Controlling Spiraling Whitefly in the Landscape

CPS Seminar

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What will this presentation cover?

*Host Range of Spiraling Whitefly (SWF)
*Seasonality and Outbreaks
*Life Cycle
*Insecticides against SWF
  Evolution, Neonicotinoids, Insect Growth Regulators
  Applications: Spray, Drench, Injection
*Classical Biological Control of SWF
*Other Pests of Plumeria
*Conservation of Natural Enemies
*Biological/Microbial Products
*Summary
*Conclusion

Spiraling Whitefly (SWF)

*First discovered in Hawaii in 1978.

*Spiraling whitefly has been recorded on 38 genera of plants belonging to 27 plant families and more than 100 species.

*Specific plants that are attacked include annona (cherimoya, atemoya, sugarapple), avocado, banana, bird-of-paradise, breadfruit, citrus, coconut, eggplant, guava, kamani, Indian banyan, macadamia, mango, palm, paperbark, papaya, pepper, pikake, plumeria, poinsettia, rose, sea grape, ti and tropical almond.

*Plumeria is probably the most favorite host of SWF.

*SWF usually starts building up in June and continue through September. From October, population starts decreasing and by December is very low (Kumashiro, HDOA).

*Prolonged drought may have accounted for the weakening of trees has led to the higher than usual SWF population during this past summer (Kumashiro, HDOA).

Spiraling Whitefly (SWF)

Aleurodicus dispersus

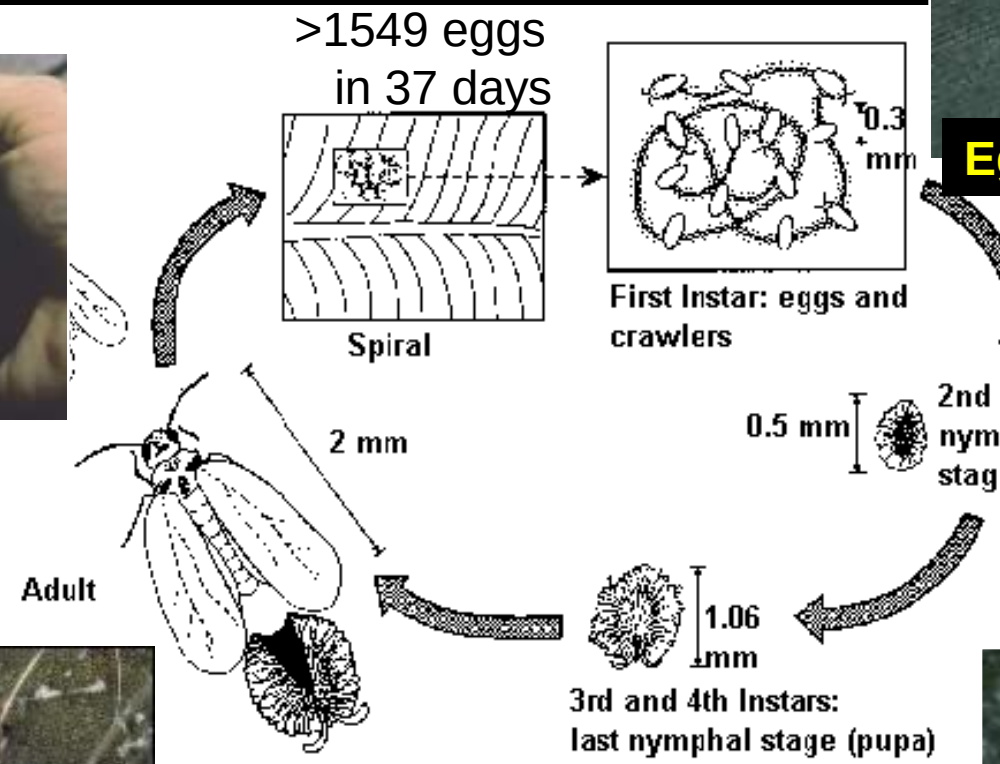
Egg to adult
34 to 41 days

Eggs laid in spiral

9 to 11 days

6 to 7 days

4 to 5 days



5 to 7 days

Adult stage
39 days

Pupal stage
10-to 11 days

Nymphal stage

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
Oils and Soaps

Insect Growth Regulators

Distance, Enstar, Talus

Neonicotinoids

Merit, Marathon, Flagship,
Safari, TriStar

NEONICOTINOID INSECTICIDES

Acetamiprid

Arena®
Clothianidin

Optigard Flex®
thiamethoxam

Dinotefuran

imidacloprid

imidacloprid

imidacloprid

ADMIRE® PRO Systemic Protectant

imidacloprid

Neonicotinoid Insecticides

Spectrum of Insect Control

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

***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 nicotiniic 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

Foliar Sprays

*In general, inefficient, prone to drift, and poor coverage to pests under plant canopy.

