

Predation of *Mallada boninensis* on *Ferrisia virgata*, *Planococcus citri* and *P. lilacinus*

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Chrysopids play a major role in regulating the mealybug populations in nature. The green lacewing *Mallada boninensis* (Okamoto) is known to feed on many mealybug species (Boussienguet, 1986; Krishnamoorthy and Mani, 1989; Mani and Krishnamoorthy, 1989). The striped mealybug *Ferrisia virgata* (Ck11.), citrus mealybug *Planococcus citri* (Risso) and the common coffee mealybug, *P. lilacinus* (Ck11.) pose variety of problems especially in fruit crops in India. According to Douth (1951), the mealybugs could be controlled by large scale releases of chrysopids. With a hope to utilise *M. boninensis* against these mealybugs, its predatory potential was determined in the present study.

The culture of mealybugs viz., *F. virgata*, *P. citri* and *P. lilacinus* were maintained on pumpkin (*Cucurbita moschata* D.) in the laboratory as suggested by Chacko *et al.* (1978). The culture of *M. boninensis* was obtained from the mealybug infested orchards and maintained on the frozen eggs of rice moth, *Corcyra cephalonica* (Staint.) by the method developed by Krishnamoorthy and Nagarkatti (1981). Freshly laid eggs of *M. boninensis* were held individually in glass vials (7.5 x 2.5 cm)

and closed with cloth walled cotton plugs. Newly hatched larvae were provided with a known number of mealybug nymphs (10-15 days old). A total of 10 predatory larvae were taken for each mealybug species considering the single larva as one replicate. Observations were made at 24 h interval on the number of nymphs preyed and the larval development. The unpreyed nymphs were removed every day before providing known number of fresh mealybug nymphs. All the studies were conducted at $25 \pm 2^\circ\text{C}$ and 65-75% RH in the laboratory.

The feeding behaviour of different larval instars of *M. boninensis* on all three mealybug species is presented in Table 1. The number of nymphs preyed by the chrysopid larva in each mealybug species increased gradually and reached a peak in third larval instar. First instar larva preyed on 40.20 to 62.66 nymphs depending on the mealybug species. Mortality of first instar larva varied from 10 to 30 per cent when reared on different mealybug species. The number of nymphs preyed by the second instar larvae varied from 66.83 to 123.80. Third instar larvae were very voracious consuming more number of nymphs than the first and second

Table 1. Predation on mealybugs by *Mallada boninensis*

Larval instars	* X no. of mealybug nymphs preyed \pm S.D.		
	<i>F. virgata</i>	<i>P. citri</i>	<i>P. lilacinus</i>
I	62.66 \pm 11.48	40.20 \pm 8.94	62.50 \pm 7.50
II	83.66 \pm 13.15	123.80 \pm 18.40	120.50 \pm 16.65
III	199.00 \pm 20.10	398.00 \pm 18.64	317.25 \pm 22.46
Total	344.70	562.00	490.25

* Mean of 10 replicates

Table 2. Larval development of *Mallada boninensis* on different mealybug species

Larval instars	X developmental period (in days)		
	<i>F. virgata</i>	<i>P. citri</i>	<i>P. lilacinus</i>
I	4.00 ± 0.66	3.30 ± 0.52	3.20 ± 0.48
II	2.00 ± 0.47	2.50 ± 0.55	2.80 ± 0.44
III	5.00 ± 0.60	5.00 ± 0.63	4.20 ± 0.54
Total	11.0	10.80	10.20

instars (Table 1). During the entire period of development, a single larva preyed a mean of 344.7 nymphs of *F. virgata* or 490.25 nymphs of *P. lilacinus* or 562 nymphs of *P. citri*. Similar feeding behaviour of *M. boninensis* on yet another mealybug *Maconellicoccus hirsutus* (Green) was observed by Mani and Krishnamoorthy (1989) who reported that a single larva consumed 237.9 mealybug nymphs. Of the mealybug species, *P. citri* was found to be relatively more preferred and preyed more by *M. boninensis*. Similarly, a single larva of *Chrysopa lacciperda* Kimmins was also found to prey as many as 767 nymphs of *P. citri* (Krishnamoorthy, 1988).

Incubation period of *M. boninensis* ranged from 4 to 5 days on all the mealybug species. The data on the larval development on different mealybugs are presented in Table 2. In general, the nymphs of different mealybug species offered as larval diet did not influence the larval development which varied only from 10.20 to 11 days. The pupal stage lasted for 8 to 10 days. Adult emergence varied from 82 to 90 per cent from the pupae reared on different mealybug species. The life cycle was completed in 22-26 days. The same chrysopid completed its development in 25.5 days on *M. hirsutus* (Mani and Krishnamoorthy, 1989). Similar developmental period of *M. boninensis* was also earlier observed by Brettel (1979) on the psyllid *Paurocephalo psylloptera* Crawford.

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Key Words : *Mallada boninensis*, predation, *Ferrisia virgata*, *Planococcus citri*, *P. lilacinus*

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