



## Research Note

# Biology of *Cryptolaemus montrouzieri* (Mulsant) on *Maconellicoccus hirsutus* (Green) at different temperature levels

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**ABSTRACT:** Laboratory experiments were conducted on the biology of *C. montrouzieri* at different temperature levels viz., 20°C, 25°C, 30°C and 35°C at the Department of Agricultural Entomology, College of Agriculture during 2014-2015. The incubation period, mean larval duration, growth index, pupal duration and per cent adult emergence of *C. montrouzieri* was observed to be 14.89, 5.89, 4.20 and 2.17 days, 83.81, 27.8, 24.38 and 11.45 days, 0.39, 3.23, 2.53 and 5.31, 26.25, 8.76, 6.94 and 4.20 days and 92.00, 94.97, 88.00 and 69.34 per cent at 20°C, 25°C, 30°C and 35°C respectively. Longevity of male and female beetles of *C. montrouzieri* was found to be 87.00 and 96.01 days, 65.61 and 80.78 days, 36.80 and 48.31 days and 24.91 and 35.05 days at 20°C, 25°C, 30°C and 35°C respectively, while the pre-oviposition and oviposition period of *C. montrouzieri* to the tune 29.00, 15.20, 13.40 and 9.8 days and 30.80, 32.30, 28.00 and 19.60 days at 20°C, 25°C, 30°C and 35°C temperature respectively.

**KEY WORDS:** *Cryptolaemus montrouzieri*, *Maconellicoccus hirsutus*, biology, different temperatures

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## INTRODUCTION

Grapevine, *Vitis vinifera* Linn. is a subtropical fruit crop, Russian (Caspian sea) origin of the oldest fruit crop grown in the world. In recent years, mealy bug *Maconellicoccus hirsutus* (Green) has become a serious menace to the successful cultivation of grapes in India. Mealy bugs are found on the leaves, shoots, nodes, fruits, branches or under loose bark of grapevine (Rao *et al.*, 1993). It is highly impossible to get perfect control of the mealy bugs with conventional insecticides due to their cryptic habitat and waxy coating over their bodies (Manjunath, 1985). Biological control is considered as an effective long term solution to mealy bug infestation apart from abating environmental and health risks associated with repeated exposures to chemical insecticides or its residues, pest resistance and pest resurgence. Australian lady bird beetle, *Cryptolaemus montrouzieri* Mulsant (Coccinellidae: Coleoptera) is an important predator of mealybug. It was introduced in South India in 1898, in an attempt to manage coffee green scale *Coccus viridis* (Green) by H.O. New Port (Mayne, 1953).

*Cryptolaemus montrouzieri* is adapted to temperatures which exist, under tropical conditions and thus the temperature plays a role in governing different life stages surviv-

ability and their longevity. Developmental time was profoundly affected by cool temperature, could not complete development between 10 and 17°C. The coccinellids have emerged as strong and potent biocontrol agent and result oriented researches are further needed continuously to ascertain their efficiency in the integrated pest management programme. Hence, keeping this in view, in the present, a laboratory work was undertaken to study the biology of *Cryptolaemus montrouzieri* on *Maconellicoccus hirsutus* at different temperature levels during 2014-15.

The laboratory technique of rearing of mealy bugs on ripe red pumpkins, *Cucurbita maxima* standardized by Chacko *et al.* (1978) and Singh (1978) was used in the present investigation. The pumpkins were inoculated with egg masses of *M. hirsutus* with the help of wet camel hair brush. Number of egg sacs placed on each pumpkin varied according to size of pumpkin. The ambient temperature and relative humidity of the laboratory were maintained from 25°C to 30°C and 65 to 75 per cent, respectively.

The culture of *C. montrouzieri* available with the Department of Agricultural Entomology, College of Agriculture, was later used in the present investigation. After completing pre-mating and pre-oviposition period, the females

of *C. montrouzieri* laid their eggs near the mealy bugs kept in Petridishes. Such Petridishes were observed daily to obtain the eggs of *C. montrouzieri*.

