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BIOLOGY AND PREDATORY POTENTIAL OF *Mallada boninensis* (Okamoto) AGAINST SUCKING PESTS

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ABSTRACT

Biology and predatory potential of *Mallada boninensis* (Okamoto) on different sucking pests viz., eggs and nymphs of citrus blackfly, nymphs of citrus psylla, nymphs of different aphids and eggs of rice moth were studied in the laboratory under controlled temperature and humidity conditions of 26 ± 2°C and 65 ± 5% R.H. respectively in Bio-control Laboratory of Entomology Section, College of Agriculture, Nagpur, Maharashtra during 2002-2003. The highest larval duration was observed as 16.66 days when reared on nymphs of *Uroleucon compositae*, while the lowest pupal duration was recorded as 8.26 days when larvae were reared on eggs of *A. woglumi*. Maximum adult longevity of male (37.06 days) was observed when their larvae were grown on nymphs of *A. woglumi* and maximum longevity of female (53.22 days) and oviposition period of 46.6 days was recorded with eggs of *C. cephalonica* as a larval food. The lowest pre-oviposition period of 4.4 days and highest incubation period as 4.53 days was recorded with the diet of nymphs of *A. woglumi*. The maximum feeding potential of *M. boninensis* was recorded as 734.66 with eggs of *C. cephalonica*. On the basis of influence on the various biological parameters of the predator, it could be inferred that the laboratory host i.e. eggs of *C. cephalomica* was found to be the most suitable host for rearing and nymphs of *A. woglumi* and *A. gossypii* can be used a substitute.

(Key words: Biology, *Mallada boninensis*, predatory potential, sucking pests)

INTRODUCTION

In recent years, use of green lacewing is being recommended in biointesive integrated pest management. In India, 67 species of lacewings belonging to 21 genera have been recorded from various crop systems. However, some species are distributed widely and are key natural enemies for soft bodied insects. Amongst them *Chrysoperla carnea, Mallada boninensis, Mallada* astur and *Apertochrysa crassinervis* are the most common (Anonymous, 1992).

During the last two decades or so, the role of chrysopids as predator of pests of different crops has been appreciated all over the world. Their comparative tolerance to commonly used insecticides for pest control has led to an interest towards utilizing them as ecofriendly and economical component of integrated pest management (Anonymous, 1992).

Amongst the various *Mallada* spp. found in world, *M. boninensis, M. basalis, M. astur* and *M. desjardinsi* are the important ones. They are found to be potential predators of the various aphids, leaf miners, citrus psylla, citrus blackfly, whitefly, etc. Various workers have studied the biology and feeding potential of *M. boninensis* by utilizing mostly the eggs and nymphs of citrus blackfly. In order to provide alternated prey food material, it was thought worth while to conduct the experiment to test the feeding potential of this predator against various sucking pests.

MATERIALS AND METHODS

Procurement of different hosts :

Eggs of *Corcyra cephalonica* were obtained by mass rearing of *Aleurocanthus woglumi* were collected from orange orchards of District Horticulture Nursery, Susundri,

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Distt. Nagpur and nymphs of *Diaphorina citri*, nymphs of different aphids viz., *Aphis gossypii, Aphis craccivora, Lipaphis erysymi* and *Uroleucon compositae* were collected from plots of Department of Entomology Section, College of Agriculture, Nagpur. The plots were kept untreated. Various hosts thus collected are utilized for rearing of predator *M. boninensis*.

Rearing of Predator :

Firstly the culture was maintained on the eggs of *C. cephalonica* and the eggs of predator were utilized for the experimentation. Single egg of *M. boninensis* was kept in separate plastic containers (3.00 x 3.5 cm) and a set of 10 containers treatment^{-1} was replicated thrice. As soon as the eggs hatched, the larvae were provided with the known quantity of different hosts, till they entered into pupation. After adult emergence, adults were transferred to the large plastic bins lined with black paper sheet from inner side, which was covered with nylon net from upper side. The adults were fed with sponge soaked with the solution containing water 50 ml + honey 2.5 g + protinex x 5 g + 8-10 granules of yeast alongwith castor pollen.

The biological parameters like larval developmental period, pupal period, larval and pupal weight, incubation period, Pre-oviposition, oviposition, adult longevity, fecundity and predatory potential of predator were studied on different hosts. The data, thus, obtained were analysed statistically after transformation, wherever necessary.

