Biological Control Programmes in the Caribbean

Dra. Yelitza Colmenarez – CABI Latin America

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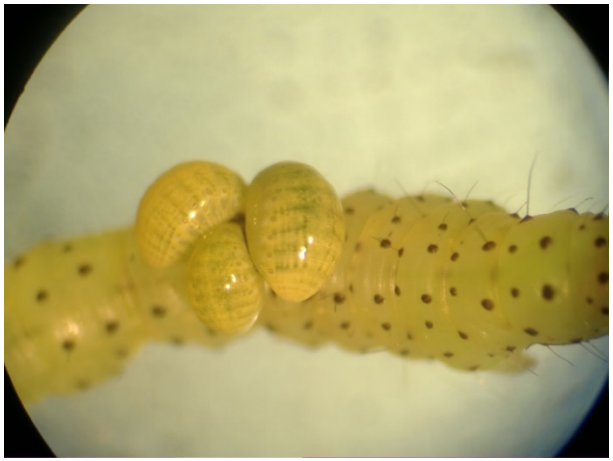
High biodiversity in the Neotropical region
Biological Control Agents



Photos: Yelitza Colmenarez

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Biological Control in the Caribbean

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3 **Biological Control in Barbados**

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3 **Biological Control in Barbados**

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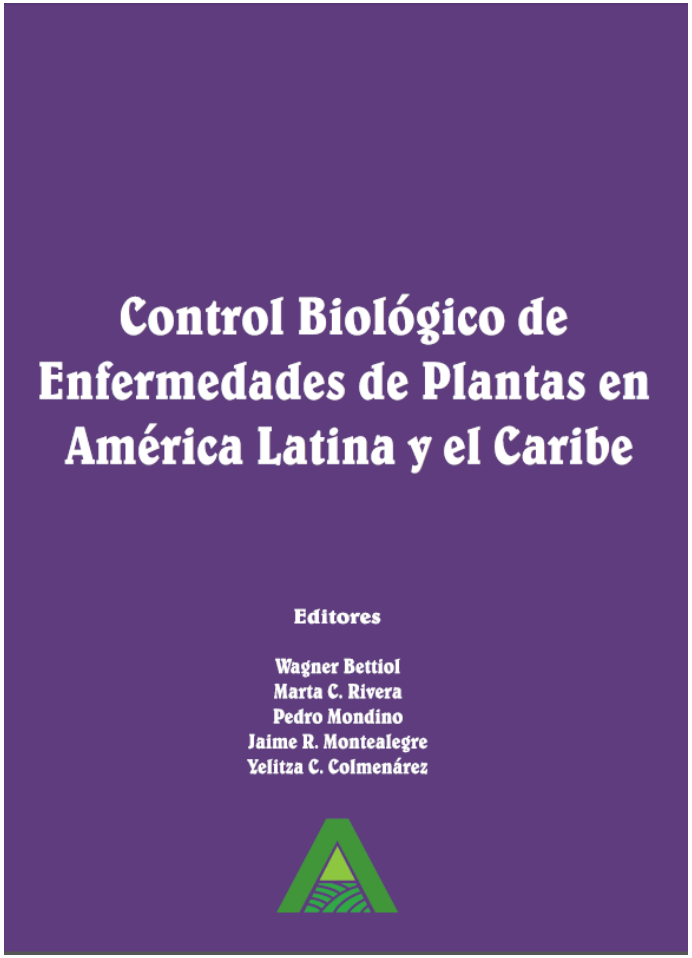
- Parasitoids are most often used, followed by predators, while microbial agents are limited.
- Barbados has regularly served as **provider of natural enemies** for other islands in the Caribbean.
- The island faced at least 25 arthropod invasions of pests since 2000, stressing the need of biocontrol solutions.

Biological Control of plant diseases - Caribbean



Capítulo 4

Control biológico de enfermedades de plantas en el Caribe

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Introducción

El control biológico de enfermedades persigue la reducción de la densidad de inóculo o de la actividad de un patógeno para producir enfermedad, llevada a cabo por uno o más organismos diferentes del hombre (Cook y Baker 1983). Debido a la gran biodiversidad de la región, es considerado como un método con gran potencial para el control de enfermedades de plantas, el cual debe ser evaluado para una implementación más amplia.

Mucho antes de terminar el siglo XX había una clara conciencia de la importancia de encontrar métodos de control más sostenibles ya que en base a varias estimaciones, las pérdidas de cosecha por la acción de plagas, enfermedades y malas hierbas había aumentado a pesar de haber multiplicado el empleo de productos fitosanitarios. A la par ya existía la necesidad de introducir criterios de sostenibilidad en las prácticas agrícolas, incluidos aquellos criterios con tendencia a disminuir su impacto en el ambiente. De allí se derivó una creciente actividad de investigación científica, basada fundamentalmente en criterios ecológicos, orientada a conocer mejor, por una parte, los agroecosistemas y, por otra, a aumentar la eficacia de métodos de control distintos al uso de plaguicidas, donde el control biológico ha ocupado un lugar preferencial.

