

The background of the slide features a close-up of a thin, dark brown branch with two dried, brownish leaves. One leaf is positioned in the upper left corner, and the other is in the lower right corner. The branch and leaves are set against a light beige, textured background that resembles aged paper or parchment, with some faint, irregular brown stains.

Insect Pests

AKA “The Ten Most Unwanted List”



Signs vs. Symptoms

- Signs

- Waste products; honeydew, frass (excrement)
- Webbing
- Cast skin
- Insects themselves

- Symptoms

- Discoloration or distortion of leaves, blossoms or twigs
- Chewing damage
- Cracked bark
- Dieback of plant parts

It's important to know the signs and symptoms of insects so we can ID them correctly.



Aphids

- Many varieties, tend to be specific for a plant
- All colors, most are about 1/8 inch long
- Pierce plants and suck juices, make "honeydew" which other insects eat and on which a fungus called sooty mold thrives.
- The same species may have wings when needed.
- Females may give birth to live females ,without breeding, then lay eggs in the fall.



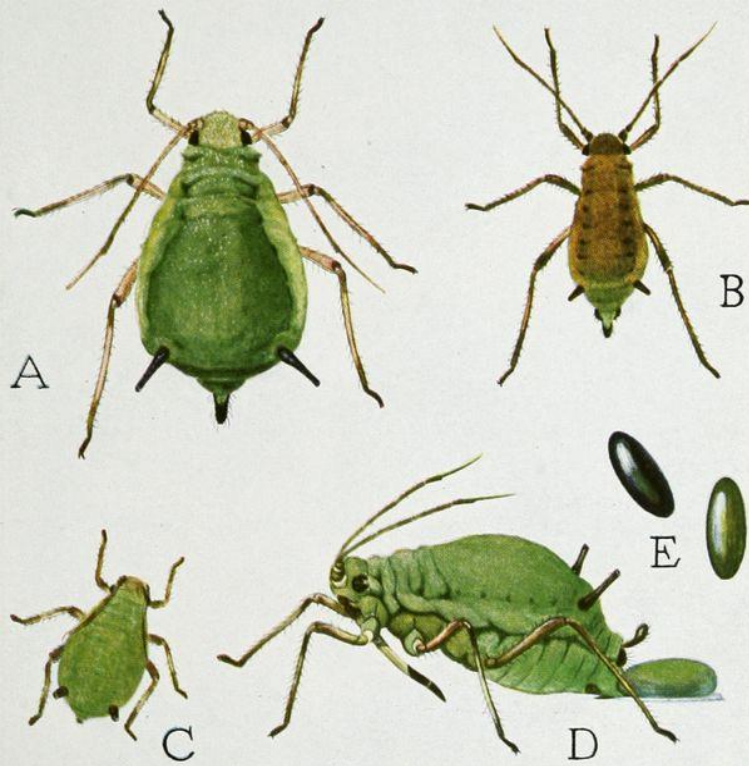
Aphids

- All colors of the rainbow. Most are species specific, i.e. ,ones on roses not likely to infest crepe myrtle.
- Virgin birth (parthenogenesis) allows females to produce live females when the weather is warm causing explosive growth. A generation can be completed in as little as 2 weeks. Later generations, when needed, will have wings, lay eggs and produce males.



- Almost every plant has an aphid that will feed on it. A few aphids will feed on a large range of unrelated hosts, but this is uncommon.
- They are very susceptible to the weather, heavy rains will decrease the population as will a strong stream from a water hose. Aphids susceptible to insecticidal soaps, oils and many standard chemical insecticides.
- Lady bug larva eating aphids. Both the adult and larva of lady bugs eat aphids as do other insects, including lacewings (not to confuse with lacebugs, which are bad bugs) and parasitic wasps.

Aphids



Lady beetle larva eating aphids





Lace bugs

- Adult lace bugs are 1/8 to 3/16 inches , have clear lacy wings.
- Species specific, each variety usually feeds on one plant type. Azalea lace bugs are a common problem.
- Suck out plant juices, causing mottled yellowing on the top of leaves
- Black frass spots on the back of the leaf is diagnostic of lace bugs
- Black frass is always present, probably not lace bug problem if absent. Responds to insecticidal soap, horticultural oils, systemic and general insecticides.

Azalea involvement is very common in susceptible plants.
There are resistant varieties.



Azalea with lace bugs



White Flies

- Tiny insects (1/16 inch) related to aphids and scales.
- Indoor and outdoor pest, serious greenhouse pest
- Wide range of host plants
- They feed on plant juices like aphids and lace bugs and produce “honeydew”
- Yellowing leaves with large infestations.
- Transmit plant viruses in food crops.
- *With large numbers they produce a white cloud when disturbed. These are big headaches in greenhouses. They are susceptible to insecticidal soaps and horticultural oils, as well as garden hoses. They are a vector of a tomato virus which has commercial and homeowner implications.*

White Flies



Sooty mold on honey dew



Sooty Mold

- Sooty mold grows on honey dew from aphids, scale and white flies. Honey dew is an excretion from the insect containing the sugars from the plant that the insect was not able to use. This excess is excreted as a clear sugar-rich liquid.

