Sending Pest-Free Products to California

Maui Flower Growers' Association
Kahului November 2, 2012

Arnold H. Hara
University of Hawaii at Manoa
College of Tropical Agriculture & Human Resources
875 Komohana St Hilo, Hawaii
E-mail: arnold@hawaii.edu
Website: http://www.ctahr.hawaii.edu/haraa/index.asp

Topics to Be Covered

- USDA, California and Hawaii Quarantine Regulations
  Recent Rejections of Hawaiian Shipments
- Major Quarantine Pests and Control Strategies
  - Armored Scales -Mealybugs
  - Ants -Whiteflies
- Systems Approach to Assure Pest-Free Shipments
- Field Control Tactics
- Postharvest Disinfestation Treatments

Regulation of Import & Export of Agricultural Products in Hawaii

Exports from Hawaii

Hawaii Department of Agriculture (HDOA) regulates the export of nursery products (propagative plants) to the mainland U.S.

U.S. Department of Agriculture (USDA) regulates the export of cut-flowers, foliage and fruits from Hawaii to the mainland U.S. and plant products to foreign countries.

Imports to Hawaii

HDOA regulates all imports from the U.S. Mainland. Agricultural items brought into the Hawaii by passengers and importers must declare all agricultural items and may be subject to inspection, including baggage, cargo and mail.

The **U.S. Customs and Border Protection Agency** and **USDA** regulate the introduction of plant products, from **foreign countries** into Hawaii. Sometimes, the State may have additional restrictions on the same commodity. These commodities must be inspected by both agencies to insure all the requirements are met. (e.g., orchids)..

Interisland Movement of Agricultural Products is Regulated by HDOA

Welcome to PHPPS.CDFA.CA.GOV (secured site)

Plant Health and Pest Prevention Services

Interior Pest Exclusion Program

High Risk Pest Exclusion Reports

- Foreign Plant Shipments
- Hawaii
- Florida
- Monthly High Risk Interception Reports
- Monthly Nematodes Sample Results
- Parcel Facility Locations
- Suspended Out of State Shippers
- Weekly A and Q Report

Hawaii Reports

A, B, Q Reports

Approved Nursery Stock Shippers (QC 650)

Weekly A and Q Interceptions Report on Fruits and Vegetables

A/Q-Rated Pest Interceptions with Determinations Entered

August 16, 2012 through August 22, 2012

Grouped by PDR Activity

Date Determined	Rating	Location or County	Dead or Alive	Common Name	Scientific Name (or Family)	PDR Number	Host	Owner	Shipper Name/State	
Exclusion & Detection										
Quarantine - State Exterior (01)										
8/22/2012	Q	Truckee		Armored Scale	Aonidiella sp.	TR0P06025566	corn			
8/22/2012	A	San Diego	L	Magnolia White Scale	Pseudaulacaspis cockerelli	1426822	phoenix roebellenii	Palm Acres, Inc.	Westwind Nursery	FL
8/22/2012	Q	Yermo	L		Cerambycidae	YE0P06027252	Ponderosa Pine			
8/22/2012	Q	Needles	L		THRIPIDAE	NE0P06017682	peach			
8/22/2012	A	Topaz	L	Western Cherry Fruit	Rhagoletis indifferens	5081616	cherry			
8/22/2012	Q	San Mateo	L		PSEUDOCOCCIDAE	410P06095501	chrysalidocarpus lutescen	San Francisco Florist	Cal Air Cargo for Cost	CA
8/22/2012	A	San Mateo	L	Boxwood Scale	Pinnaspis buxi	410P06095500	chrysalidocarpus lutescen	San Francisco Florist	Cal Air Cargo for Cost	CA
8/22/2012	Q	San Mateo	L	Insect egg		410P06095499	chrysalidocarpus lutescen	San Francisco Florist	Cal Air Cargo for Cost	CA
8/22/2012	Q	Fresno		Ant	Technomyrmex albipes	1561463	[illegible]	[illegible]	[illegible]	HI
8/21/2012	Q	Los Angeles	L		PSEUDOCOCCIDAE	190P06058450	Chamaedorea Leilani	[illegible]	[illegible]	HI
8/21/2012	A	Los Angeles	L	Lesser Snow Scale	Pinnaspis strachani	190P06058450	Chamaedorea Leilani	[illegible]	[illegible]	HI
8/21/2012	Q	Los Angeles	L	Mealybug	Nipaecoccus sp.	190P06058450	Chamaedorea Leilani	[illegible]	[illegible]	HI
8/21/2012	Q	Needles	L		APHIDIDAE	NE0P06017680	oak			
8/21/2012	Q	San Diego			indet.	1508900	Unknown	Rainbow Tropicals	Naugle's Nursery	FL
8/20/2012	Q	Los Angeles	L	Ant	Technomyrmex albipes	190P06058449	Cut Flowers	[illegible]	Maui	HI
8/17/2012	Q	Los Angeles	L	Margarodid Scale	Icerya sp.	190P06058445	Cut Flowers	[illegible]		HI
8/17/2012	Q	San Bernardino	L		PSEUDOCOCCIDAE	1630590	dracena sp	[illegible]	[illegible]	HI
8/17/2012	A	Santa Clara		Sansevieria Scale	Parlatoria proteus	1626383		Milady Weisenstein	Oneida Ferrer	FL
8/16/2012	Q	Fresno			VERONICELLIDAE	1561462	Ti Leaves	Lou Gentile's Flower Ba	International Orchid	CA
8/16/2012	Q	Los Angeles	L	Carpenter Ant	Camponotus sp.	190P06058444	Longan	Lo's Nursery	Mr. Sushi Express	FL
8/16/2012	Q	Los Angeles	L	Carpenter Ant	Camponotus sp.	190P06058444	Longan	Lo's Nursery	Mr. Sushi Express	FL
8/16/2012	Q	Los Angeles	L		Delottococcus confusus	190P06058445	Cut Flowers	[illegible]	Maui	HI
Quarantine - State Interior (02)										
8/20/2012	A	Alameda		Light Brown Apple Mo	Epiphyas postvittana	1592205	olea sp.	Regan's Roses		
Quarantine - Federal Domestic (03)										
8/21/2012	A	Alameda	D	Japanese Beetle	Popillia japonica	SJ0P06002973		United Parcel Service		
8/20/2012	A	Alameda	L	Magnolia White Scale	Pseudaulacaspis cockerelli	1646960	Mixed leis	[illegible]	[illegible]	HI
Quarantine - Agricultural Code (06)										
8/22/2012	Q	Truckee	L		PSEUDOCOCCIDAE	TR0P06025565	orange			
8/22/2012	A	Vidal	L	Quagga Mussel	Dreissena rostriformis bugen	VI0P06026779	boat	Vanderhoof, Brian	Vanderhoof, Brian	CA
8/22/2012	Q	Tulelake		Mango Scale	Radionaspis indica	TUOPO602567	mango			
8/22/2012	A	Tulelake		Vanda Orchid Scale	Parlatoria pseudaspidiotus	TUOPO602567	mango			
8/22/2012	A	Tulelake	L	Vanda Orchid Scale	Parlatoria pseudaspidiotus	TUOPO602567	mango			
8/22/2012	A	Tulelake		Vanda Orchid Scale	Parlatoria pseudaspidiotus	TUOPO602567	mango			

CDFA Pest and Damage Report
1982 - 10/2008

Pest

Bigheaded Ant	1785
Spiraling Whitefly	1350
Leafhopper	553
Other Ant Species	535
Slug *Veronicella* sp.	358
Green Garden Looper	304
Croton Whitefly	202
Mealybug	187
Seed Bug	186
Green Scale	160
Whitefly	154
Snail	150
Torpedo Bug	143
(blank)	135
Club Moss Mealybug	120
Longhorned Beetle	111
Red Wax Scale	109
Inornate Scale	103

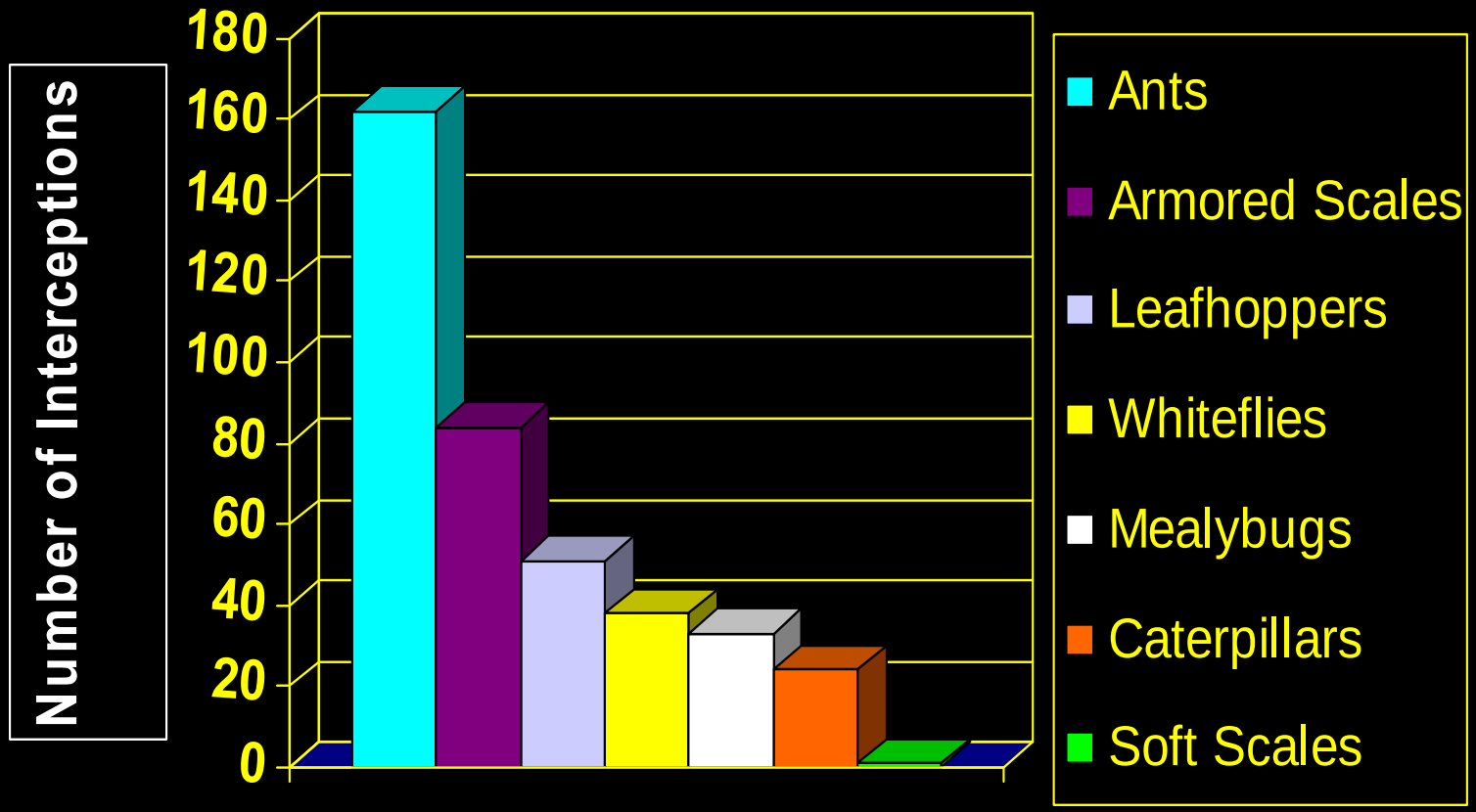
Host

Basil	720
Floral Ginger	541
Malungai	527
Betel Leaf	489
Cut Flowers	429
Protea sp.	359
Pineapple	319
Cordyline sp.	275
Automobile	250

(USDA APHIS, CDFA)

