

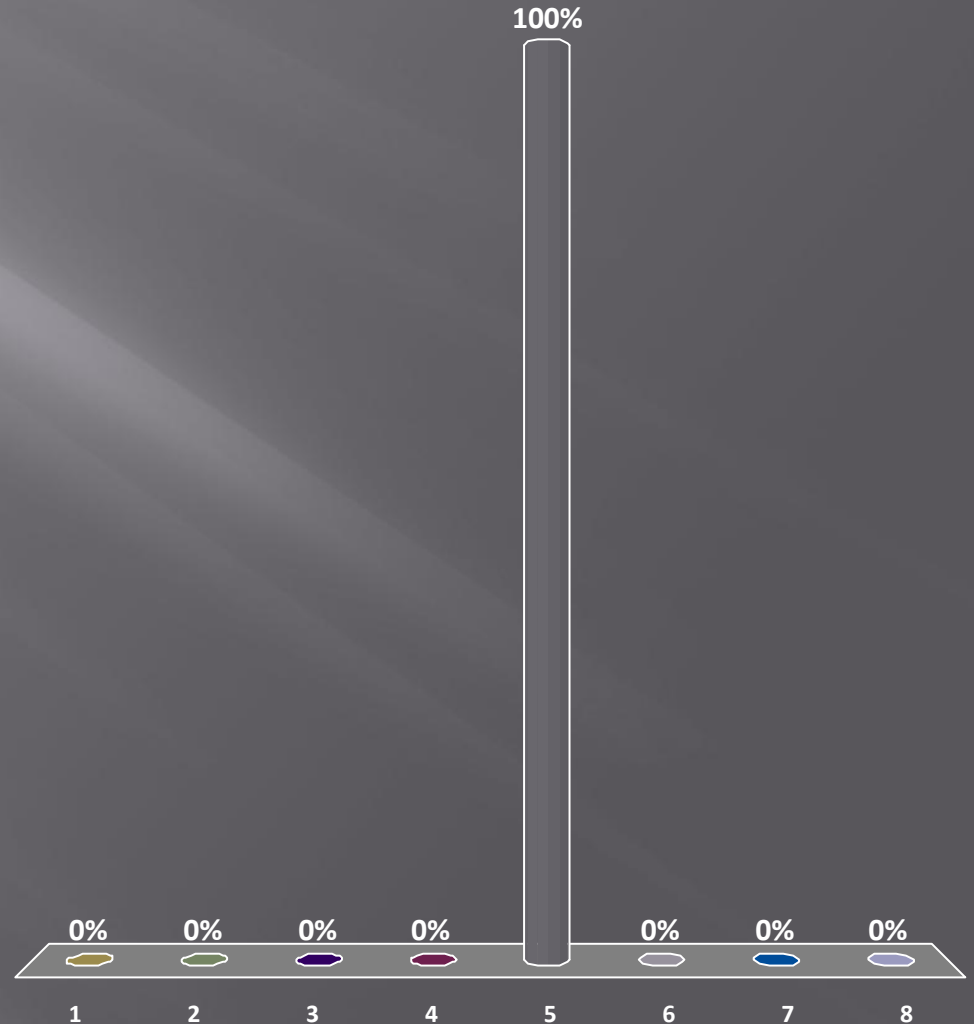
Facilitating biological control of insect pests on ornamental crops

