Oozing of sap or gum from wounds or other openings in bark
  - borers – amber-colored ooze
  - environmental stress (over-bearing, severe pruning, excessive irrigation, planting too deep) or wound – mostly clear ooze
  - fungal canker (disease) – dark amber ooze
Canker Management

- Prevent wounding
- Maintain tree health with optimal watering and fertilization
- Remove all dead or diseased branches and limbs
- If canker is on main stem and small and new, cut diseased tissue away with sterile tools; otherwise, no “cure”
CROWN AND COLLAR ROT

- Causal agent: many species of *Phytophthora*, including *P. cactorum*, *P. megasperma*, *P. cambivora*, and others

- Hosts: apple, cherry, stone fruits
CROWN AND COLLAR ROT
CROWN AND COLLAR ROT MANAGEMENT

Use an integrated approach:

- monitor trees for symptoms in early spring and early fall;
- plant on well-drained soil;
- plant trees on berms;
- plant resistant rootstock;
- use targeted chemical control only