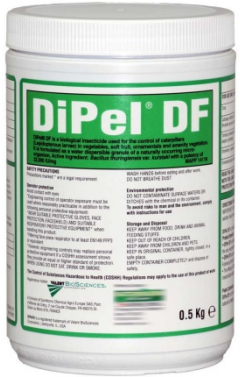
A pesar del creciente interés por los gobiernos de las diferentes islas del Caribe en buscar formas más sustentables de producción agrícola e incentivar el uso de métodos alternativos de control, y la existencia de ejemplos de programas de control biológico de artrópodos exitosos, como es el caso de la cochinilla

Bettiol, W.; Rivera, M.C.; Mondino, P.; Montealegre, J.R.; Colmenárez, Y.C. (Eds.)
Control biológico de enfermedades de plantas en América Latina y el Caribe
ISBN: 978-9974-0-1091-8

https://www.researchgate.net/publication/263070103_Control_Biologico_de_Enfermedades_de_Plantas_en_America_Latina_y_el_Caribe

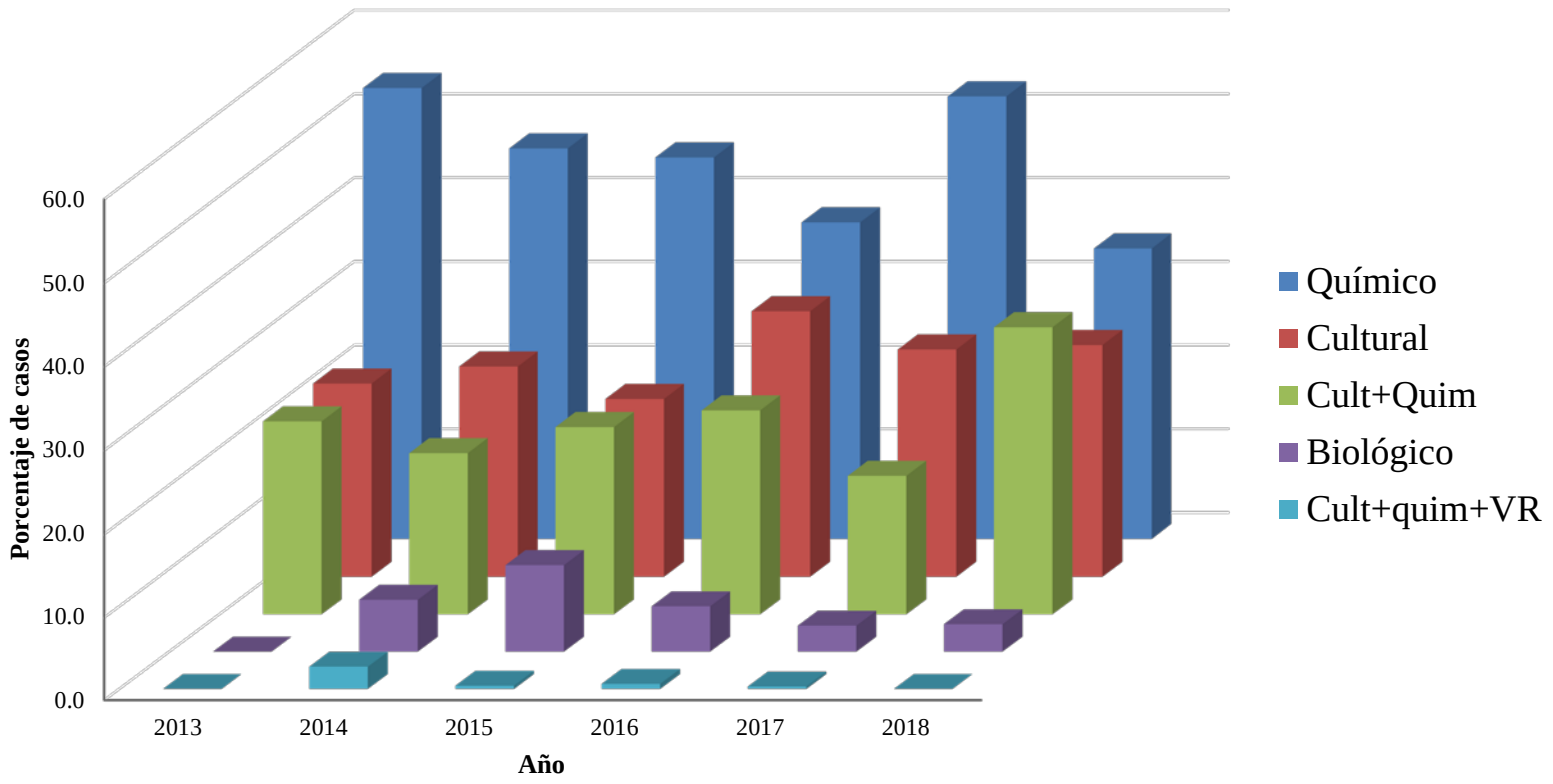
Biological control agents

How frequently Do farmers use them?