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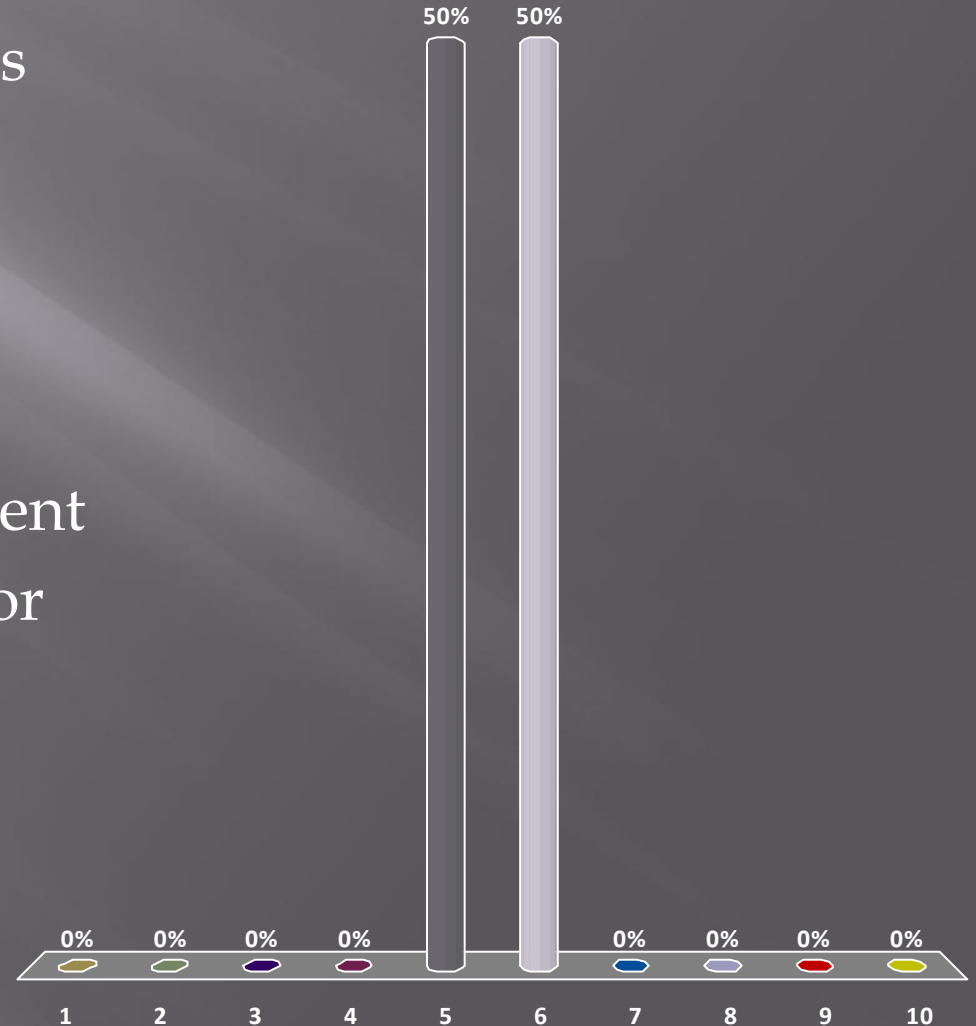
Where do you work?

1. California
2. Oahu
3. Kauai
4. Maui
5. Molokai/Lanai
6. Big Island
7. American Pacific Islands
8. Other



How many of you grow (as your primary commodity)....

1. Ornamental crops
2. Greenhouse vegetables or fruits
3. Outdoor vegetables
4. Fruit trees
5. Bees
6. A different commodity
7. I am an educator/extension agent
8. I am an administrator/regulator
9. I am a researcher
10. My job is not listed above



Nursery, greenhouse, floriculture, and sod: products in
Hawaii: 1628 farms, \$119 million in 2007

Vegetables, melons, potatoes, and sweet potatoes: 866
farms, \$61 million in 2007

Major ornamental commodities:

- ▣ *orchids (cut and potted)*
- ▣ *anthuriums (cut and potted)*
- ▣ *Dracaena*
- ▣ *potted palms*