Treatments details :

T_1	-	Eggs of citrus blackfly	-	*Aleurocanthus woglumi* Ashby
T_2	-	Nymphs of citrus blackfly	-	*Aleurocanthus woglumi* Ashby
T_3	-	Nymphs of citrus psylla	-	*Diaphorina citri* Kuwayama
T_4	-	Nymphs of cotton aphids	-	*Aphis gossypii* Glover
T_5	-	Nymphs of mustard aphids	-	*Lipaphis erysymi* Kaltenback
T_6	-	Nymphs of safflower aphids	-	*Uroleucon compositae* Theobald
T_7	-	Nymphs of bean aphids	-	*Aphis craccivora* Koch
T_8	-	Inactivated eggs of rice moth (Standard check)	-	*Corcyra cephalonica* Stainton

RESULTS AND DISCUSSION

The data collected on various biological parameters of *M. boninensis* on different hosts are presented in table 1.

Influence of different prey hosts on different life stages of *M. boninensis*.

Larval duration :

The maximum larval duration of 16.66 days was recorded when *M. boninensis* were reared on nymphs of *U. compositae* followed by the treatment of the host where it was reared on nymphs of *A. woglumi* recording 15.36 days duration. The larval duration of 13.46 and 12.66 days was recorded when the hosts were nymphs of *D. citri* and eggs of *A. woglumi*, respectively. However, the next minimum duration of 12.00 days was observed when host was nymphs of *A. craccivora* and was found at par when the host was nymphs of *L. erysymi* (11.63 days) which in turn was at par when the host was nymphs of *A. gossypii* (11.13 days). The minimum larval duration of 8.55 days was found when they were reared on eggs of *C. cephalonica*.

The results of the present investigations corroborate with the findings of Unnikrishnan (1995) who reported the larval duration of 9-10 days with eggs of *C. cephalonica* and 10-12 days with eggs and nymphs of citrus blackfly, Satpute (1992) reported the duration of 12-13 days on eggs and nymphs of citrus blackfly, Lad (1987) reported the duration of 17.5 days and Jalali and Singh (1994) reported 11.6 days duration of *M. astur* on *A. gossypii*.

Pupal duration :

The longer pupal duration of 12.00 days was recorded when prey host was nymphs of *U. compositae* and the shortest duration of 8.26 days when it was reared on the eggs of *A. woglumi*. Whereas, the duration of 8.50 days and 8.73 days was recorded when prey hosts were nymphs of *A. woglumi* and *D. citri* and were at par with each other. The pupal duration of 10.40, 10.46 and 10.63 days was recorded when it was reared on nymphs of *L. erysymi*, *A. gossypii* and *A. craccivora*, respectively and were at par among themselves. However, the prey host treatment of nymphs of *A. craccivora* was found at par with the treatment where host was eggs of *C. cephalonica* (10.73 days).

The results of the present findings are comparable with the reportings of Unnikrishnan (1995) who recorded the pupal duration of 8.5 - 9.5 days with eggs of *C. cephalonica* and 10-12 days with eggs and nymphs of citrus blackfly, Satpute (1992) reported 9-11 days duration with an average of 8.9 days on eggs and nymphs of citrus blackfly and Bretell (1997) reported the duration of 10 days on *A. gossypii*.

Larval and pupal weight :

During the present investigation the larval weight recorded was 7.80, 7.70, 7.47, 7.40, 7.22, 7.17, 6.91 and 6.90 mg larva^{-1} with nymphs of *A. woglumi*, eggs of *A. woglumi*, nymphs of *U. compositae*, eggs of *C. cephalonica*, nymphs of *A. gossypii*, nymphs of *A. craccivora*, nymphs of *L. erysymi*, nymphs of *D. citri* and pupal weight was 7.60, 7.59, 7.32, 7.17, 7.07, 7.04, 6.70 and 6.56 mg pupa^{-1} with nymphs of *A. woglumi*, eggs of *A. woglumi*, nymphs of *U. compositae*, eggs of *C. cephalonica*, nymphs of *A. gossypii*, nymphs of *A. craccivora*, nymphs *D. citri* and nymphs of *L. erysymi*.

The results of the present findings are on similar line as those of Wadhai (2001) and Ramkumar (2002).

Male longevity :

In the present studies, male longevity was recorded as 16.88, 18.33, 18.83, 19.11, 20.47, 30.00, 35.16 and 37.06 days with nymphs of *L. erysymi*, nymphs of *A. craccivora*, nymphs of *A. gossypii*, nymphs of *D. citri*, nymphs of *U. compositae*, eggs of *C. cephalonica*, eggs of *A. woglumi* and nymphs of *A. woglumi* used as larval diet.