*Harmful effects to natural enemies, especially with broad spectrum:
carbamates
organophosphates
synthetic pyrethroids

Drench Application

"Doing nothing is better than an improper drench application"

Giant Whitefly, Aleurodicus dugesii

*First discovered in HI heavily infesting hibiscus, fiddlewood, plumeria in May 2002.

Merit drench – (Best Guess)

* Applied to infested fiddlewood trees by City in Chinatown.
*Not effective (improper application at base of trunk and not canopy drip line to feeder roots).
*No reports of Merit being highly effective.

*Drench application must be applied to the feeder roots that has adequate soil moisture.

* Subsequently must be irrigated to assure uptake.

*Liquid fertilizer added to insecitcide may assist uptake.

*Competition by groundcovers or turf contributes to effective uptake.

Injection Systems Evaluated

Types of Insect Growth Regulators

1. ***Juvenile hormone (JH) mimics***
   - Enstar (kinoprene)
   - Distance (pyriproxyfen)
   - Precision (fenoxycarb)?
2. ***Ecdysone inhibitors***
   - Azadirachtin = Aza-Direct, Azatin and Ornazin
3. ***Chitin synthesis inhibitors***
   - Citation (cyromazine)
   - Adept (diflubenzuron)
   - Pedestal (novaluron)
   - Talus (buprofezin)

Buprofezin

Insect growth regulator

Talus = ornamentals, Sepro
Applaud = food crops, Nichino

*Inhibits chitin synthesis which interrupts molting, suppresses oviposition & reduces egg viability.
*High level of activity against most homopteran insect pests including whiteflies, mealybugs, soft scales, armored scales, leafhoppers and planthoppers.
*Vapor activity allows buprofezin to reach the undersides of leaves and new growth.

Whiteflies	Mealybugs	Soft Scales	Armored Scales
Silverleaf	Longtailed	Black	Coconut
Greenhouse	Citrus	Brown	Cockerell
Sweet potato	Mexican	Hemispherical	Fern
Ash	Obscure	Wax	Boisduval
	Comstock	Tessellated	White peach
			Cycad

Pests of Ornamentals in Hawaii

Distance (Juvenile Hormone mimic) is effective against whiteflies

Untreated — 27 Days After Treatment — Treated

Also effective against fungus gnats and armored scales

Insecticide Toxicity to Natural Enemies

Common name (trade name)	Class	Selectivity (affected groups)	Predator Mites	General Predators	Parasites	Duration of impact to natural enemies
carbaryl (Sevin)	carbamate	Broad (insects, mites)	Moderate/ High	High	High	Long
chlorpyrifos (Dursban)	OP	Broad (insects, Mites)	Moderate	High	High	Moderate
fenpropathrin (Tame) similar To (Talstar)	Pyrethroid	Broad (insects, Mites)	High	High	High	Moderate Long for Talstar
Imidacloprid (Merit as a Drench)	Neonico-tinoid	Narrow (sucking, insects)	-	Low	Low	-
Imidacloprid (Merit as a Foliar)	Neonico-tinoid	Narrow (sucking, insects)	-	Moderate	High	Short to moderate
Insecticidal Soap (M-Pede)	soap	Broad (insects, Mites)	Moderate	Moderate	Moderate	Short to none

http://www.ipm.ucdavis.edu/PMG/r302900111.html

Classical Biological Control of the Spiraling Whitefly

- First discovered in 1978, importation of ladybeetles and whitefly parasites from Trinidad in 1979 brought SWF under control.

*Heavy infestations were only observed where these natural enemies are not present due to insecticide or windy, ocean salt condition.

Nephaspis

Encarsia

Aleuroctonus

Fortuitously Discovered In 2007 & more effective.

