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Development and Feeding Potential of Coccinellid Predator, *Cryptolaemus montrouzieri* Muls. on the grape mealybug, *Maconellicoccus hirsutus* (Green)

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ABSTRACT

Development and feeding potential of the coccinellid predator, *Cryptolaemus montrouzieri* Muls. was studied on the eggs, nymphs and adult females of the grape mealybug, *Maconellicoccus hirsutus* (Green). The life cycle of the predator was prolonged when it was reared on eggs of mealybugs. Incubation period ranged 4 to 5 days. The grub took 22.80, 13.85 and 13.45 days when reared on eggs, nymphs and adult f male mealybugs, respectively. The prepupal and pupal periods averaged 2.15 and 8.50 days, respectively. Adult longevity averaged 55.90 days for males and 61.40 days for females. The mean fecundity of a mated female was 210.52. The coccinellid grub consumed a total of 881.30 eggs or 259.00 nymphs or 27.55 adult females of *M. hirsutus* under laboratory conditions.

Key words : *Cryptolaemus montrouzieri, Maconellicoccus hirsutus,* development, feeding potential.

The predator, *Cryptolaemus montrouzieri* Muls. is native to Australia. Following the successful control of mealybugs in California, the beetle was introduced into India in 1898 by New Port (Puttarudriah *et al.,* 1952). Its biology has been studied earlier by several workers on many species of mealybugs (Tirumala Rao and David, 1958; Fisher, 1963; Liotta and Mineo, 1965; Bhat *et al.,* 1981; Satyanarayanamurthy, 1982). Recently a lot of interest has been shown on the use of *C. montrouzieri* for the suppression of grape mealybug, *Maconellicoccus hirsutus* Green. The present study was carried out to

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observe the development and feeding potential of this coccinellid on different stages of the grape mealybug.

MATERIALS AND METHODS

Development of the predator

The predator was reared on mealybug infested pumpkin fruits in the laboratory following the methods of Chacko *et al.* (1978) and Singh (1978). Effect of three stages of the mealybug *M. hirsutus* (eggs, nymphs and adults) on the developmental period of the coccinellid predator was determined. Eggs of the predator were obtained from the beetles reared on mealybug eggs. Twenty eggs of the coccinellid were kept individually in glass vials (7.5 × 2.5 cm) and plugged with cotton. Incubation period was recorded. After hatching, the predatory larvae were fed only with the mealybug eggs. Fresh eggs were offered to the predator once in three days. Another batch of predatory grubs (20) were fed individually with 10-15 day old nymphs until pupation. Fresh nymphs were offered to the predator once in three days. Similarly the predatory grubs (20) were also fed with adult mealybugs individually. Mealybugs were supplied to the predator once in three days until pupation. Developmental period of each instar of the predatory grub and prepupal and pupal periods were recorded in each case separately

Predatory Potential

Experiments were conducted to determine the rate of consumption of different stages of the mealybug (eggs, nymphs and adults) by the predatory grubs. After hatching, each predatory grub was contained in a glass vial (10 × 2.5 cm) and provided with a known number of preys. Observation was taken on the number of preys eaten at every 24 h. Surviving preys were counted and removed. Fresh preys were offered to the predatory grub every day until pupation. Number of prey consumed by the predatory grub in each instar and also the total number consumed in its grub development were later calculated. The feeding potential studies were conducted with 20 predatory grubs where each predatory grub was considered as one replicate. The temperature and humidity ranged from 24 to 28°C and 58 to 64% respectively during the study period.

