

Insect Identification

CPS Seminar

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Topics to Be Covered

- Basic Entomology

- What is an insect? Why so many insect pests?
- Major types of development
- Types of mouthparts

- ID of Pests & Beneficials

- Moths=caterpillars
- Beetles =grubs
- Flies=maggots
- Aphids
- Mealybugs
- Scale insects
- Whiteflies
- Thrips
- True Bugs
- Bees & Wasps

What is an Insect?

Head

Thorax

Abdomen



3 body regions

3 pairs of jointed legs

1 pair antennae or feelers

1 or 2 pairs of wings

*Hard exoskeleton requiring molting for growth.

*Open circulatory system (no blood vessels).

*Highly adaptable to the environment (land, water, air).

*Accounts for 90% of known animals w/ 10+ million species.

The Hawaiian Islands

“Invasive Species Capital of U.S.”

- * Worst-case example of invasive species problem in the U.S and probably the entire world.
- * Hawai'i's lush vegetation, warm temperatures and high humidity not only welcome tourist but provide a tropical paradise for the more than 1,000 alien plants, vertebrates, and invertebrates that have been accidentally introduced from all corners of the world over the past 65 years.

20° N

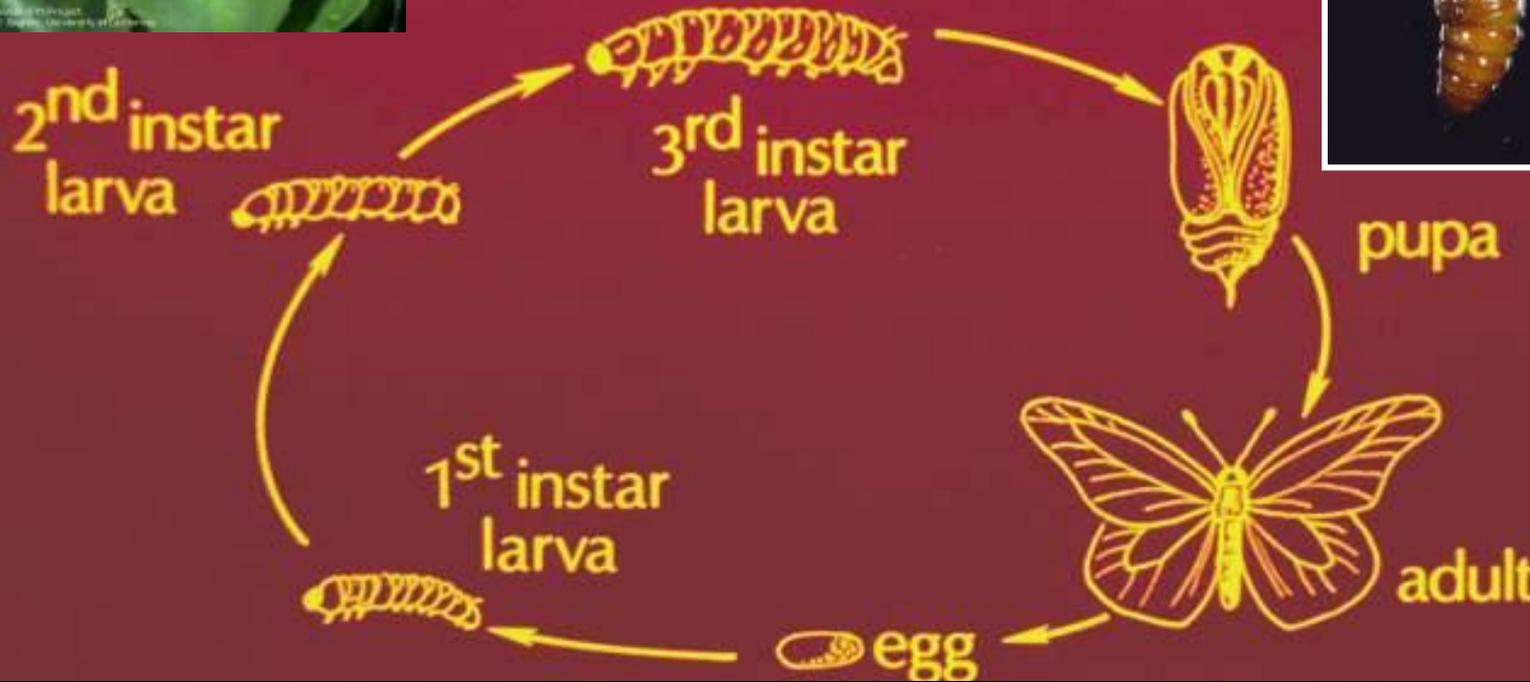
Two Major Types of Insect Development

- I. Complete Metamorphosis
- II. Gradual Metamorphosis

Complete Metamorphosis



Beet
armyworm



Insects with Complete Metamorphosis

- * Butterflies, Moths=caterpillars
- * Flies=maggots
- * Bees and Wasps=(larvae)
- * Beetles=grubs