“Before” & “After” Introducing Natural Enemies of the Spiraling Whitefly

Heavy Spiraling Whitefly Infestation
Mauna Lani
09/2010

Stems infested with White Peach Scale

Plumeria at Keahole Ag Park (09/2010)

Immature Lady Beetle

Adult Lady Beetle

No natural enemies present

Spiraling Whitefly in West Hawaii

Parasitic wasp, very effective against spiraling whitefly in windy, coastal areas in Hawaii. (Kumashiro HDOA)

Parasitized Whitefly Nymph

Parasitoid Emergence Hole

Eulophid parasitic wasp, *Aleuroctonus vittatus*

Spiraling Whitefly heavily parasitized by parasitic wasps

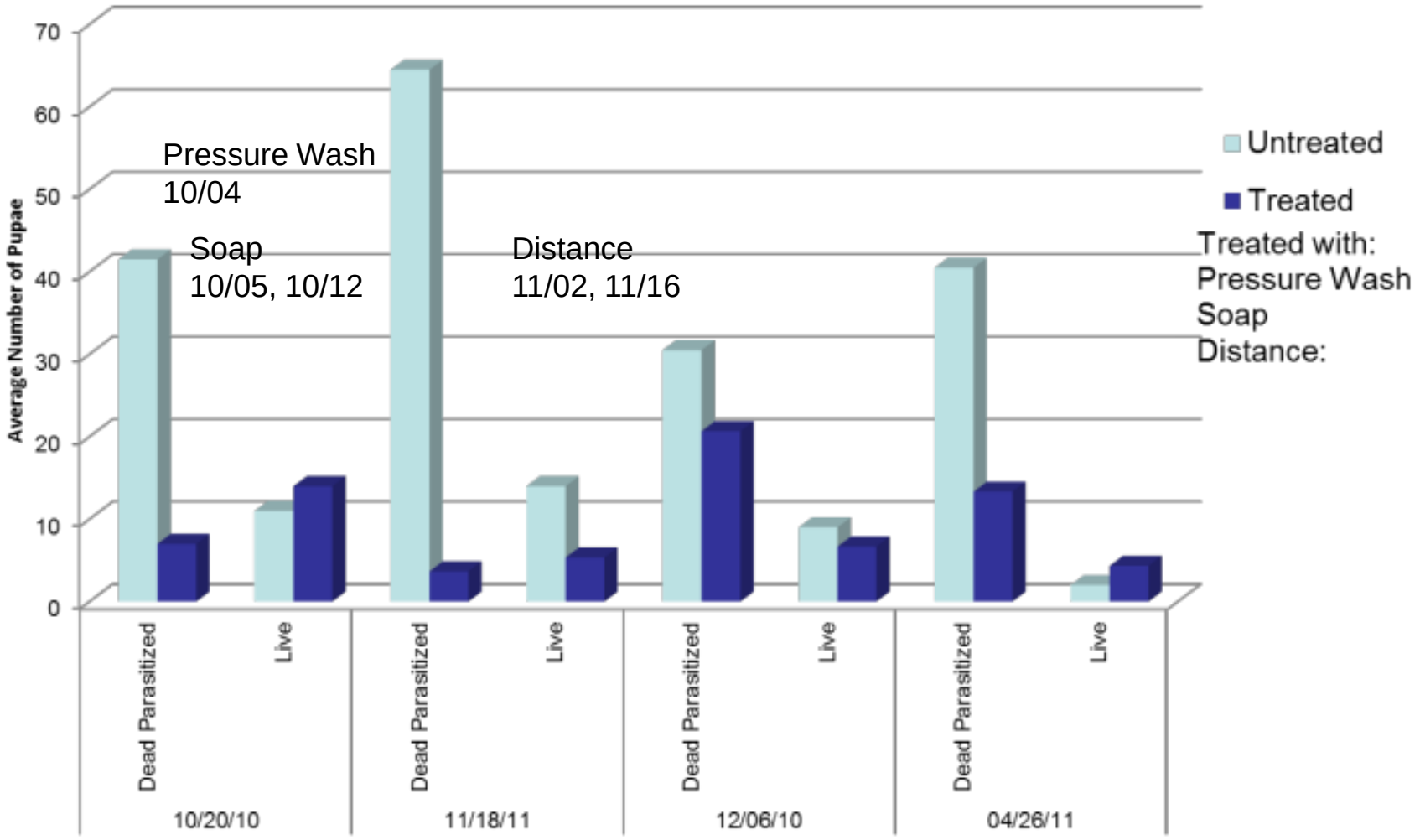
(Note 4th Instar pupae with round exit holes)

Treatments against SWF at Islands at Mauna Lani

*Pressure water wash on 10/04/2010
*Treated with insecticidal soap on 10/05 and 10/12.
*Treated with insect growth regulator, Distance 11/02 and 11/16.