Pests Commonly Rejected in Hawaiian Shipments

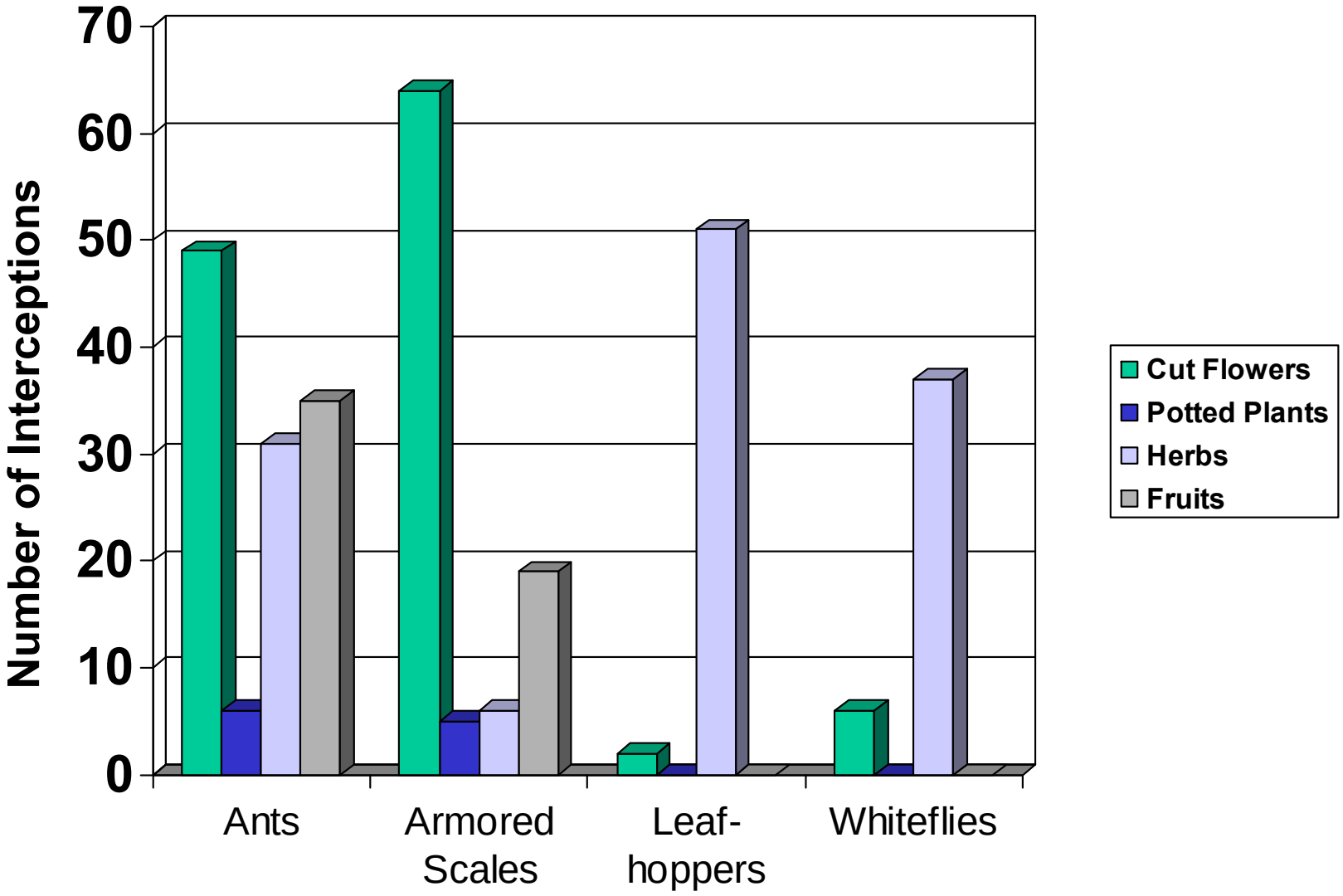
October 2008 to February 2009



(USDA APHIS, CDFA 2009)

Quarantine Pests Intercepted on Hawaiian Shipments

October 1, 2008 to February 28, 2009



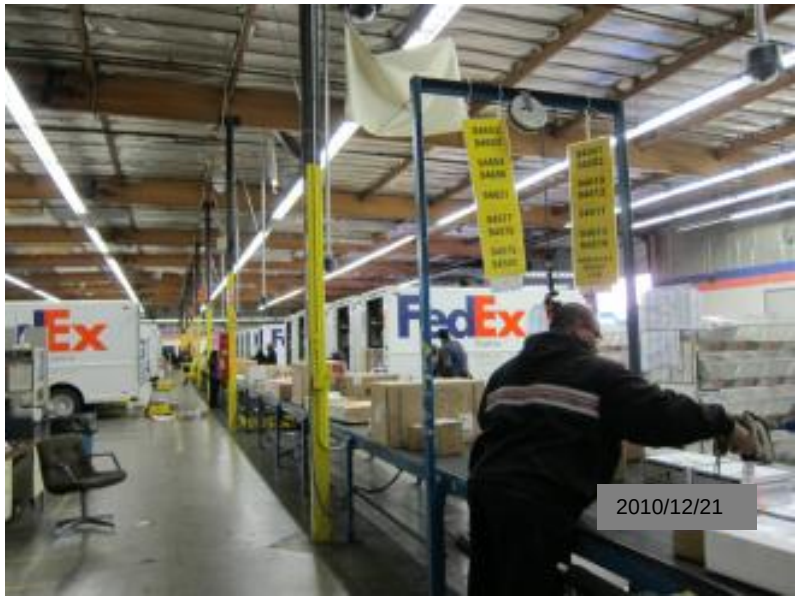
FedEx Distribution Center Near San Francisco Airport, San Mateo County

Roses from South America considered low risk

Flowers from HI considered high risk

Inspection at FEDEX Distribution Center in Oakland

With Ken Peek, Senior Agricultural Biologist, **December 21, 2010**



2010/12/21

2010/12/21

HAWAIIAN
HILO
2010/12/21

HAWAII DEPARTMENT OF AGRICULTURE
PLANT QUARANTINE BRANCH
NEMATODE CERTIFICATE # 0009
NURSERY CERTIFICATION NO. 9
BENCH GROWN IN SOIL-FREE MEDIA
2010/12/21

cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE
Karen Ross, Secretary

DATE: July 24, 2012

TO: All County Agricultural Commissioners

FROM: Plant Health and Pest Prevention Services

SUBJECT: **A and Q Pest Report No. 28-2012**
Weekly A and Q Report: For the week of July 5-11, 2012

Attached is the report for all A and Q pests intercepted or detected in California from July 5-11, 2012. Pests are identified by the California Department of Food and Agriculture's Plant Pest Diagnostics Laboratory.

Fresno Dog Team Interception **PDR: 1626935**

On Thursday, July 5, 2012, Fresno dog team handler Stephanie LeBarron, dog Chelsea, and Inspector Aide Matthew Douglas were inspecting packages at FedEx in Fresno. Chelsea alerted on a package sent from Allegiant Air in Las Vegas, Nevada. Upon opening, the team discovered ti leaf garland with egg masses on the leaves.

On June 30, 2012, Allegiant Air began flying from Fresno to Hawaii. The first return flight from Hawaii to Fresno was scheduled for July 6, 2012. Phone conversations with Allegiant Air determined that the garland had originated in Hawaii and was being sent to Fresno Air terminal for good luck on the inaugural Hawaiian flight into Fresno. A sample submitted to the lab came back with a determination of live Q-rated *Orchamoplatus mammaeferus* (croton whitefly) pupae. The ti leaf garland was double bagged and destroyed.

Fresno Dog Team pictured with infested ti leaves from Hawaii

Rejected for maile (maire) NOT ti-leaf, imported from Cook Islands to Hawaii

Summary of package holding requirements for Agriculture

•Packages containing unprocessed agricultural commodities must be held for inspection, including California origin packages, unless they bear:

•A green and white "Passed California Agriculture" sticker

or,

•A certificate or permit with the following text:

"THIS SHIPMENT NEED NOT BE HELD FOR INSPECTION IN CALIFORNIA"

**********If this text does not appear, the box must be held for inspection*********

Examples of Certificates:

CALIFORNIA
APPROVAL FOR RELEASE
OF INTRASTATE SHIPMENTS
NO.:_____

This shipment has passed quarantine inspection upon entry into California or at the shipping origin within California and meets all California quarantine requirements.

THIS SHIPMENT NEED NOT BE HELD
FOR INSPECTION IN CALIFORNIA

Issued by:_____
and California Department of Food and Agriculture
1220 N Street, Sacramento, CA 95814

CALIFORNIA/_____
ORIGIN INSPECTION CERTIFICATE
FOR INTERSTATE SHIPMENTS
NO.:_____

This plant material or nursery in premises from which this shipment was made has been inspected and found free from especially injurious plant pests and disease symptoms.

THIS SHIPMENT NEED NOT BE HELD
FOR INSPECTION IN CALIFORNIA

Issued by:_____
and California Department of Food and Agriculture
1220 N Street, Sacramento, CA 95814

CALIFORNIA NURSERY STOCK
CERTIFICATE FOR
INTERSTATE AND INTRASTATE SHIPMENTS
NO.:_____

This plant material or nursery or premises from which this shipment was made has been inspected and found free from especially injurious plant pests and disease symptoms.

THIS SHIPMENT
FOR INSPECTI

Issued by:_____
and California Department of Food and Agriculture
1220 N Street, Sacramento, CA 95814

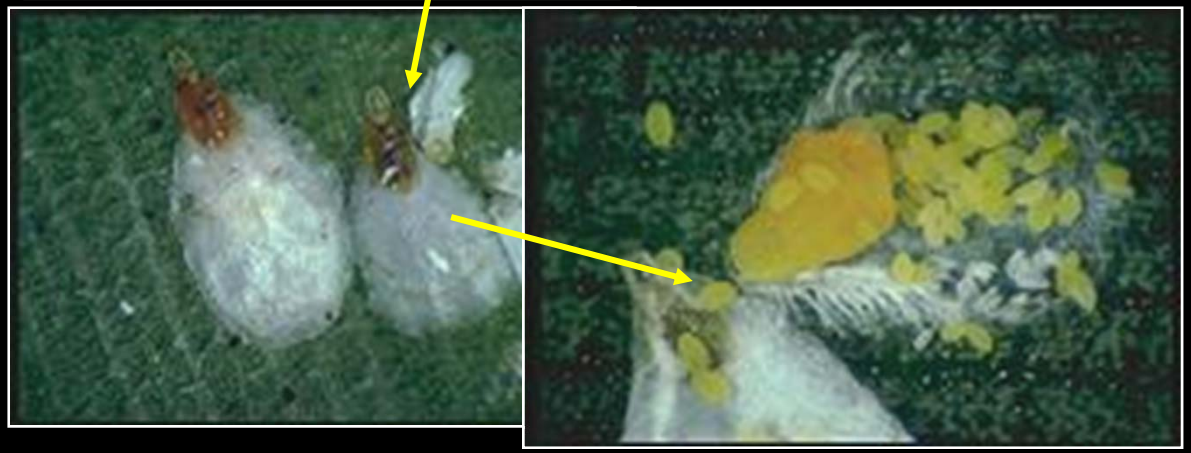
2010/12/23

Major Cause of Shipment Rejections

Scale Insects

Armored

Cockerell
or Magnolia
White Scale



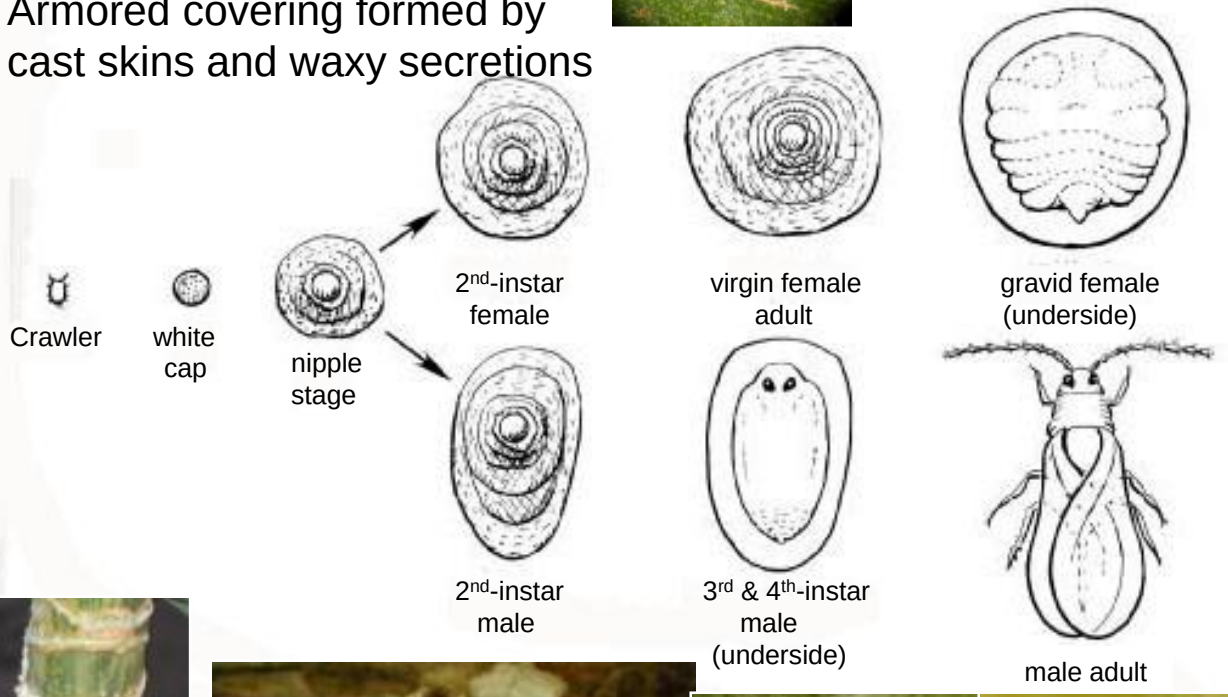
Soft

Green scale

Development of Armored Scales

Crawler to adult is about one month

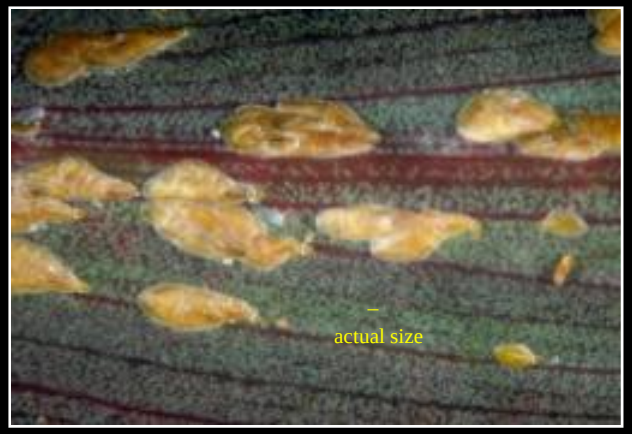
Armored covering formed by cast skins and waxy secretions



