Applied Biological Control Research for Managing Asian Citrus Psyllid

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Why control ACP?

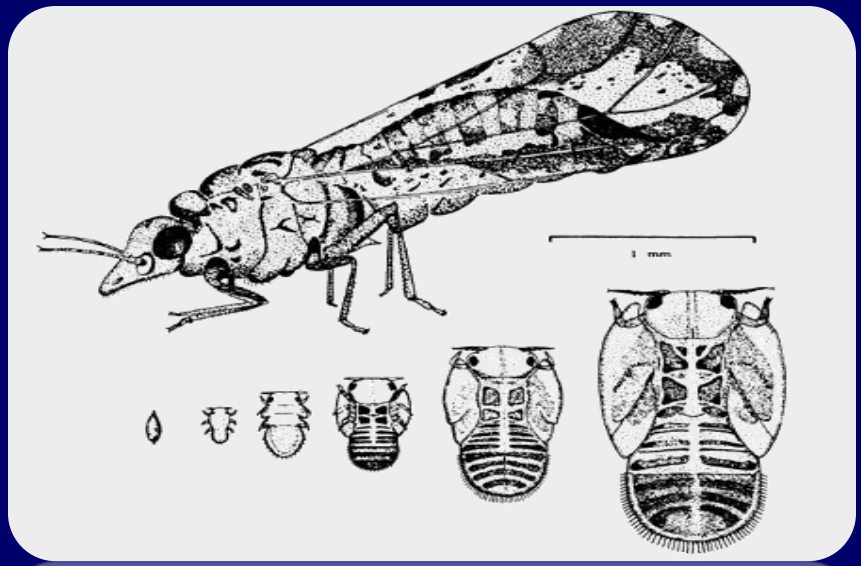
- Vector of the causal pathogens of huanglongbing (HLB) or citrus greening disease
- Reduce incidence and severity of HLB
- Sustain mature bearing groves
- Protect young groves

Asian Citrus Psyllid (ACP)

Adult

Eggs

Nymphs



5 nymphal stages

Biological control of ACP

Predators

Common predators found in the citrus groves

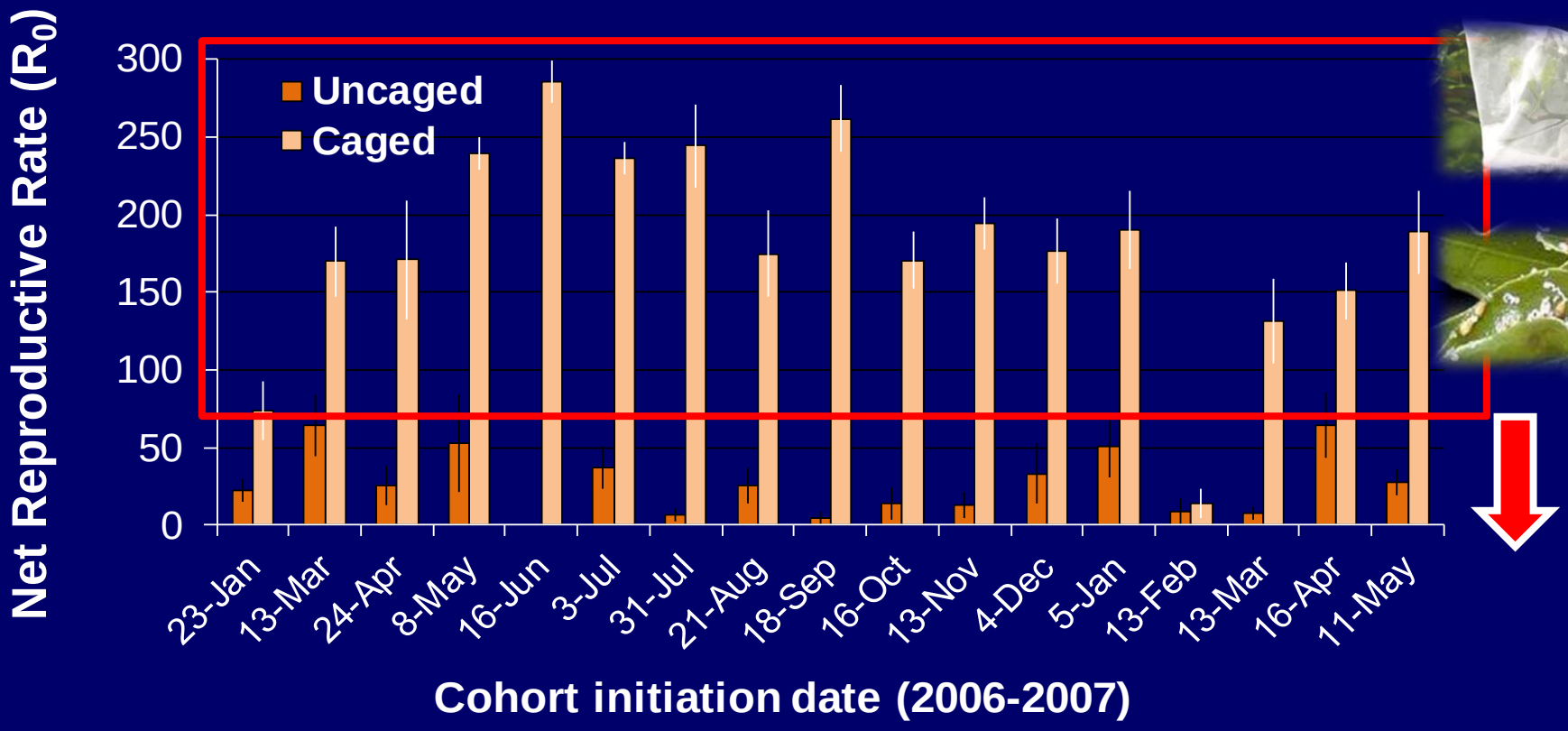
Commercially available predators

Parasitoids

Entomopathogens

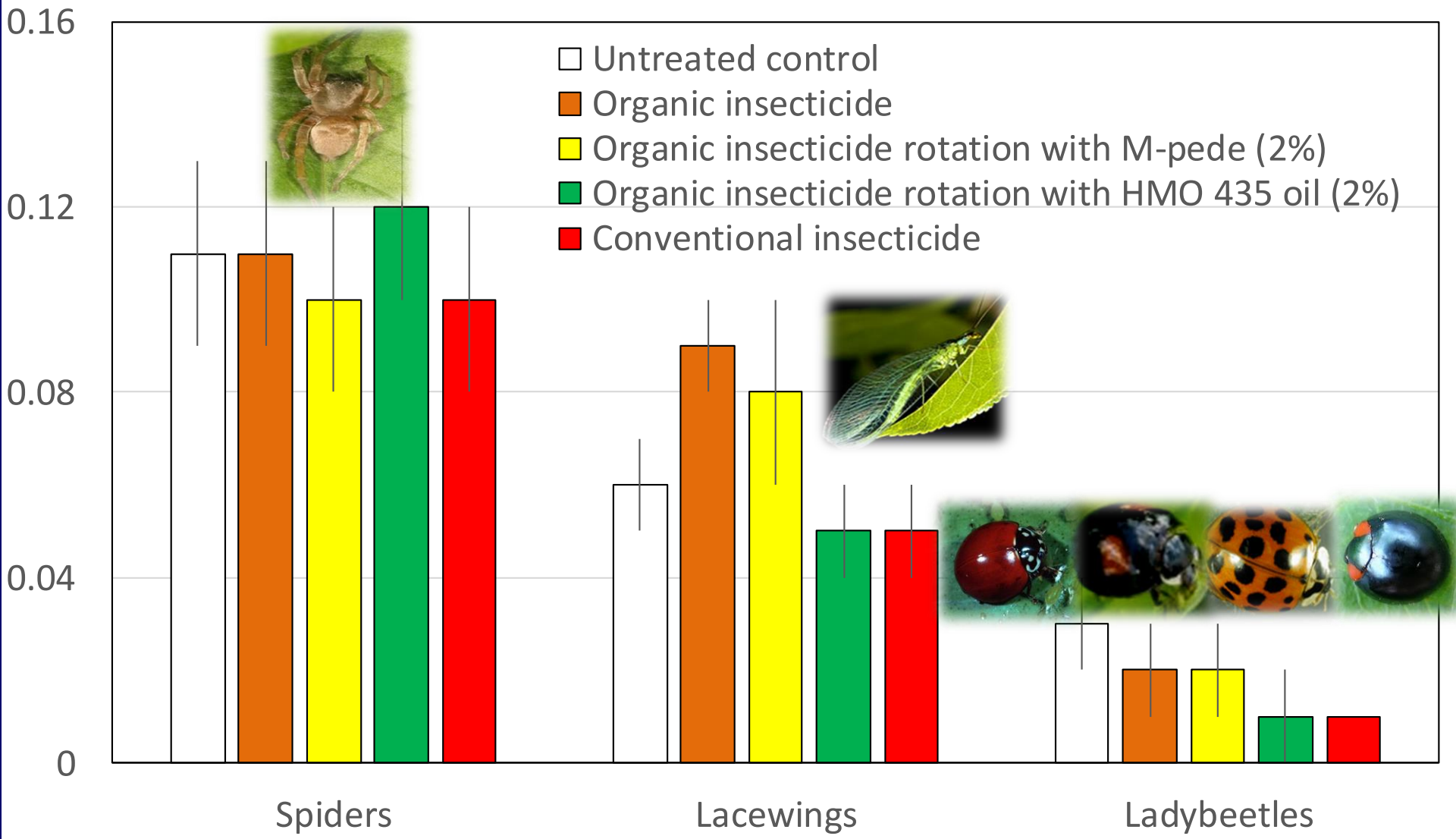
Hirsutella citriformis
Cordyceps fumosorosea
Beauveria bassiana