Squash Bug



- Can be difficult to control?
- Use right insecticide
- Piercing-sucking mouthparts
- Inject a saliva that causes browning of plant
- Found on all cucurbits, especially squash, cucumber and pumpkin

This insect is a common problem here in this part of the state. They are easily controlled, but must use the correct insecticide. Sevin, neem oil and pyrethrins.

Squash Bug




- Look for egg laying activity; one method of control is to “squash” the squash bug eggs
- Chemical controls need to target nymphs (the younger the better)



Spider Mites


- Spiders, not insects, almost too small to see. Color usually red.
- Several types, we have a lot of two spotted mites, they love dust and heat.
- Many insecticides, such as Orthene and Sevin actually increase there numbers due to loss of predators


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- Spider mites frequently become a problem after the application of insecticides. Such outbreaks are commonly a result of the insecticide killing off the natural enemies of the mites, but also occur when certain insecticides stimulate mite reproduction. For example, spider mites exposed to carbaryl (Sevin) in the laboratory have been shown to reproduce faster than untreated populations. Carbaryl, some organophosphates, and some pyrethroids apparently also favor spider mites by increasing the level of nitrogen in leaves. Insecticides applied during hot weather usually appear to have the greatest effect on mites, causing dramatic outbreaks within a few days.



Spider Mites

- Yellow, mottled leaves, some have webs. If no webs, do the white paper test.
- Two spotted mites may infest many plants, but they love tomatoes and marigolds.
- Always use insecticidal soaps and oils regularly at first hint of infestation, heavy numbers will not respond

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- Two-spotted red spider mites love dry, dusty hot weather. Dust particles somehow is favorable for their growth. If you see mottled leaves and cannot see a pest, get a white sheet of paper and sharply tap the leaf while holding the paper underneath. Red spider mites will drop off and can then be seen as tiny red dots crawling on the white paper.

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- Soaps and oils must be used frequently, usually weekly, starting either before or at the first observation of spider mites. Always read and follow the label. On tomatoes, spider mites are a predictable problem when it is hot and dusty in mid summer. It is almost easier to pull up the vines, if infested, and plant a new crop of tomatoes in July aiming for a fall harvest. Mites are rarely problems with tomatoes after it cools.
 - Kelthane is a strong mitocide which should be reserved for heavy infestations of mites. Be aware that there are restrictions on kelthane for use of vegetables. It may be used, but the interval between application and harvest must be observed. Kelthane is labeled for only two applications to tomatoes per year.

Spider Mites





Description for Previous Photo

- Mite damage on tomato plant leaves and tomatoes. Also damage to a evergreen conifer. Conifers have their own type of mites and some of these may be more prevalent in the cool of spring and fall (e.g. Spruce mites) as opposed to the two spotted mites which prefer the summer. The point is that we usually think of mites only as a hot weather pest because of our most prevalent one, but there are others at other times.

Cabbage Looper



BT insecticide will control it like hornworm.

- Can be a common pest
- 3-4 generations; numbers tend to build as season progresses
- Host: cabbage, lettuce, spinach, beet, potato, tomato
- Chewing mouthparts
- Causes defoliation
- Does have lots of natural enemies

Hornworm



- Very Common pest on tomato
- Very destructive in small numbers (1-2)
- Chewing mouthparts is what causes damage
- Complete defoliation almost overnight
- Look for feeding signs

Hornworm Feeding Signs



Hornworm Control



- Hornworms are susceptible to natural enemies
- Hand picking
- Insecticides BT var. *kurstaki*, spinosad)

Tomato hornworm with eggs of a tiny Braconid wasp that parasitizes the worm. The eggs are laid on the worm, they hatch and eat the worm, end of story.



Web Worms

- Two types of webbed worms in Oklahoma trees, Eastern tent caterpillar and fall webworms.
- Tent caterpillars make webbed nests in the spring at junction of limbs and tree trunks
- Fall webworms produce webs summer and fall, at the tips of limbs of trees.
- Tent caterpillars roam the tree, feeding on leaves, fall webworms eat only leaves within their web.
- Fall webworms prefer pecans other nut trees, but invade many varieties. May impair pecan production, but neither pest will kill trees.



Web Worms

- Two generations of fall webworms, the late summer one is usually the most noticable, hence “fall” webworms.
- Treatment is either nothing , mechanical removal, or insecticides. Bt is effective and safe for both of the worms, although there is no immediate effect. Many of the standard insecticides such as orthene, sevin, malathion and others are also effective.