Armored Scales Causing Rejections

Coconut Scale

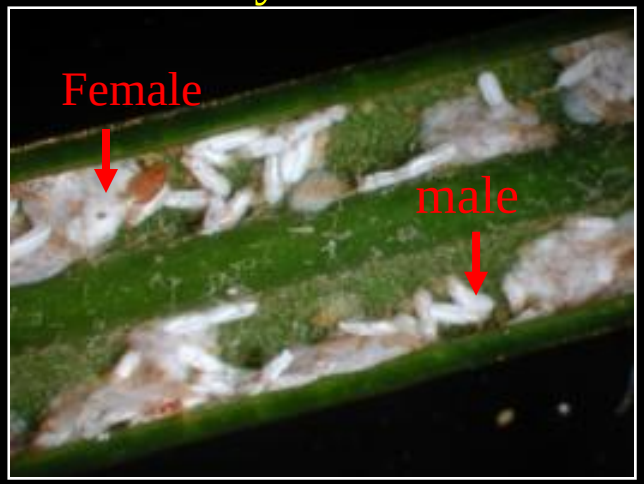
Ti Scale



Black Thread Scale

Saprophytic fungus,
Sphaerobolus stellatus

Cycad Scale



Mining Scale

Major Cause of Shipment Rejections

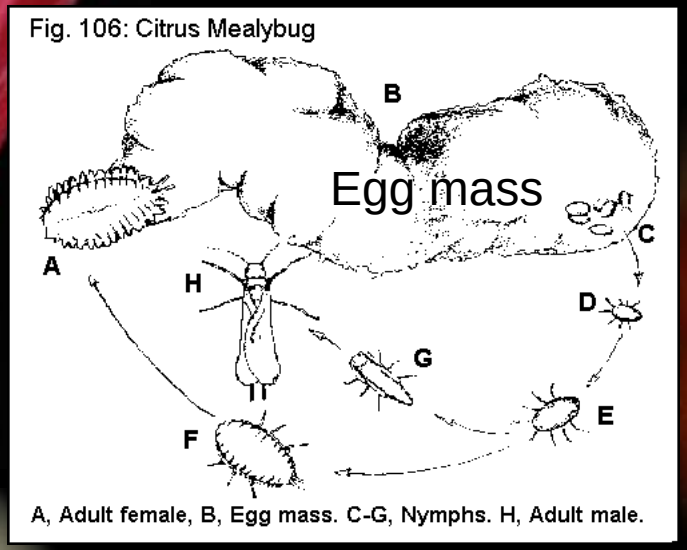
Mealybugs

Foliar

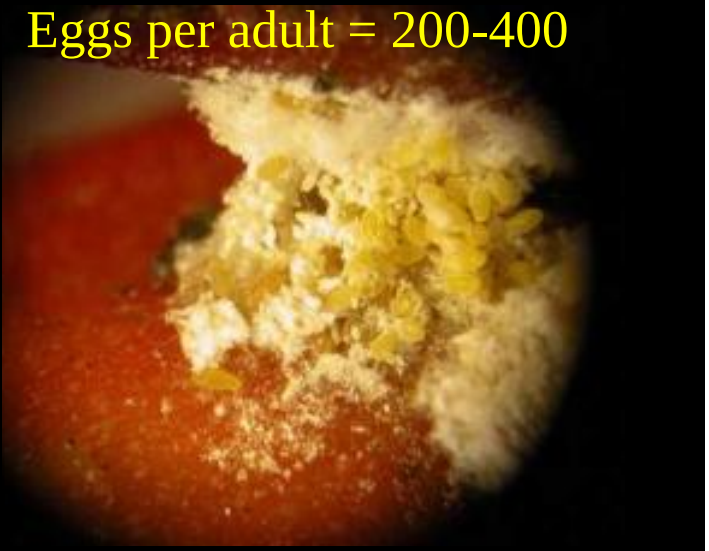
Root

Mealybugs Causing Rejections

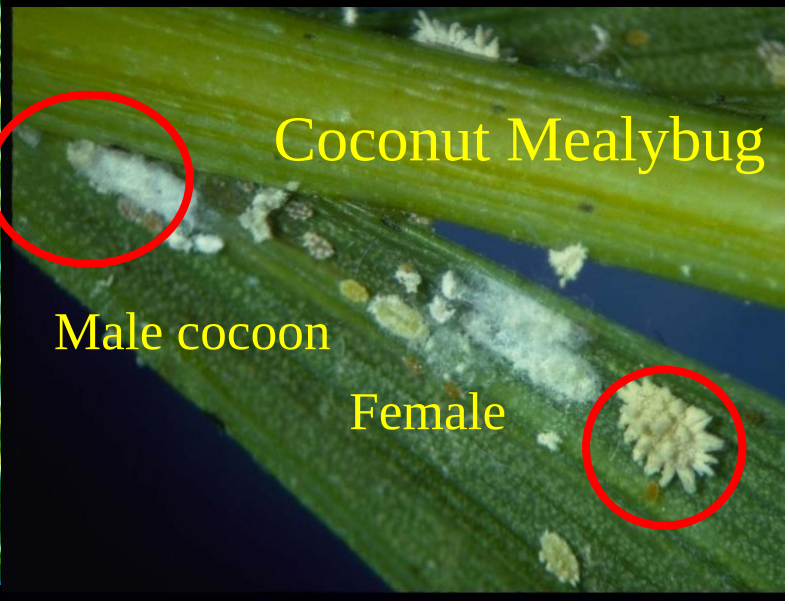
Citrus Mealybug



Eggs per adult = 200-400



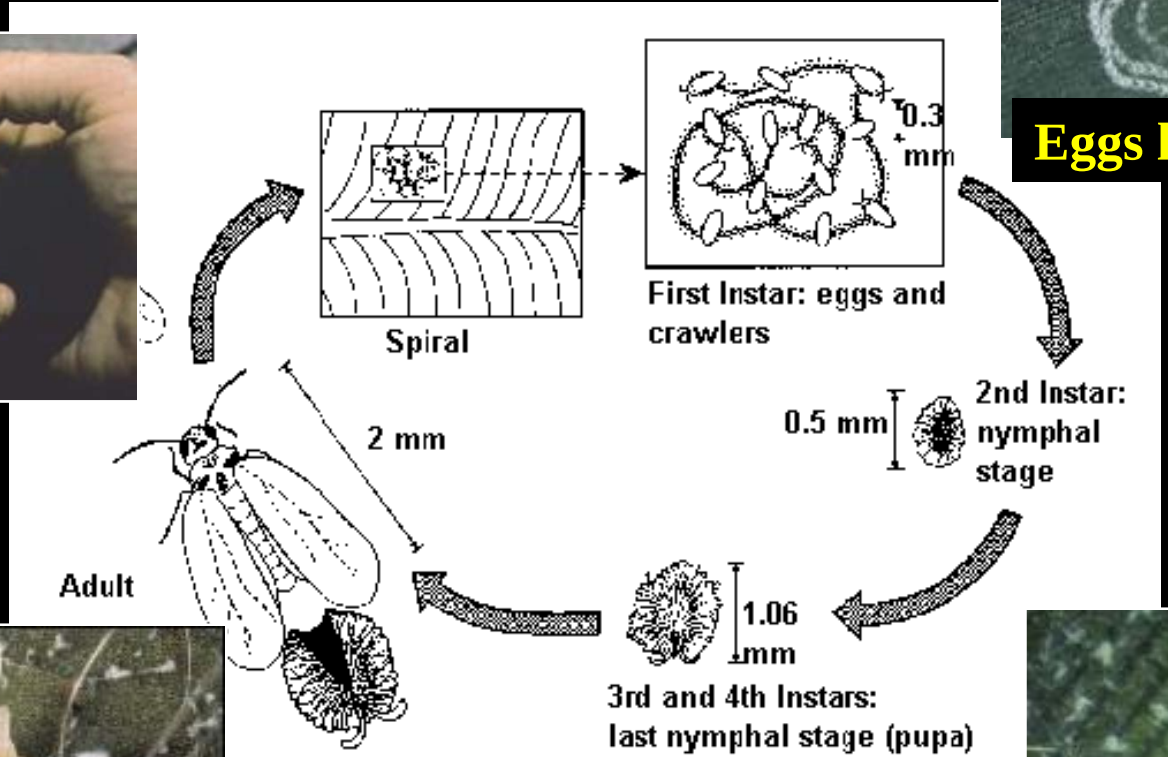
Egg to egg-laying adult
= 20-44 days
Female adult life span
= 90 days