Bioproducts vs Conventional method of control

Trend of recommended cumulative control types for pest and disease control - Case 1 (2013-2018).



CABI – POMS (2013-2018)

Availability of Biological Control Agents

Despite the Biodiversity and potential for Biological control, the commercialization of Biocontrol Agents remains to be a key factor to increase its utilization.

Van Lenteren (2012), **230** (250) Bio-products are availabe worldwide.

95,2% are Arthropods, 10 Nematodes specie e 1 Mollusca.

Among the Arthropods:

- **52,2% (120 specie) are Hymenoptera,**
- **13,1% (30 species) are Acari,**
- **12,2% (28 species) are Coleoptera**
- **8,3% (19 species) are Heteroptera**

van Lenteren (2012)

Biological Control vs commodities

Sugar Cane

Cotesia flavipes (Hymenoptera: Braconidae) attacking *Diatraea saccharalis*

(Photo: Divulgação/BUG/Heraldo Negri)

- ✓ High efficiency of control
- ✓ More than **3.3 millions of hectares** treated with *C. flavipes* only in Brazil (Parra, 2015).
- ✓ Applied in big areas

Challenges: Calendar of application and technology of application of pesticides

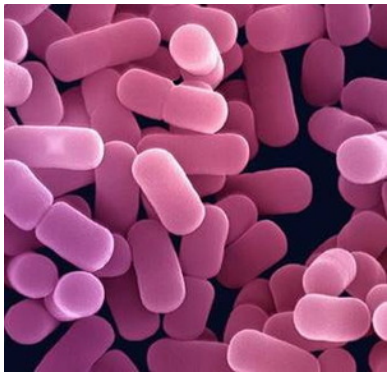
Entomopatogens – Case study Brazil

Metarhizium

2,5 mi ha

Trichoderma

5,5 mi ha



Bacillus

5,0 mi ha

Baculovirus

0,7 mi ha

Beauveria

0,2 mi ha

Source: Parra, 2015

Studies has showed **Baculovirus** presented a reduction in use due negative effects in its performance caused by **high temperatures and very intense irradiation** – New formulation is needed to help facing these problems at field level