ACP reduction from naturally occurring biological control

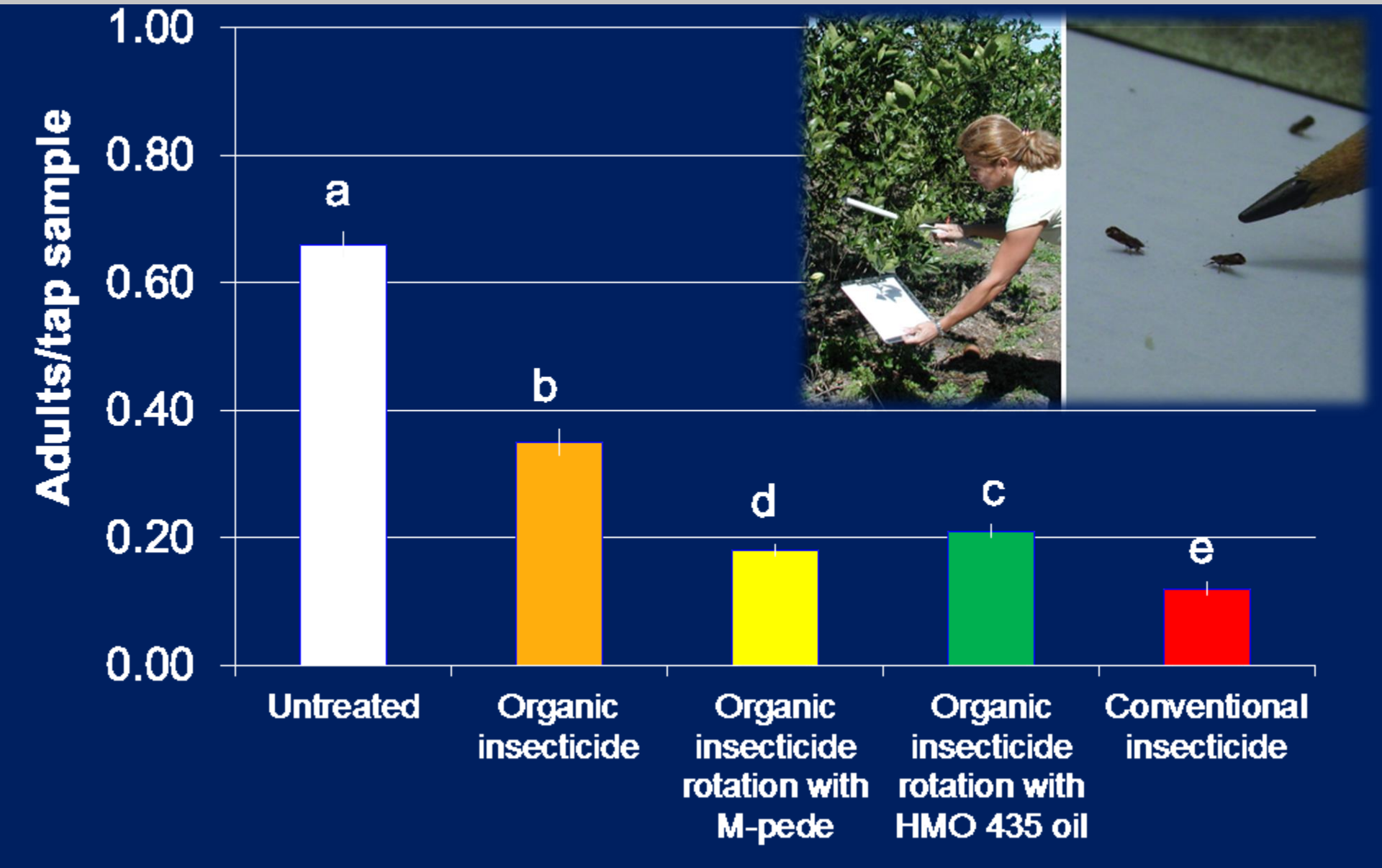


Qureshi and Stansly, 2009 Biological Control

Predator population density
Mean (± SE) no. per tap sample



ACP Population Density (Mean ± SE)
Three Year Average

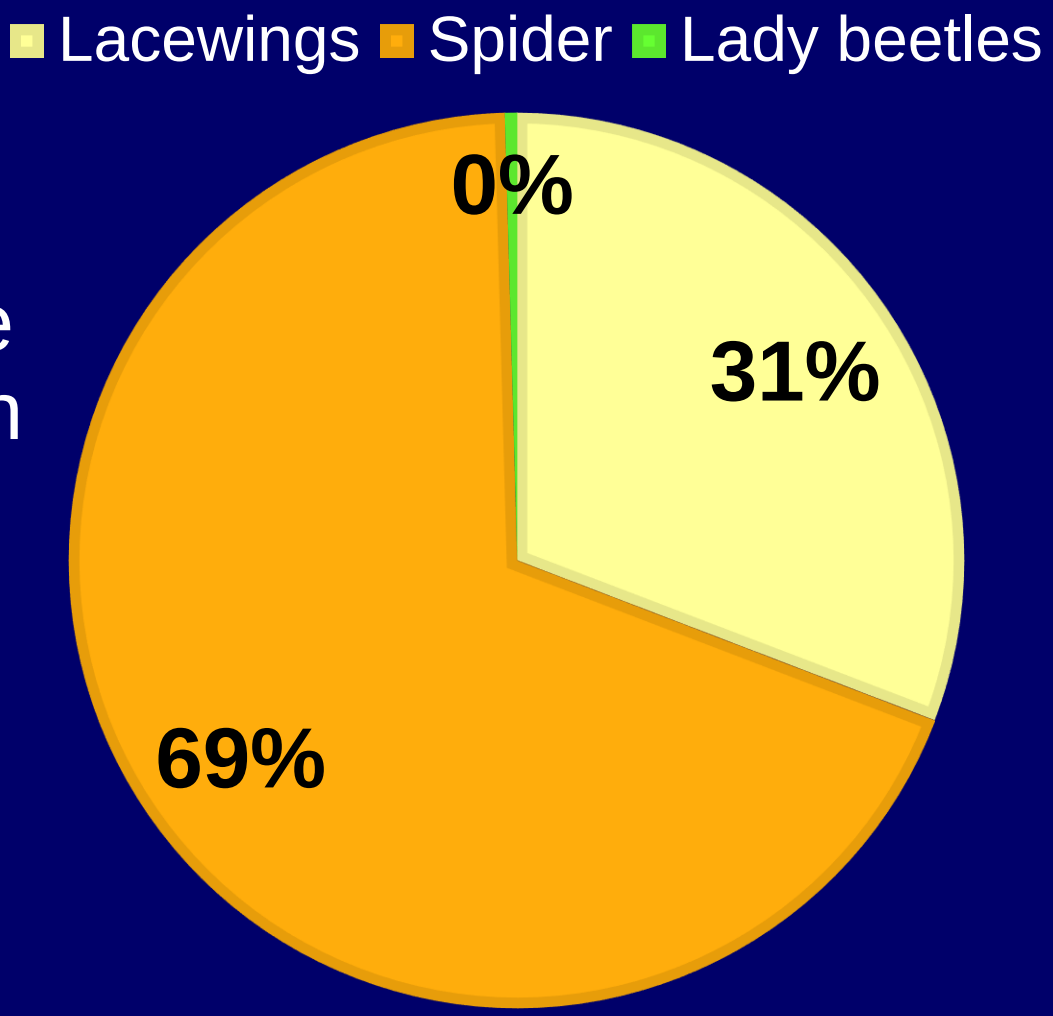


Integrated Pest Management for ACP

- 1. Conventional insecticides (CI), organic insecticides (OI) , and biological control (BC)
- 2. OI, Horticultural Mineral Oil (HMO), and BC
- 3. CI and BC
- 4. HMO and BC
- 5. BC only (the control)