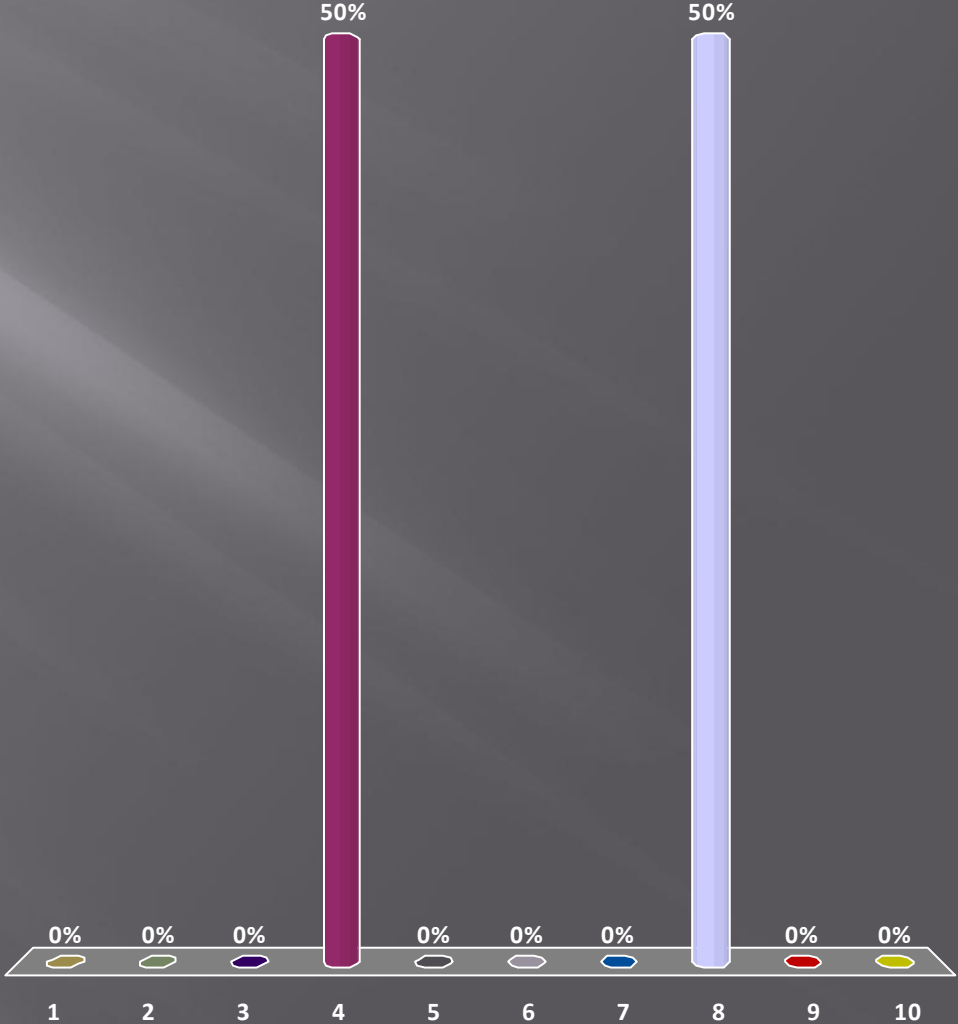
Common pests on nursery plants:



- ▣ *Thrips*
- ▣ *Aphids*
- ▣ *Whiteflies*
- ▣ *Scales*
- ▣ *Mealybugs*
- ▣ *Mites*
- ▣ *Caterpillars*
- ▣ *Nematodes*
- ▣ *Slugs*
- ▣ *Snails*

Which insect pest causes you the most problems?

- 1. Thrips
- 2. Aphids
- 3. Scales
- 4. Mealybugs
- 5. Mites
- 6. Beetles
- 7. Stinging wasps
- 8. Fruit flies
- 9. Caterpillars
- 10. I like insect pests



Pest management strategies will depend on:

- ▣ Market and market destination
- ▣ Tolerance of commodity for pest
- ▣ Attitude of grower
- ▣ Which techniques work for the major pest(s)

Types of biological control

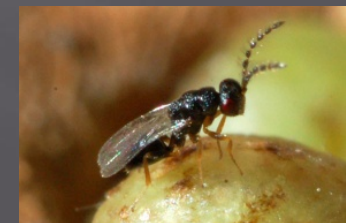
- ▣ *Introduction of exotic natural enemies (classical biological control) (e.g. gall wasp parasite for *Erythrina*)*
- ▣ *Mass-production and release of natural enemies*
- ▣ *Conservation/augmentation of existing natural enemies*
- ▣ *Use of microbial pesticides (*Beauveria bassiana*, *Steinernema carpocapsae*)*
- ▣ *Planting resistant cultivars*



