

BIOLOGICAL CONTROL OF THE CYCAD AULACASPIIS SCALE



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INDIAN RIVER RESEARCH
& EDUCATION CENTER

1947



CITRUS: SCION AND ROOTSTOCK TRIALS



- Nutritional therapies
- Fertilization guidelines
- Bactericides
- Genomics of fungal pathogens
- Early detection system for CLas
- Oak mulch
- Smart irrigation
- Phosphorus management
- Tolerant grapefruit varieties

RHIZOTRONS: BELOWGROUND IMAGERY OF ROOTS



CITRUS UNDER PROTECTIVE COVER



POSTHARVEST FACILITY



AQUACULTURE RESEARCH AND DEMONSTRATION FACILITY



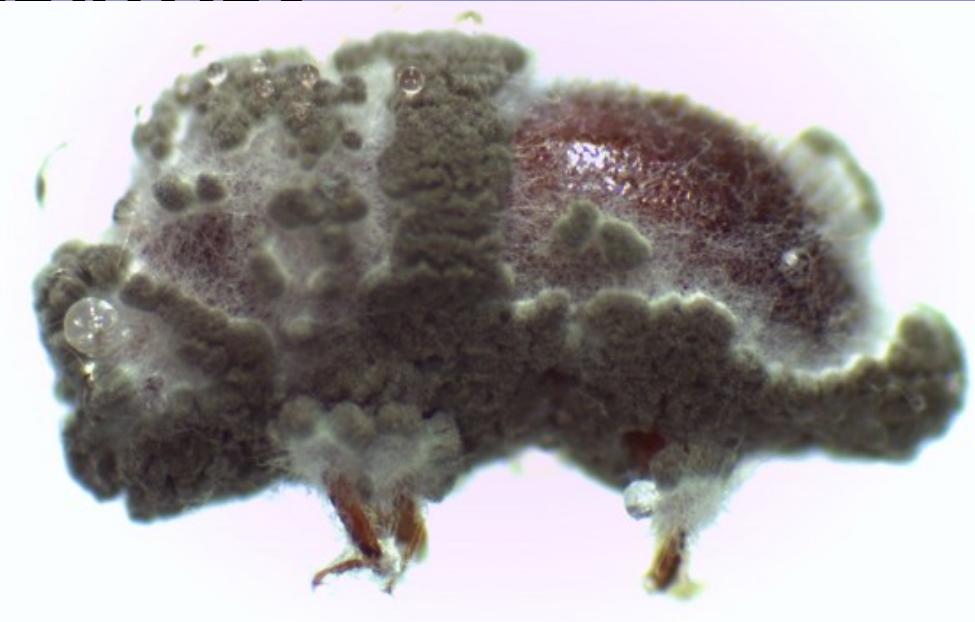
HAYSLIP BIOLOGICAL CONTROL RESEARCH & CONTAINMENT LABORATORY