➢ Diversity and abundance of natural enemies and their impact

Percentage distribution of three predatory groups in the collected materials.

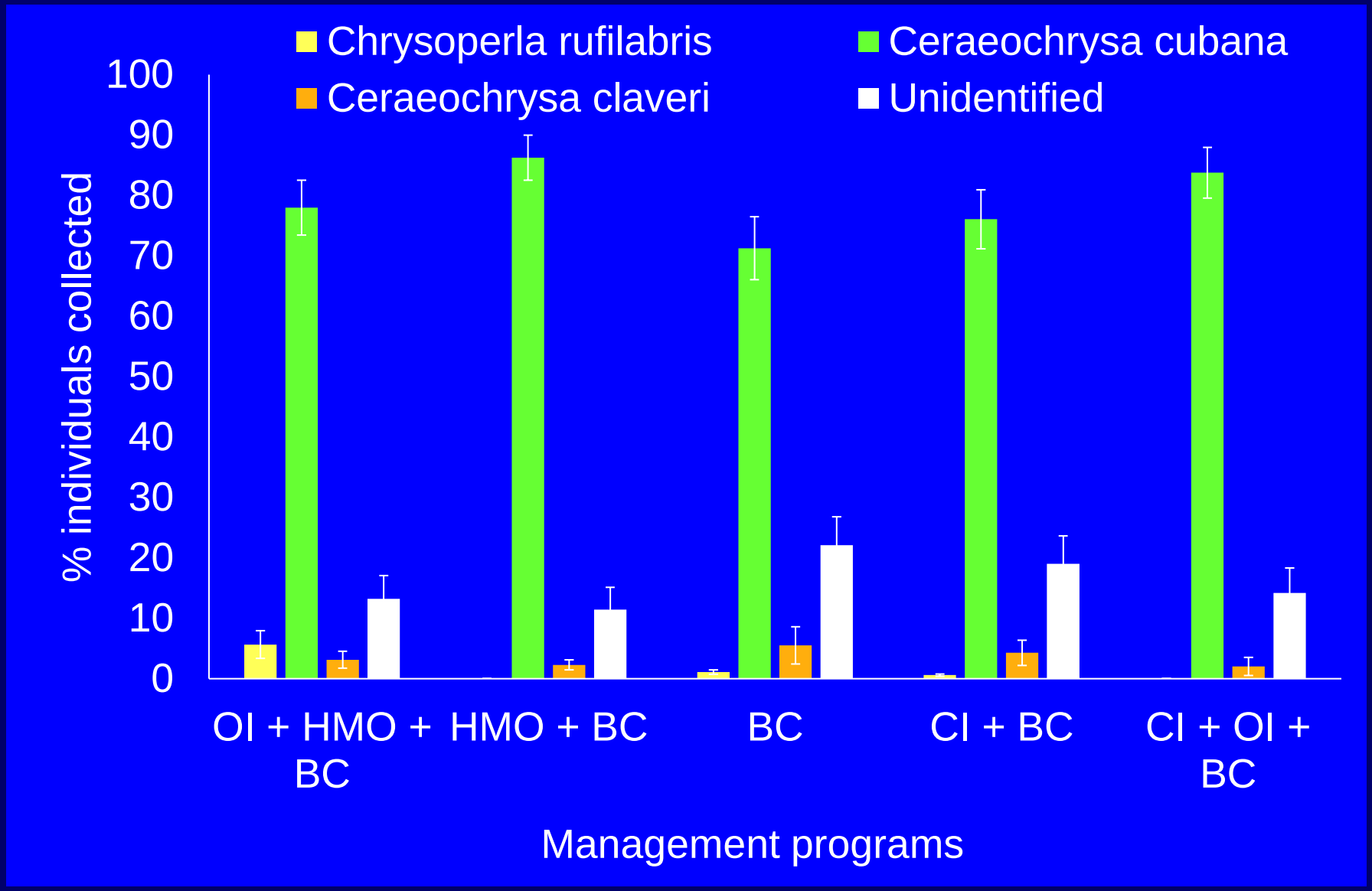


Lacewings: Attack multiple pests including psyllid

Chysoperla

Ceraeochrysa

Abundance of lacewing species in different ACP management programs



Commercially Available Predators

Convergent ladybeetle
Hippodamia convergens

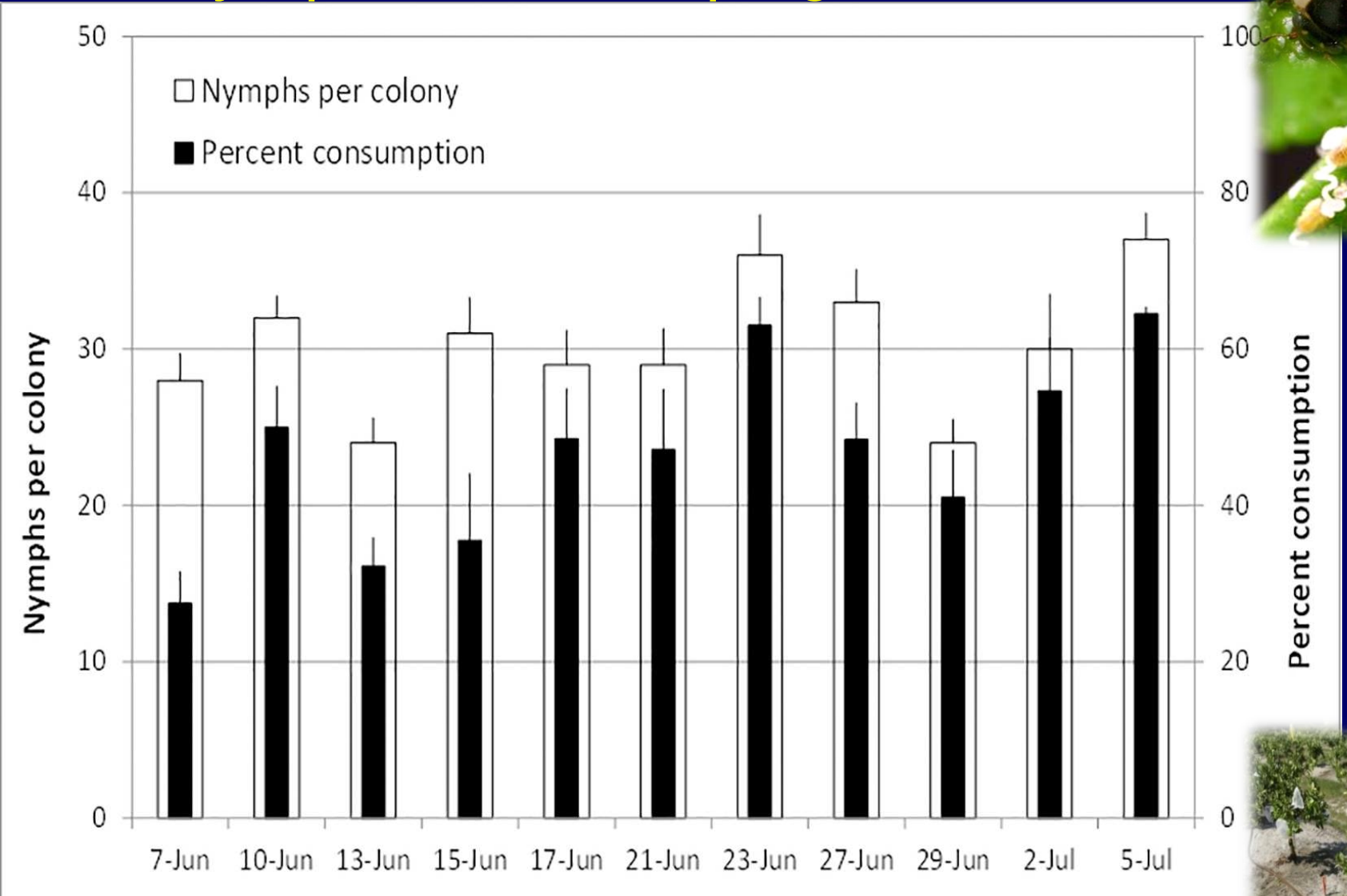
Mealybug destroyer
Cryptolaemus montrouzieri

