Insect Control Update

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2006 Pesticide Recertification Workshops

Topics

- NeW Pest – Japanese Beetle
- Insect Diagnostics – Recognizing Common Insects & Plant Injury
- Examples of Insect Pests
  - Woody Ornamentals
  - Greenhouse
  - Turf

Japanese Beetle

Popillia japonica

Scarab Beetle

Mating pair of adults

First found in U.S. in 1916

Orem, Utah:
July 2006
>600 adults

Trap:
Sex pheromone/
Floral lure

Adult feeding injury to Virginia Creeper

Japanese Beetle

Primarily a turf pest – Larvae or grubs feed on grass roots

Adults have a broad host range – Skeletonize leaves – rose, fruit trees, shade trees, grape, etc.

Injury to rose

Injury to crabapple

Japanese Beetle Management

- Eradication is extremely difficult
- Don't panic – it's unlikely to have a large impact
- Keep plants healthy
- Plant non-attractive plants (lilac, forsythia, dogwood, magnolia, American Holly)
- If detected in turf, control larvae with insecticides (imidacloprid, carbaryl, permethrin)
- Traps can provide some adult suppression (75% catch; but can attract them into an area)
- Contact local Utah Dept. of Agriculture and Food Office

Japanese Beetle Fact Sheet

on USU Extension Web Site

UtahState UNIVERSITY Utah Pest Factsheet

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Japanese Beetle

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What You Should Know

- Japanese beetle was initially detected in Orem, Utah, in July 2006.
- Adults have a broad host range (over 300 plant species) and can cause significant damage.
- Grubs prefer to feed on turfgrass roots and spend about 10 months of the year under the soil surface.
- Homeowners can successfully manage Japanese beetle with proactive cultural practices, biological control and reduced risk insecticides.

The Japanese beetle, *Popilia japonica* Newman, can be a highly destructive pest to ornamentals, trees, shrubs, turfgrass, and vegetables. First discovered in the eastern United States in 1916, the Japanese beetle has threatened agriculture and horticulture by slowly moving south and west. In 2006, a small population of adult Japanese beetles was detected in Orem, Utah. The invasive pest is especially harmful because the adults and immatures (i.e., grubs) feed on plants and can cause significant damage when in high numbers. Together, the adults and grubs feed on more than several hundred plant species; some of the most susceptible plants are grown in Utah. Adult beetles feed on the upper leaf surface, removing leaf tissue and releasing a strong aggregation pheromone that attracts additional beetles to a potential food source (Fig. 1).

Damage Symptoms

Feeding damage by Japanese beetle adults is commonly seen as holes or skeletonized leaves (Fig. 1). Adults are highly attracted to rose, apple, stonefruits (peach, plum, cherry), basswood/linden, willow, elm, grape, birch, Japanese and Norway maples, pin oak, horse chestnut, and sycamore.

Without actively looking for grubs under the soil surface, grubs often go unnoticed until September, when large patches of turf are destroyed. Evidence of grub damage begins as localized discolored patches, but patches can enlarge and coalesce in just a few weeks. Heavily damaged turfgrass can feel spongy and be easily pulled away from the soil surface. Drought conditions can make turfgrass injury worse.

Fig. 1. Adult Japanese beetles feeding[2]

Description

Adults are oval, metallic green with bronze-colored wings, and are about ½" long (Fig. 2). Males are slightly smaller than females. Adults have six white tufts of hair along each side of the body (Fig. 2). Grubs are creamy white, C-shaped, and 1" long when fully grown (Fig. 2). Adults are found clustered together on plants and grubs can be clumped under the soil of turfgrass.

adult[2] eggs[2]

larva[2] pupa[2]

Fig. 2. Japanese beetle life stages

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http://extension.usu.edu/files/publications/factsheet/ENT-100-06PR-A.pdf

Insect Diagnosis

Insect is present

Injury is present

What type of injury?

Friend or Foe?
What life stage is present?

