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**M Ayyamperumal**

Parasitoid Taxonomy and  
Biocontrol Laboratory,  
Department of Entomology,  
Faculty of Agriculture,  
Annamalai University,  
Chidambaram, Tamil Nadu,  
India

**S Manickavasagam**

Parasitoid Taxonomy and  
Biocontrol Laboratory,  
Department of Entomology,  
Faculty of Agriculture,  
Annamalai University,  
Chidambaram, Tamil Nadu,  
India

## *Paracoccus marginatus* Williams and Granara de Willink (Hemiptera: Sternorrhyncha: Pseudococcidae) and its parasitoids (Chalcidoidea: Encyrtidae) in Tamil Nadu and pudhucherry

**M Ayyamperumal and S Manickavasagam**

### Abstract

Surveys were conducted for two years from 2017 to 2018 to record the occurrence of papaya mealybug, *Paracoccus marginatus* on different host plants and its parasitoids in Tamil Nadu and Pudhucherry. Infested plant parts were collected, reared under laboratory conditions and two encyrtid parasitoids viz, *Acerophagus papayae*, and *Pseudleptomastix mexicana* were recovered. The tritrophic relationship is presented in a form of flowchart for easy understanding of biocontrol workers.

**Keywords:** Papaya mealybug, *Acerophagus papayae*, *Pseudleptomastix mexicana*, tritrophic relationship.

### 1. Introduction

The papaya mealybug, *Paracoccus marginatus* Williams and Granara de Willink is believed to be native of Mexico and/or Central America, where it never acquired the status of a serious pest, probably due to the presence of an endemic natural enemy complex. It was described by Williams and Granara de Willink in 1992 from the specimens collected from neo-tropical regions in Belize, Costa Rica, Guatemala and Mexico [7]. It has a wide host range of over 60 species of plants including *Annona squamosa*, *Carica papaya*, *Hibiscus rosa-sinensis*, *Ipomea* spp., *Gossypium* spp., *Jatropha* sp., *Manihot esculenta*, *Parthenium hysterophorus*, *Sida acuta*, *Acalypha indica*, *Cassia sericea* and others [6, 15]. It was first reported in India by Muniappan *et al* [10], from Tamil Nadu Agricultural University, Coimbatore infesting papaya. They also reported the incidence of this insect from Udumalpet, Karur and Coimbatore districts of Tamil Nadu on papaya, mulberry and *Jatropha*. Later it was also reported from Kerala, Karnataka, Maharashtra and Tripura in India on many agricultural and horticultural crops [5, 18]. It might have been introduced into India from Sri Lanka [17].

As there was no desired control by natural enemies in almost all introduced countries, USDA [19] initiated biocontrol work and collected five encyrtid parasitoids from Mexico and evaluated their efficiency. *Acerophagus papayae* emerged as the dominant parasitoid species [6] and is considered as one of the efficient parasitoids for the suppression of papaya mealybug in its native range [9, 11]. Hence it was imported into India along with *Pseudleptomastix mexicana* and *Anagyrus loecki* from USDA, APHIS in 2010 [14] by ICAR, NBAIR, Bengaluru. The present study is meant to explore the encyrtid-papaya mealybug association and to assess the impact of introduced parasitoids especially in Tamil Nadu and Pudhucherry.

### 2. Materials and Methods

A field survey was conducted for two years in 2017 and 2018 in various agricultural and horticultural ecosystems from various districts of Tamil Nadu and Pudhucherry to search for potential parasitoids against papaya mealy bugs.

#### (i) Collection and Identification of mealy bug species

Field collected papaya mealy bugs from different host plants were kept in polythene bags, reared and observed for the emergence of parasitoids. Few mealybug samples were also preserved in 70 per cent ethyl alcohol for identification and they were submitted to Dr. Sunil Joshi, Principal Scientist (Entomology), NBAIR, Bengaluru for identification.

#### Correspondence

**S Manickavasagam**

Parasitoid Taxonomy and  
Biocontrol Laboratory,  
Department of Entomology,  
Faculty of Agriculture,  
Annamalai University,  
Chidambaram, Tamil Nadu,  
India

**(ii) Collection and Identification of Parasitoids**

Any emerged parasitoids were preserved in 70% alcohol for identification. The recovered parasitoids were then dry mounted on rectangles and labeled as per the standard procedure [11]. Emerged parasitoids were identified [12] and all the parasitoids were deposited with Parasitoid Taxonomy and Biocontrol Laboratory, Department of Entomology, Faculty of Agriculture, Annamalai University, Annamalai Nagar.

**3. Results and Discussion**

Papaya mealybug was mainly collected and reared from papaya, sunflower, tapioca, cotton, China rose, *Hibiscus*, *Jatropha* and trumpet bush. From the reared mealybugs, a total of 629 parasitoids were recovered, among which 456 belonged to *P. mexicana* and 173 to *A. papayae*. Among the mealybug parasitoids recovered, *P. mexicana* was the dominant one followed by *A. papaya* (Table 1).