Two spotted ladybeetle
Adalia bipunctata

Brown lacewings
Sympherobius barberi

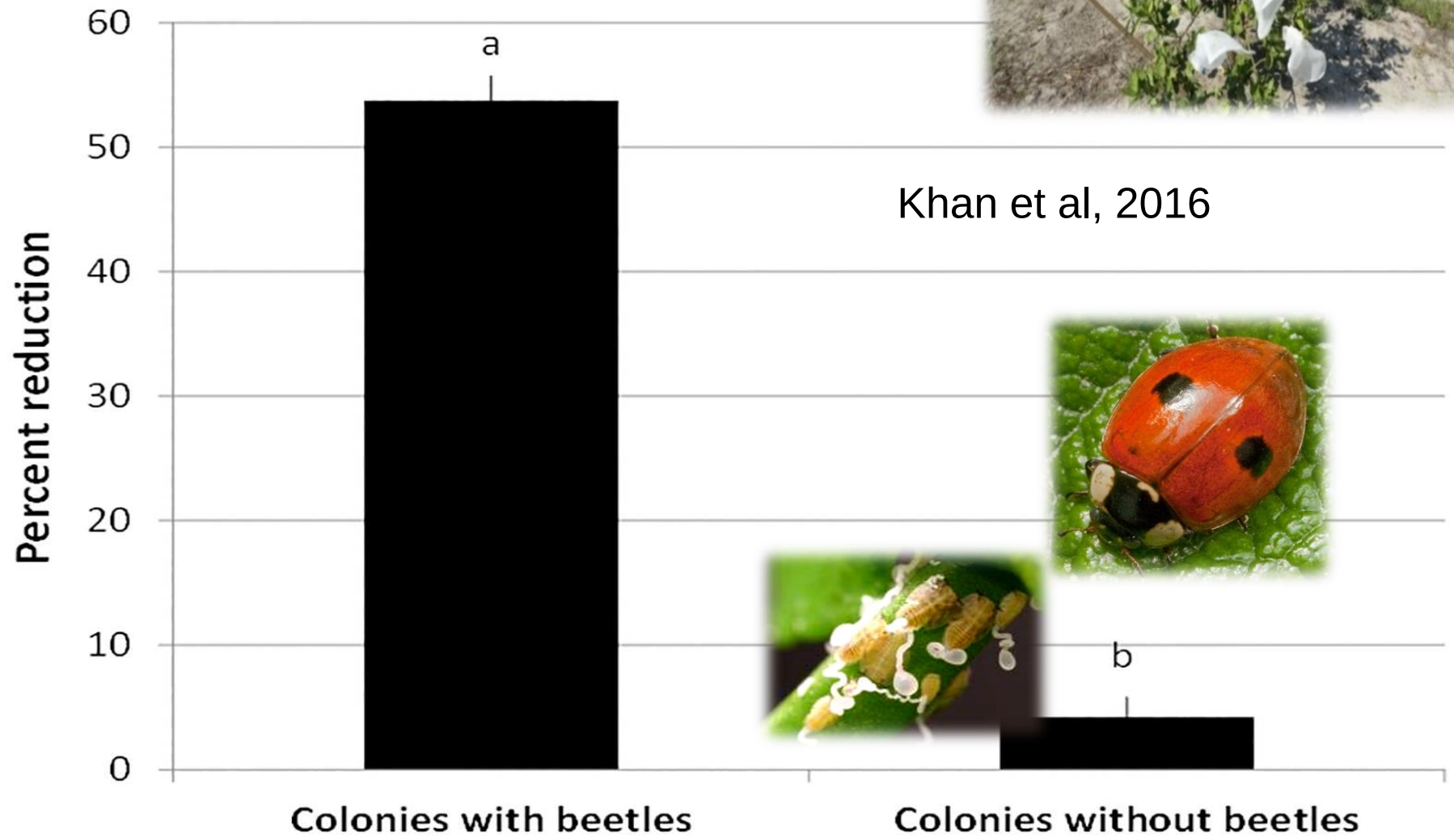
Predatory mite
Amblyseius swirskii

Adalia bipunctata: Ladybeetle consumption of ACP nymphs in developing colonies in the field



Khan et al, 2016

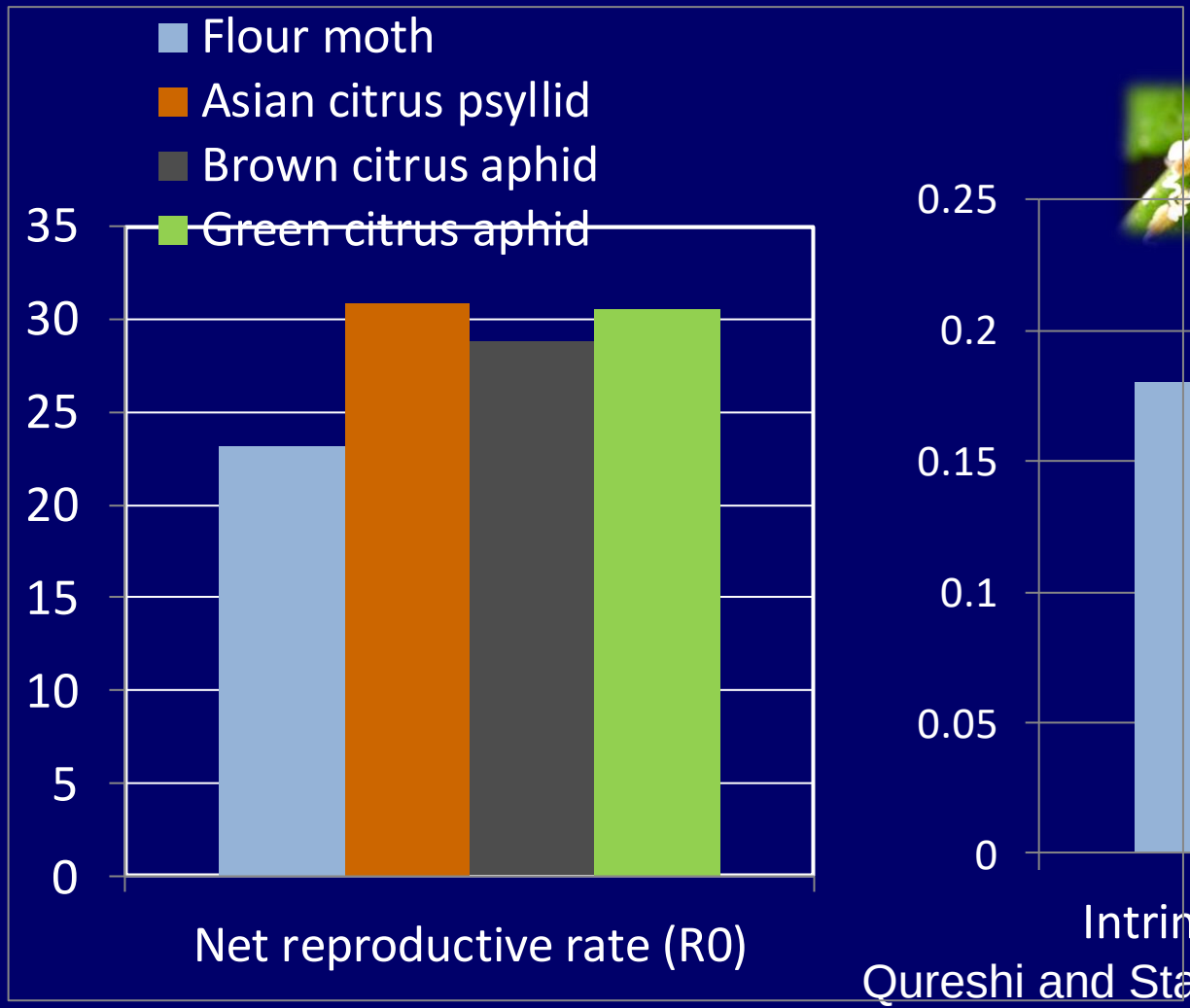
Adalia bipunctata: Ladybeetle consumption of ACP nymphs in developing colonies in the field