Examples of Biological Control Programmes

Diaphorina Citri - (Hemiptera: Psyllidae) vector of Citrus greening disease

Adult

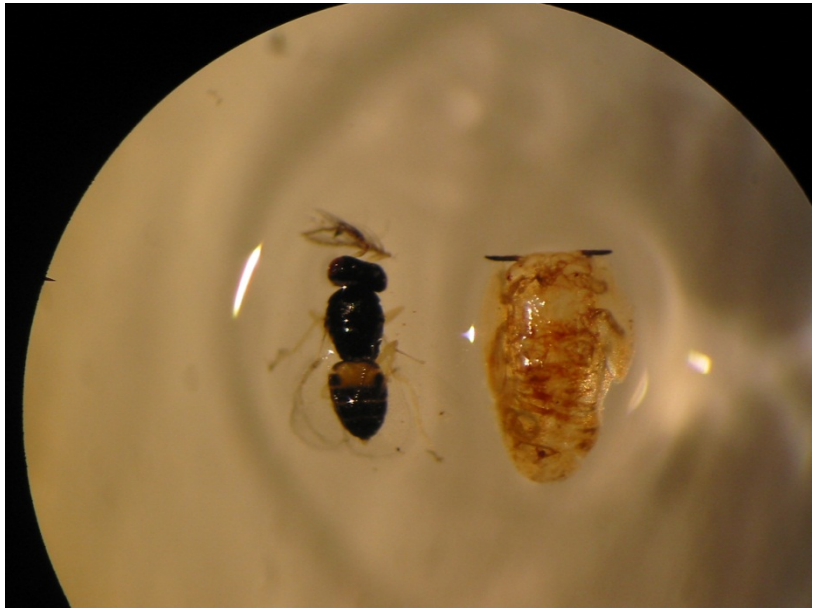
Nymph

Monitor of the vector – Symptoms of the disease

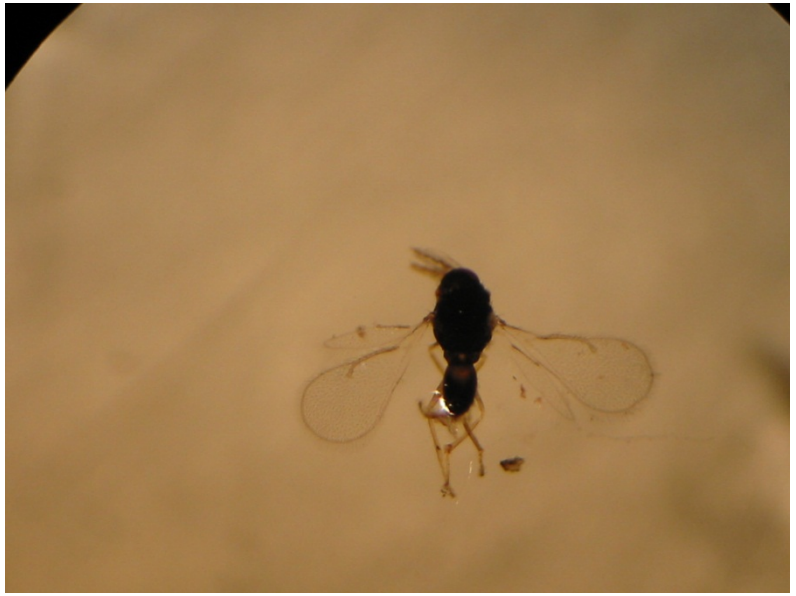
Source: University of Florida

Diaphorina Citri
Biological Control Programme

Tamarixia sp. (Hymenoptera: Eulophidae)



Tamarixia radiata



Diaphorina Citri
Biological Control Programme

Through the multiplication at the field and dispersion to other places including also with Good Agricultural practices, the suppression of the population of the vector and reduction of the disease incidence was obtained

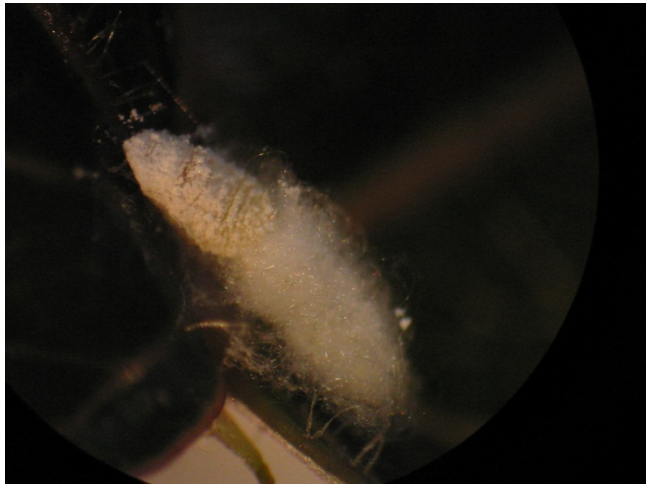
Foto: Yelitza Colmenarez

Paracoccus marginatus (Hemiptera: Pseudococcidae)