Insect Feeding Types

Chewing

Piercing-Sucking

Borers

Gall Formers

Diagnosis

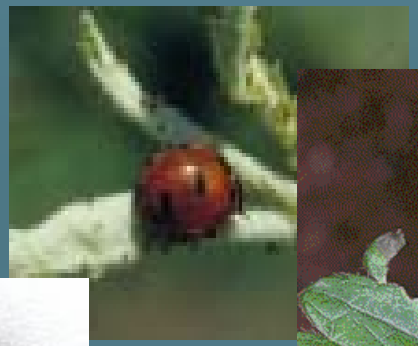
Scouting for Pests

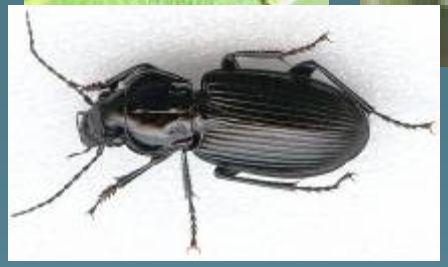
- Look at the big picture
  - Pattern of plant decline/injury
    - Pest injury tends to be aggregated
    - Can injury be associated with irrigation or other pattern?
- Look at new growth
- Check for root/crown problems
- Hand lens for small insects and mites
- Scout every 1-2 weeks

Raspberry horntail injury to cane tips

Recognizing Common Insects
Beetles

Hard wing covering
Most diverse group
Chewing mouthparts





Larvae – grub-like
Chewing mouthparts

Beetle Injury

Leaves: holes, skeletonizing, notching

Trunks: tunnels, girdling

Roots/Crowns: tunnels, chew off fine roots

Recognizing Common Insects
Moths

Colored scales on wings
Adults feed on nectar
Good flyers
Most are active at night

rworm, *Helicoverpa zea*, adult moth.

Larvae – caterpillars
Chewing mouthparts

Caterpillar Injury

Tunnels in limbs and trunks

Holes chewed in leaves

Tunnels and holes in fruits

Recognizing Common Insects
Hemiptera - True Bugs

Half wing: front is leathery, back is membranous
Inverted triangle on back
Piercing sucking mouthparts



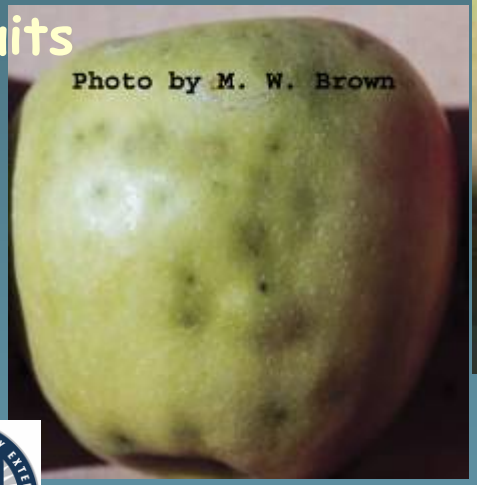




Nymphs – mini adults without wings

True Bug Injury

Pitting and bumps:
Cells killed in older fruits



Cat facing:
Cells killed in young fruit

Squash bug injury

Toxin injected:
Plant stunting and death

Recognizing Common Insects

Aphid, Scale, Whitefly, Mealybug, Leafhopper

Small
Soft bodied
Wax or covering
Many produce honeydew
Piercing sucking mouthparts

Many feed in phloem
Nymphs

Aphid, Scale, Whitefly, and Mealybug, Leafhopper Injury

Leaf curling

Limb dieback

Leafhopper burn: Speckling

Honeydew

Leaf spots from dead cells

Woody Ornamental Insect Pests

Lilac Root Weevil

Scale

Ips Bark Beetles

Lilac Root Weevil

Drought related

Lilac Root Weevil

Otiorhynchus meridionalis

- Common hosts: lilac, peony, dogwood, yew, privet, cotoneaster, arbovitae, spruce, others
- Adults chew irregular notches in leaf edges – target with foliar insecticide (Orthene, Merit, Sevin, Azadirachtin, Pyrethroids) – in late spring with first leaf notching
- Larvae feed on roots – target with soil insecticide (Merit), insect-attacking nematodes, *Beauveria* fungus – late spring or early fall

Adult & leaf notching

Needle notching on spruce

Larvae feeding on crown & roots

Scale Insects

- Soft scales feed in phloem, produce sticky honeydew
- Armored scales feed on mesophyll of plant cells, do not produce honeydew
- Multiple years of scale feeding can kill limbs; cause dieback

European fruit lecanium scale

San Jose scale & injury

Scale Biology

- 1-2 generations per summer
- Overwinter as eggs or young nymphs
- Females are sessile
- Males have wings
- "Crawler" stage is the best target for control

