



E-ISSN: 2278-4136  
P-ISSN: 2349-8234  
JPP 2017; SP1: 629-631

**A Maneesha**

Department of Entomology, S.  
V. Agricultural College, Tirupati,  
Andhra Pradesh, India

**SR Koteswara Rao**

Department of Entomology, S.  
V. Agricultural College, Tirupati,  
Andhra Pradesh, India

**T Murali Krishna**

Department of Entomology, S.  
V. Agricultural College, Tirupati,  
Andhra Pradesh, India

**P Sudhakar**

Department of Entomology, S.  
V. Agricultural College, Tirupati,  
Andhra Pradesh, India

## Biology of *cryptolaemusmontrouzieri* mulsant on papaya mealybug, *paracoccusmarginatus* Williams and granara de willink

**A Maneesha, SR Koteswara Rao, T Murali Krishna and P Sudhakar**

**Abstract**

A lab experiment was conducted during 2017 at Insectary, Department of Entomology, S.V. Agricultural College, Tirupati to study the biology of *C. montrouzieri* on different life stages of papaya mealybug, *P. marginatus*. The results revealed that the developmental period of *C. montrouzieri* was significantly maximum (40.80 days) when reared on ovisacs of papaya mealybug followed by on I instar nymph (36.20 days), II instar nymph (33.80) and was minimum when fed on III instar nymphs (28.20 days) of papaya mealybug.

**Keywords:** *C. montrouzieri*, *P. marginatus*, total developmental period.

**Introduction**

Papaya is infested by several insect pests of which mealybug cause major losses to the yield. The papaya mealybug *Paracoccusmarginatus* Williams and Granara de Willink 1992 (Hemiptera: Pseudococcidae), is a notorious pest of papaya. It is a highly polyphagous pest of 133 plant species belonging to 48 families (Sakthivel *et al.*, 2012) [12].

In India, occurrence of the pest had been reported first from Coimbatore area of Tamil Nadu in 2008 on papaya (Muniappan *et al.*, 2008) [9] and later in Kerala (Krishna kumar and Rajan, 2009; Lyla and Philip, 2010) [4, 6], Karnataka, Andhra Pradesh, Maharashtra, Tripura and Odisha. Papaya mealybug infestation causes clusters of cotton – like masses of the insect on the aboveground portion of plants. The mealybug sucks plant sap by inserting its stylets into the epidermis of the leaf, stem and fruit. While, feeding on the plant fluid, it injects its toxic saliva into the host which ultimately leads to the death of the plant.

The mealybug is called as “hard to kill pest of fruit crops” (Lower, 1968) [5]. However, there are several reasons which may account for this fact. So far, various pesticides have been attempted for the management of mealybug either singly or in combinations but did not give desired control of the pest. The reason is that only those sheltering in the crevices of the bark escape and re-establish their population quickly (Manjunath, 1985) [8]. The most important factors are their habitat and the waxy coating present on the body. The waxy coating present on their body limits the efficiency of insecticides. This condition limits the use of insecticides for management of mealybug. The effective and safer method to manage this pest is said to be the biological control (Rao and David, 1958) [10]. Among the predators of mealybugs, the Australian lady beetle, *Cryptolaemusmontrouzieri* Mulsant (Coleoptera: Coccinellidae) has been reported to be a general predator of mealybugs at all stages of its development. Both the stages of the predator that is grub and adult are voracious feeder of all the stages of mealybug. It is commonly referred as mealybug destroyer. It has been employed as the possible solution for combating the menace of the pest around the world. The biological suppression of mealybugs through this potent predator in India was well documented (Rao *et al.*, 1971; Babu and Azam, 1989) [11, 1]. In other countries, *C. montrouzieri* had proved effective as it is evident from the study of Smith and Armitage (1920) [15] that succeeded in keeping under the destructive mealybugs in California by large scale multiplication of beetles. It has played a major role in the control of different sucking pests especially mealybugs (Mani and Krishnamoorthy, 2008; Shylesha *et al.*, 2011) [7, 14]. Keeping this in view, biology of *C. montrouzieri* on different life stages of *P. marginatus* were carried out.

**Material and Methods****Multiplication of prey**

The papaya mealybug (PMB), *Paracoccusmarginatus* was used as prey throughout the study period. Mass multiplication of papaya mealybug, *Paracoccusmarginatus* was done on potato sprouts under laboratory conditions at  $25 \pm 2^{\circ}\text{C}$  and  $75 \pm 2\%$  RH.

