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Comparative biology and predatory potential of Australian ladybird beetle (*Cryptolaemus montrouzieri*) on *Planococcus citri* and *Dactylopius tomentosus**

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The Australian ladybird beetle (*Cryptolaemus montrouzieri* Mulsant) was introduced from United States to India in 1898 to combat the coccid pest *Coccus viridis* (Gr.) on coffee *(Coffea arabica* L.) (Mayne 1953). It was used to control mealybugs, scales, aphids, coccids and aleyrodids on a variety of plants in more than 40 countries (Bartlett 1977). The predator was reported to prey on citrus mealybug, *Planococcus citri* Risso (Singh 1978), pink mealybug, *Maconellicoccus hirsutus* (Green) (Ranga Reddy and Lakshmi Narayanan 1986, Mani and Thontadarya 1988) and cochineal insect, *Dactylopius tomentosus* Lam. infesting the waste land weed, prickly pear (*Opuntia dilenii* Haw.) around Coimbatore. The predator was cultured successfully in the laboratory on *P. citri* and *M. hirsutus* infested muskmelon *(Cucumis melo* L.) or red pumpkin (*Cucurbita moschata* Duchesne) fruits by Chacko *et al.* (1978) and Mani and Krishnamoorthy (1997). The biology and predatory potential of *C. montrouzieri* on mealybugs has been studied. However, information on the life history and feeding preference by *C. montrouzieri* on *D. tomentosus* is lacking. Hence, the present study was undertaken to generate information on these aspects under controlled conditions.

The cultures of *P. citri* and *D. tomentosus* maintained on red pumpkin and *O. dilenii* respectively were used for studying the biology and predatory potential of *C. montrouzieri* during winter 1997 at Madurai. Eggs obtained from *C. montrouzieri* were allowed to complete 1 generation on the respective hosts and were used in the experiments to find out the influence of hosts on the biology.

Twenty five eggs of *C. montrouzieri* were kept individually in glass vials (7.5 cm × 2.5 cm) and covered with cotton plug. The grubs were fed with host insects separately till completion of life cycle. Development period of grub, pre-pupal and pupal periods were recorded. Pupae were collected and kept in adult emergence cages. Observations on adult emergence, sex ratio, weight of pupae and adults were also recorded. Growth indices, viz larval-pupal, pupal and adult weight (Deshmukh *et al.* 1982), adult emergence (Tripathi *et al.* 1982), development period (Prasad and Bhattacharya 1975) and suitability were calculated.

The predatory potential of *C. montrouzieri* was assessed by confining a single predatory grub held separately in each glass vial (10 cm × 2.5 cm) and provided with a known number of prey. Observations on the weight of prey consumed 24 hr were made. Fresh prey was offered each day until pupation. Weight of prey consumed in each instar and total weight consumed in its development period were calculated. The temperature and humidity during experimental period ranged from 29.4 to 32.1°C and 65 to 71% respectively.

In both the prey species, *C. montrouzieri* completed its growth successfully but preferred *P. citri* over *D. tomentosus.* The egg period on *P. citri* and *D. tomentosus* was 4.00 and 4.23 days respectively. The egg period on *C. montrouzieri* reported by Hall (1926) and Tirumala Rao and David (1958) was 3–5 days. However, Bishop (1961) reported it to be 8–10 days during winter. The average duration of the first to fourth instar of the predator was 2.58–4.08 days on *P. citri* and 3.92–4.89 days on *D. tomentosus* (Table 1). The total duration of grub stage of the predator was prolonged by 6.42 days when reared on *D. tomentosus* than *P. citri.* This may be due to the quality of the prey. The mean grub period of the predator on both prey species occupied 12.42 and 17.67 days respectively. This is in agreement with the observations of Tirumala Rao and David (1958).

The pre-pupal and pupal periods of *C. montrouzieri* averaged 2.17 and 7.50 days on *P. citri* and 2.44 and 8.17 days on *D. tomentosus* (Table 1). *C. montrouzieri* took 32.51 days from egg to pupa when reared on *D. tomentosus* compared to 26.09 days on *P. citri.* The extended life of the predator on *D. tomentosus* is due to prolongation of grub period. Though the pupation of predator reared on *D. tomentosus* was less (75%), there was no difference among the prey species with

*Short note

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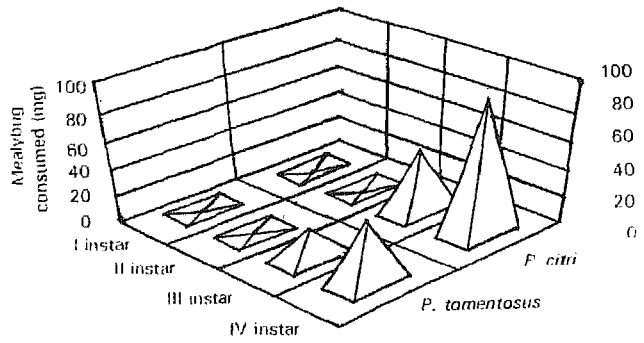

Fig 1 Predatory potential of various larval stages of *Cryptolaemus montrouzieri*

reference to adult emergence. Sex ratio of *C. montrouzieri* was in favour of females when reared on *D. tomentosus* (1:1:75) compared to rearing on *P. citri* (1:1.49). The difference in sex ratio of predator might be due to differential preference by beetles on prey species. Beetles reared on *P. citri* gained more pupal and adult weight than those reared on *D. tomentosus*. The reduction in weight of predator reared on *D. tomentosus* is not unreasonable in that *D. tomentosus* is less preferred by *C. montrouzieri* (Suitability index = 0.75) than *P. citri*.

Table 1 Biological parameters of *Cryptolaemus montrouzieri* reared on *Planococcus citri* and *Dactylopius tomentosus* under laboratory conditions

Stage	Development period (days) of *C. montrouzieri*	
	P. citri	*D. tomentosus*
	4.00 ± 0.50	4.23 ± 0.44
Grub		
I instar	2.58 ± 0.51	3.92 ± 0.29
II instar	1.58 ± 0.39	3.08 ± 0.29
III instar	3.92 ± 0.51	5.83 ± 0.39
IV instar	4.08 ± 0.51	4.89 ± 0.60
Total grub period	12.42 ± 0.99	17.67 ± 0.87
Prepupae	2.17 ± 0.72	2.44 ± 0.53
Pupae	7.50 ± 0.52	8.17 ± 1.19
Total development period	26.09 ± 2.73	32.51 ± 3.03
Pupation (%)	91.7	75.0
Adult emergence (%)	94.6	94.3
Sex ratio male : female	1:1.49	1:1.75
Pupal weight (mg)	14.00 ± 1.70	7.70 ± 1.30
Female weight (mg)	10.00 ± 1.20	6.40 ± 1.90
Male weight (mg)	10.00 ± 1.70	6.30 ± 1.50

Each grub consumed 1.94, 6.29, 46.69 and 95.88 mg of *P. citri* and 0.73, 3.00, 22.29 and 45.77 mg of *D. tomentosus* during the first, second, third and fourth instars respectively (Fig 1). Fourth instar grubs were voracious feeder and consumed 63% of total food requirement for both prey species as against 30% by third instar grub and remaining by first and second instars. Feeding preference by *C. montrouzieri* on *P. citri* (150.83 mg) was two times higher than that of *D. tomentosus* (72 mg).

Suitability index and predatory potential of *C. montrouzieri* on *D. tomentosus* indicated that *D. tomentosus* can be used successfully for maintaining the culture of predatory beetles in the laboratory as well as by commercial insectaries when the culture of *P. citri* is not available.

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