Major Cause of Shipment Rejections

Whiteflies

Eggs laid in spiral

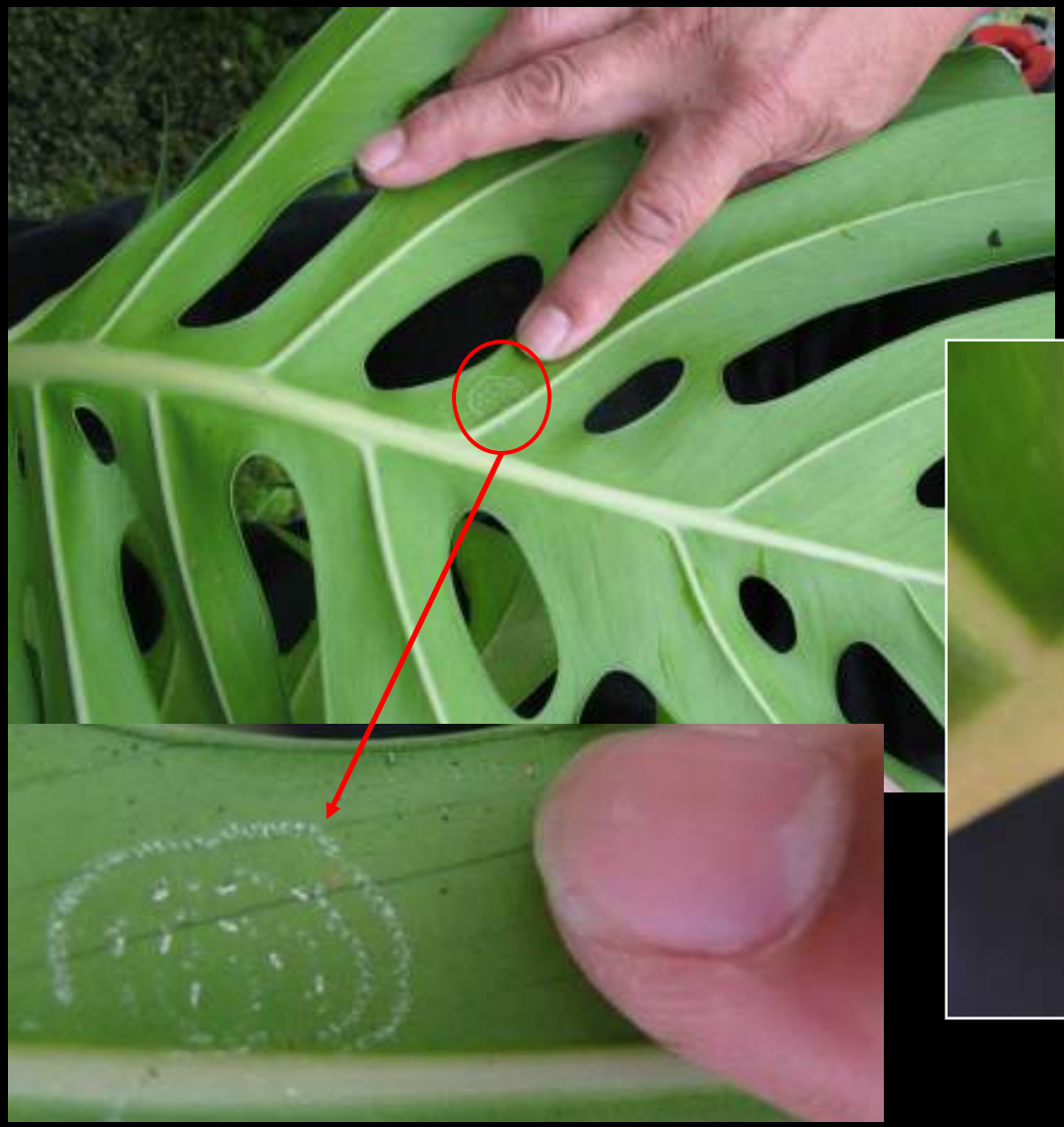


Pupal stage

Egg to adult
<3 weeks

Nymphal stage

Major Cause of Whitefly Rejection = Spiraling Whitefly Eggs



Stem end of monstera leaf ("ruffle") for scale and mealybug infestation

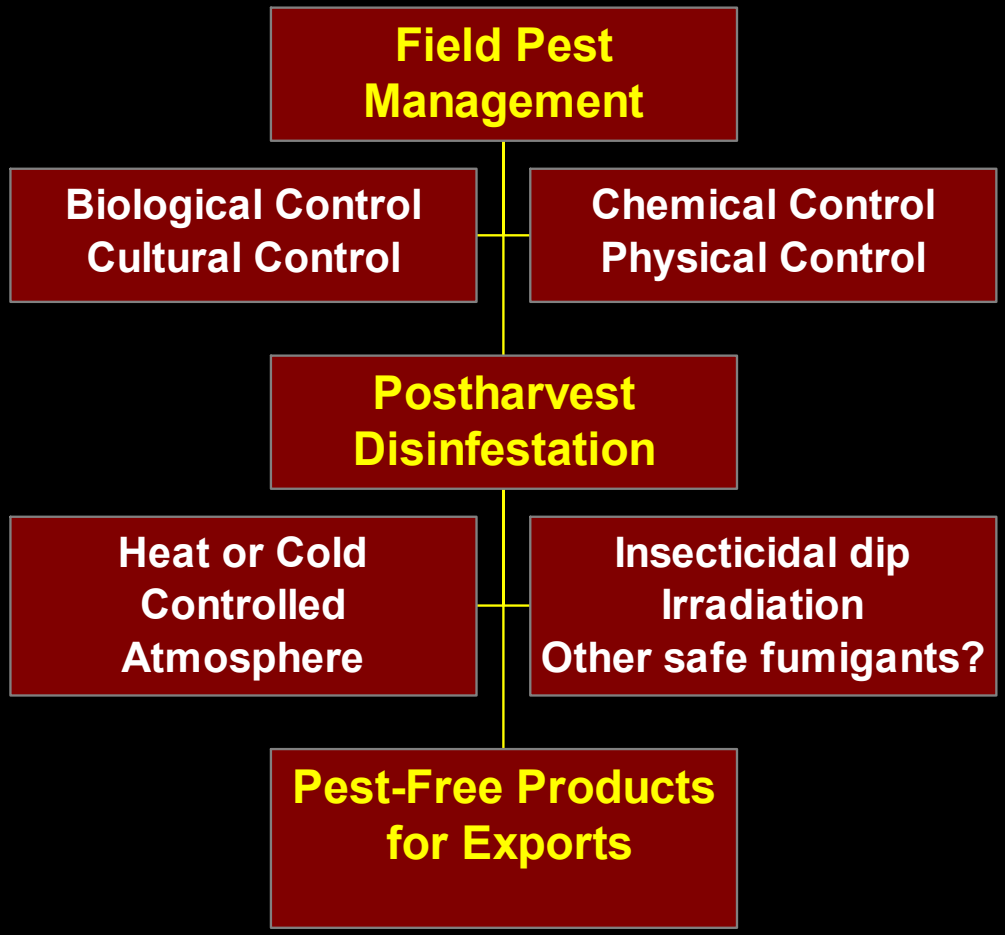
Sooty Mold

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

Ants Increase Aphid, Mealybug, Soft Scale, and Whitefly Infestations

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

Systems Approach to Quarantine Security



Field Control Tactics

- **Cultural Control** - Sanitation by removal of plant parts or plant. Grow healthy plants. Stressed plants are more susceptible to pests.
- **Physical Control** - temperature, water.
- **Mechanical Control** - fly swatter, screening
- **Biological Control** - use of parasites, predators, or pathogens (fungus, bacteria, virus, nematode).
- **Biorational Control** - soaps, oil, insect growth regulators, softer/natural insecticides-neem, pyrethrins, rotenone.
- **Chemical Control** - Malathion, Diazinon, Dursban (OP) and Sevin (carbamate)

Reduced-Risk Insecticides: Insect Growth Regulators-Talus, Distance; systemic neonicotinoids-Marathon, Safari

Evolution of Insecticides

1940-50's

Chlorinated hydrocarbons

DDT, Chlordane, Dieldrin, Mirex

1960-70's

Organophosphates & Carbamates

Dimethoate, Diazinon, Dursban, Orthene

1980-90's

Pyrethroids (synthetic)

Mavrik, Tame, Tempo, Decathlon, Talstar

1990-2000's

Reduced-Risk Insecticides

Naturalytes

Conserve, Avid, Ultiflora, Neem, Bt

Insect Growth Regulators

Distance, Enstar, Talus

Neonicotinoids

Merit, Marathon, Safari, TriStar

NEONICOTINOID INSECTICIDES

Foliar

Acetamiprid

Arena®
INSECTICIDE
grubs

Clothianidin

More Water Soluble
Effective against armored scales

Dinotefuran

Landscape

imidacloprid

Nursery

Marathon

imidacloprid

Termite

Premise

imidacloprid

ADMIRE®
PRO
Systemic
Protectant

Fruits & Vegetables

imidacloprid

*__Neonicotinoids__ act on the nervous system of insects with very low toxicity to mammals and minimal environmental impact and therefore, considered a reduced-risk pesticide.

*Neonicotinoids are among the most widely used insecticides worldwide.

*The mode of action of neonicotinoids is similar to the natural insecticide nicotine. In insects, neonicotinoids cause paralysis which leads to death, often within a few hours.

*They bind at a specific site, the nicotinic receptor, and there are no records of cross-resistance to the carbamate, organophosphate, or synthetic pyrethroid insecticides, thus making them important for management of insecticide resistance

Neonicotinoid Insecticides

Systemic Insect Control

Insecticide is taken up via roots

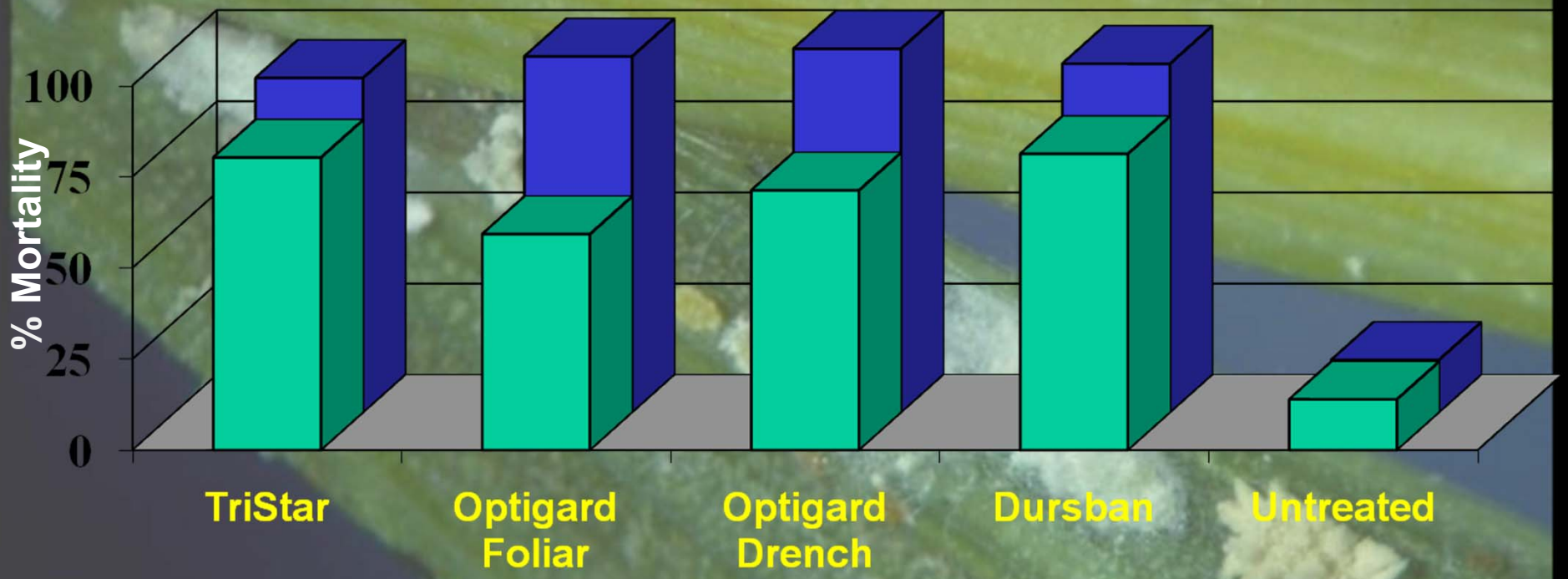
Sucking insects

- Aphids
- Lace Bugs
- Leafhoppers
- Mealybugs
- Plant Bugs/Hoppers
- Psyllids
- Scale Insects
- Spittlebugs
- Thrips
- Whiteflies

Chewing insects

- Beetles
- Borers
- Mole Crickets
- Gall Wasps
- Grubs
- Leafminers
- Termites
- Weevils

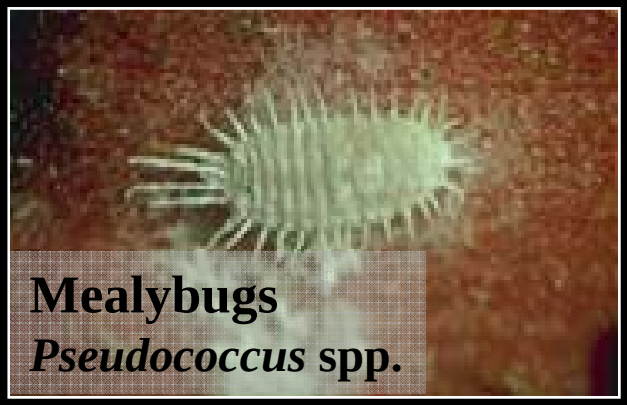
TriStar and Optigard Against the Coconut Mealybug, *Nipaecoccus nipae*