BIOCONTROL OF WEEDS

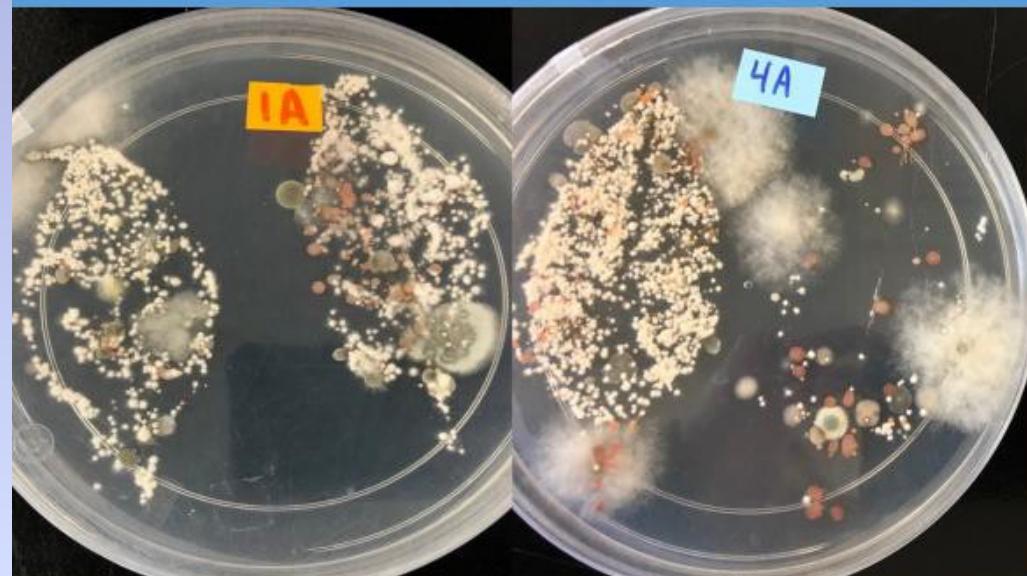
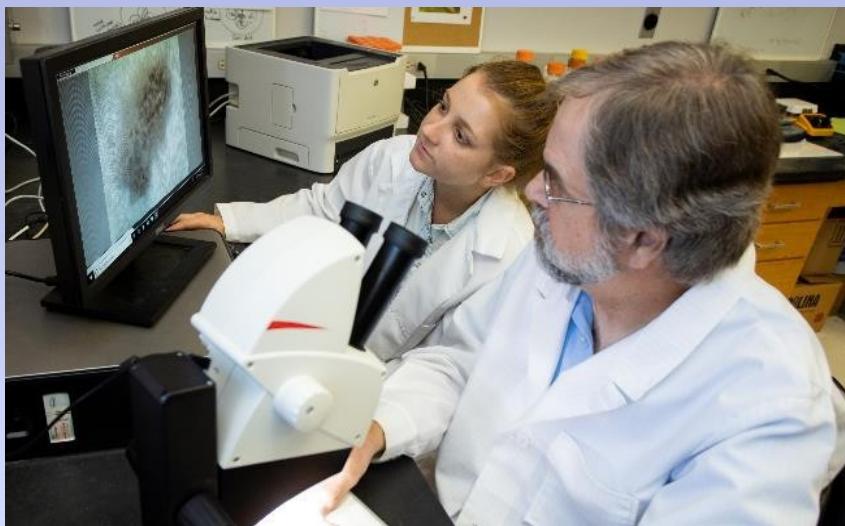