*On 10/20/10 noted control of early instar nymphs, but adults, pupae, late instar nymphs and eggs are present.
*Minimal to no parastism and no predators present.

Whitefly 4th Instar Pupae on Plumeria at Islands at Mauna Lani



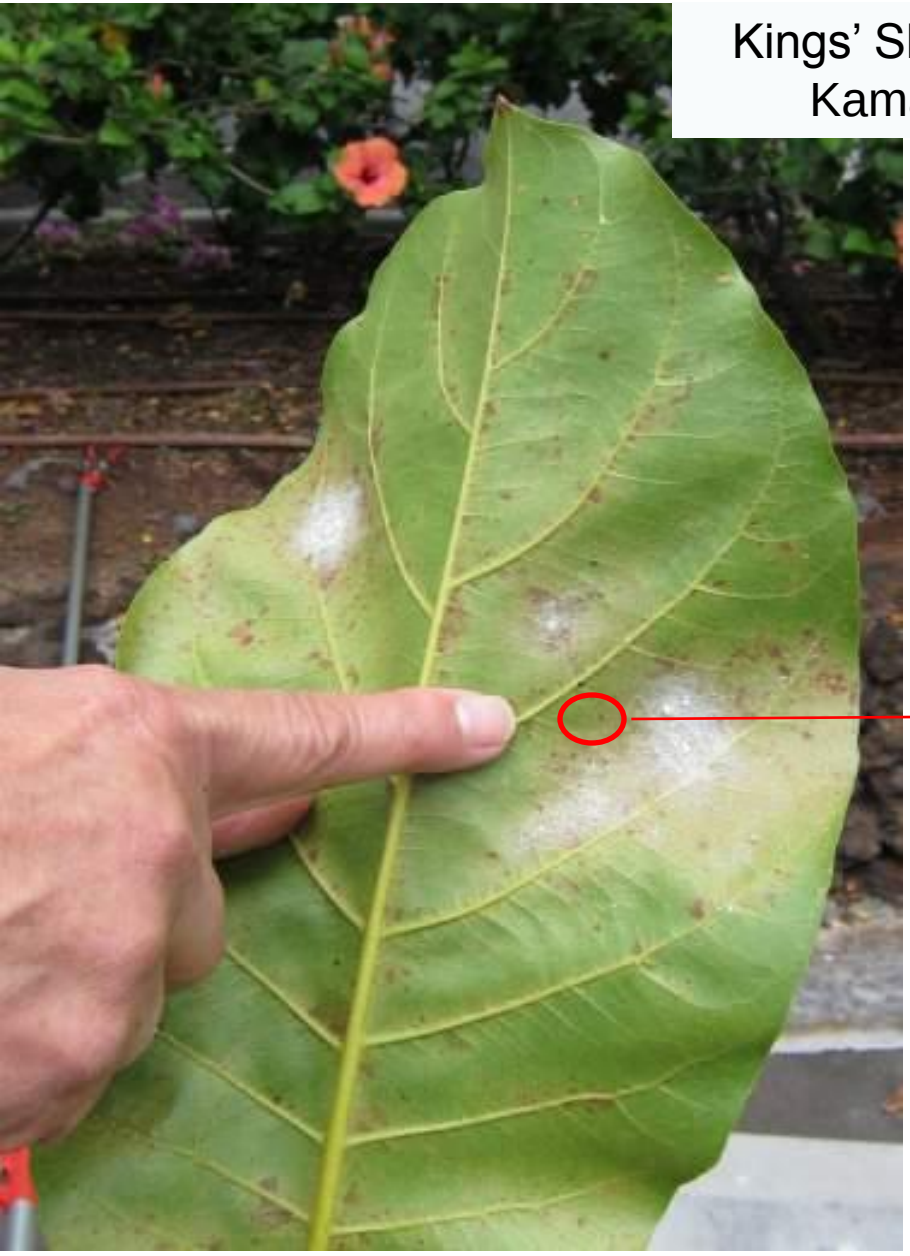
Dead or Parasitized and live Pupae from Oct 2010 to Apr 2011