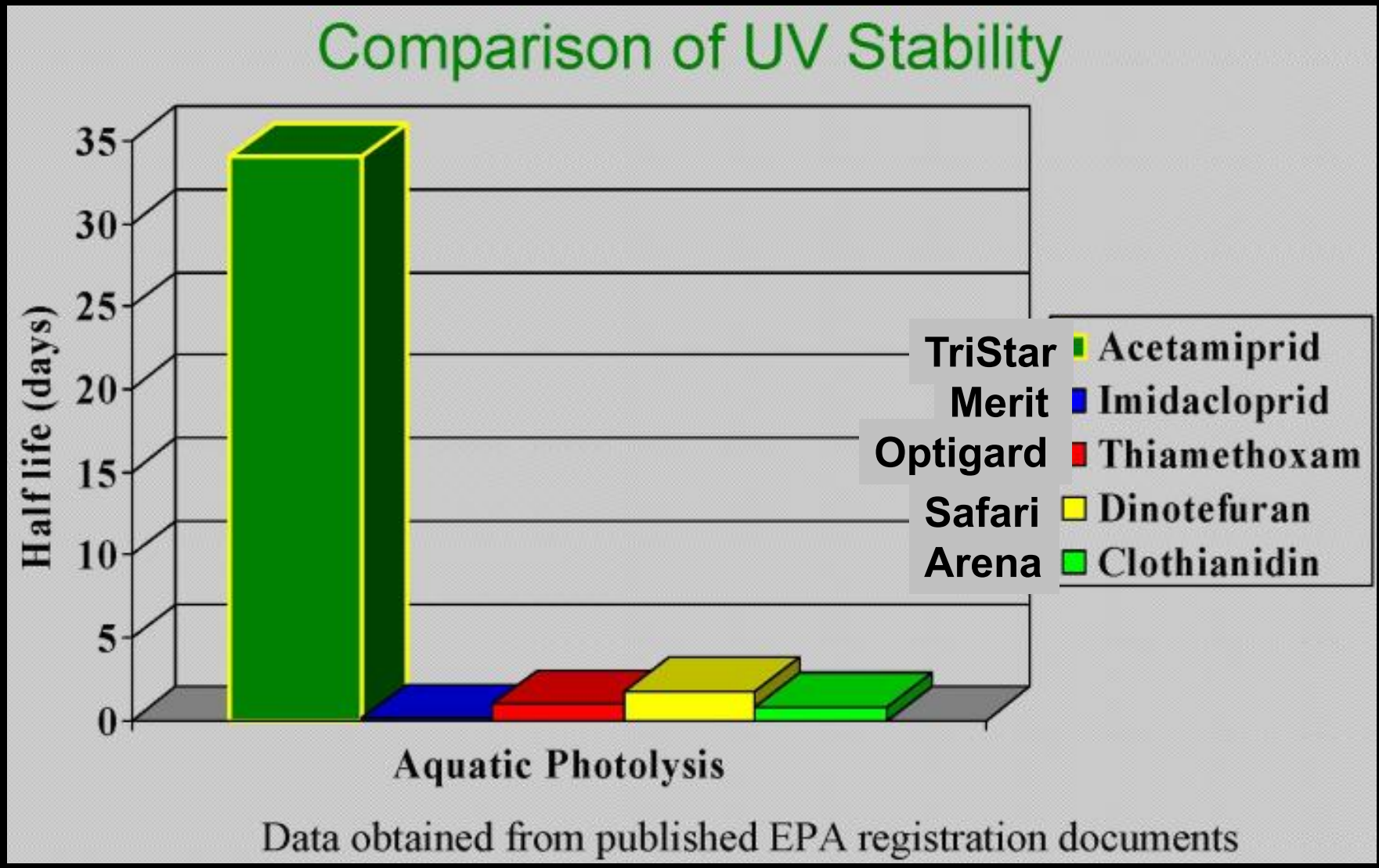
TriStar = acetamiprid

Optigard = thiamethoxam
(Now for sale in Hawaii)

Imidacloprid against Red Ginger Pests



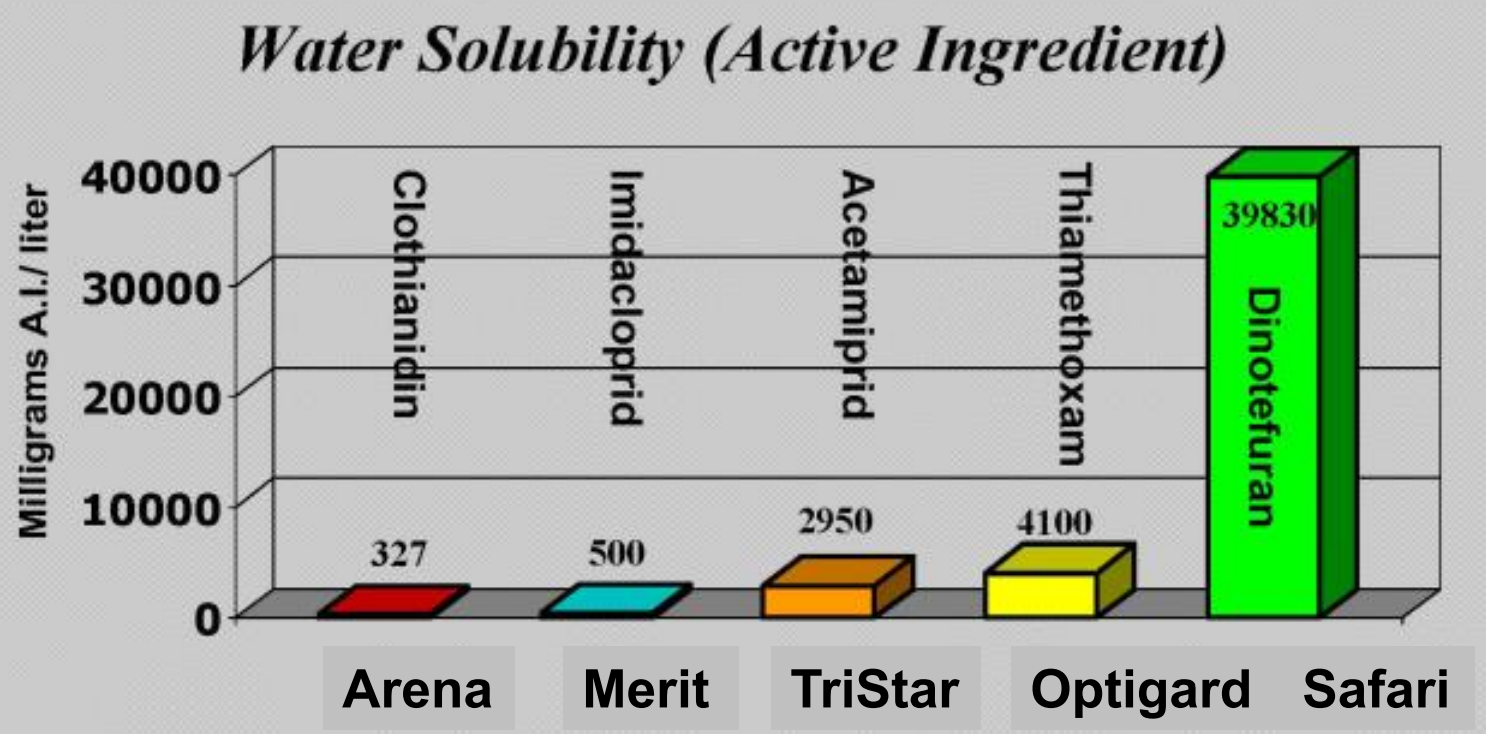
	WEEKS OF EFFECTIVE CONTROL (>95%):	
FIELD TREATMENT	MEALYBUGS	BANANA APHIDS
IMIDACLOPRID (1 APPL.)	17	53
DURSBAN (3 APPL.)	3	4



TriStar is registered for foliar use only and the most uv stable of all neonicotinoids.

Slide Credit: R. Fletcher

Relative Water Solubility of Neonicotinoids:



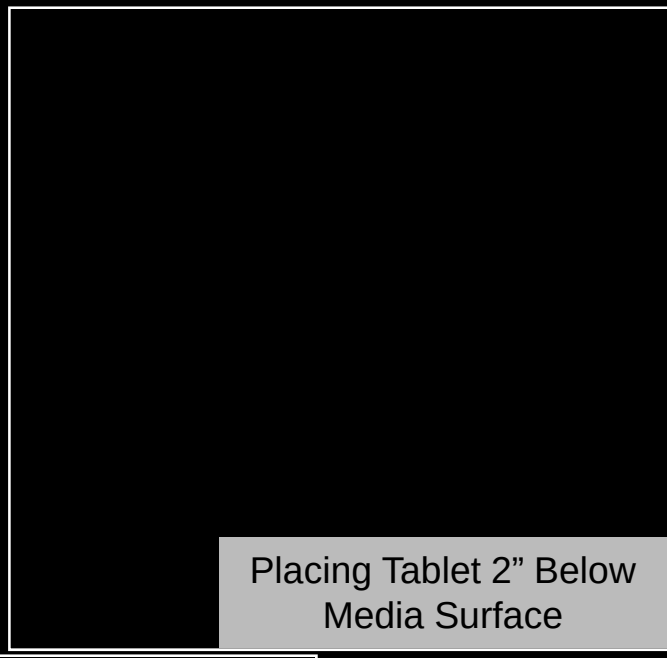
Information sources
Clothianidin (Celero), Acetamiprid (Tristar), Dinotefuran (Safari) – EPA Pesticide Fact Sheet
Imidacloprid (Marathon), hiamethoxam (Flagship) – MSDS for Products

Slide information courtesy J. Chamberlin

Application of Merit as a “Tablet”

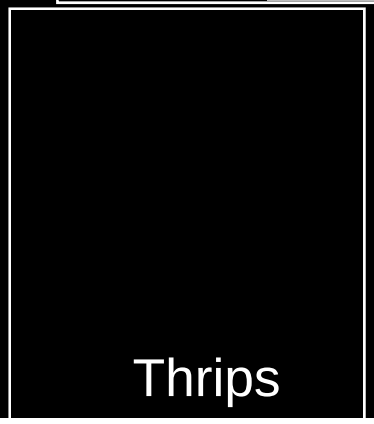
*Insert the “pill” in the pot media and solve your pest problem.

Imidacloprid
20%
NPK 12-9-4

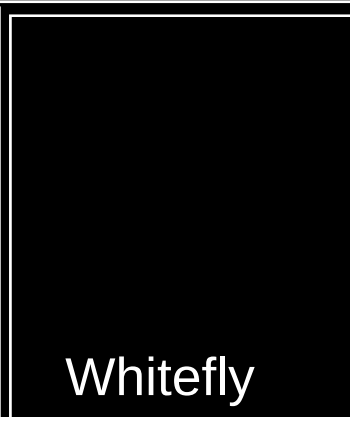


Placing Tablet 2” Below Media Surface

* >20 weeks of whitefly control
* >12 weeks of thrips control



Thrips



Whitefly

Common name (trade name)	Class	Selectivity (affected groups)	Predator Mites	General Predators	Parasites	Duration of

Control of King Protea Mealybug

Foliar applications 2 wks apart w/mistblower:

Safari (Neonicotinoid)	150 gal/A
Talus (IGR)	
Optigard (Neonicotinoid)	
Kontos (Tetronic Acid)	
TriStar (Neonicotinoid)	

Sept 2011

Nov 2012

Break!

Control of Scale Insects

INSECTICIDE	ARMORED/HARD	SOFT
Oils, horticultural	Effective	Effective
Pyrethroids: Talstar/Decathlon	Not effective	Effective
Neonicotinoids: Merit/Marathon TriStar Safari	Not effective Not effective Effective	Effective Effective Effective
Insect Growth Regulators (IGRs): Distance	Effective	Not effective
Talus	Effective	Effective

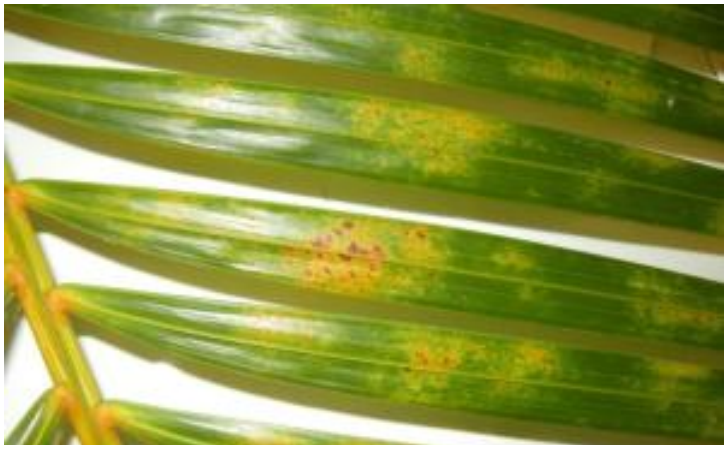
New Armored Scale on Palms and Ornamental Plants in Hawaii

Fiorinia phantasma (Hemiptera: Diaspididae)

*First discovered in Hawaii in Dec 2004 on Japanese privet on Oahu; previously, only reported from Philippines.

*Also found on various palms, including coconut palms and traveler's palm, kamani, *Ficus benjamina, Cassia* sp., naio (myoporum), pandanus, heliconia, mock orange, Madagascar olive.

*Reported as a serious pest on areca palms in the landscape in Wailea/Kihei, Maui (Sept 2011).

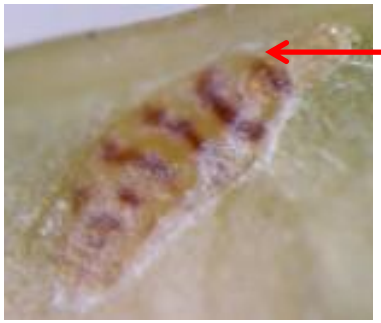


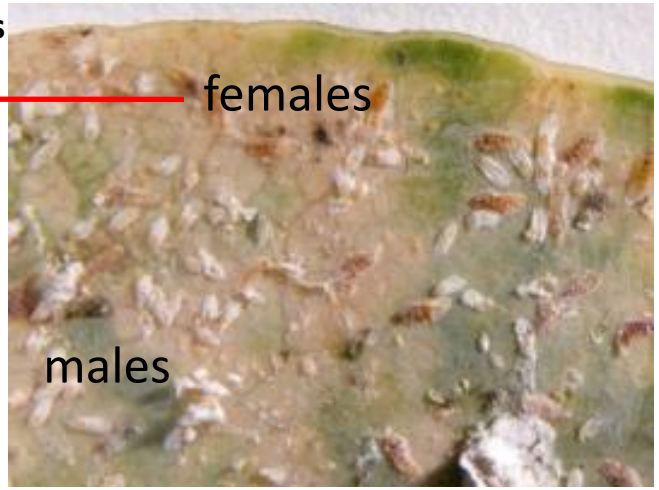
Damage on upper leaf surface of areca

*Natural enemies not identified yet. Scale insect is totally encased in in their cast skin "shell" providing protection.