ENTOMOPATHOGENIC FUNGUS RESEARCH LABORATORY



Air Blast Sprayer

Proptec (ULV) Sprayer



BIOCONTROL OF INSECTS

Mexican bromeliad weevil



Yellowmargined leaf beetle



UF / B. Larson

Cycad aulacaspis scale









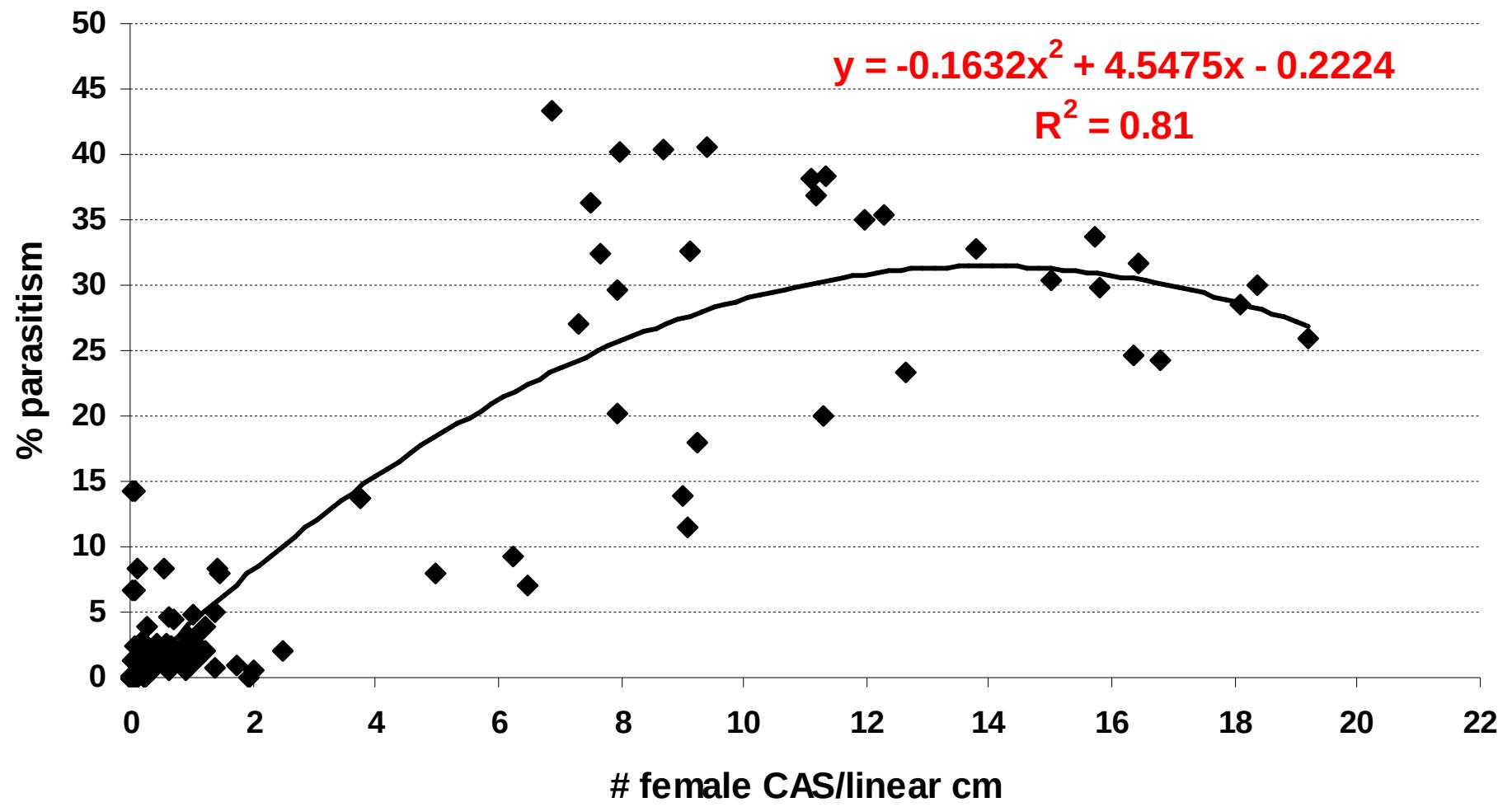
Coccobius fulvus

Native to Southeast Asia

Introduced into FL in 1998



Rates of parasitism on leaflets in Florida



Cybocephalus nipponicus



Larvae and adults are predaceous on many species of armored scales

Larval-pupal parasitoid
Aphanogmus albicoxalis



Rhyzobius lophantheae



Why is it not abundant in Florida?

FOREIGN EXPLORATION

VIETNAM - 2006, 2007



FOREIGN EXPLORATION CHINA - 2006, 2009



FOREIGN EXPLORATION

THAILAND - 2007, 2009



FOREIGN EXPLORATION

Aprostocetus purpureus

- generalist that attacks females scales
- widespread, not too common in Asia



Arrhenophagus chionaspidis

- specialist on male armored scales only
- widespread and abundant in Asia



Aphytis lingnanensis?
Aphytis lepidosaphes?

cryptic species?
biotypes?