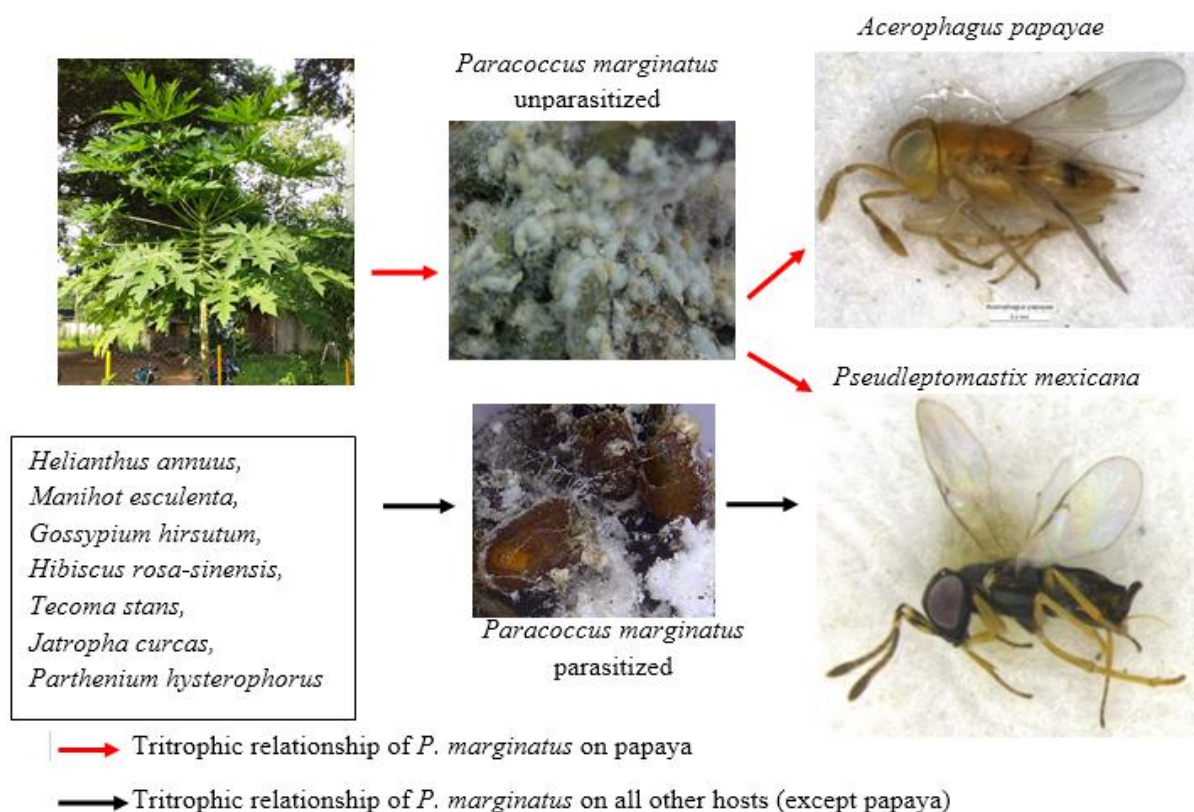
**Table 1:** Parasitoids recovered from *Paracoccus marginatus* on various host plants

S. No	Host Plant	Locality	<i>Acerophagus papaya</i>	<i>Pseudleptomastix mexicana</i>	Total
1	<i>Carica papaya</i>	Cuddalore, Dharmapuri, Puducherry & Karaikkal	173	78	251
2	<i>Helianthus annuus</i>	Cuddalore	No	48	48
3	<i>Manihot esculenta</i>	Cuddalore	No	22	22
4	<i>Gossypium hirsutum</i>	Cuddalore	No	42	42
5	<i>Hibiscus rosa-sinensis</i>	Puducherry & Karaikkal	No	2	2
6	<i>Tecoma stans</i>	Salem & Cuddalore	No	18	18
7	<i>Jatropha curcas</i>	Cuddalore	No	160	160
8	<i>Parthenium hysterophorus</i>	Cuddalore & Dharmapuri	No	86	86
Total			173	456	629

*Paracoccus marginatus* was parasitized by introduced parasitoids like *P. mexicana* and *A. papayae* from various plants. But *Anagyrus loecki* was not observed. *Acerophagus papayae* was recovered from *P. marginatus* infesting papaya, however, the same was not recovered from *P. marginatus* on

any other host plants. Conversely *P. mexicana* alone was recovered from *P. marginatus* infesting any other host plants. It is worthwhile to note here that *A. papayae* was recovered only from *P. marginatus* reared on papaya plant whereas from other host plants, only *P. mexicana* emerged (Fig. 1).

**Flowchart 1:** Tritrophic relationship of *Paracoccus marginatus*



Survey results from the present study is in conformity with those of [2, 3, 4, 8, 13, 16] who reported *A. papayae* established very well and brought spectacular control of papaya mealybug in Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu and Kerala. However, in the present study, *Pseudleptomastix mexicana* was the dominant parasitoid attacking *Paracoccus marginatus* infesting any host plants other than papaya. *Acerophagus papayae* failed to establish on *Paracoccus marginatus* from host plants other than papaya. *Anagyrus*

*loecki* was not recovered indicating its less efficiency as compared to the other two.

**4. Acknowledgments**

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