*Horticultural oils should be effective against crawler stages. Systemic insecticides (e.g. Safari) and insect growth regulars (e.g., Distance , Talus) has shown some effectiveness.

Female – yellow w/red stripes





Infestation on lower leaf surface

Janis Garcia, HDOA
Arnold Hara, UH-CTAHR
October 2011

White-footed Ant

Bigheaded Ant

Little Fire Ant

*Bigheaded and LFA are effectively controlled with commercially available red imported fire ant bait insecticides.

*White-footed ant is very difficult to control because food or bait toxicants ingested by foraging workers is not regurgitated, nor is it shared with others.

*Sugary liquid bait insecticides with boric acid (Terro) has shown to be effective by killing white-footed ant workers, who feed sterile eggs to the brood and nestmates. Brood and nestmates die by starvation.

*A highly effective insecticide, fipronil, is slow-acting and eliminates ant nests, but is not registered for use on ornamentals; registered for use only against termites.

*Pyrethroids such as Talstar or the organophosphate, Dursban, can be effective as a barrier treatment to prevent worker ants from foraging on plants nurturing honeydew-producing insects.

Stinging!!!

Little fire ant (LFA) or Electric Ant

*First discovered on the Big Island in 1999.
*Stings; tends honeydew-producing insects.
*Nests in trees (coconut, fruit trees) with no connectio
ground.
*An inter-island, inter-state & global quarantine pest.
*Eventually will spread throughout the Hawaiian Islands.

Active Ingredients:

1.00% Hydramethylnon, similar AI to Amdro & Probait

Mode of Action: Disrupts energy metabolism.

Maxforce Complete granules contain a bait matrix combining sugars, proteins (including silk worm pupae), fats and oils, which accommodate insects' changing nutritional needs.

Ants (Acrobat, Argentine, Big Headed, Carpenter, Cornfield, Field, imported and native Fire, Ghost, Harvester, Odorous House, Pavement, Pharaoh, Thief)

Maxforce® Complete Brand Granular Insect Bait is a ready-to-use product for use indoors and outdoors and around buildings, on lawn, and other non-crop areas: (including school yards, playgrounds, golf courses, and ornamental nurseries).

Little Fire Ant
Infestation at UH-Hilo Instructional Farm

1 Hour after placement

Control (Peanut Butter) | Maxforce Complete | Probait

2 Hours after placement

Control (Peanut Butter) | Maxforce Complete | Probait

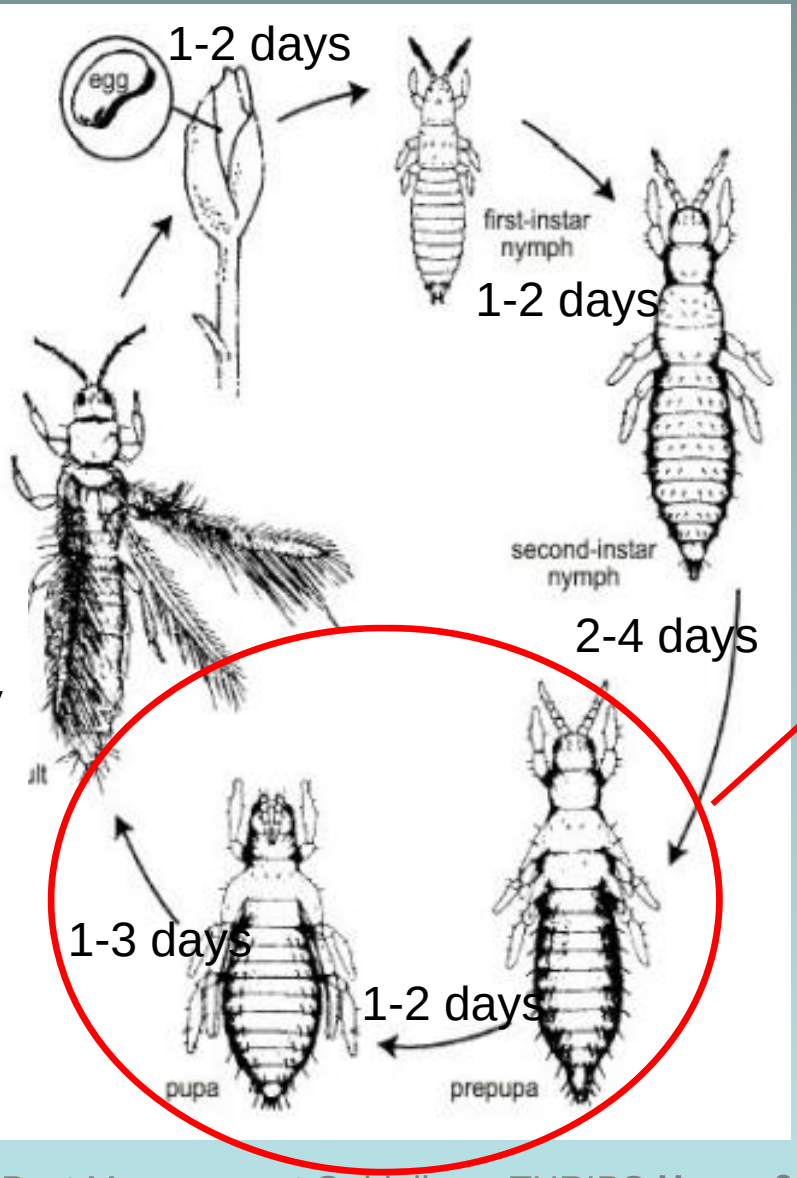
*Western Flower Thrips, Glasshouse Strain (GH) damage to dendrobium blossoms.

*Resistant to insecticides including Avid and Conserve.

About 1/16 an inch long

Life Cycle of Thrips (7 to 14 days)

Eggs inserted in plant tissue. 150-300 eggs per female



Adult and nymphs occur on flowers or foliage.

Adults are characterized by wings fringed with hair-like setae.
Life span =
30 to 45 days

Prepupa and pupa occur in the media below the plant.

Adapted from UC Pest Management Guidelines, THRIPS **Home & Landscape** (Published: 5/01)

Products Against Western Flower & Melon Thrips

Hachi Hachi (Sepro) - Group 21A inhibits energy metabolism
GH also aphids, scale insects, whiteflies

Pylon (BASF) - Group 13 disrupts proton gradient.
GH also mites, foliar nematodes

Overture (Valent) - Unknown MoA; in a unique group.
GH also caterpillars

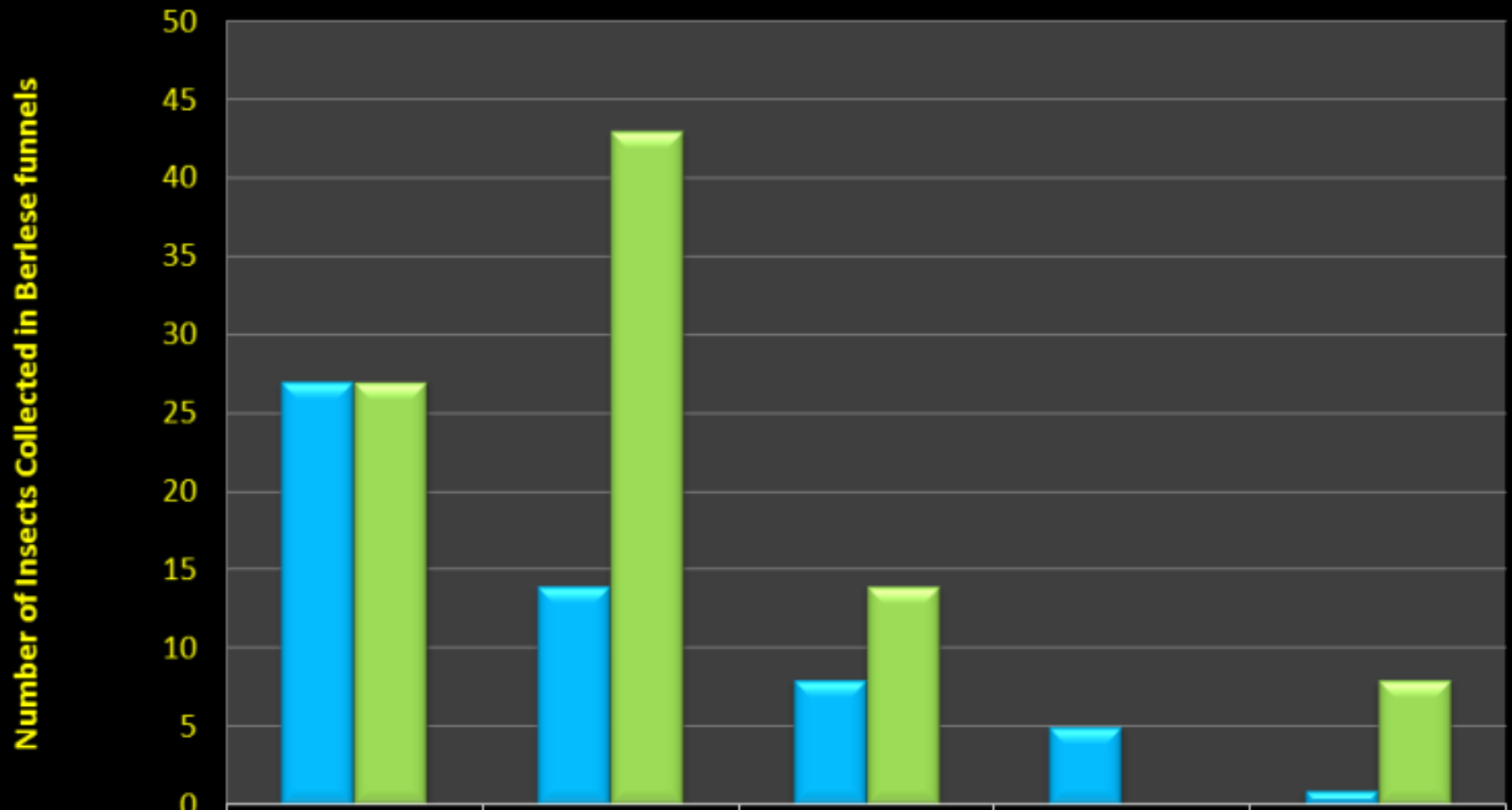
Aria (FMC) - Group 9C stops insect feeding.
GH, N, L also aphids, whiteflies, mealybugs,

Mesurol (Gowan) - Group 1A (carbamate) nerve poison
GH, N, L (RUP) also snails and slugs

Avid (Syngenta) - Group 6 WFT-G resistance
GH, N, L also mites, nematodes

Conserve (Dow) - Group 5 WFT-G resistance
GH, N, L also caterpillars, leafminers

Thrips on Dendrobium Flowers



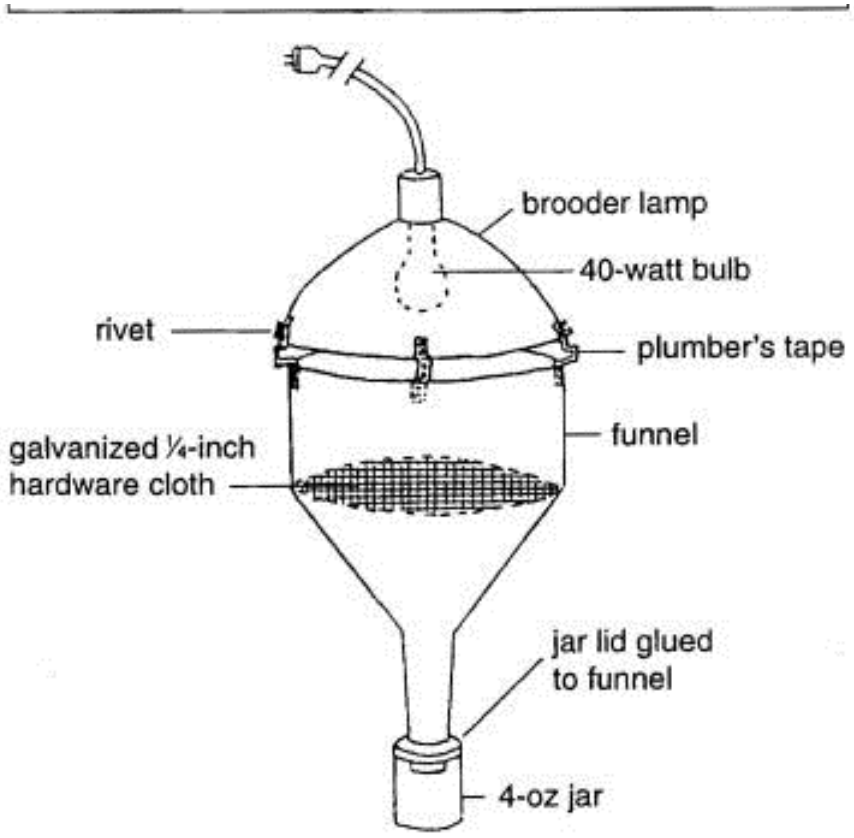
	2nd Hachi Hachi, no drench	3rd Hachi Hachi, no drench	1st Pylon spray + Duraguard drench	2nd Aria + Malathion Drench	2nd Overture +Malathion Drench
Total Adults	27	14	8	5	1
Total larvae	27	43	14	0	8