Oystershell scale female surrounded by crawlers

Scale Management

- Delayed Dormant Control is effective for soft scales & some armored scales: Dormant oil + Pyrethroid (at first bud break)
- Use sticky tape in late spring to early summer to time a spray for "crawlers"
- Soft scales: Merit (systemic), Precision, Flagship, horticultural oil, insecticidal soap
- Armored scales: pyrethroids or others timed with crawlers

Oystershell scale

Pine needle scale

Bark Beetles (Scolytidae)

Spruce
Pine
Fir
Prunus
Elm

Attack old or stressed trees
& seemingly healthy trees

Ips Bark Beetles

- *Ips pilifrons* – spruce
- *Ips pini* – pine
- *Ips confusus* – pinyon pine
- *Ips paraconfusus* – pine, spruce

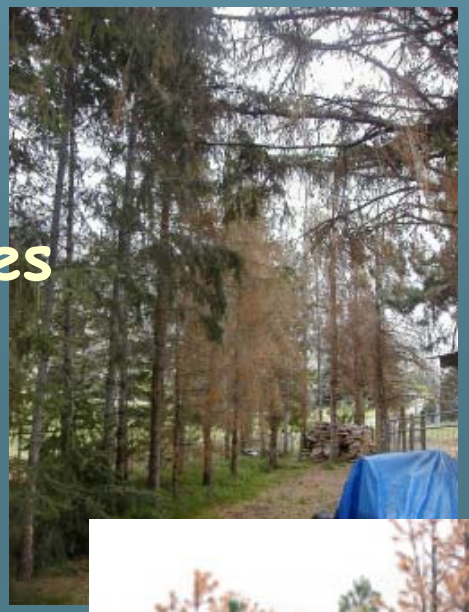
1/8-3/8" long
Spines on rear

Ips Facts

- Adults colonize & reproduce in conductive (cambial) tissues
- Construct tunnels (galleries) to lay eggs & feed
- 6-8 wk life cycle; up to 5 generations per year
- <u>Attack trees under stress</u>
- Attack smaller diameter limbs at tops of trees first

Trees at Risk for *Ips* Attack

- Stressed trees:
  - Drought-stressed, trees in dry sites
  - Newly transplanted
  - Root injuries from construction or other
  - Crowded trees
- Trees surrounded by breeding populations of *Ips*
  - Slash (piles of prunings)
  - Stacks of green or infested wood
    - Freshly cut wood is a preferred breeding site



Management of *Ips* in the Landscape

- Maintain tree vigor, avoid stress (proper watering, planting site, avoid injuries)
  - 2-4" water every 2-6 weeks
  - Avoid planting in very dry sites
- Remove & dispose of infested material
  - Dispose 2-3 miles away from hosts
- Remove and treat infested material
  - Chip and spread to dry
  - Burn
  - Remove all bark
  - Cover logs with ≥10 ml clear plastic & heat to lethal temperatures

Management of *Ips* in the Landscape

- Apply preventive insecticide or apply to "lightly" infested trees:
  - Carbaryl (Sevin): flowable, 2% ai solution
  - Permethrin (Astro, Dragnet)
  - Treat in spring before beetle flight (April) or treat in fall (late Sep to Oct)
  - 12-18 months protection (carbaryl)
  - High-pressure sprayer (≥250 psi) for large trees
  - Apply to entire bole & larger limbs

"New" Mealybug

Honeylocust
Redbud

Davis and Utah Counties

Photos by JayDee Gunnell, USU Extension

Greenhouse Insect Pests

Greenhouse Whitefly

Spider Mites

Greenhouse Whitefly

- Homoptera: Aleyrodidae
- 1st instar nymph – crawler
- 3 sessile nymphal stages
- piercing-sucking mouthparts
- 30 day life cycle

- foliage pest; secrete honeydew; sooty mold
- develop resistance to insecticides quickly
- extremely difficult to eradicate

Whitefly Management

- Monitor to detect presence – yellow sticky cards
- Threshold = 10 nymphs/leaf
- Problems with insecticide use:
  - Develop resistance quickly
  - Must rotate chemical type regularly
  - Confined system – applicator safety concerns
  - Fresh market crop – short residuals
  - Phytotoxicity to crop


Adult whiteflies under a leaf

Whitefly Insecticides

- JH mimic IGR:
  - kinoprene; Enstar
  - fenoxycarb; Precision
- Ecdysone disruptor IGR:
  - neem oil; Azatin