Galled tissue



Gall wasp



Biocontrol wasp released

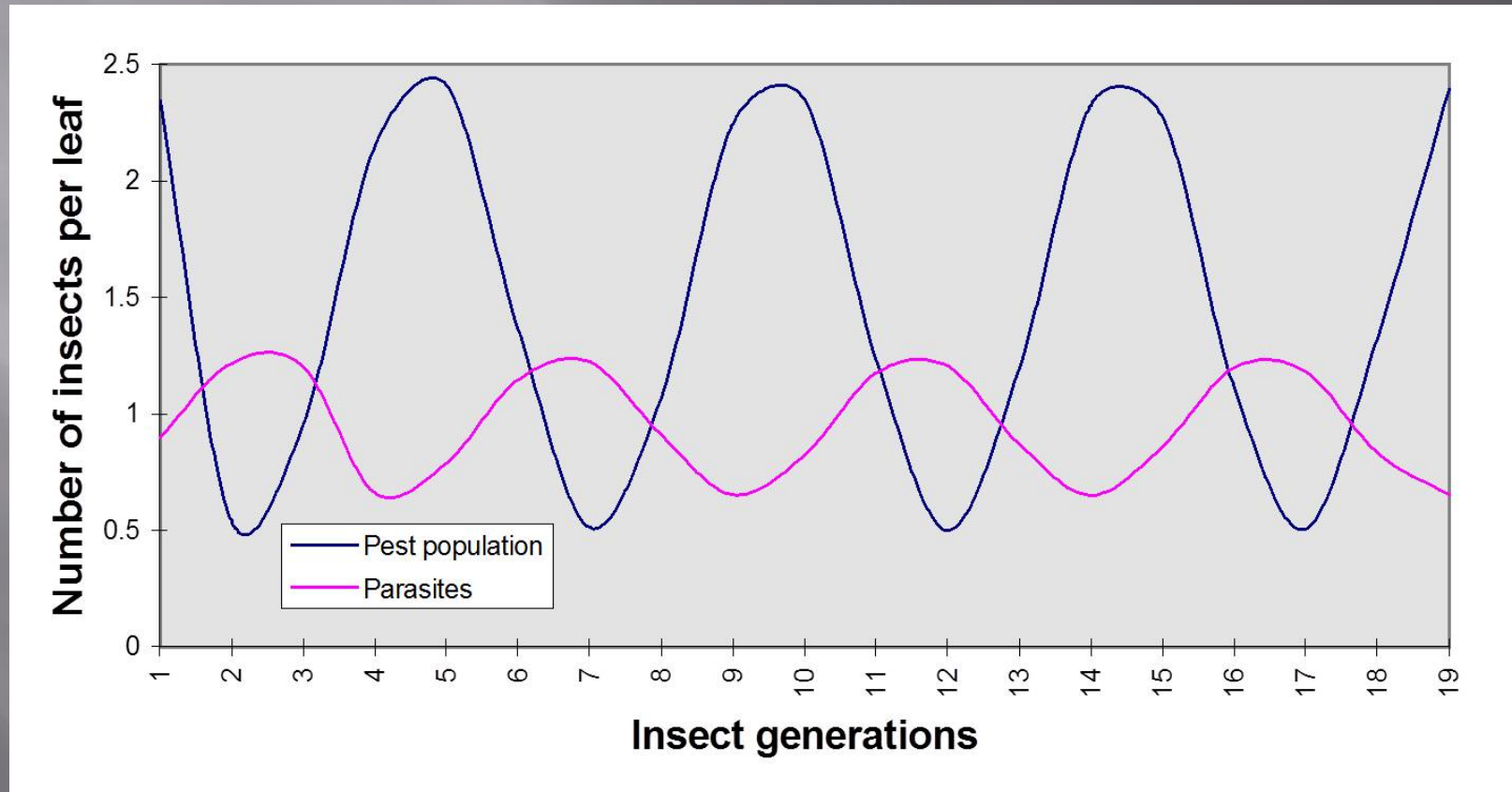
Is biological control really going on in my nursery?