The Berlese Funnel

Materials:
Automotive Funnel (Napa)
¼” galvanized hardware cloth
4-ounce glass jar (baby food jar)
Alcohol or detergent water
10-inch brooder lamp (Ace)
40 watt bulb
½ “pvc pipe and fittings

The Berlese Funnel, A Tool for Monitoring Thrips on Orchids

CTAHR Insect Pests IP-3 10/98



The modified Berlese funnel

Biological or Microbial Insecticide

Bacteria - *Bacillus thuringiensis – caterpillars*
B.t. israelensis – mosquitoes, fungus gnats

Fungi - *Paecilomyces fumosoroseus* – whiteflies,
Preferal aphids, thrips, mealybugs
Humidity is 80% or higher for 8 - 10 hours
Temp is between 68° and 82° F

- *Beauvaria bassiana* – whiteflies, thrips, aphids
BotaniGard coffee berry borer
High humidity and free water enhance activity.
Sunlight kills fungal spores.

Nematodes - *Steinernema carpocapsae* – banana moth,
Nematac borers (weevil), soil-
High humidiy required. dwelling insects.

Posthavest Disinfestation Treatments for Export Ornamentals

- Washes and Chemical Dips
- Fogs and Aerosols
- Heat Treatment
- Irradiation
- Systems Approach

Washes and Wipes

Cut Flower and Foliage Shjpper in Costa Rica

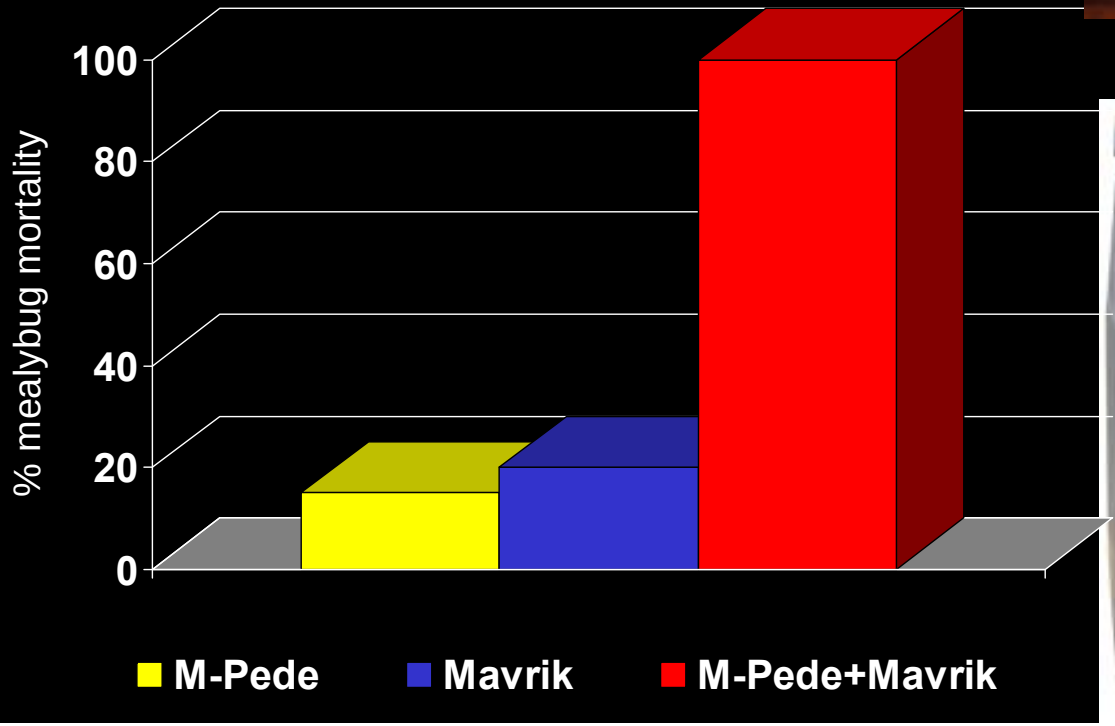
Chemical Dips

*Mavrik is labeled for use as a dip for flower and foliage cuttings.

*Broad-spectrum pyrethroid effective against aphids, leafhoppers, mites, thrips, whiteflies.

*In tank-mix with insecticidal soap (M-Pede), effectiveness against mealybugs is significantly increased.

+



HOT WATER TREATMENTS: NON-CHEMICAL CONTROL OF INVASIVE PESTS

A.HARA, C. JACOBSEN, E. OUCHI, S. MARR, and R. NIINO-DuPONTE
University of Hawai'i at Mānoa, College of Tropical Agriculture and Human Resources, Beaumont Agric. Research Center, Hilo, HI

All photos by UH CTAHR unless otherwise noted.

HEAT TREATMENT TO KILL PESTS

(lowest temperature, shortest duration to achieve 100% mortality)

°F / °C

122 °F / 50 °C

Roger Lopez-Chaves

Burrowing nematode **15 min**

Root mealybugs **15 min**

120 °F / 49 °C

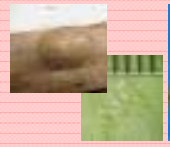
Julie Coughlin
Taro root aphid **5.5 min**

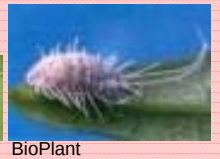
Cockerel scale **6 min**

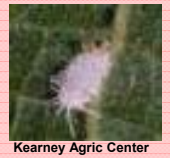
Green scale **7 min**

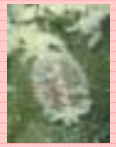
Spiraling whitefly **10 min**

117 °F / 47 °C


Nettle caterpillar (pupa) **7 min** (eggs) **10 min**


BioPlant
Long-tailed mealybug **12 min**


Kearney Agric Center
Obscure mealybug **12 min**

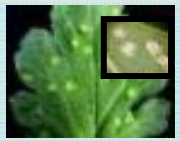

Pink hibiscus mealybug **12 min**

113 °F / 45 °C

Missouri Botanical Garden
Foliar nematode **10 min**

Nettle caterpillar (larva) **12 min**

109 °F / 43 °C



W Nagamine

Can Food Ins Agency
Chrysanthemum white rust **5 min**
Little fire ant adults **10 min**
Snail s adults **15 min**

Coqui Frog

adults **5 min** **103**
eggs **5 min** **109**

PLANT TOLERANCE TO HEAT

(highest temperature, longest duration tolerated)

122 °F / 50 °C

Anthurium 'gobo' (propagative material) **10 min**

120 °F / 49 °C

POTTED PLANTS

6 min: Rhapis palm
10 min: Dracaena 'Massangeana', 'Compacta', Bromeliad 'Tillandsia'
10 min w/ hot water conditioning at 102 °F (39 °C): Palms: Parlor, Bamboo, Phoenix, Fishtail; Dracaena: 'Janet Craig' and 'L'

PROPAGATIVE MATERIAL

- Gardenia
- Ginger, edible
- Plumeria
- Sugarcane
- Dracaena: cutbacks: 'Massangeana', 'Jumbo', 'Warneckii', money tree tip cuttings: 'Janet Craig', 'L'

10 min

CUT FLOWERS & FOLIAGE

- Bird-of-paradise buds, foliage
- Calathea foliage
- Red ginger
- Heliconia flowers (16 cv, var.)
- Palm foliage
- Papyrus foliage
- Ti leaves
- Whaleback foliage

10 min

117 °F / 47 °C

Orchid Oncidium Sharry Baby 'Sweet Fragrance'
Orchid Vuylstekeara Michelle Rehfield 'Pacific Blue Skies'
5 min

Chrysanthemum 'Cupertino' 'Manhattan'
10 min

Bromeliad Vriesea
- 'Flammea'
- *V. cocorvadensis*
- 'Purple cockatoo' (right)

10 min

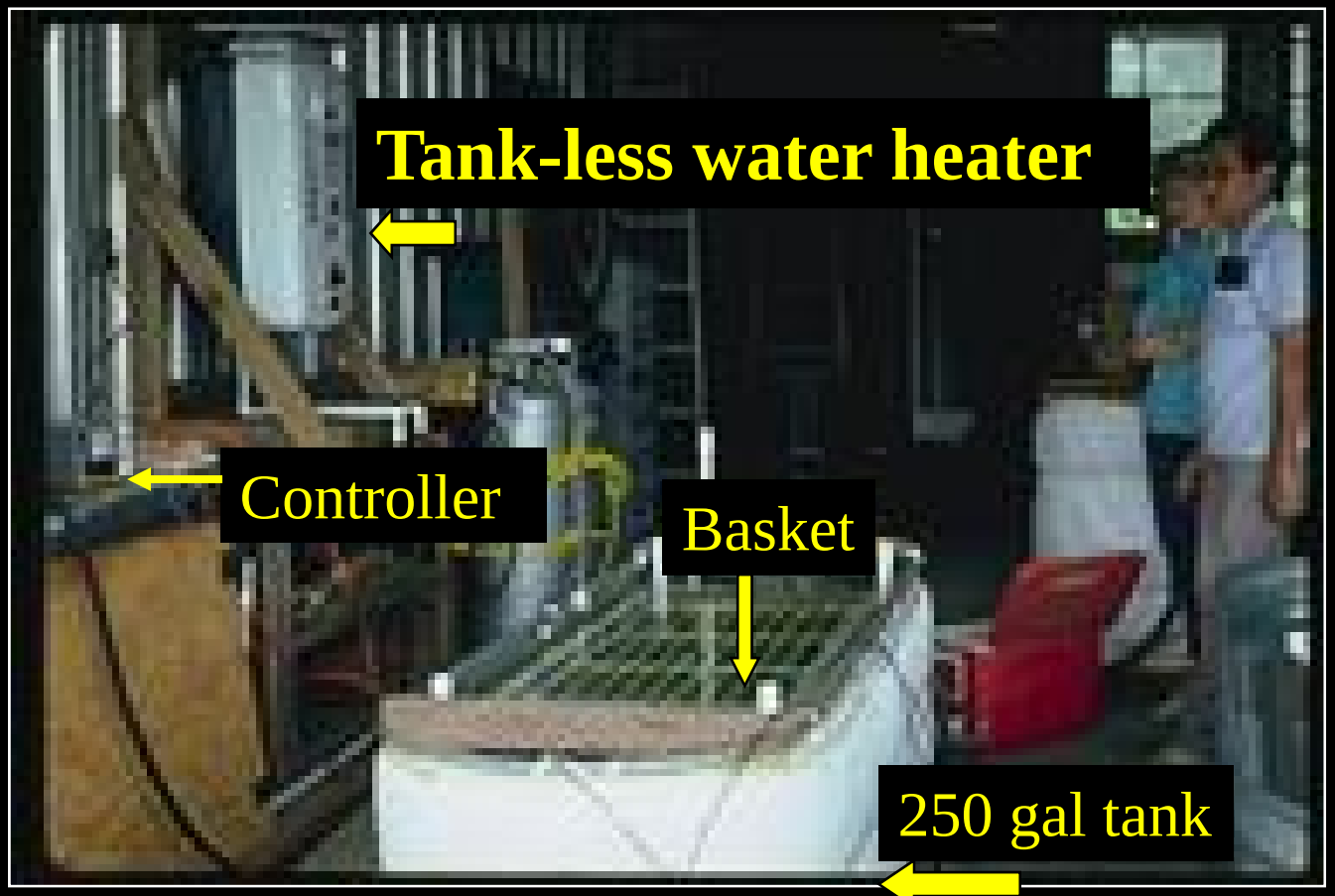
113 °F / 45 °C

Bromeliads Guzmania 'Fiesta', 'Marjam'. 'Puna Gold' **5 min**
Ornamentals Canna lily, Dieffenbachia, Dracaena 'Tricolor coloramma', Easter lily, Philodendron, Salvia
Landscape Bougainvillia, Croton, Kupukupu fern, Lantana, Laua`e fern, Liriope var., Plumbago, Podocarpus, Ti 'Kaua'i', Zoysia grass
Orchids Dendrobium 'Din Daeng Blue', Beallara Peggy Ruth Carpenter 'Jem', Epicat Hilo Delight 'Starlight'