- generalists that attack females scales
- widespread for biocontrol in citrus

FOREIGN EXPLORATION

Phaenochilus kashaya

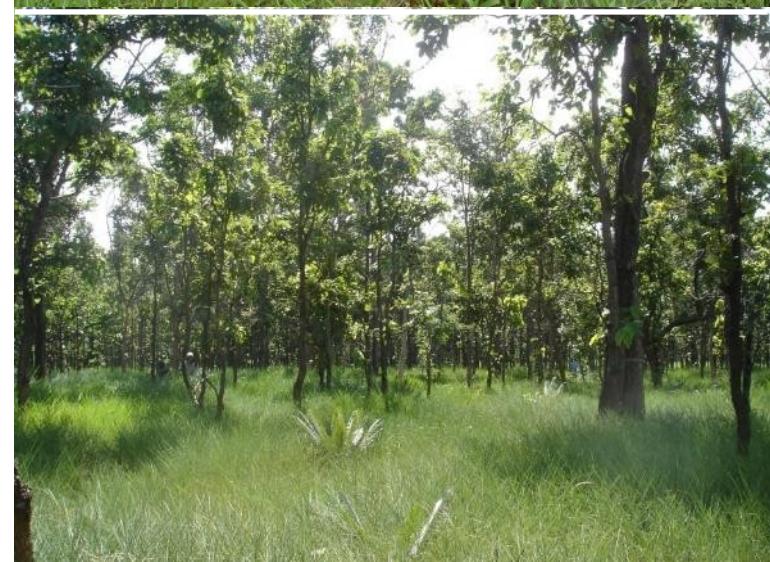


Voracious predator of armored scales

HABITAT OF *P. kashaya* IN THAILAND

Sub Tao

**Sakaerat Environmental
Research Station**



COMPARATIVE DEVELOPMENTAL TIMES

egg hatch-adult at 25° C

Aulacaspis yasumatsui 23 days

Coccobius fulvus 27 days

Cybocephalus nipponicus 32 days

Rhyzobius lophantheae 28 days

Phaenochilus kashaya 39 days

COMPARATIVE FECUNDITY

Aulacaspis yasumatsui

?? “1-10 daily, 50-150 total”

Coccobius fulvus

61 eggs at 25° C

Cybocephalus nipponicus

288 eggs at 22° C

Rhyzobius lophantheae

50 eggs at 24° C

Phaenochilus kashaya

339 eggs at 20° C

COMPARATIVE CONSUMPTION RATES

at 25° C

<i>Coccobius fulvus</i>	61/adult female
<i>Cybocephalus nipponicus</i>	20/larval period
<i>Rhyzobius lophantheae</i>	75/larval period 2-3/adult day
<i>Phaenochilus kashaya</i>	380/larval period 29/ 5 adult days adult ♀♀ live 158 days

ENTOMOPATHOGENIC FUNGI

Cordyceps javanica



- **73-84% infection rate;
reduced molting rate by 72%**
- **Capable of infecting scales on
leaves, trunk, crown, and in soil?**
- **Field trials needed**

ENTOMOPATHOGENIC NEMATODES, maybe?

Steinernema carpocapsae

Heterorhabditis bacteriophora

Heterorhabditis marelatus

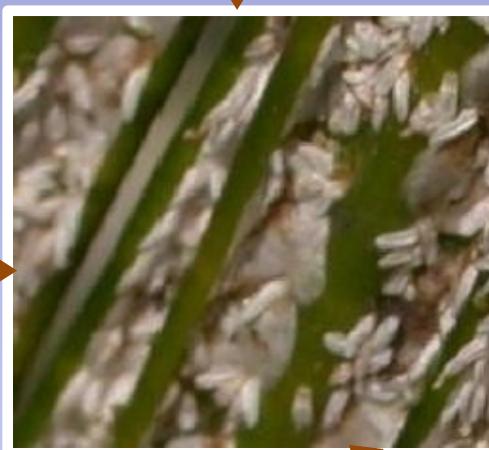
Heterorhabditis indica

- Parasitism by all 4 species, but low
- Capable of killing scales on trunk, crown, soil?
- Need to do lab and field trials again

FIVE AGAINST ONE



SIX AGAINST ONE?



Scymnine lady beetle





SEVEN AGAINST ONE?