**Correspondence****A Maneesha**

Department of Entomology, S.  
V. Agricultural College, Tirupati,  
Andhra Pradesh, India

Potatoes were used as an alternate food source for rearing of mealybugs (Serrano and Laponite, 2002) [13]. Seed potatoes with eyes were brought from local market at Tirupati, washed and disinfected in 5 per cent sodium hypochlorite solution. After cleaning, the potatoes were treated with gibberellic acid 100 ppm solution for half an hour and placed under dark condition in wet gunny bags for four to five days to induce sprouting. Later, these sprouted potatoes were transferred to rearing cages for inoculation of PMB. *P. marginatus* colonies were collected from the infested papaya plants from surroundings of Tirupati. The colonies were transferred on to the sprouted potatoes using camel hair brush or entire infested leaves were placed over the sprouted potatoes for two to three days. The sprouted potatoes became fully infested within 20-30 days.

### Multiplication of predator

Initial culture of *C. montrouzieri* was obtained from National Institute of Plant Health Management (NIPHM), Hyderabad and reared in laboratory on mealybug, *P. marginatus*. Freshly emerged adults of *C. montrouzieri* were released and maintained on the sprouted potatoes infested with *P. marginatus* in the same rearing cages. Freshly laid eggs and grubs were gently removed with the help of camel hair brush and used for further studies and multiplication.

Biology including egg period, duration of different instars, total grub period, pre-pupal and pupal period, total developmental period was studied in Completely Randomized Design with four treatments and each replicated five times.

### Results and Discussion

In the present findings, it was observed that the mean incubation period, duration of I, II, III and IV instars, total grub period, pre-pupal period, pupal period and total developmental period of *C. montrouzieri* when fed on ovisacs of *P. marginatus* was 6.20±0.20, 4.40±0.51, 5.40±0.24, 6.60±0.40, 7.60±0.24, 24.00±0.70, 2.20±0.20, 8.40±0.24 and 40.80±0.86 days, respectively. The mean incubation period, duration of I, II, III and IV instars, total grub period, pre-pupal period, pupal period and total developmental period of *C. montrouzieri* when fed on I instar nymphs of *P. marginatus* was 5.20±0.20, 3.60±0.24, 4.80±0.20, 5.40±0.24, 6.40±0.40, 20.20±0.73, 2.60±0.24, 8.20±0.37 and 36.20±1.24 days (Table 4.4), respectively. The mean incubation period, duration of I, II, III and IV instars, total grub period, pre-pupal period, pupal period and total developmental period of *C. montrouzieri* when fed on II instar nymphs of *P. marginatus* was 4.80±0.37, 3.20±0.20, 3.80±0.20, 5.60±0.24, 5.80±0.20, 18.40±0.51, 2.80±0.20, 7.80±0.37 and 33.80±0.51 days (Table 4.4), respectively. The mean incubation period, duration of I, II, III and IV instars, total grub period, pre-pupal period, pupal period and total developmental period of *C. montrouzieri* when fed on III instar nymphs of *P. marginatus* was 2.80±0.37, 3.60±0.24, 3.40±0.24, 4.40±0.24, 4.20±0.20, 14.80±0.86, 2.40±0.24, 7.40±0.24 and 28.20±0.86 days (Table 4.4), respectively. Significantly, minimum total developmental period was observed when fed on III instar nymphs while, the maximum total developmental period was on ovisacs of papaya mealybug (Table.1)

**Table 1:** Biology of *C. montrouzieri* on different life-stages of *P. marginatus*

Life stages of <i>P. marginatus</i>	Life stages of <i>C. montrouzieri</i> (Mean ± S. E.)								
	Incubation period	I instar	II instar	III instar	IV instar	Total grub period	Pre-pupa	Pupa	Total developmental period
Ovisac	6.20±0.20	4.40±0.51	5.40±0.24	6.60±0.40	7.60±0.24	24.00±0.70	2.20±0.20	8.40±0.24	40.80±0.86
I instar nymphs	5.20±0.20	3.60±0.24	4.80±0.20	5.40±0.24	6.40±0.40	20.20±0.73	2.60±0.24	8.20±0.37	36.20±1.24
II instar nymphs	4.80±0.37	3.20±0.20	3.80±0.20	5.60±0.24	5.80±0.20	18.40±0.51	2.80±0.20	7.80±0.37	33.80±0.51
III instar nymphs	3.60±0.40	2.80±0.37	3.40±0.24	4.40±0.24	4.20±0.20	14.80±0.86	2.40±0.24	7.40±0.24	28.20±0.86

The results of the present study are in close agreement with Gore *et al.* (2013) [3] who reported the significantly minimum duration to the extent of 17.82 days was required to complete the entire grub period when fed on second instar nymphs of *Phenacoccusolenopsis*. While, maximum is on when fed with eggs of *P. solenopsis*.