- ▣ Pests are the exception. The majority of insect species which feed on the host plant are rare.
- ▣ These species might be rare because good habitat is limited, or because natural enemies reduce the pest in a density dependent fashion.



Pest populations typically go up and down due to:

Weather, Natural enemies, Dispersal, Pesticides, and Changes in plants



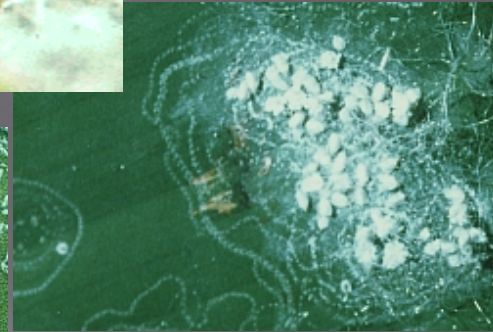
Is biological control really going on in my nursery?

- ▣ Biological control is sometimes so effective that it is difficult to observe directly (particularly for wasp parasites and pathogens).
- ▣ Over-use of insecticides will help you find out if a pesticide resistant pest is under biological control
- ▣ If un-sprayed plants have fewer pests, this is also evidence of biological control



Spiraling whitefly, *Aleurodicus dispersus*

Detected in 1978, under biological control by 1981. Hosts include bird-of-paradise, palms, plumeria, poinsettia, and ti.



Insecticides/miticides hard on beneficials (broad-spectrum pesticides)

- ▣ *Organophosphates (acephate, diazinon, dimethoate, chlorpyrifos, malathion)*
- ▣ *Organocarbamates (carbaryl, bendiocarb)*
- ▣ *Many pyrethroids (e.g. Decathlon, Topside, Bifenthrin)*

Insecticides/miticides easy on beneficials

- ▣ *Pesticides with little residual effect (soaps, oils)*
- ▣ *Pesticides that affect some types of insects/mites more than others (Conserve, Avid, and microbials such as BotaniGard and Bacillus thuringiensis (Bt))*
- ▣ *Insect growth regulators (neem, Distance, Enstar, Talus)*
- ▣ *Systemic insecticides active via plant uptake (Merit, Marathon, Safari, TriStar)*

Which of these insects are ladybugs?

1. A
2. B
3. A and C
4. A, B, C and D



Cryptolaemus montrouzieri and Harmonia axyridis

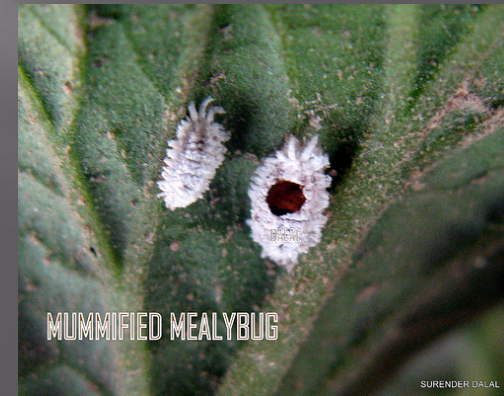




Green scale (*Coccus viridis*) with *Verticillium* fungus (right side)



Mealybugs on gardenia and emergence holes of parasitic wasp species (bottom middle, bottom right)



Banana moth in *Dracaena* stem



Pest of *Dracaena*, Coffee, Palms, and others
Use Bt (*Bacillus thuringiensis*) or insect-eating
nematodes

Entomopathogenic Nematode: *Steinernema carpocapsae*

Mass-produced by Becker Underwood (product name: Millenium)

Nematodes are mixed with water, sprayed on crops. Commonly used to control caterpillar pests.

Juveniles burst from dead insect and seek out new hosts.