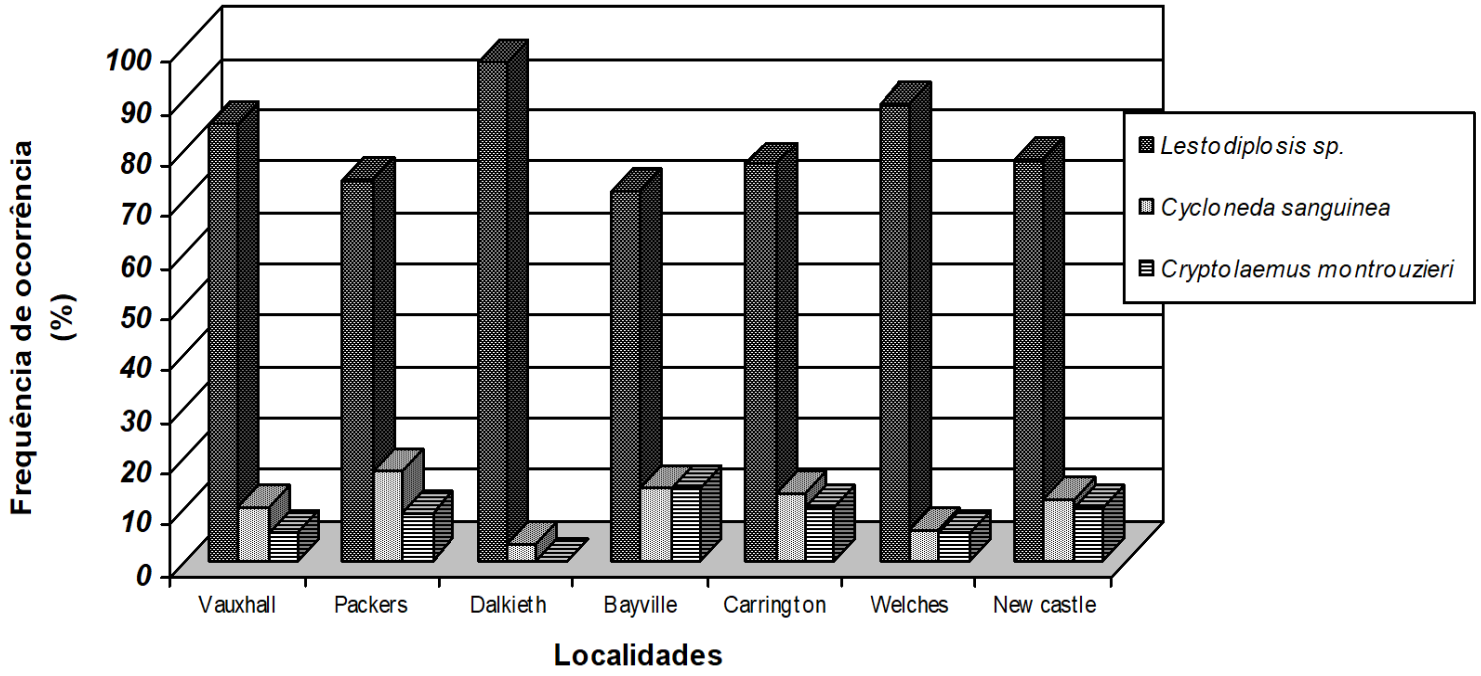
www.cabi.org

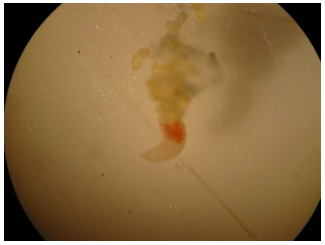
- 1999 ⇨ Cuba ⇨ 2001 ⇨ Caribe ⇨USA ⇨ Central America.
- It is a polyphagous insect that attacks several species of plants, including economically important tropical fruits (especially papaya) and ornamental plants.
- The life cycle takes about 24 to 30 days to complete
- High reproduction rate (females can deposit up to 600 eggs) and produces up to 15 generations / year.
- During feeding the insects inject a toxin that atrophies the growth of the leaves, the inflorescences and the young fruits.

Paracoccus marginatus (Hemiptera: Pseudococcidae)