Complete Metamorphosis

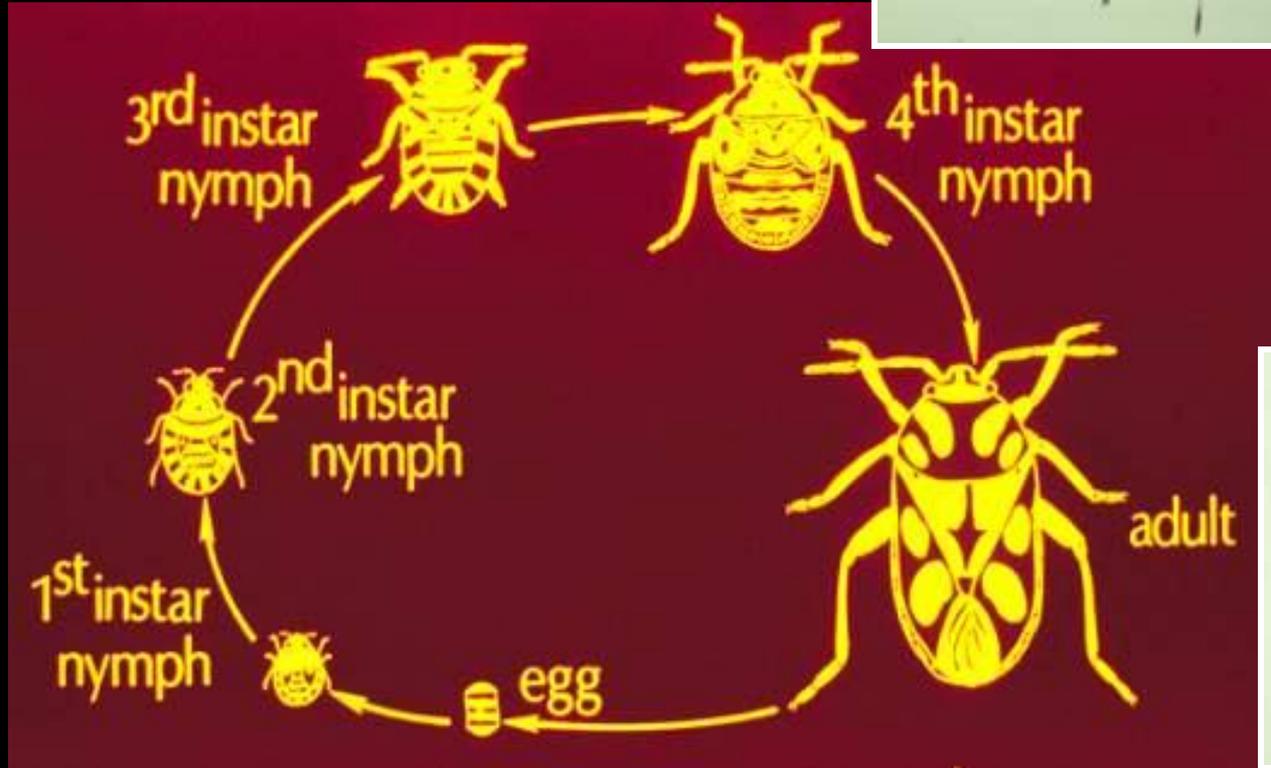
(House fly)



Complete life cycle in as short as 9 days

Gradual Metamorphosis

Stink bug



Insects with Gradual Metamorphosis

- * Cockroaches, Grasshoppers, Crickets
- * True Bugs (lacebugs, stinkbugs)
- * Planthoppers (leafhoppers)
- * Aphids, Mealybugs & Armored scales (males complete), Soft Scales, Whiteflies