The studies on biology of *C. montrouzieri* on *M. hirsutus* were carried out in a completely randomized design replicated five times at different temperature levels *viz.*, 20<sup>o</sup>, 25<sup>o</sup>, 30<sup>o</sup> and 35<sup>o</sup>C in BOD incubator. One hundred freshly laid eggs of *C. montrouzieri* were kept individually in each homeopathic plastic vial. Each replication comprised of 20 eggs. The observations were recorded in respect of incubation period and per cent egg hatch. The newly hatched grubs were reared on third instar nymphs of *M. hirsutus*. The observations on the egg hatching, larval instar duration, and percent larvae pupated, growth index, pre-pupal and pupal duration, successful adult emergence, adult longevity and life-cycle duration were recorded on *M. hirsutus*. The data obtained were subjected to statistical analysis. The growth index was calculated by using Howes (1953) formula.

$$\text{Growth index} = \frac{\text{Percent larvae pupated}}{\text{Mean larval duration(days)}}$$

The incubation period of *C. montrouzieri* was recorded to be significantly minimum to the extent of 2.17 days at 35<sup>o</sup>C temperature followed by 4.20, 5.89 and 14.89 days at 30<sup>o</sup>C, 25<sup>o</sup>C and 20<sup>o</sup>C, respectively (Table 1). The present investigation supported in good line with the results reported earlier, to be 5 to 6 days by Bhat *et al.* (1981), 4 to 6 days by Mani (1986), 4 to 5 days by Mani and Thontadarya, (1987), 4.5 days by Naik *et al.* (2003) and 4.94 days by Surwase (2014) on *M. hirsutus* at temperature 25<sup>o</sup>C to 28<sup>o</sup>C. Baskaran *et al.* (1999) reported that incubation period at 29.4<sup>o</sup>C to 32.1<sup>o</sup>C was found to be 4.00 days with *P. citri* and 4.23 with *D. tomentosus*, while Torres and Marcano (2007) reported that incubation period was found to be 8.35, 4.43, 3.90 and 4.20 days at 20<sup>o</sup>C, 25<sup>o</sup>C, 30<sup>o</sup>C and 35<sup>o</sup>C, respectively.

The shortest larval duration (11.45 days) and highest

growth index (5.31) were recorded (Table 1) in the case of those larvae of *C. montrouzieri* which were reared at 35<sup>o</sup>C followed by 30<sup>o</sup>C (24.38 days and 2.53). The larval development of *C. montrouzieri* was completed by passing through four instars at different temperature levels *viz.*, 20<sup>o</sup>, 25<sup>o</sup>, 30<sup>o</sup> and 35<sup>o</sup>C under investigation. Present findings are supported by the results reported by Surwase (2014).

The lowest pupal duration of *C. montrouzieri* to the extent of 4.20 days was recorded (Table 1) when reared at 35<sup>o</sup>C temperature followed by 30<sup>o</sup>C (6.94 days), 25<sup>o</sup>C (8.76 days) and 20<sup>o</sup>C (26.25 days). Torres and Marcano (2007) reported that pupal duration of *C. montrouzieri* was found to be 11.94, 6.58, 5.96 and 5.29 days at 20<sup>o</sup>C, 25<sup>o</sup>C, 30<sup>o</sup>C and 35<sup>o</sup>C respectively. Saljoqi *et al.* (2014) reported that pre-pupal and pupal periods of *C. montrouzieri* fed on cotton mealy bug were found to be 1.21 and 5.47, 1.14 and 5.28 and 0.66 and 3.84 days at 24<sup>o</sup>C, 28<sup>o</sup>C and 32 ± 1<sup>o</sup>C temperatures, respectively.