Predators of *Paracoccus marginatus* reported



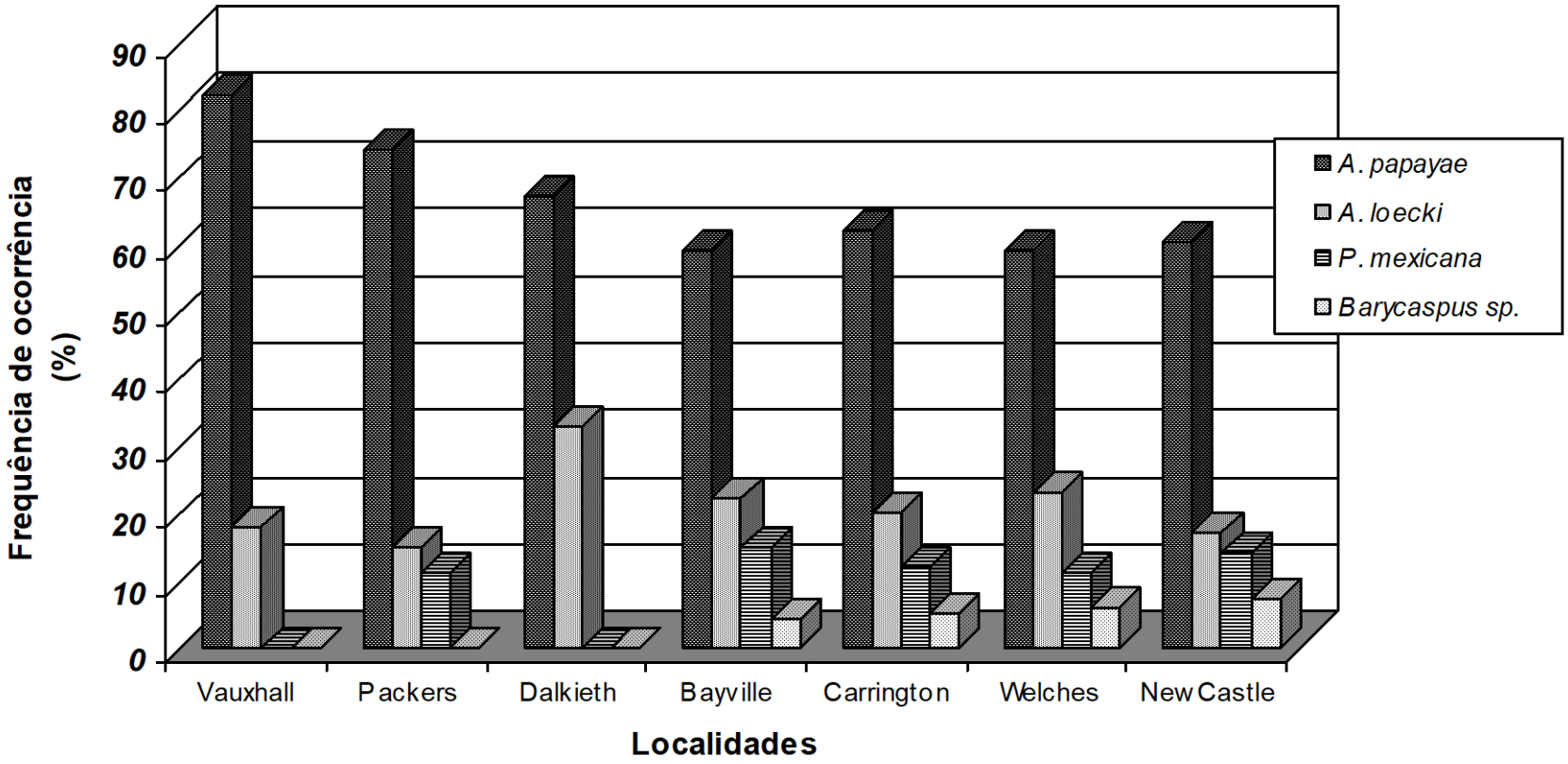


Lestodiplosis sp. (Diptera: Cecidomyiidae)

Cycloneda sanguinea

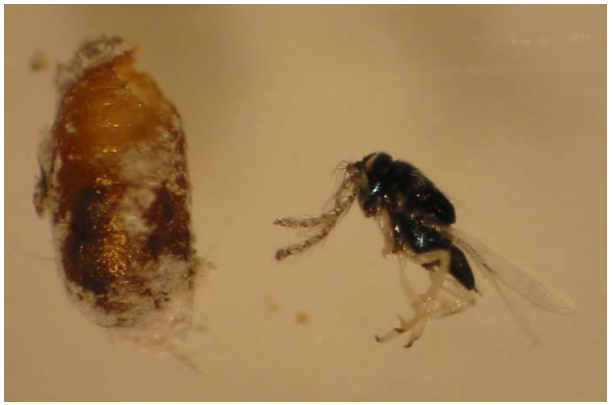
Cryptolaemus montrouzieri

Parasitoids of *Paracoccus marginatus*



Parasitoids of *P. marginatus*

Acerophagus papayae (Hymenoptera: Encyrtidae)