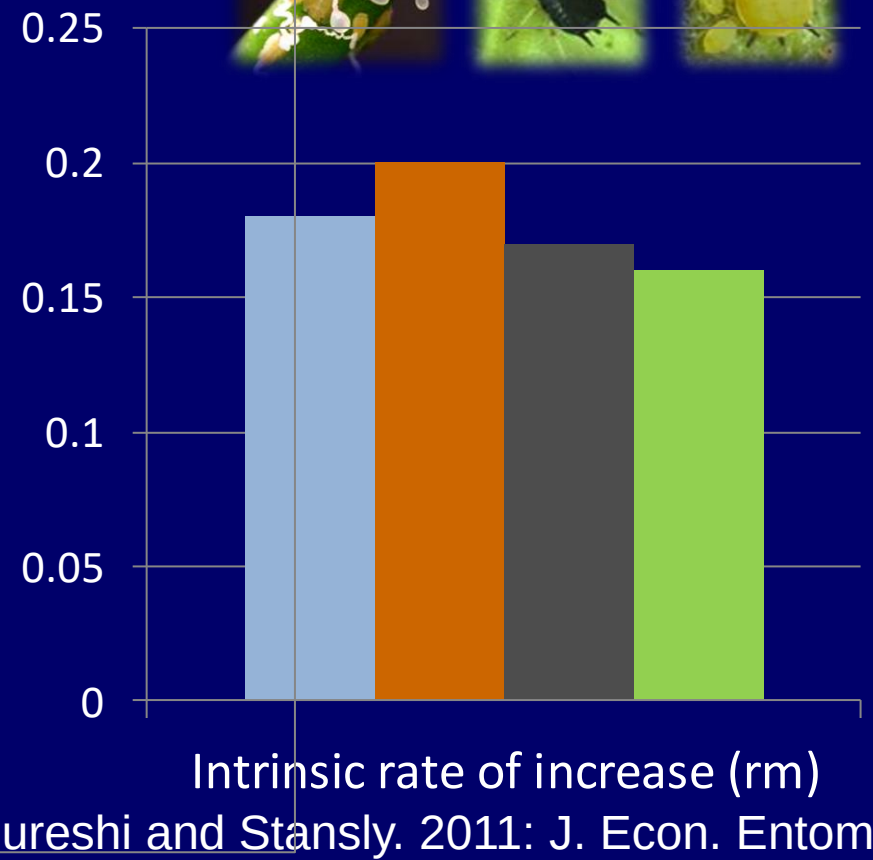


Khan et al, 2016

Adalia bipunctata: Adult and larval consumption of psyllid and aphid nymphs

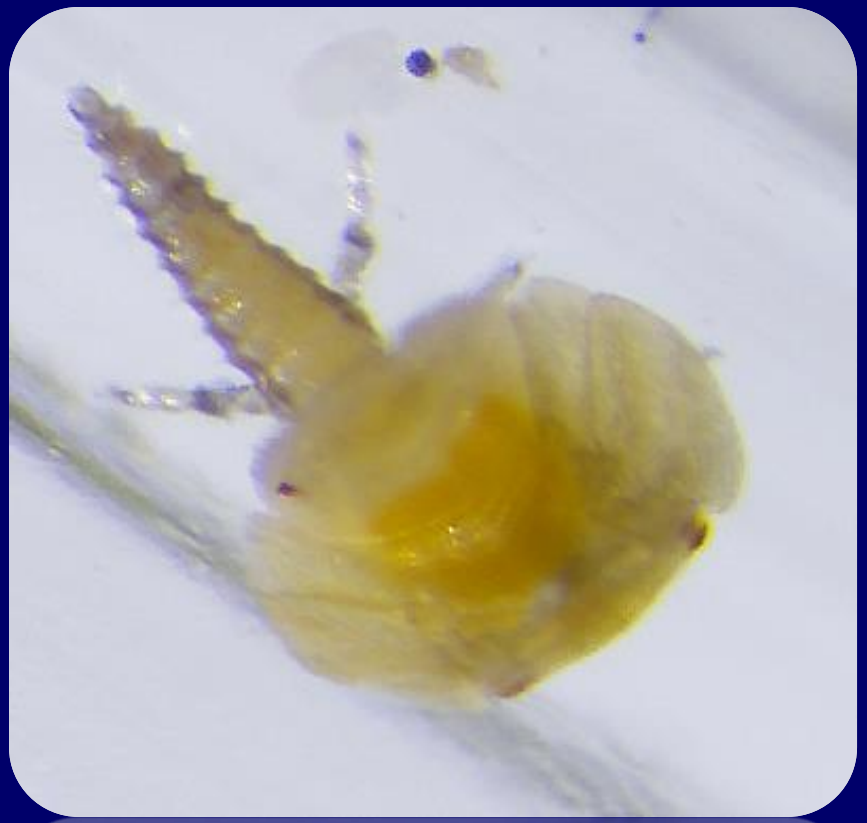
Demographic parameters of *Hippodamia convergens* on three citrus pests