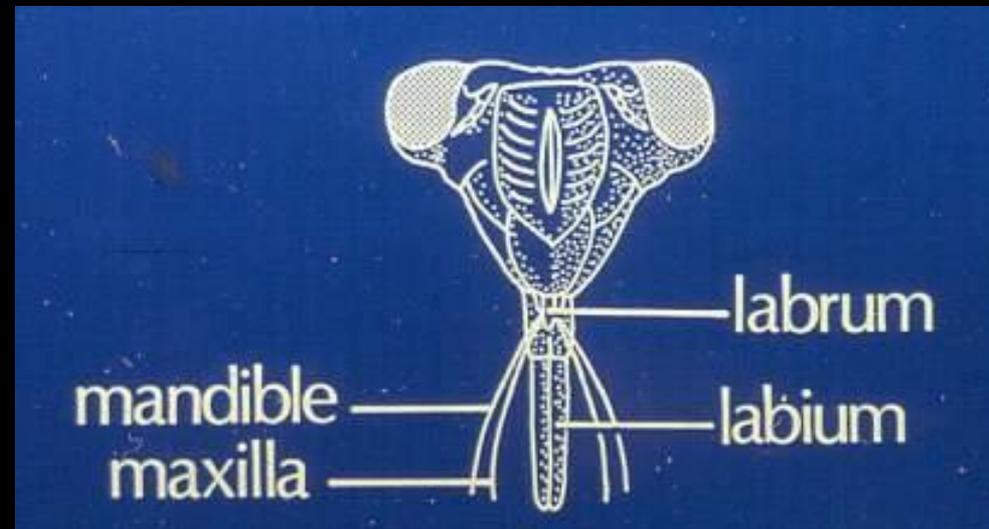
Two Major Types of Mouthparts

Chewing Mouthparts



Mandibles are like teeth for chewing.

Sucking Mouthparts



Mouthparts modified to function like an hypodermic needle for sucking plant juices or blood.

Examples of Insects with Chewing Mouthparts

Green garden looper



Chinese Rose Beetle



Walking stick



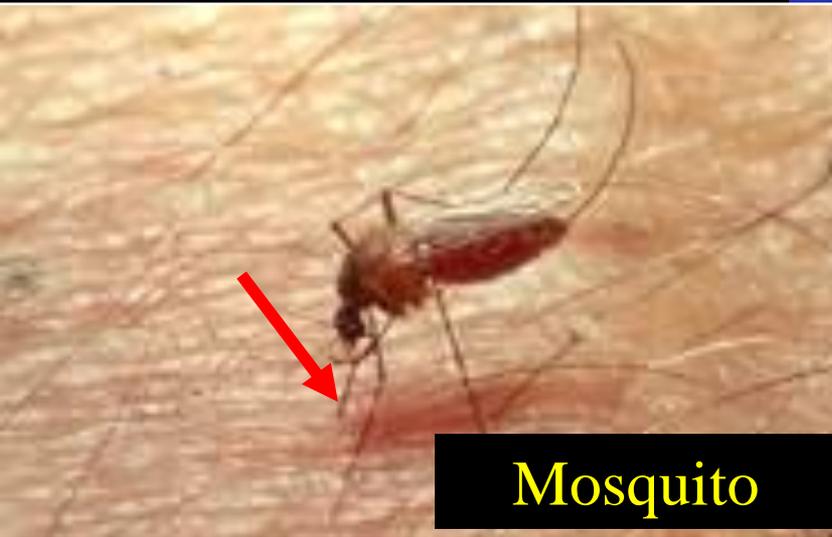
Katydid



Fuller Rose Beetle



Examples of Insects with Sucking Mouthparts



Chinese Rose Beetle

Complete Metamorphosis

Chewing Mouthparts

Grubs



Pupa



Adult



Grubs do not attack live plant tissue, but preferably live in loose rich soil, leaf litter, or compost.

This beetle is nocturnal in habit. During the day they remain under leaf litter and emerge at dusk. Peak feeding and mating activity occurs about 30 minutes after sunset. It also prefers to feed on leaves with feeding or other types of damage, because these leaves release ethylene gas which serves as an attractant to beetles.