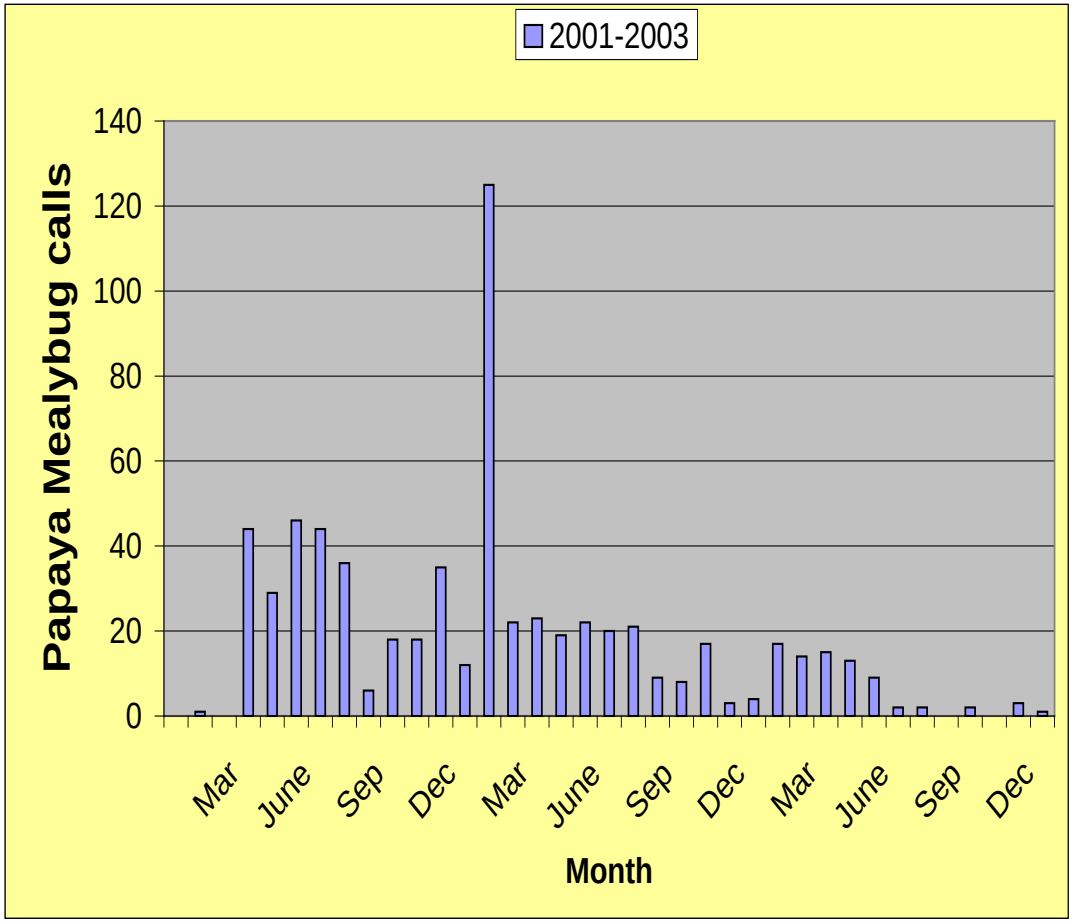


Anagyrus loecki
(Hymenoptera: Encyrtidae)

Biological Control Programme of Papaya mealybug (*P. marginatus)* – Field releases

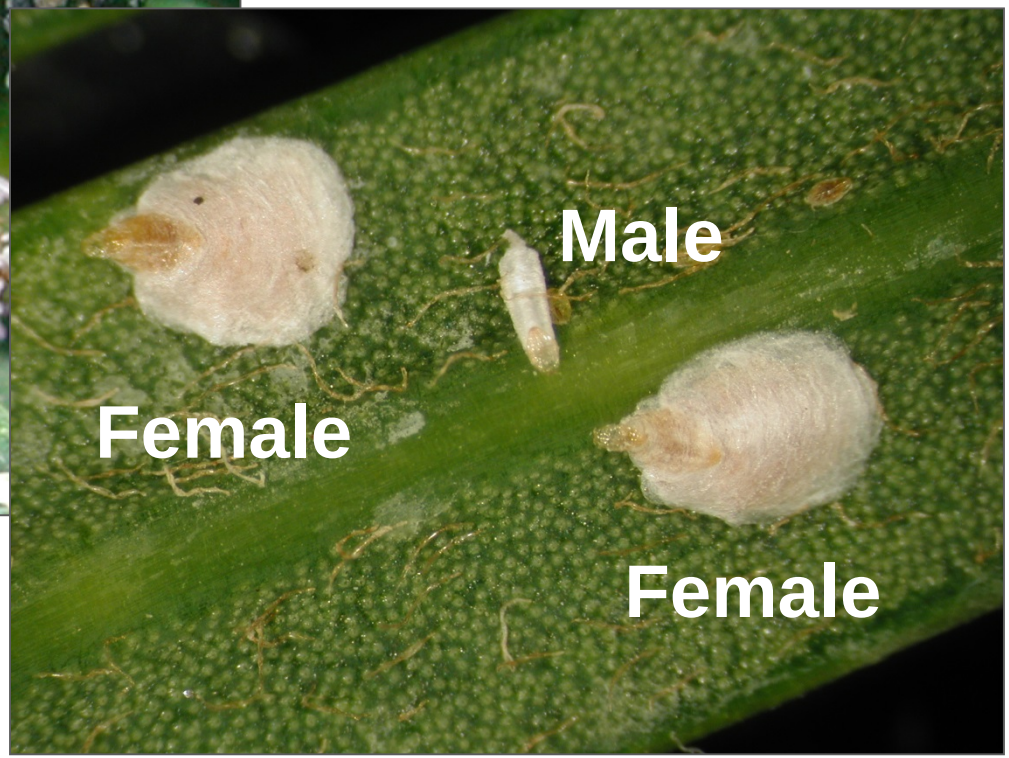
Biological Control Programme

Fig. 3: Trend in papaya mealybug calls for the period Jan 2001- Dec 2003



Biological Control programme of Sago Palm Scale, *Aulacaspis yasumatsui* (Hemiptera: Sternorrhyncha: Diaspididae)