0.25 Billion
Nematodes
(in 3x5”
bento
container)

Some Common thrips on orchids in Hawaii



Thrips palmi



Western flower thrips



Vanilla thrips



Western flower thrips

- ▣ Quarantine pests
- ▣ Cause scarring, twisting, loss of blossoms



**Thrips
palmi**



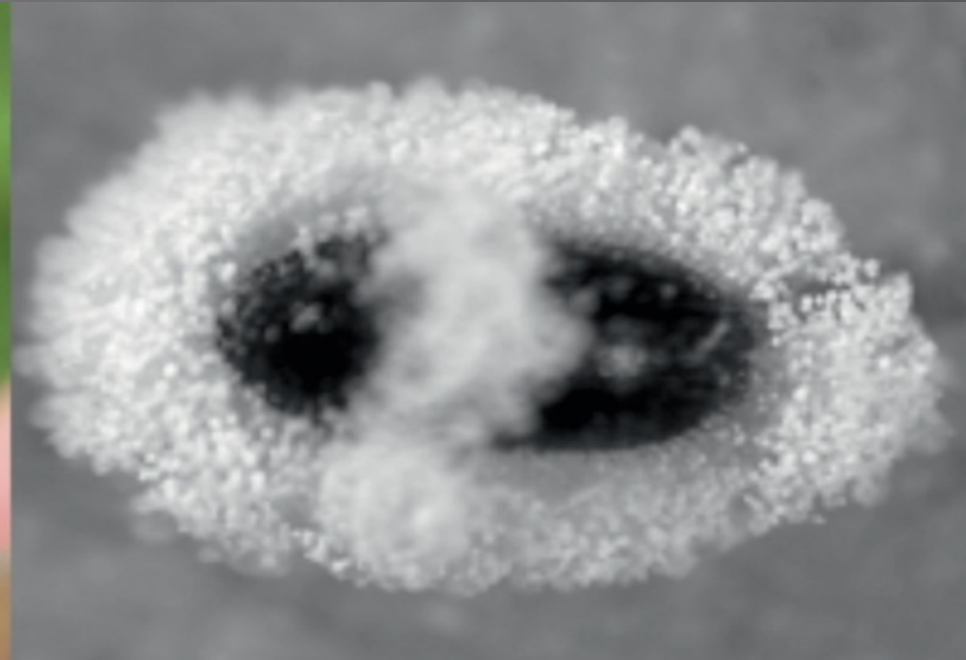
Natural Enemies of Thrips

In vegetable “glasshouses,” most important 3 biocontrols:

- ▶ Spores of insect-killing fungi (*Beauveria bassiana* or Botanigard)
- ▶ Mites that predate on thrips nymphs
- ▶ Minute pirate bugs



Beauveria bassiana (BotaniGard, Mycotrol) on coffee berry borer



Minute Pirate Bugs (*Orius* spp.) in Hawaii

- ▶ *Orius* are occasionally seen in orchids in East Hawaii island where thrips problems are frequent. Most growers would mistake them for thrips.
- ▶ A ratio of 20 thrips to 1 *Orius* leads to control of thrips



Macaranga tanarius

Blush Macaranga or Parosol Leaf Tree



Photo -Starr

Macaranga tanarius trees
along roadside in Keaau, HI



Dioecious trees blooming year round in Hawaii



**Panicles of
male flowers**



**Female flowers &
seed pods**

Prey, Predators & Pollinators



- ▣ **Thrips on the Big Island:**
Dolichothrips nesius
(Stannard)



- ▣ **Big Island Anthocorids:**
Orius persequens
(White)
Montandoniola confusa
(Streite & Matocq)





Greenhouse Experiments

- ▣ *Dendrobium* orchid sprays were infested with 400-500 Western Flower Thrips larvae, *Frankliniella occidentalis*
- ▣ **Experiment 1:** 1, 5, 10 meters from *Macaranga tanarius* panicles which had an average of 50 Orius per 30 centimeters:
Experiment 1: 1, 5 and 10 meters.

Dioecious trees blooming year round in Hawaii



**Panicles of
male flowers**



**Female flowers
&
seed pods**

Questions?