Web Worms



Fall Web Worm



Eastern tent caterpillar





Bagworms

- Prefers junipers, arborvitae, but found on many others- destructive
- Eastern red cedar is favored(a juniper)
- Female builds bag while feeding
- Once bag attached and closed, resistant to insecticides
- In our area must treat in late May to early June, before bag closure
- BT, a safe biological, is effective

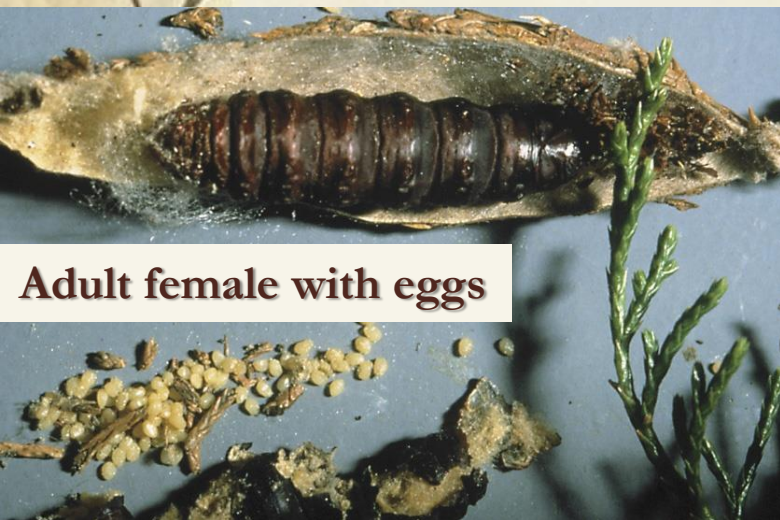
Bagworms



Adult female feeding



Immature Bagworms feeding



Adult female with eggs





- Bagworms are pests that are aptly named for the bags they form. They love to chew on our Junipers, Arborvitae, Spruce and Pines. They also damage some deciduous trees, but in our area the Eastern Red Cedar is a favorite. The insect eggs start out the growing cycle by hatching from a spindle-shaped bag, consisting of silk and old plant parts formed during the previous summer. The tiny caterpillars then begin to feed and grow. The males eventually develop into a moth, the females remain a caterpillar and start to build a bag around themselves. Eventually the female attaches the bag to a twig, mating occurs and she lays eggs. These hatch the following year and the cycle begins anew.
- The immature stage, is the time they are most susceptible to insecticides. *Bacillus thuringiensis* is very effective at this stage and is safe for pets and children. Hand picking, depending on the size of the tree, is also effective. The eastern red cedar, a juniper, is far and away the most common host in Oklahoma. Other trees involved less often are pines, spruce, cypress, sycamore and several others.



Borers

- Usually larvae of beetles or moths
- Larvae feed on woody parts of trunk, stems and roots of trees and shrubs
- Attracted to injured plants, probably by smell
- Severe economic impact on trees and shrubs
- Damage hard to detect early, look for holes, sawdust, oozing sap
 - VS. yellow-bellied sapsucker damage
- Best control is preventative
 - Keep trees healthy, avoid injury to trunks
 - Remove any parts of plants infested

Borers



Random borer holes in board and tree trunk



**Yellow bellied sapsucker
and patterned holes**



Asian long horned borer



Emerald ash borer



Borers

- Many types of borers in trees and our landscape plants. They, like many insects tend to be species specific. They cause damage generally by feeding just under the bark, in the cambium layer of trees and shrubs. They occasionally go deeper into the heartwood. Feeding in the cambium may girdle and kill the limb or even the tree if the trunk is involved. After feeding they exit the tree leaving exit holes of various sizes. They mature into the adult, lay eggs and the cycle begins anew.

Control of Pests

General

- Look for plants resistant to pests
- Pests may over-winter or lay eggs in trash from the previous year. Sanitation is very effective.
- Several of the pests(aphids, white flies, and spider mites) may be partially removed with a jet of water
- Depending on the situation, hand removal of insects is effective, children may find it fun to do!!!



Controlling pests

- Identify the particular pest that is likely in your area and try to select plants that have resistance. Some azaleas seem to never get lace bugs, while others planted next to them always do.
- Many insects deposit eggs in garden trash. This trash also may contain fungus which cause disease. A little cleanup in fall and spring is much more effective than a lot of chemicals later in the season. Also many insects overwinter in weeds close to vegetable gardens, keep these trimmed back. Consider barriers around plants to prevent things such as cutworms or barriers over plants such as row covers to prevent flying insects.



