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BIOLOGY OF *Cryptolaemus montrouzieri* MULSANT ON PAPAYA MEALYBUG, *Paracoccus marginatus* WILLIAMS AND GRANARA DE WILLINK

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ABSTRACT

A lab experiment was conducted during 2017 at Insectary, Department of Entomology, S.V. Agricultural College, Tirupati to study the biology of *Cryptolaemus montrouzieri* on different life stages of papaya mealybug, *Paracoccus 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 1st instar nymph (36.20 days), 2nd instar nymph (33.80) and was minimum when fed on 3rd instar nymphs (28.20 days) of papaya mealybug.

KEYWORDS: *Cryptolaemus montrouzieri*, *Paracoccus marginatus*, total developmental period.

INTRODUCTION

Papaya is infested by several insect pests of which mealybug cause major losses to the yield. The papaya mealybug *Paracoccus marginatus* 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).

In India, occurrence of the pest had been reported first from Coimbatore area of Tamil Nadu in 2008 on papaya (Muniappan *et al.,* 2008) and later in Kerala (Krishnakumar and Rajan, 2009; Lyla and Philip,2010), 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). 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). 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).

Among the predators of mealybugs, the Australian lady beetle, *Cryptolaemus montrouzieri* 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 *i.e.*, grub and adult are voracious feeder on 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). In other countries, *C. montrouzieri* had proved effective as it is evident from the study of Smith and Armitage (1920) who was succeeded in keeping the destructive mealybugs in California by large scale multiplication of beetles. The predator has played a major role in the control of different sucking pests especially mealybugs (Mani and Krishnamoorthy, 2008; Shylaja *et al*. 2011). Keeping this in view, biology of *C. montrouzieri* on different life stages of *P. marginatus* was studied under laboratory.

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MATERIAL AND METHODS

Multiplication of prey

The papaya mealybug (PMB), *Paracoccus marginatus* was used as prey throughout the study period. Mass multiplication of papaya mealybug, *Paracoccus marginatus* was done on potato sprouts under laboratory conditions at 25 ± 2 ^{0}C and 75 ± 2 per cent RH.

Potatoes were used as an alternate food source for rearing of mealybugs (Serrano and Laponite, 2002). Seed potatoes with eyes were brought from local market, 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 mealybug. *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 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 1), 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 1), 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 1), respectively.

In the present investigation, minimum total developmental period of *C. montrouzieri* was observed when fed on III instar nymphs of *P. marginatus* while, the maximum total developmental period was on ovisacs of papaya mealybug (Table .1).

The results of the present study are in close agreement with Gore *et al.* (2013) who reported that a significantly minimum duration to the extent of 17.82 days was required by *Cryptolaemus montrouzieri* to complete the entire grub period when fed on second instar nymphs of *Phenacoccus solenopsis*, while, maximum was on when fed with eggs of *P. solenopsis*. Also, Deokar *et al.* (2013) reported that the maximum total developmental period of *C. montrouzieri* was 51.6 days on eggs of *Maconellicoccus hirsustus*. While, it was found to be 41.18 and 38.92 days when reared on I and II instar nymphs of *M. hirsutus*, respectively.

REFERNCES

Babu, T.R and Azam, K.M. 1989. Biological control of grape mealybug, *Maconellicoccus hirsutus* (Green). *Indian Journal of Plant Protection*. 17:123-126.

Deokar, M.D., Shetgar, S.S., Sonkamble, M.M and Gade, R.S. 2013. Biology and consumption capacity of *Cryptolaemus montrouzieri* Mulsant on *Maconellicoccus hirsutus* (Green). *Journal of Entomological Research*. 37 (1): 61-66.

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

Life stages of *P. marginatus*	Life stages of *C. Montrouzieri* (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 nymps	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

Gore, A.B., Shetgar, S.S and Deokar, M.D. 2013. Predatory potential of *Cryptolaemus montrouzieri* Mulsant on *Phenacoccus solenopsis* Tinsley. *Indian Journal of Entomology*. 75(4): 282-284.

Krishnakumar, R and Rajan, V.P. 2009. Record of papaya mealybug, *Paracoccus marginatus* infesting mulberry in Kerala. *Insect Environment.* 15(3): 142.

Lower, H.F. 1968. Hard to kill pests of fruit trees. *Journal of Agriculture South Australia.* 72: 75-77.

Lyla, K.R and Philip, B.M. 2010. Incidence of papaya mealybug, *Paracoccus marginatus* Williams and Granara de Willink (Hemiptera: Pseudococcidae) in Kerala. *Insect Environment.* 15(4): 156.

Mani, M and Krishnamoorthy, A. 2008. Biological suppression of the mealybugs *Planococcus citri* (Risso), *Ferrisia virgata* (Cockerell) and *Nipaecoccus viridis* (Newstead) on pummelo with *Cryptolaemus montrouzieri* Mulsant in India. *Journal of Biological Control*. 22: 169-172.

Manjunath, T.M. 1985. India- *Maconellicoccus hirsutus* on grapevine. *FAO-Plant-Protection Bulletin.* 33(2): 74.

Muniappan, R., Shepard, B.M., Watson, G.W., Carner, G.R., Sartiami, D., Rauf, A and Hammig, M.D. 2008. First report of the papaya mealybug, *Paracoccus marginatus*, in Indonesia and India. *Journal of Agricultural and Urban Entomology.* 25(1): 37–40.

Rao, T.V and David, L.A. 1958. The biological control of coccid pest in South India by the use of the beetle *Cryptolaemus montrouzieri* Mulsant. *Indian Journal of Agricultural Sciences*. 28: 545-552.

Rao, T.V., Gahani, M.A., Sankaran, T and Mathur, K.C. 1971. A review of biological control of insects and other pests in South East Asia and Pacific Region. *Technical Communication, Commonwealth Institute of Biological Control.* 6: 142.

Sakthivel, P., Karuppuchamy, P., Kalyanasundaram, M and Srinivasan, T. 2012. Host plants of invasive papaya mealybug, *Paracoccus marginatus* (Williams and Granara de Willink) in Tamil Nadu. *Madras Agricultural Journal.* 99(7-9): 615-619.

Serrano, M.S and Laponite, S.L. 2002. Evaluation of host plants and a meridic diet for rearing *Maconellicoccus hirsutus* (Hemiptera: Psuedococcidae) and its parasitoid *Anagyrus kamali* (Hymenoptera: Encyrtidae). *Florida Entomologist.* 85: 417-425.

Shylaja, A.N., Rabindra R.J and Bhumannavar, B.S. 2011. The papaya mealybug *Paracoccus marginatus* (Hemiptera: 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 Paracoccus marginatus* in India. NBAII, Bangalore. pp: 1- 8.

Smith, H.S and Armitage, H.M. 1920. Biological control of mealybugs in California. *California State Department of Agriculture Monthly Bulletin*. 9: 104-158.