Black (Coffee) Twig Borer

Complete Metamorphosis
Chewing Mouthparts

Dieback symptom



Adults

Pinhole
to gallery



Eggs



Grubs



Pupae

Green Garden Looper

Complete Metamorphosis
Chewing mouthparts (caterpillars)

Younger instars



Older instar



Pupa in silken cocoon



Adult



Monkeypod Caterpillars



Monkeypod-
Kiawe caterpillar
Melipotis



Monkeypod moth
Polydesma



Black Witch, *Ascalapha odorata*



caterpillar



pupae



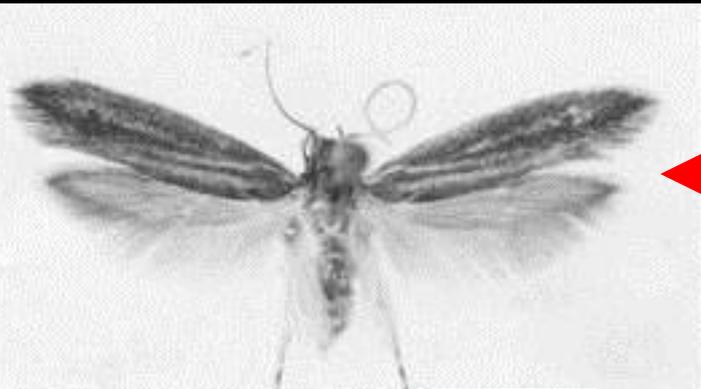
Monkeypod Caterpillars

- *In the 1970's defoliated monkeypods.
- *Eggs laid in crevices of the bark.
- *At dusk, caterpillars migrate to up the tree to feed in the canopy at night.
- *At dawn, caterpillars migrate down the tree and hide during the day in cracks and crevices in the bark or down into the soil.
- *Caterpillars pupate in the bark.
- *Egg to adult in 50 to 60 days.
- *Continued nightly eating of the sprouting leaves caused swellings or "galling" of the monkeypod. (Insects of Hawaii 7: 395, 1958)
- *Control by spraying tree trunk not canopy with insecticides or treat burlap or carpet attached to tree trunk that provides hiding habitat for caterpillars between bark and carpet/burlap.



Banana Moth

Complete Metamorphosis
Chewing mouthparts (caterpillars)



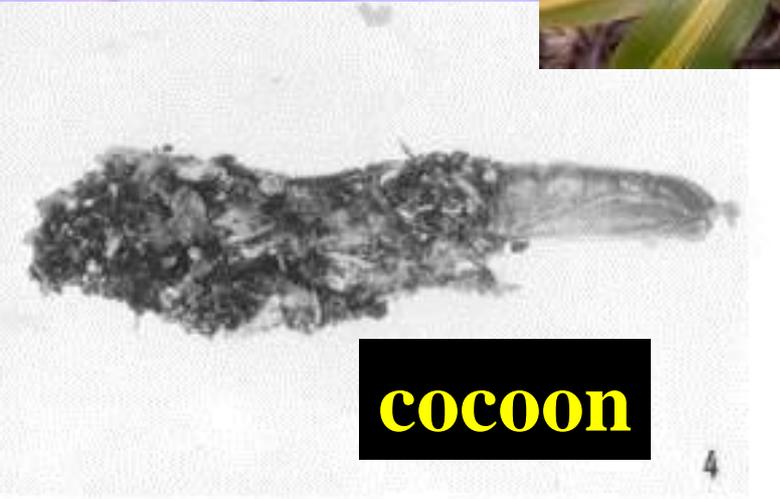
Adult



Damage



Caterpillar



cocoon

Banana Moth

- First discovered in Hawaii in 1982.
- Most related species feed only on decaying matter.
- Begin feeding on damaged, dead tissue and then attack living plant tissue.
- Bores into stem and feeds internally on the cortex and pith.
- Most noticeable symptom is the present of frass and debris bonded by silky secretions.

Banana Moth Damage



Pritchardia

Plumeria



Frit Fly

Oscinella frit , DIPTERA: Chloropidae

Complete Metamorphosis

Sponging mouthparts

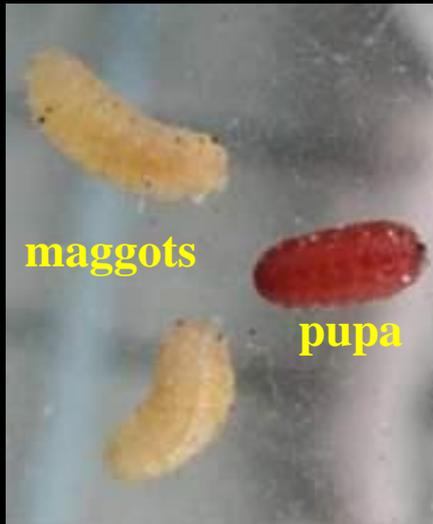


Problem in turf. The adult fly lays its eggs on the shoots of young grasses and the emerging maggots burrow into the young shoots, causing withering of the affected plants.

http://www.escience.bayercropscience.co.uk/bcsweb/es/bcs_uk_greenws.nsf/id/BA85825F18A5856AC125749B002EC24F?open&ccm=200050

Beneficial Flies

Flies are excellent biological control agents.