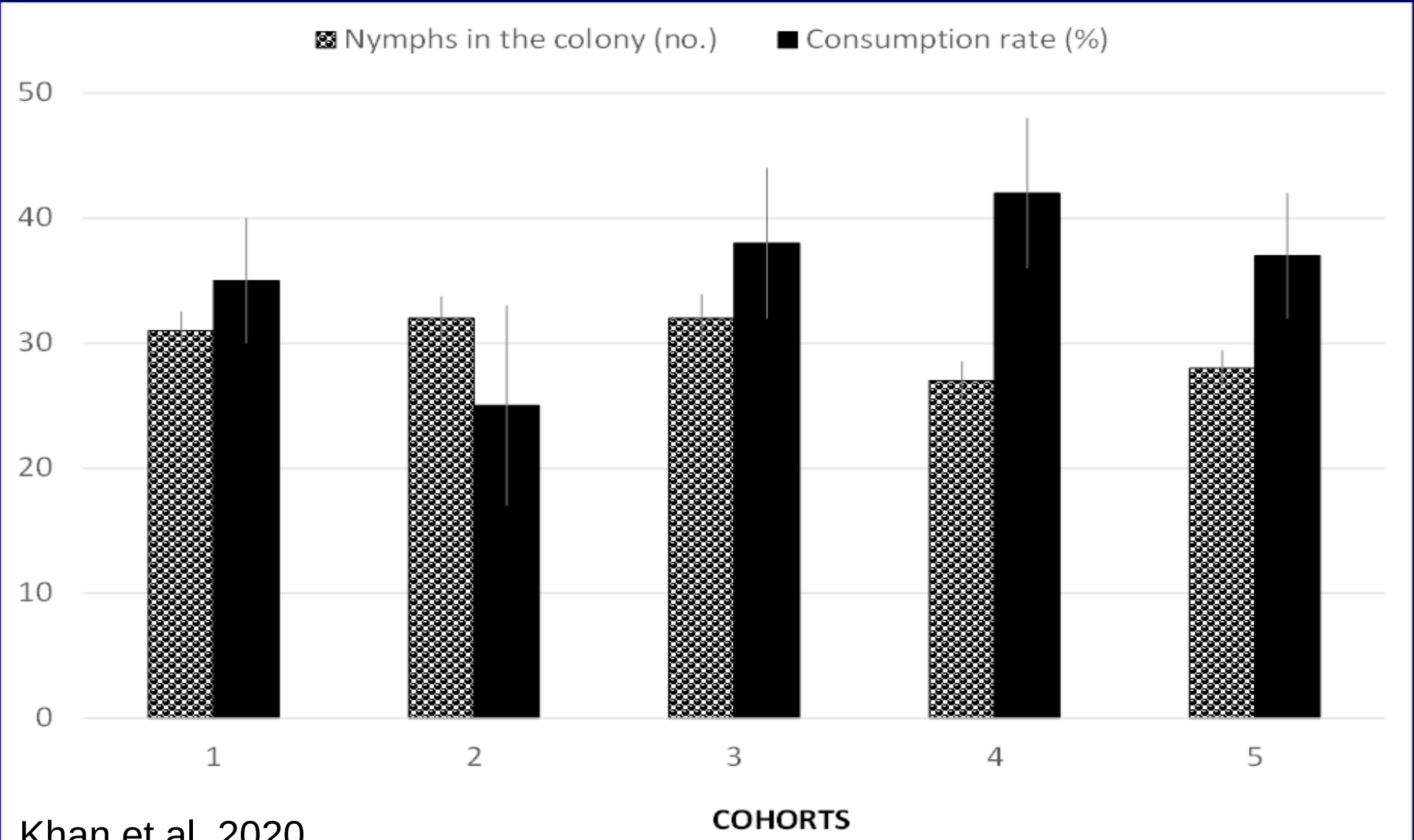


Qureshi and Stansly. 2011: J. Econ. Entomol

Brown lacewing, *Sympherobius barberi*

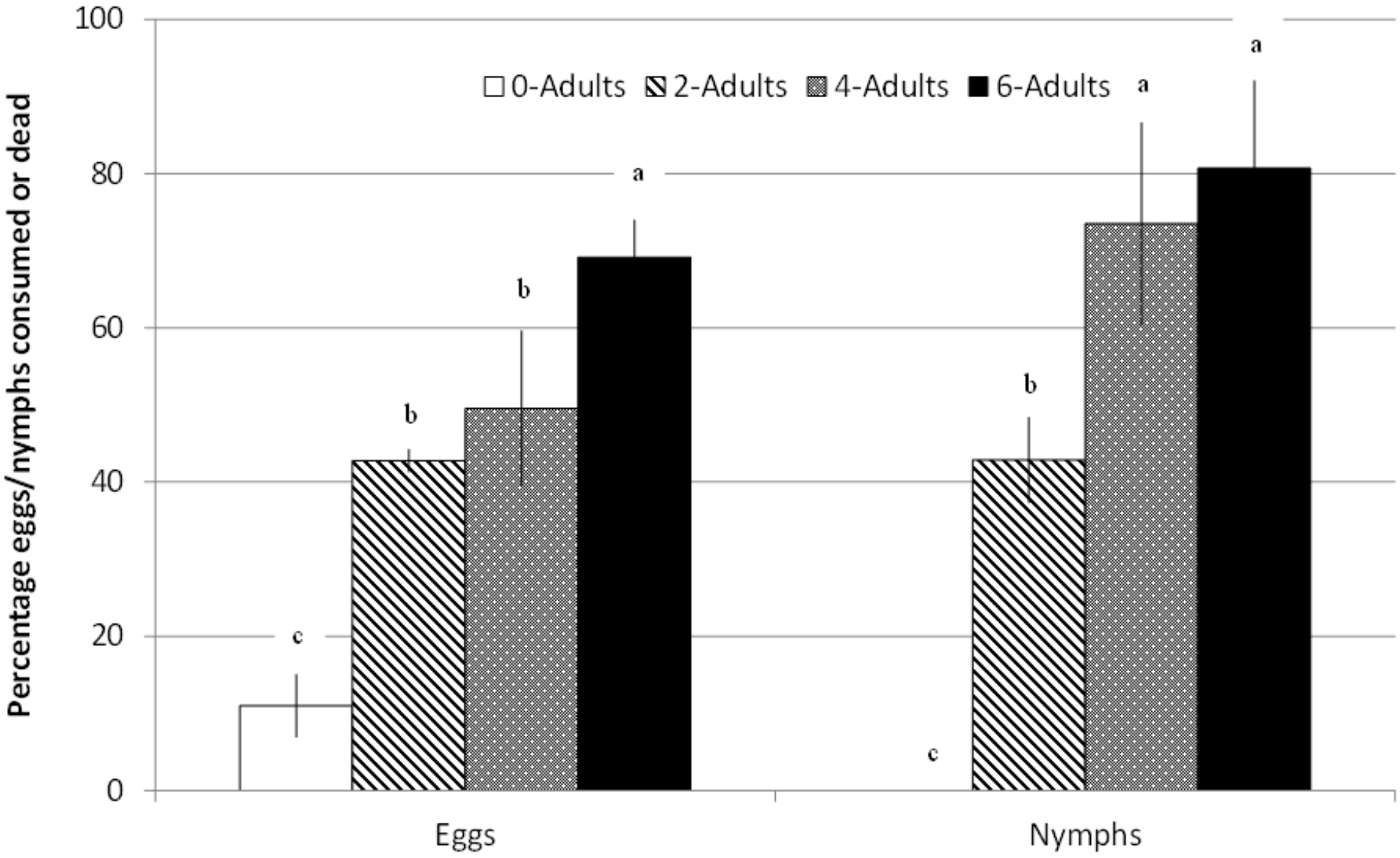


Sympherobius barberi : Consumption of nymphs in developing colonies in the field



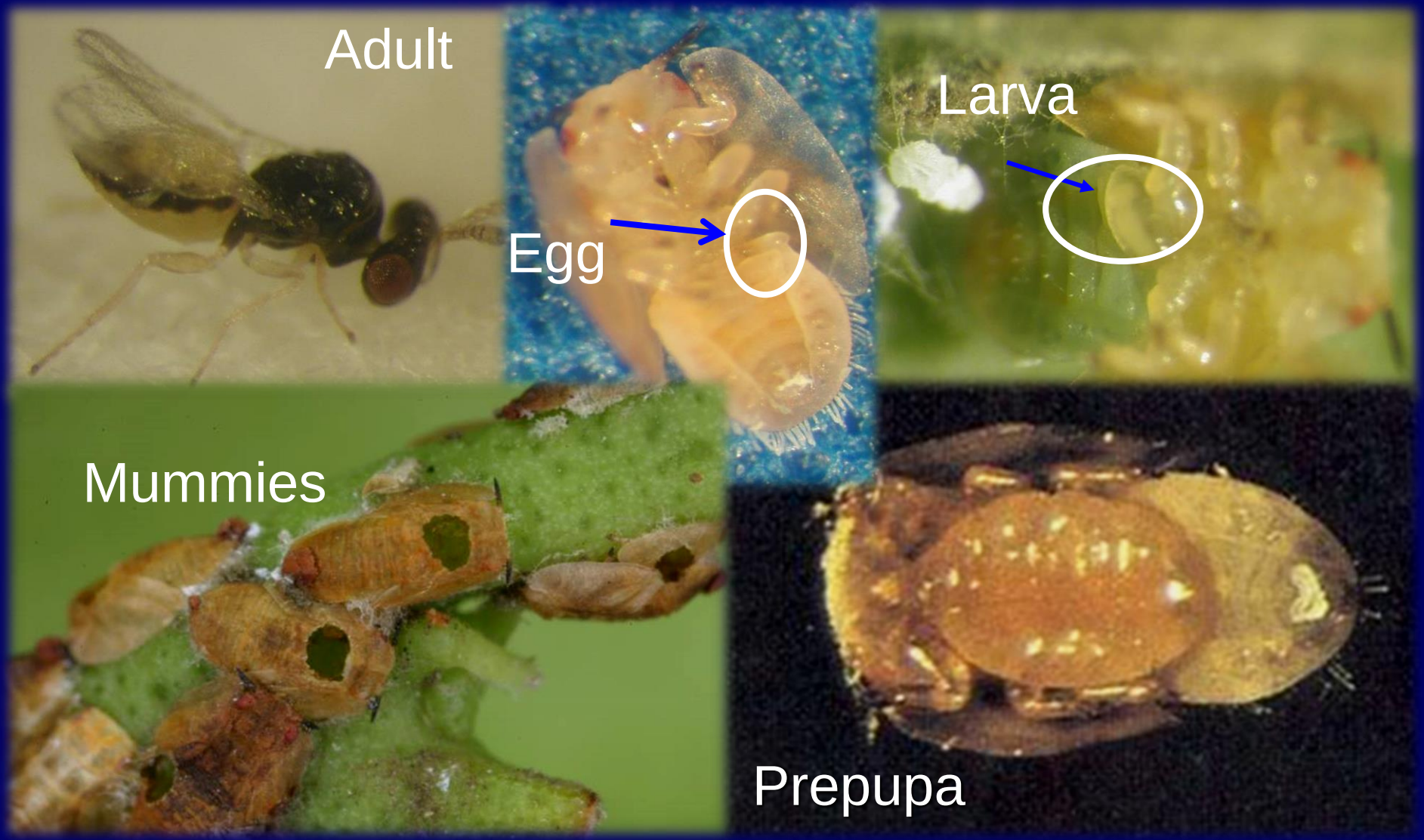
Khan et al, 2020

Sympherobius barberi : Suppression of ACP eggs and nymphs at different release densities