***Overall, untreated had more dead and parastized pupae and was as effective as treated.**

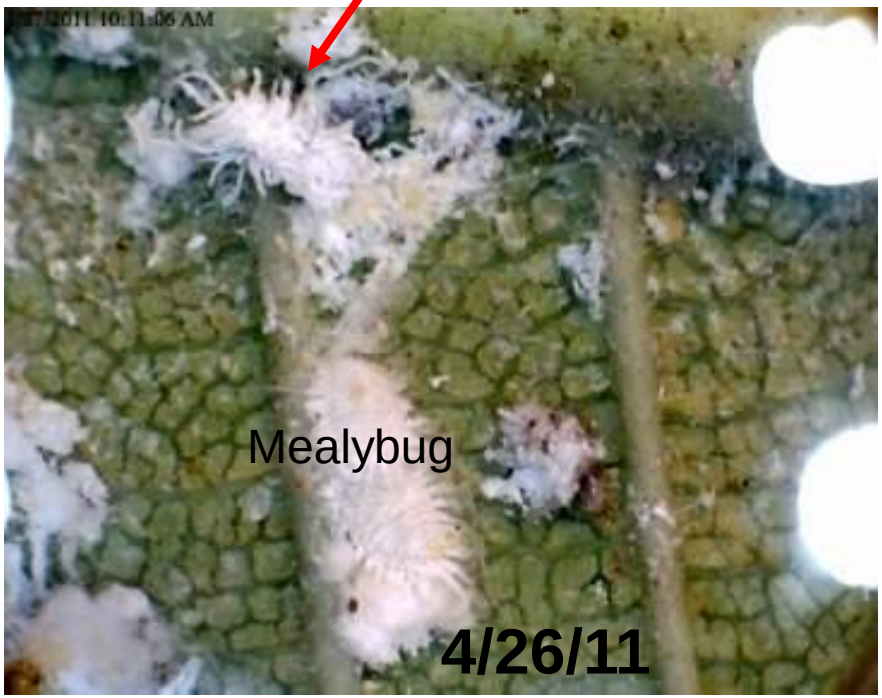
***Wash, Soap and Distance lowered live pupae on 11/18 to 12/05.**

Predatory beetle feeding on whitefly

Kings' Shop 4/26/11
Kamani Leaf



Mealybug Destroyer, Ladybeetles, Parasitic wasps
working on Papaya Mealybug on Plumeria



Biological Control:

4 species of ladybeetles.
3 species of tiny parasitic wasps providing excellent in most situations in Hawaii.

Biological Control of Mealybugs

http://www.youtube.com/watch?v=l69sltGaZW0

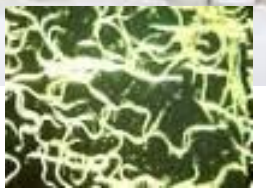
Inundative Biological Control

Live Biological Control Agents for Sale in Mainland U.S.

Parasite for Aphids

Parasite for whiteflies

Ladybeetle for mealybugs



Nematodes for Root weevils

Predatory Mite

*Inundative releases works best in totally enclosed greenhouses.
*Most of these parasites and predators already occur naturally. HI
*Importation and sale in Hawaii requires Hawaii Dept. of Ag permit and approval.
*Expensive, e.g. 3,000 whitefly parasites for $97.95 (ARBICO Organics)

Summary

*Most importantly, recognize natural enemies (parasitic wasps and predators) of whiteflies.

*Avoidi the use of broad-spectrum insecticide, such as OP's carbamates and pyrethroids, to conserve natural enemies.

*Use more selective insecticides and application methods, such as drench application of neonicotinoids (Merit, Safari, Optigard), insect growth regulators (Distance,Talus), to avoid negative effects on natural enemies.

*Use of commercial biological control agents in mass numbers is only effective in enclosed greenhouses and requires permit.

*Continuously monitor whitefly infestations for natural enemies.

Conclusion

Comments from Insect Taxonomist, Bernarr Kumashiro, HDOA

“Plumeria is probably the most favorite host of Spiraling Whitlefly (SWF).”

“Plumeria is also a favorite host of papaya mealybug, many other mealybugs, scales, whiteflies, and aphids which love to feed on plumeria.”

“We should encourage resort landscapers to choose other plants, since planting plumeria is just asking for trouble.”

A BIG THANK YOU!

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