109 °F / 43 °C

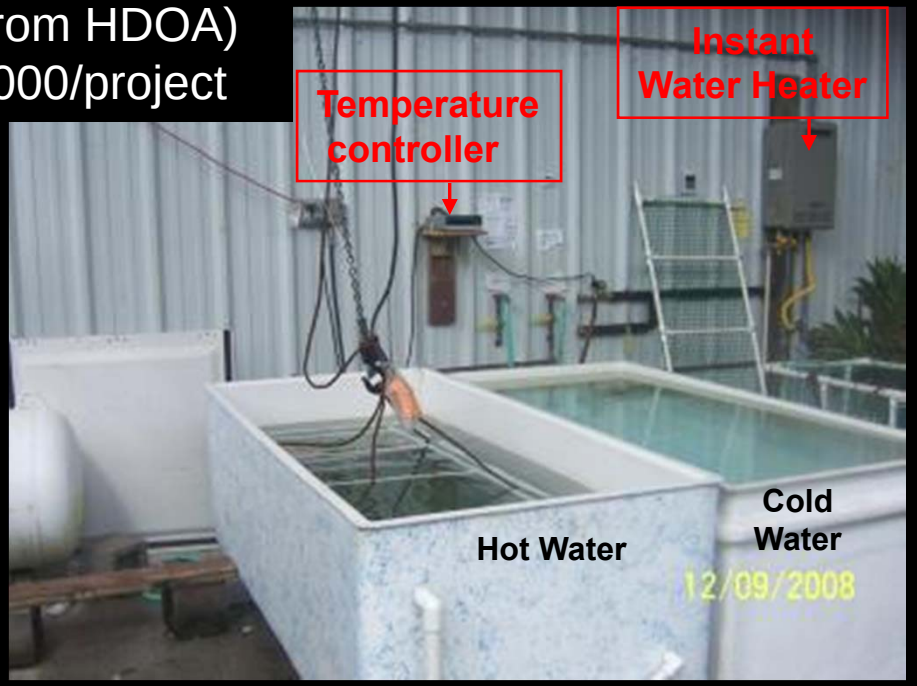
Ornamentals Spathiphyllum **15 min**

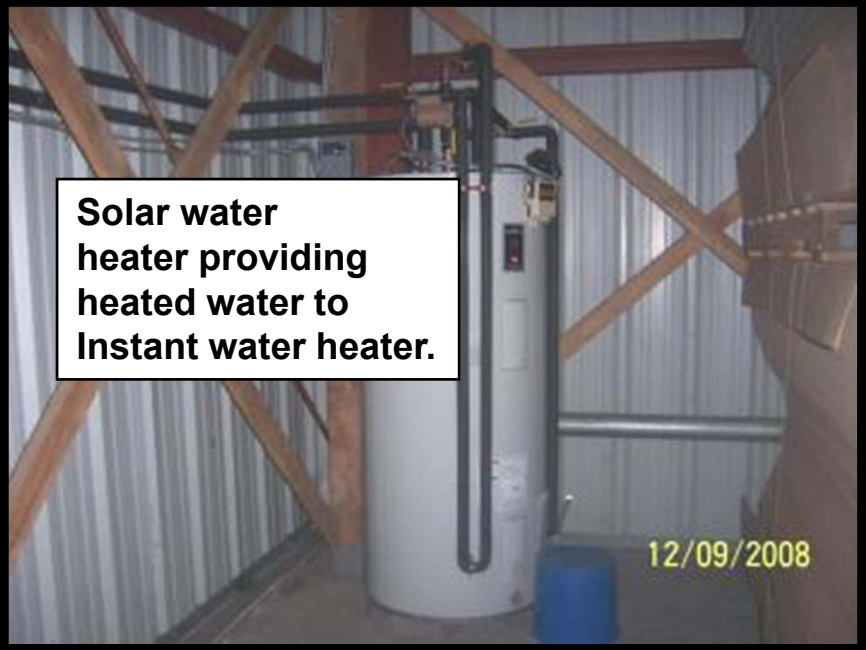
Hot-Water Dip Tank



Basket loaded w/ red ginger

Cut Flower Shipping Co w/ Hot water Treatment 12/09/08
(County Cost Sharing Program, $125,000 from HDOA)
25% of all qualified cost not to exceed $10,000/project





Hot Water Treament Recognized as Effective by CDFA

Notifies inspector that insects may appear live; hot water preserves soft bodied insects

NOTICE OF TREATMENT

PRODUCTS DIPPED IN HOT WATER

- ☐ Ginger Pink
- ☐ Ginger Red
- ☐ Bird of Paradise
- ☐ Bird Leaves

Palm Leaves:

- ☐ Areca
- ☐ Phoenix
- ☐ Queen Sago
- ☐ Rhapis
- ☐ Ti Leaves

The shipper performed this treatment without official regulatory supervision at origin. Insects killed by this treatment may appear "fresh" or "alive." DO NOT REJECT FOR INSECTS UNLESS IT IS DETERMINED THEY ARE ACTUALLY ALIVE THROUGH AN APPROVED MANNER. IF NECESSARY, CONTACT CDFA'S Pest Exclusion Branch for further information.

FLORAL RESOURCES, INC. HAWAII
175 E. KAWAILANI ST
HILO, HAWAII 96720
PH: (808) 959-5851/FAX: (808) 959-2077

Hot Shower Chamber

For commercial use by export plant nurseries

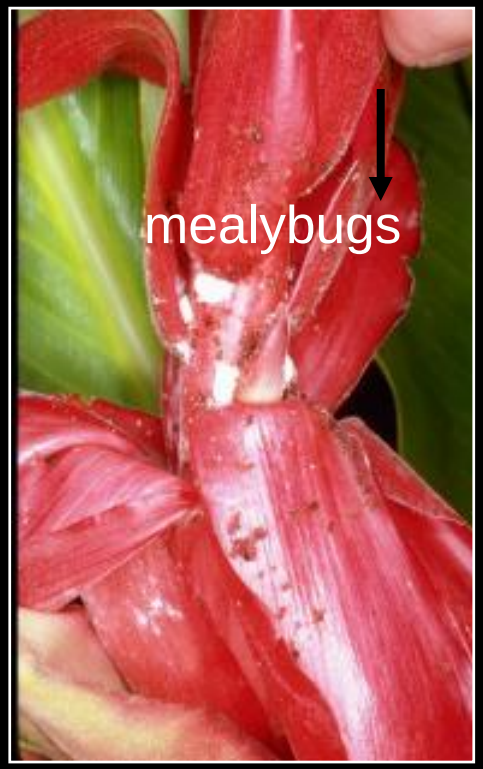
Refrigerated freight container modified to hot shower chamber delivering 43 - 49^{o} C water at 70 gpm through 110 full conejet nozzles.

Shower chamber

80 plants
in one load

Dead frogs, geckos,
Slugs at 113 F for 5 min

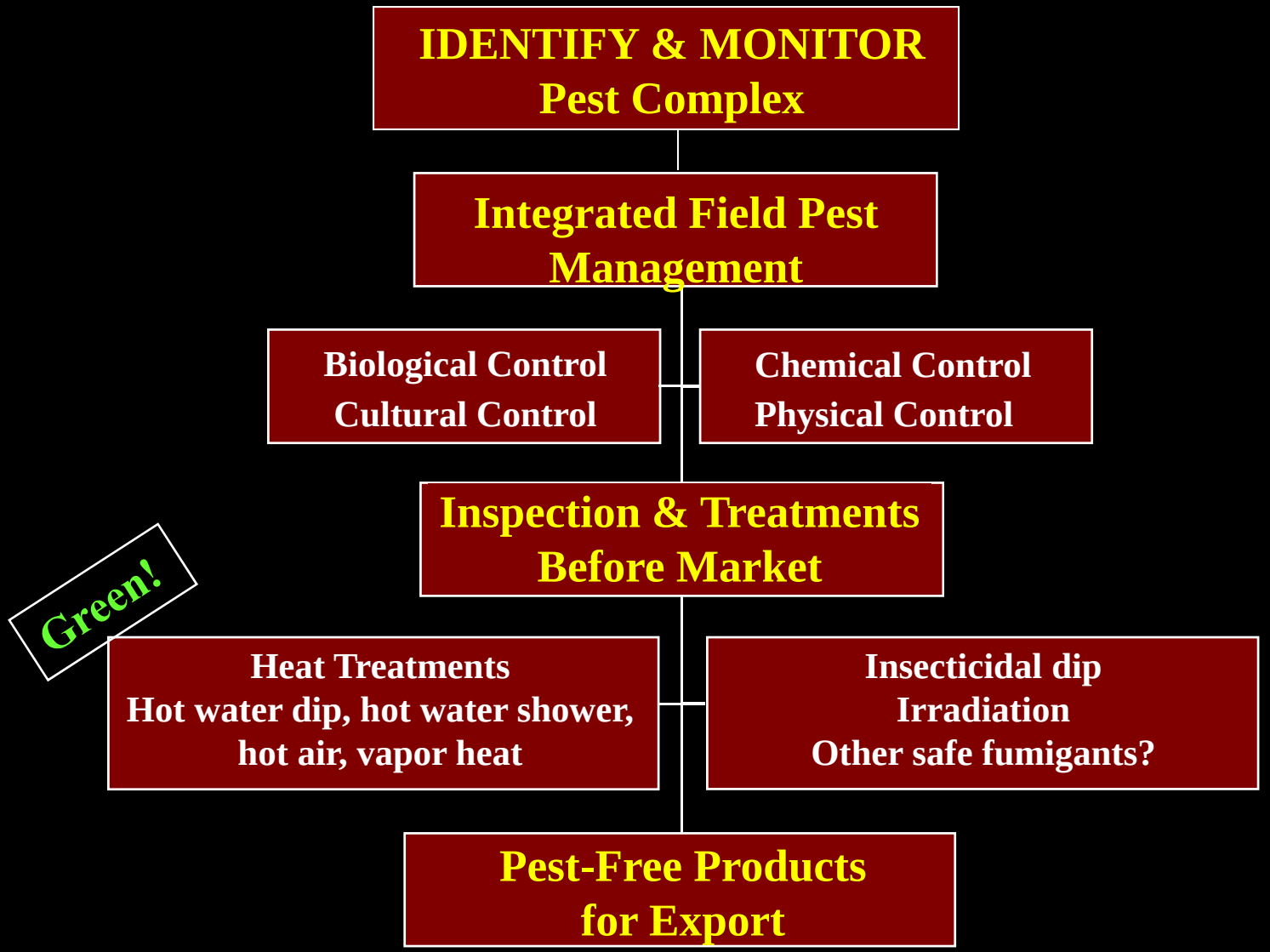
Systems Approach for Red Ginger



	% flowers infested w/ mealybug	
Field Treatment	No postharvest dip	Mavrik/Soap
Foliar Dursban	3	0
No Treatment	12	17

Overall Control Strategy

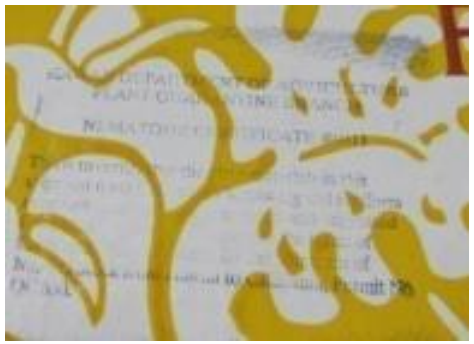
The Systems Approach



FedEx Distribution Center Near San Francisco Airport in San Mateo County

Summary

*CA considers Hawaii high-risk for quarantine pests, similar to Florida.
*USDA, Limited Permit Stamps, State Certifications on boxes do not prevent inspections.
*Only boxes with origin inspection stickers are not opened.
*Replace rubber stamp permits and certificates with stickers.
*Invite personnel from CDFA and/or CDFG to discuss origin inspection programs for cut flowers and potted plants.
*Public outreach program on shipping clean fresh flowers and foliage to California.



A BIG THANK YOU!
For assistance:
Kris Aoki
Peter Ballerini
Brian Bushe
Susan Cabral
Pat Conant
Stacey Chun
Christopher Jacobsen
Ruth Niino-DuPonte
Johnny Gordines
Reggie Hasegawa
Clyde Hirayama
Andrew Kawabata
Charlie Nelson
Ken Ogawa
Kyle Onuma
Erik Ouchi
Kelvin Sewake
Marcel Tsang
08 Feb 14