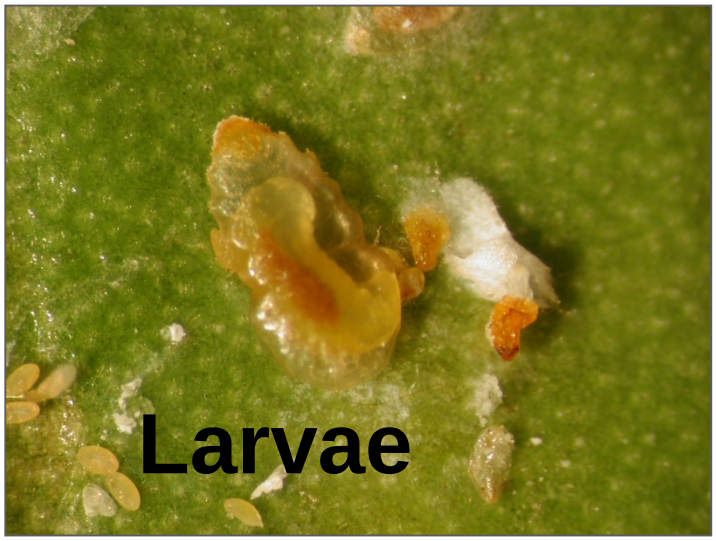
Aulacaspis yasumatsui
(Hemiptera: Sternorrhyncha: Diaspididae)

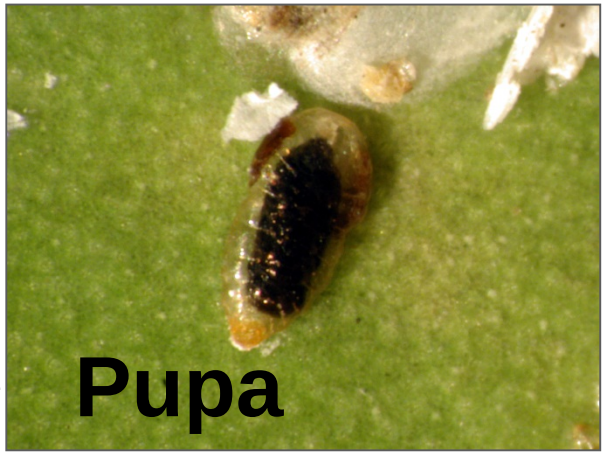


Source: University of Florida

Parasitoid of *Aulacaspis yasumatsui*

Coccobius fulvus (Hymenoptera: Aphelinidae)





Source: University of Florida

Predator of *Aulacaspis yasumatsui*

Cybocephalus binotatus (Coleoptera: Nitidulidae)

Biological Control

Larvae predator- Coleoptera

Source: University of Florida

Recovery of adults at the field

Recovery of adults at the field

Citrus leafminer Damage

Biological Control Programme

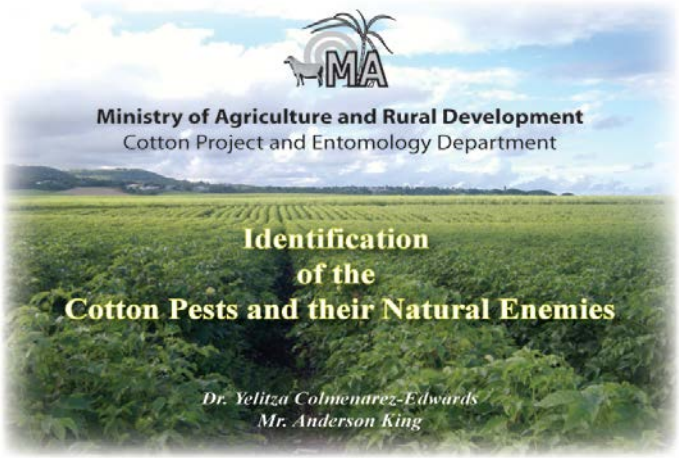
Ageniaspis citricola
(Hymenop.: Encyrtidae)

Cirrospilus sp. (Hymenop.: Eulophidae)

Field monitoring - Necessary to assess damage level and the appropriate time for application of Biological Control Agents

Integrated Pest Management – Biological Control - is a solution for sustainable agricultural production

Field guide of Natural Enemies for farmers



Final Considerations

- High potential for the use of Biological Control in the Caribbean
- It will be important to report-document the successes on Biological Control programmes that have been implemented in different Caribbean Islands, in order to replicate those models to other countries
- The multiplication and distribution of natural enemies at the national and regional level are important factors which can influence the implementation of biological control in the region
- It’s important to keep training extension officers and farmers on Biological Control, its requirements and technology of application, in order to increase its adoption at field level

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