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

A. MANEESHA*, S.R. KOTESWARA RAO, T. MURALI KRISHNA AND P. SUDHAKAR

Department of Entomology, S.V. Agricultural College, ANGRAU, Tirupati-517 502, Chittoor Dt., A.P.

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.

*Corresponding author, E-mail: addankimaneesha@gmail.com
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 °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. 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 hirsutus. 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


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

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