Control of Pests

“Soft Insecticides”

- You may want to use the “soft” insecticides first
- Insecticidal soaps
 - Effective for aphids, white flies, spider mites
 - Safe for bees and other good insects
 - Soaps work by contact, damage insect’s outer covering
 - No residual effect, must be used often, usually every 4-7 days
 - Some household soaps are effective, but tend to damage plants



Insecticidal Soaps

- All insecticidal soaps can cause damage to some plants. It is not common, but always read the label. If a plant is at risk for damage, you can spray on the soap, leave for 2 hours then hose off and prevent damage while still getting a soap effect.
- The soap spray must come in contact with the insects, so all of the plant should be covered, front and back for the leaves.



Control of Pests

“Soft Insecticides”

- Horticultural oils
 - Summer or light oil-safe to use while plants are growing
 - Can damage some plants
 - Effective for same insects as soaps
 - Don't use the dormant oil as it is not for use on green growing plants.
 - Both oils smother insects, and suppress some fungal diseases, especially powdery mildew
- Oils not only have good general insecticidal effect on all stages of many insects, including eggs, but they also have fungicidal activity on some of the common fungal diseases.
- They have no undesirable environmental effects. Safe for pets, children, wildlife and beneficial insects.



Control of Pests

“Soft Insecticides”

- Neem products
 - Neem tree from India has products used for insect control
 - Neem oil similar to horticultural oils
 - Works on most vegetable pests other than caterpillars



Neem Products

- The neem tree has many chemicals with biological activity. Some are insecticidal. The most significant of these is azadirachtin which affects many different insects. It is safe, has no re-entry restrictions and mainly causes insects to stop feeding. It also prevents them from entering the next stage of metamorphosis. It is structurally similar to native insect hormones and its similarity allows interference with metamorphosis. It must be ingested by the insect to be effective.
- There is a wide assortment of insects susceptible to it. You should always make sure the insect you wish to control is mentioned on the label. The good news about this product is they when sprayed on plants it rarely gets into the pollen thereby sparing butterflies, bees and other pollinators. It also has little effect on the good insect population that feeds on other insects, such as lady beetles, lacewings and mantids.



Control of Pests

“Soft Insecticides”

- **Bacillus thuringiensis-bacteria toxic to the intestines of some insects**
 - **Effective for most of the common garden caterpillars**
 - **Slow to work, but safe for pets, children and wildlife**
 - **Does not work on the aphids, mites and squash bug**
- Most of the caterpillars in the landscape are sensitive, including the ones in the vegetable garden. This is totally non-toxic to people and other animals. Widely available, one example is 'Thuricide'. There is a Bt variety, a sub-species termed *Israelensis*, effective for mosquito larvae in fish ponds and elsewhere. Bt must be ingested by insects and then paralyzes their gastrointestinal tracts. They stop feeding and starve, so it takes a few days to see an effect. Many people will conclude that it is not effective due to this delay. It also is sensitive to the sun and is easily washed off of plants, so it must be re-applied frequently similar to many of the soft insecticides. It does not effect the good insects in the garden.
- New preparations are being developed that are longer lasting and effective for more insects, including some adult beetles.
- It is used in commercial food production.



Control of Pests

Chemical insecticides

- Many types, most affect the insects nervous system
- Absorbed by insect from contact or feeding
- Can be dangerous-Read and follow label
 - Use only on labeled plants and only for labeled insects
 - Never use on vegetables, unless labeled
 - Early morning, late evening use spares bees
 - Never use any pesticide when wind drift is possible



Control of Pests

Chemical insecticides

- These chemicals are also a good option to use for control, but must be used carefully. There may be many brand named products with the same chemical in it. Some brand names will stay the same while the actual insecticide chemical will be different from year to year. You must read and follow labels, not doing so may cause injury to you or your family and the product may not work like it is supposed to.
- Do not use on vegetables or fruits for consumption unless specifically stated that it is safe, they usually have an interval that must be observed between application of the chemical and harvesting of the vegetable/fruit.



Chemical Control

Pesticides:

New ones are more specific, less toxic, and have new modes of action; often exploit biologically active chemicals within the pest's physiology

Other chemical controls:

Pheromones: mating disruption

Attractants: baits laced with toxins

Plants that produce their own pesticide

Beneficial Insects



Parasitoids



Predators




Weed feeders



Pollinators



Decomposers

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- Fortunately, most insects are either beneficial or harmless. Some are predators, some insects eat weeds, others are parasitic (for example, some wasps). Parasitic insects kill other insects, often pests, by laying eggs on or in their victim's bodies or eggs. Still others, such as honeybees, produce honey and pollinate fruits, vegetables, and flowers. And many insects are responsible for decomposition of plant and animal matter.



QUESTIONS???

- Ryan Sproul
- Delaware County OSU Extension
 - Phone 918-253-4332
- E-mail ryan.sproul@okstate.edu
 - Fact Sheet Library website
 - <http://osufacts.okstate.edu>