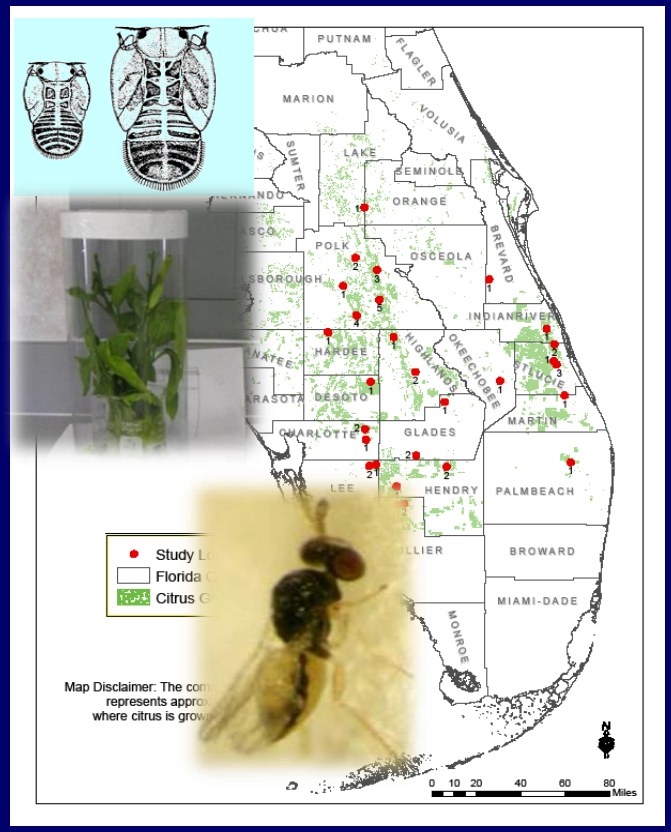
Khan et al, 2020

Parasitoid: *Tamarixia radiata* (Hymenoptera: Eulophidae)

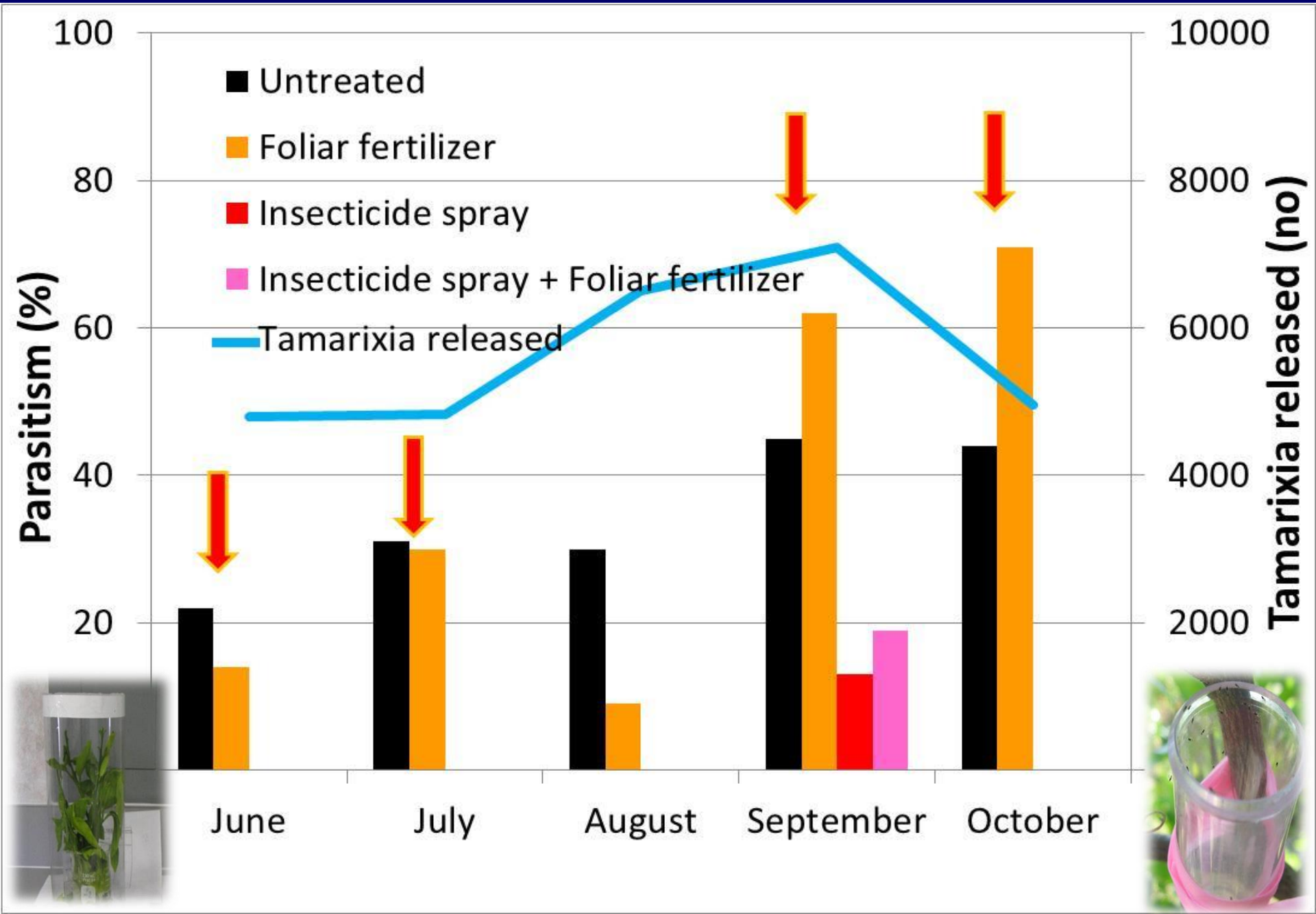


Evaluation of *T. radiata* in Florida citrus (Qureshi et al. 2009, Qureshi and Stansly, 2009) originally brought in from Taiwan and south Vietnam (Hoy and Nguyen, 2001)