- Chloronicotinyl (imidacloprid; Marathon)
- Pyrethroid (Talstar, Tempo, Tame)
- Organochlorine (Thiodan)
- Insecticidal soap; Horticultural mineral oil

Biological Control

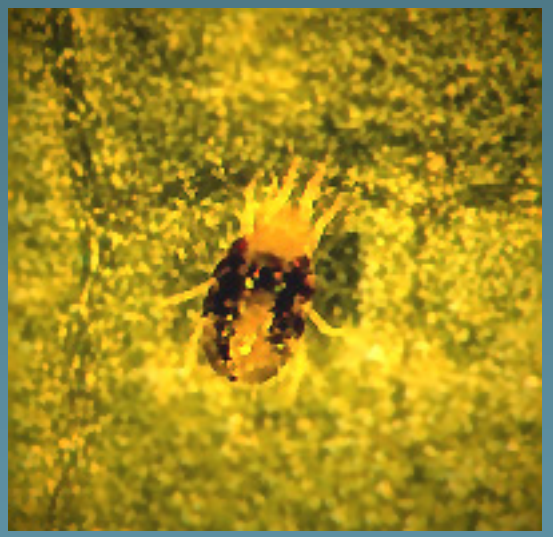
- Can be very successful
- Parasitic wasps – *Encarsia*
- Predators – ladybeetle, lacewing
- Pathogenic fungi – *Beauveria*

Encarsia Program

- Parasitizes whitefly early nymphal stages
- 10 nymphs/leaf will sustain wasp
- 2 schemes for use:
  - At whitefly threshold density, release wasps at 1/sq-ft grnhse space, check for whitefly hotspots and release more
  - Cucumber plants at ends of rows; whiteflies will concentrate on cucs, target cucs for wasp release
- Cannot use insecticides

Twospotted Spider Mite

- Foliage pest; feeds on epidermis & mesophyll, suppresses photosynthesis
- Mites go dormant in fall (photoperiod induced)



Cultural Management

- Prevent diapause of mite in the fall
- Interrupt night with 2 hr light
- Keeps mites active
- Remove crop & starve mites
- Clean up with insecticidal soap, horticultural oil or acaricide

Mite Biological Control

- Predatory mite – *Phytoseiulus persimilis*
- Release predator in ground corn cob carrier
- 1st year: 1/5 plants infested with TSSM or release TSSM with predator, release predator (4 preds/infested TSSM plant), monitor, redistribute TSSM if preds consume all prey in an area
- Subsequent years: release preds in TSSM hotspots; can establish for many years
- No toxic pesticides

"New" Miticides

Twospotted Spider Mite

Leaf Blister Mite

Clofentezine & Hexythiazox


Twospotted spider mite

- Mite growth inhibitor
- Acts primarily as an ovicide (kills eggs) with some effect on early instars (first stages of young)
- Need to apply "early" in development of a mite population
- Translaminar activity (local systemic uptake)
  - Ovation & Hexagon – Flowering Orn., Greenhouse, Nursery
    - Twospotted spider mite, McDaniel spider mite, European red mite
  - Apollo, Onager & Savey – Tree Fruits & Raspberry (Savey only)

Etoxazole

European red mite

- Mite growth inhibitor
- Acts primarily as an ovicide (kills eggs) with some effect on early instars (first stages of young)
  - Tetrasan – Woody & Herbaceous Orn.
    - Twospotted spider mite, McDaniel spider mite, European red mite
  - Zeal – Fruit & Nut Trees, Strawberries

Chlorfenapyr

Spider mites

- Insecticide/miticide
- Interferes with formation of ATP, which is the "fuel" for muscle contractions
  - Pylon – Herbaceous Ornamentals
    - Mites, Thrips, Fungus gnats, Loopers, Fruitworms, Budworms
  - Phantom – Indoor sites & Outdoor soil treatments
    - Ants, Cockroaches, Termites

Pyridazinones

Spider mites

- Inhibits mitochondrial electron transport, affects respiration
- Same mode of action as rotenone
  - Akari & Nexter – Herbaceous & Woody Orn.
  - Sanmite – Herbaceous Orn., Greenhouse
    - Spider mites, Whiteflies, Leafhoppers
  - Fujimite, Pyramite, Nexter –Fruits
    - Spider mites, Leafhoppers, Aphids, Pear psylla

Whiteflies

Acequinocyl

Spruce spider mite

- Inhibits mitochondrial electron transport, affects respiration
- Different site of action than other METI compounds
  - Kanemite & Shuttle – Herbaceous Ornamentals, Pome Fruits, Strawberries
    - Spruce spider mite, Twospotted spider mite, European red mite

Bifenazate

- Carbazate (related to carbamates)
- Neurotoxic, but exact MOA unknown
  - Floramite – Flowering & Woody Orn., Turf
    - Spider mites
  - Acramite – Stone & Pome Fruits, Grapes, Vegs.