Tachinid fly



Syrphid (Bee fly)

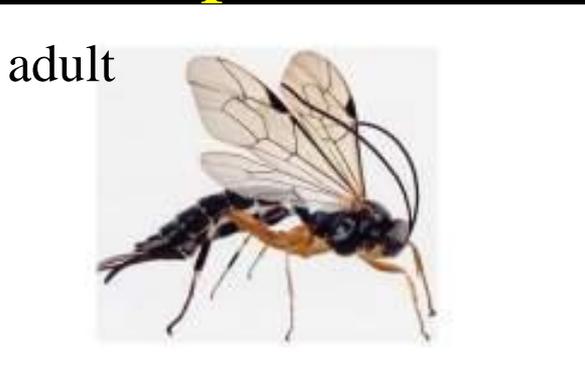




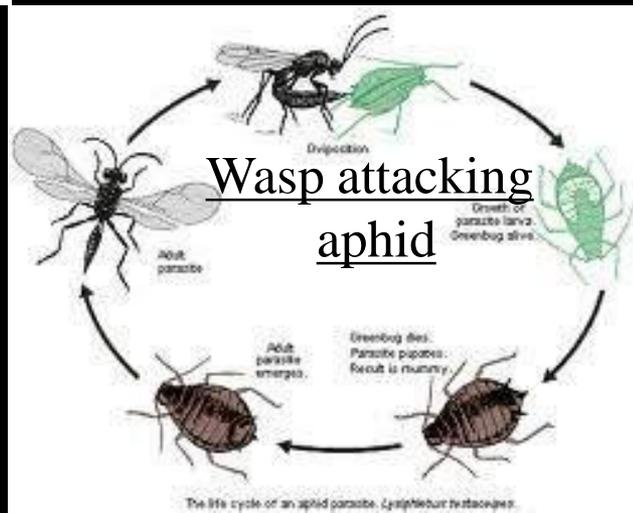
Bees and Wasps Hymenoptera



Parasitic wasp



Leafcutting Bee



Aphids

Incomplete Metamorphosis
Sucking mouthparts

Cornicles:
Emits
defensive
fluids



Orchid aphids



Banana aphids



Oleander Aphid



Aphid damage to day lily

Biology and Control of Aphids

- *No male aphids occur in Hawai'i.
- *One aphid develops into an entire colony of aphids.
- *Aphids transmit serious plant viruses, such as the papaya ring spot virus, banana bunchy top virus, and cucumber mosaic virus.
- *Aphids easily develops resistance to insecticides.
- *Aphids are under excellent biological control in HI by:



Aphids parasitized by wasps

Mummified aphids



Syrphid maggot



Ladybug



Lacewing



Pseudoscorpion

Mealybugs

Foliar

Root



Coconut Mealybug

Nipaecoccus nipae

Hosts: avocado, banyan,
breadfruit, canna, fig,
grape, guava, palms,
Pritchardia



Male cocoon



Female

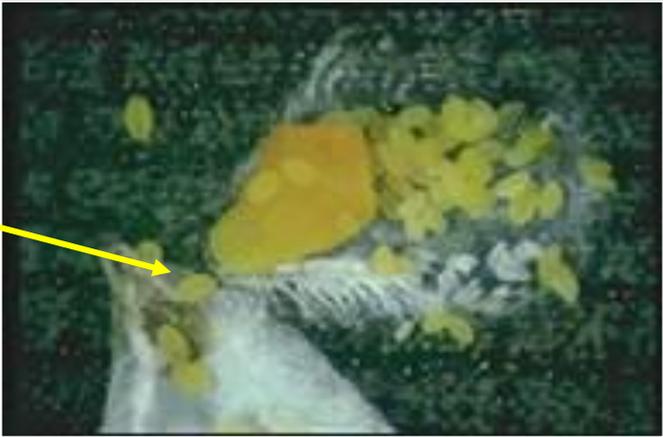
Scale Insects

Armored

Soft



Cockerell
or Magnolia
White Scale



Green scale

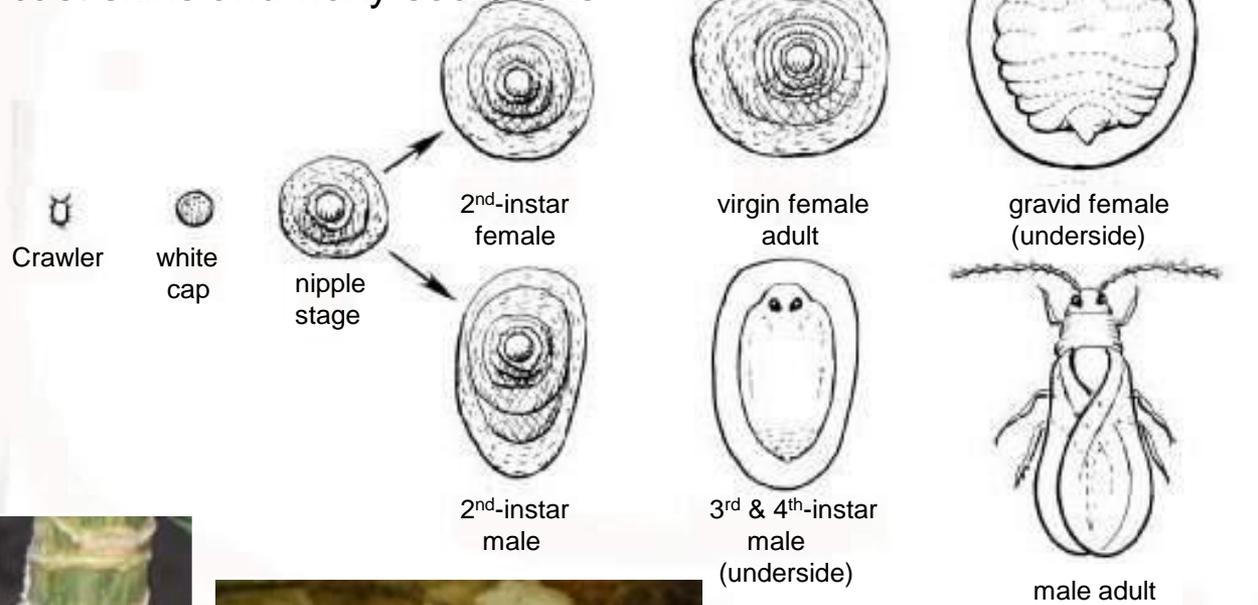


Development of Armored Scales

Crawler to adult is about one month



Armored covering formed by cast skins and waxy secretions



Hibiscus
Snow
Scale



Armored Scales in the Landscape

Coconut Scale



Ti Scale



Black Thread Scale



Cycad Scale



Mining Scale



Soft Scales in the Landscape

Hemispherical Scale



Wax Scale



Green Scale

Nigra Scale



- Whiteflies:** *Major pests of vegetable and ornamental crops.
*Difficult to control chemically because of resistance to common insecticides.
*Most species under excellent biological control.



Egg track - spiraling whitefly

Biological Control Strategies for Scales, mealybugs and whiteflies

Pathogenic fungi
and parasitic wasps



Ladybug



Immature ladybugs



Sooty Mold

Sooty mold is caused by a sweet substance called honeydew excreted by aphids, mealybugs, soft scales and whiteflies. Plants with sooty mold indicates severe infestations of one of the above insects.



Ecological Control Strategies

Ant Control

Ants feed on sweet honeydew excreted by aphids, mealybugs and soft scales. Ants nurture these pests by protecting them from predators and “cleaning house”. Controlling ants will reduce these pests.