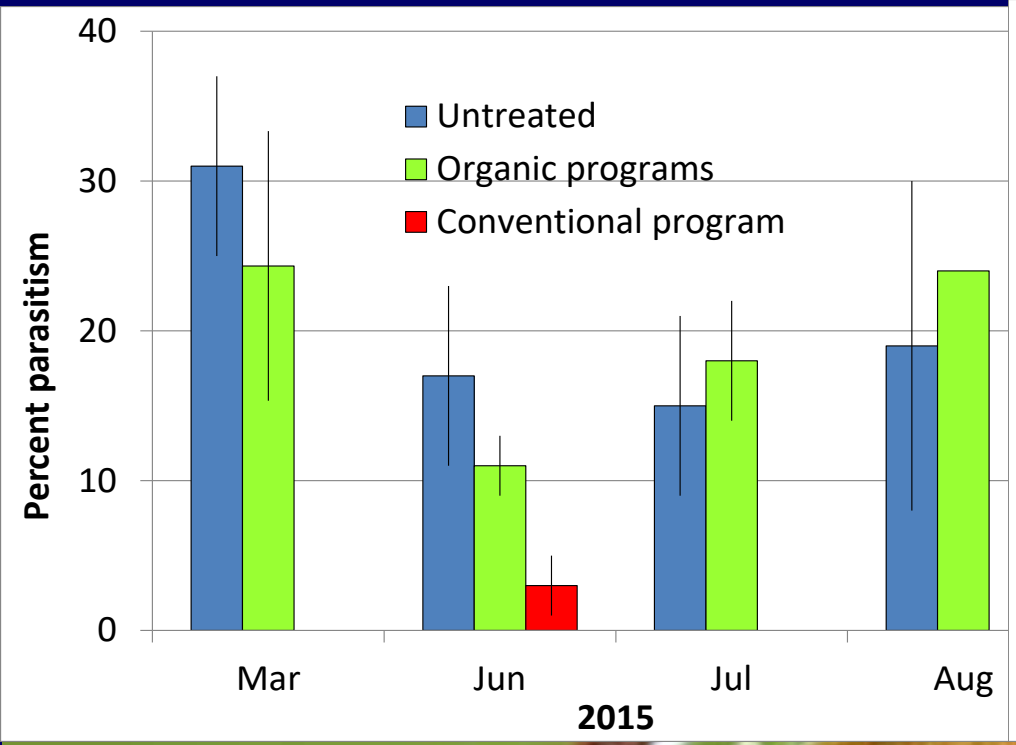
Studies revealed widespread establishment of *T. radiata* throughout Florida, but incidence of parasitism was generally low.

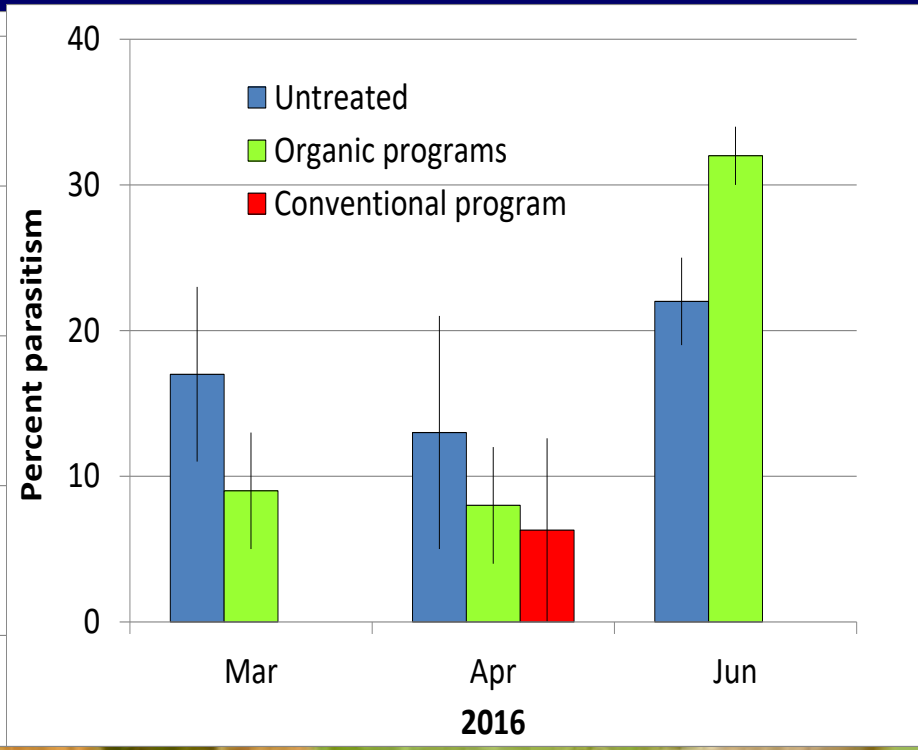


Augmentation of *T. radiata* in commercial citrus

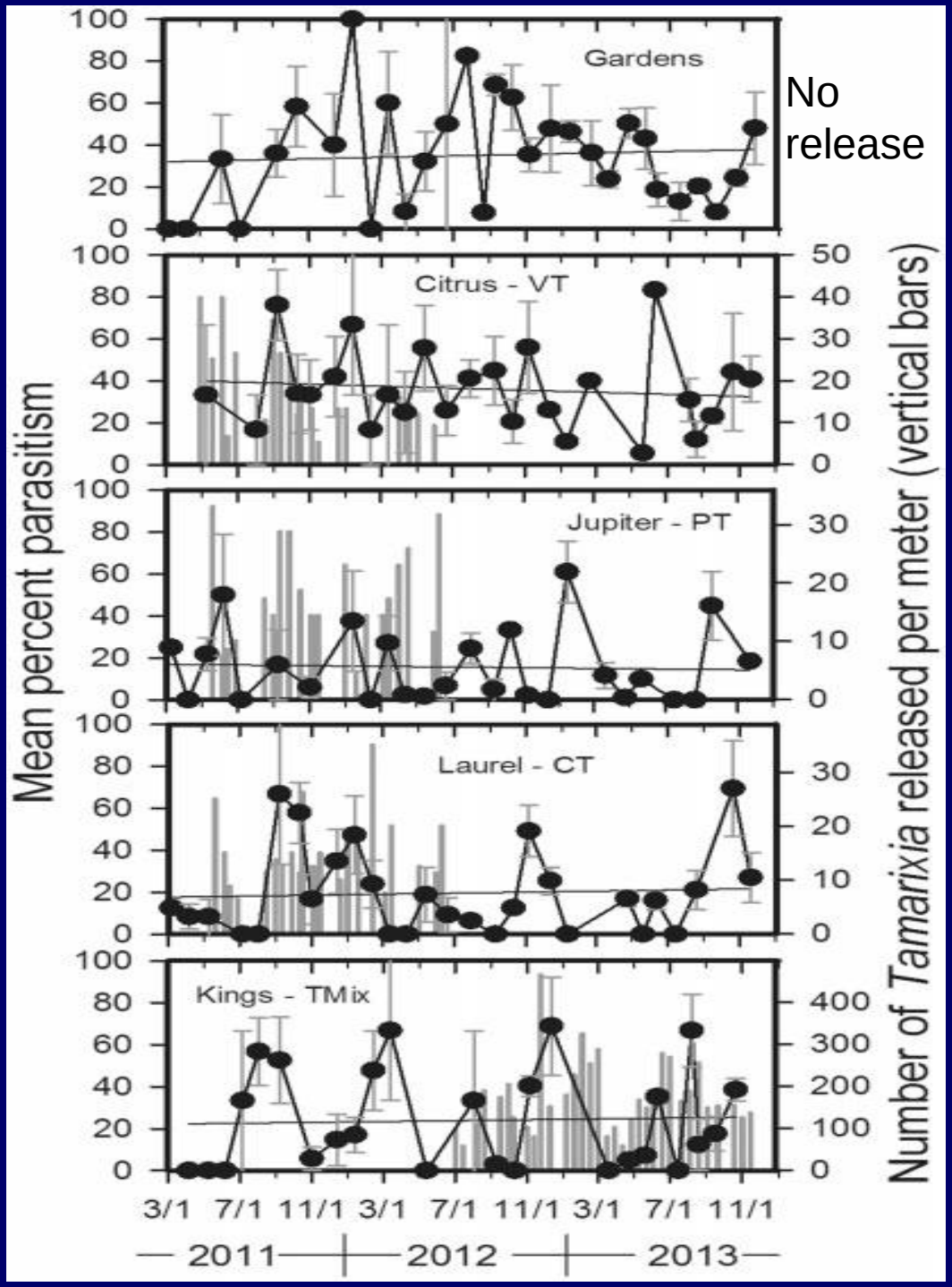


Percent parasitism by *Tamarixia radiata* in organic and conventional programs





Tamarixia radiata releases and parasitism in orange jasmine hedges in Southeast Central Florida



Hall and Rohrig, 2015

Conclusions and Implications

- Predators and parasitoid *Tamarixia radiata* show significant potential in suppressing psyllid populations.
- Successful integrated area-wide citrus pest management require use of all available tools including biological control.
- Evaluation of biological control and Integrated Pest Management in progress in the open and protected systems.

Acknowledgements

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