Spider mites

Turf Insect Pests

Billbug

Sod webworm

Identification of Insect Problems

Look for type of injury:

- Chewed leaves
- Short stems
- Stems break easily
- Sawdust like frass
- Spongy turf
- "Turf roll-back"
- Predator digging

Look for presence of insect:

- Fat caterpillars
- Brown moths
- Small, legless grubs
- Large C-shaped grubs

Major Turf Pests

- Surface / Thatch Feeders (leaf, stem):
  - Armyworm
  - Cutworm
  - Sod webworm
  - Mites
- Surface / Crown Feeders (burrow into stem, crown):
  - Billbug
  - Subterranean webworm
- Subsurface (root):
  - May & June beetles

Billbugs (*Sphenophorus* spp.)

- Bluegrass & Denver Billbugs
- Weevil beetle family (snout)
  - Burrow in stems, crown
  - Small, legless larvae
  - Blades break at crown
  - Sawdust like frass
- 1 year life cycle

Billbugs

- **Life Cycle**
  - Adults & larvae overwinter in turf
  - Begin feeding in spring
  - Eggs laid in stems (spring to summer)
  - New adults in summer
- **Damage**
  - Larvae feed within stems, crowns
  - Abundant frass
  - Stems break easily at crown
  - Dollar spots grow into larger patches

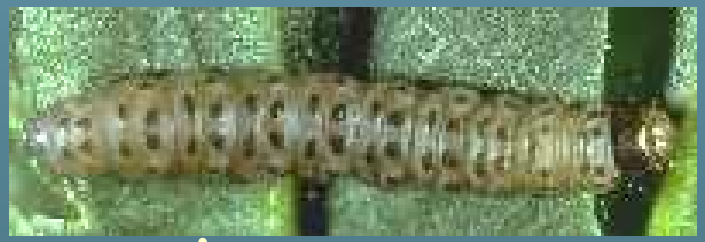
Billbug Control

- Target small larvae (spring and early summer)
- Threshold: 20 larvae/sq ft
- Light irrigation to move materials into crown zone
- Resistant turfgrass varieties
  - Imidacloprid (Merit™)
  - Halofenozide (Mach 2™)
  - Scimitar™, Talstar™ & Tempo™ for adults
  - Chlorpyrifos (Dursban Pro™)
  - Carbaryl (Sevin™)
  - Beneficial Nematodes -*Heterorhabditis bacteriophora* (Cruiser™) & *Steinernema carpocapsae* (Scanmask™)
  - Fungus – *Beauveria bassiana* (Botanigard™, Naturalis™)

Sod Webworms

- Lepidoptera (moth, caterpillar)
- Snout moths
  - Gray to brown caterpillars
  - Larvae feed on grass blades
  - Larvae form silken tunnels in thatch
  - Injury not as severe as grubs & billbugs
  - Gray to brown moths fly just above turf in zigzag pattern; especially near dusk
- 1-3 generations per year

Sod Webworms



- Damage
  - Larvae chew on leaves & stems at night or on cloudy days
  - Cut off grass blades, drag into tunnels
  - Small, irregular brown patches of closely cropped grass
  - Green frass accumulates at crowns
  - Secondary damage from birds pecking holes in turf
- Larvae overwinter in silken tunnels

Sod Webworm Control

- Target young larvae (late spring to summer)
- Threshold: 15 larvae/sq ft
- Increase mowing height
  - *Bacillus thuringiensis* (Bt) – must be ingested by small larvae
  - Spinosad (Conserve™)
  - Azadirachtin (Ornazin™)
  - Imidacloprid (Merit™)
  - Halofenozide (Mach 2™)
  - Scimitar™, Talstar™, Tempo™)
  - Acephate (Orthene™)
  - Carbaryl (Sevin™)
  - Diazinon
  - Chlorpyrifos (Dursban Pro™)
  - Beneficial Nematodes

Utah Pests Web Page

http://utahpests.usu.edu