Deokar *et al.* (2013) [2, 3] reported that the total developmental period of *C. montrouzieri* on eggs of *M. hirsutus* was 51.6 days. While, it was found to be 41.18 and 38.92 days when reared on I and II instar nymphs of *M. hirsutus*, respectively.

### References

- Babu TR, Azam KM. Biological control of grape mealybug, *Maconellicoccushirsutus* (Green). Indian Journal of Plant Protection. 1989; 17:123-126.
- Deokar MD, Shetgar SS, Sonkamble MM, Gade RS. Biology and consumption capacity of *Cryptolaemusmontrouzieri* Mulsant on *Maconellicoccushirsutus* (Green). Journal of Entomological Research. 2013; 37(1):61-66.
- Gore AB, Shetgar S, Sand Deokar MD. Predatory potential of *Cryptolaemusmontrouzieri* Mulsant on *Phenacoccusolenopsis* Tinsley. Indian Journal of Entomology. 2013; 75(4):282-284.
- Krishna kumar R, Rajan VP. Record of papaya mealybug, *Paracoccusmarginatus* infesting mulberry in Kerala. Insect Environment. 2009; 15(3):142.
- Lower HF. Hard to kill pests of fruit trees. Journal of Agriculture South Australia. 1968; 72:75-77.
- Lyla KR, Philip BM. Incidence of papaya mealybug, *Paracoccusmarginatus* Williams and Granara de Willink (Hemiptera: Pseudococcidae) in Kerala. Insect Environment. 2010; 15(4):156.
- Mani M, Krishnamoorthy A. Biological suppression of the mealybugs *Planococcuscitri* (Risso), *Ferrisiavirgata* (Cockerell) and *Nipaeoccusviridis* (Newstead) on pummelo with *Cryptolaemusmontrouzieri* Mulsant in India. Journal of Biological Control. 2008; 22:169-172.
- Manjunath TM. India- *Maconellicoccushirsutus* on grapevine. FAO-Plant-Protection Bulletin. 1985; 33(2):74.
- Muniappan R, Shepard BM, Watson GW, Carner GR, Sartiami D, Rauf A. *et al.* First report of the papaya mealybug, *Paracoccusmarginatus*, in Indonesia and India. Journal of Agricultural and Urban Entomology. 2008; 25(1):37-40.
- Rao TV, David LA. The biological control of coccid pest in South India by the use of the beetle *Cryptolaemusmontrouzieri* Mulsant. Indian Journal of Agricultural Sciences. 1958; 28:545-552.
- Rao TV, Gahani MA, Sankaran T Mathur KCA. Review of biological control of insects and other pests in South

- East Asia and Pacific Region. *Commonwealth Institute of Biology and Technology Commission*. 1971, 6:142.
12. Sakthivel P, Karuppuchamy P, Kalyanasundaram M, Srinivasan T. Host plants of invasive papaya mealybug, *Paracoccusmarginatus* (Williams and Granara de Willink) in Tamil Nadu. *Madras Agricultural Journal*. 2012; 99(7-9):615-619.
  13. Serrano MS, Laponite SL. Evaluation of host plants and a meridic diet for rearing *Maconellicoccushirsutus* (Hemiptera: Psuedococcidae) and its parasitoid *Anagyruskamali* (Hymenoptera: Encyrtidae). *Florida Entomologist*. 2002; 85:417-425.
  14. Shylesha AN, Rabindra RJ, Bhumannavar BS. The papaya mealybug *Paracoccusmarginatus* (Coccidae: Pseudococcidae). *Proceedings of the National consultation meeting on strategies for deployment and impact of the imported parasitoids of papaya mealybug classical biological control of papaya mealybug Paracoccusmarginatus in India*. NBAII, Bangalore. 2011, 1-8.
  15. Smith HS, Armitage HM. Biological control of mealybugs in California. *California State Department of Agriculture Monthly Bulletin*. 1920; 9:104-158.
  16. Williams DJ, Granara de Willink MC. Mealybugs of Central and South America. *CAB International*, Wallingford, England. 1992, 1-635.