The highest longevity of male and female beetles of *C. montrouzieri* was recorded (Table 2) at 20<sup>o</sup>C temperature (87.00 and 96.01 days) followed by 25<sup>o</sup>C (65.61 and 80.78 days), 30<sup>o</sup>C (36.80 and 48.31 days) and 35<sup>o</sup>C (24.91 and 35.05 days). Mani and Thontadarya, (1987) reported that the longevity of male and female beetle of *C. montrouzieri* was to the extent of 55.9 and 61.4 days at 24<sup>o</sup>C to 28<sup>o</sup>C, respectively, Surwase (2014) reported that the longevity of male and female beetle of *C. montrouzieri* was to the extent of 77 and 107 days at 25 ± 2<sup>o</sup>C temperature while Saljoqi *et al.* (2014) reported that the longevity of male and female beetle were in the tune was observed to be 82.2, 60.6 and 38.5 days and 91.2, 74.8 and 57.0 days at 24<sup>o</sup>C, 28<sup>o</sup>C and 32 ± 1<sup>o</sup>C temperature, respectively. Babu and Azam (1987) reported that the adult longevity was extended when reared at 20<sup>o</sup>C than at 30<sup>o</sup>C and ambient temperature. The data on adult longevity of *C. montrouzieri* on *M. hirsutus* at different temperature levels in the present investigation are in good line with the results reported by above mentioned earlier workers.

**Table 1. The mean incubation period, per cent egg hatch, larval duration, per cent pupation and growth index of *Cryptolaemus montrouzieri* on third instar nymphs of *Maconellicoccus hirsutus* at different temperature levels**

Temperature levels	Mean incubation Period (days)	Mean larval duration (days)	Growth Index	Pre-pupal duration (days)	Pupal duration (days)
20 <sup>o</sup> C	14.89	83.81	0.39	6.19	26.25
25 <sup>o</sup> C	5.89	27.84	3.23	2.31	8.76
30 <sup>o</sup> C	4.20	24.38	2.53	1.42	6.94
35 <sup>o</sup> C	2.17	11.45	5.31	1.00	4.20
S.E ±	0.17	00.80	0.09	0.07	0.26
C.D P= 0.05	0.52	02.41	0.27	0.19	0.78
C.V. (%)	5.79	04.81	6.95	5.45	5.08

**Table 2. The mean longevity and life-cycle duration of *Cryptolaemus montrouzieri* on third instar nymphs of *Maconellicoccus hirsutus* at different temperature levels**

Temperature levels	Male longevity (days)	Female longevity (days)	Pre-oviposition period (days)	Oviposition period (days)
20° C	87.00	96.01	29.00	30.80
25° C	65.61	80.78	15.20	32.30
30° C	36.80	48.31	13.40	28.00
35° C	24.91	35.05	09.80	19.60
S.E ±	01.13	01.13	00.48	00.64
C.D P= 0.05	03.38	03.40	01.43	01.93
C.V. (%)	04.70	03.9	06.35	05.21

Pre-oviposition period of *C. montrouzieri* to the tune of 9.80 days (Table 2) at 35°C followed by 30°C (13.40 days). The oviposition period lasted for 32.30 days (Table 2) when reared at 25°C temperature. Present investigations are in good line with the results reported by Surwase (2014). Saljoqi *et al.* (2014) reported that pre-oviposition and oviposition periods of *C. montrouzieri* fed on cotton mealy bug were found to be 11.62 and 73.85 days, 9.47 and 60.65 days and 5.43 and 48.58 days, respectively at 24°C, 28°C and 32 ± 1°C temperature levels.

The females obtained from larvae which were reared at 25°C laid significantly more eggs (211.60) followed by 25°C (203.80), 30°C (202.00), while its egg laying was significantly lowest (159.20) at 35°C temperature. Surwase (2014) reported that on an average 205.2 eggs were laid by the adult female of *C. montrouzieri* fed on third instar nymphs of *M. hirsutus* during oviposition period of 34.24 days at 25 ± 2°C temperature. Öncüer and Koldag (1981) also stated that the highest egg laying of *C. montrouzieri* was obtained at 20°C than at 25°C and 30°C.

It is concluded that *C. montrouzieri* successfully completed development on *M. hirsutus* at 20°C, 25°C, 30°C and 35°C temperature levels. However, development period of all the stages of *C. montrouzieri* was reduced at 35°C temperature and extended at 20°C temperature.

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