Thrips

Complete metamorphosis
Rasping-sucking mouthparts

Wings fringed with hair (setae)

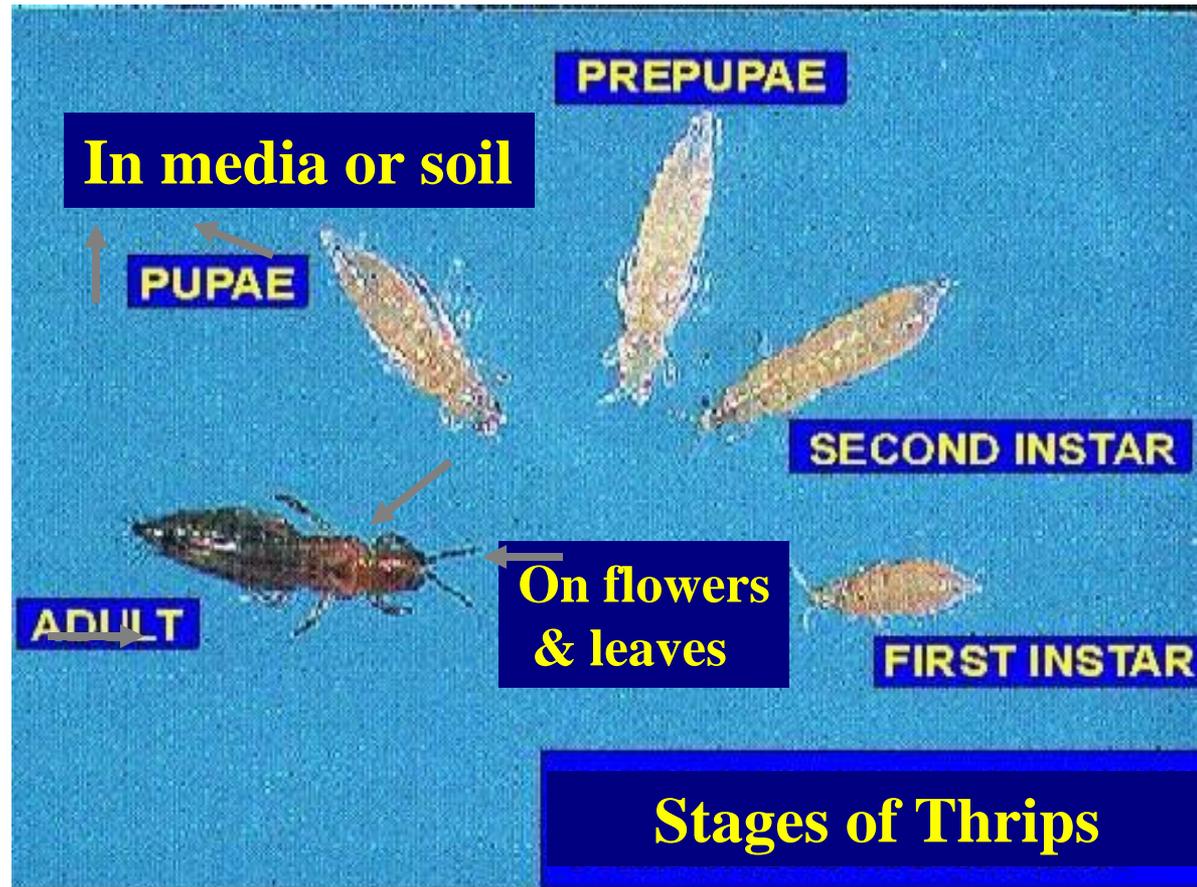
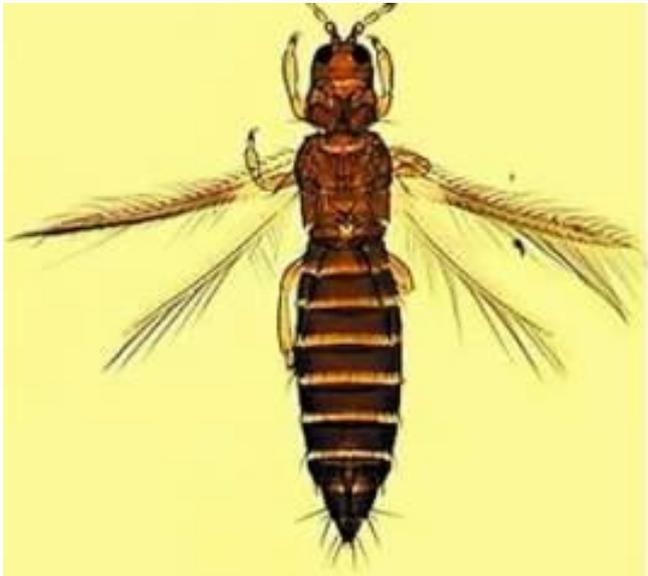


Photo by R. Mau

Thrips Feeding Damage



Anthurium



Ti-leaf



Orchid



A BIG THANK YOU!

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