RESULTS AND DISCUSSION

Development of *C. montrouzieri*

Incubation period ranged from 4 to 5 days. The newly hatched out grub was smooth and pale greyish in colour. Waxy strands developed on the grub 24 after hatching. There were four larval instars. Developmental period of each instar was influenced by the stage of prey used. The duration of the first to fourth instars was respectively in the range of 3.05—5.25, 2.20—4.40, 3.86 - 6.30 and 4.30 - 6.85 days when fed on egg, nymph and adult mealybug. The total developmental period of grub varied significantly when reared on different stages of mealybug (Table 1). The grub period was extended when reared on eggs compared to rearing on mealybug nymphs and adults. This may be due to the quantity and quality of the prey offered to the predator. The grub took 13 to 16 days to complete the

Table 1. Duration of development of *C. montrouzieri* on *M. hirsutus*

Stage of the predator	Developmental period (mean) in days when reared on Mealybug		
	eggs	nymphs	adult
1. Egg	4.25 (0.44)	4.10 (0.51)	4.30 (0.47)
2. Grub			
I Instar	5.25 (0.45)	3.50 (0.37)	3.05 (0.37)
II Instar	4.40 (0.50)	2.20 (0.36)	2.25 (0.44)
III Instar	6.30 (0.49)	4.10 (0.31)	3.86 (0.37)
IV Instar	6.85 (0.48)	4.91 (0.51)	4.30 (0.47)
Total	22.80a(0.62)	13.85b(0.81)	13.45b(0.51)
3. Prepupa	2.10 (0.31)	2.25 (0.44)	2.15 (0.36)
4. Pupa	8.70 (0.66)	8.95 (0.83)	8.50 (0.69)
Total developmental period*	37.90a(0.75)	29.15b(1.31)	28.40b(1.05)

Figures in parentheses represent standard deviation

* In horizontal columns means followed by same letters are not different statistically (P=0.01) by LSD.

development on nymphs and adults. This is in close agreement with the observations of Liotta and Mineo (1965), Tirumala Rao and David (1958) and Fisher (1963) that the grub developmental period ranged from 12 to 17 days.

The prepupal and pupal periods of of *C. montrouzieri* ranged from 2 to 3 days and 7 to 9 days, respectively. Similar observations were made by earlier workers (Tirumala Rao and David, 1958; Bhat *et al.*, 1981). However, the stage of prey did not have any significant influence on the pupal period. The adult spent one to two days in the pupa.

In all, the length of life cycle from egg to imago was significantly influenced when the predator was reared on different stages of the mealybug. *M. hirsutus*. The predator took 37.90. 29.15 and 28.40 days when reared on the mealybug eggs, nymphs and adult female, respectively.

Predatory potentialy

The number of mealybug eggs consumed by the first, second, third and fourth instar grubs averaged 33.95 53.70, 183.20 and 610.45, respectively. A total of 881.3 eggs of *M. hirsutus* was consumed by the grub during its development (Table 2). This finding is at variance with Whitcomb (1940) and Oncuer and Baylan (1982) who have reported respectively that the grub consumed 1325 and 3330 eggs of *Planococcus citri* (Risso). Among the larval instars, fourth instar grub was voracious, preying more number of mealybug eggs (Table 2). This is in conformity with the findings of Satyanarayanamurthy (1982).

A grub consumed 3.35, 10.80, 80.20 and 164.25 mealybug nymphs (10 to 15 days old) during the development of first, second, third and fourth instars respectively. Number of adult female mealybugs consumed by the four instars was 1.65, 3.35, 7.90 and 14.65, respectively.

The predatory grub consumed an average of 259 mealybug nymphs or 27.55 adult female mealybugs in the

Table 2. Predatory potential of different larval stages of *C. montrouzieri* on *M. hirsutus*

Larval instar of *Cryptolaemus montrouzieri*	Mealybug consumed (mean)		
	eggs	nymphs	adults
I	33.95 (3.17)	3.35 (0.75)	1.65 (0.59)
II	53.70 (3.11)	10.80 (1.32)	3.35 (1.32)
III	183.20 (12.03)	80.20 (5.68)	7.90 (0.68)
IV	610.00 (54.75)	164.65 (10.19)	14.65 (0.75)
Total	881.30 (58.69)	259.00 (14.40)	27.55 (1.38)

Figures in parenthesis represent standard deviation

present study. Number of adult mealybugs required for a grub was less than that of nymphs because of larger body size Earlier, Bhat *et al.* (1981) observed that the average number of adult citrus mealybugs consumed by the four instars were one mealybug in 3 days, one mealybug in 2 days, one mealybug per day and 3 mealybugs in two days.

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