The results of present studies are comparable with the findings of Wadhai (2001) who reported male longevity as 36-40 days with citrus blackfly and Ramkumar (2002) who reported male longevity as 34.08 and 38.19 days with eggs and nymphs of citrus blackfly.

Female longevity :

During the present investigation the female longevity was recorded as 30.08 (T_3) 37.00 (T_5), 43.50 (T_1), 44.46 (T_2), 45.33 (T_6), 45.72 (T_7), 49.41 (T_4) and 53.22 (T_8) days with nymphs of *D. citri*, nymphs of *L. erysymi*, eggs of *A. woglumi*, nymphs of *A. woglumi*, nymphs of *U. compositae*, nymphs of *A. craccivora*, nymphs of *A. gossypii* and eggs of *C. cephalonica* used as larval diet. However, the treatment T_1 and T_2, T_2 and T_6, T_6 and T_7 were found at par with each other.

The results of these studies are very much comparable with the records of Bavanthade (1997) and Wadhai (2001) who reported 45-50 days of female longevity with eggs and nymphs of citrus blackfly. Also, Ramkumar (2002) recorded longevity of 47.6, 42.94 and 43.46 days with eggs of rice moth and with eggs and nymphs of citrus blackfly.

Pre-oviposition period :

The pre-oviposition period in the present findings was recorded as 3.75, 4.40, 6.97, 8.93, 8.97, 9.95, 11.95 and 12.01 days with eggs of *A. woglumi,* nymphs of *A. woglumi*, eggs of *C. cephalonica,* nymphs of *D. citri*, nymphs of *L. erysymi*, nymphs of *A. craccivora*, nymphs of *U. compositae* and nymphs of *A. gossypii* used as larval diet of *M. boninensis*.

The results of present investigation are very much comparable with the findings of Naib (1986) who reported the pre-oviposition period of 4-11 days and Joshi and Yadav (1990) who reported the duration of 9-11 days with eggs and nymphs of citrus blackfly.

Oviposition period :

All the treatments showed significant differences and the oviposition period was recorded as 9.50 (T_3), 24.66 (T_5), 30.66 (T_6), 33.25 (T_1), 35.91 (T_4), 35.93 (T_2), 41.21 (T_7) and 46.60 (T_8) days with nymphs of *D. citri,* nymphs of *L. erysymi*, nymphs of *U. compositae*, eggs of *A. woglumi,* nymphs of *A. gossypii*, nymphs of *A. woglumi,* nymphs of *A. craccivora* and eggs of *C. cephalonica*. The treatment T_2 and T_4 were found at par with each other.

The results of the present study corroborate with the findings of Unnikrishnan (1995) who reported the oviposition period of 36.91 + 4.4 days, Lavhe (1996) reported 41.1 days, Bavanthade (1997) reported 30 to 40 days and Wadhai (2001) reported 30 to 41 days on eggs and nymphs of citrus blackfly.

Incubation period :

In the present finding the incubation period was recorded as 3 and 3.03 days with nymphs of *A. gossypii* and nymphs *D. citri* and both of them were at par with each other. The incubation period of 3.41, 3.98, 4.01, 4.21 and 4.53 days was recorded with eggs of *A. woglumi*, nymphs of *L. erysymi* and eggs of *C. cephalonica*, nymphs of *U. compositae,* nymphs of *A. craccivora* and nymphs of *A. woglumi*.

The results of the present study are in conformation with the findings of Unnikrishnan (1995) who reported the incubation period of 4-5 days with eggs of *C. cephalonica* and 4-5 days in case of eggs and nymphs of citrus blackfly.

Fecundity :

In the present study the lowest fecundity was recorded as 70.33 with nymphs of *D. citri* followed by nymphs of *L. erysymi* (96.66). It was 108 and 114.60 where prey host was nymphs *U. compositae* and nymphs of *A. craccivora* and were at par with each other. It was recorded as 121.60, 315.33, 341.00 and 349.3 where larval host was nymphs of *A. gossypii*, eggs of *C. cephalonica,* eggs and nymphs of *A. woglumi*, respectively.

The results of the present finding are comparable with the studies of Wadhai (2001) who recorded 268-372 eggs female^{-1} on eggs and nymphs of citrus blackfly. Similarly, Ramkumar (2002) reported 345.77, 331.31 and 345.17 eggs female^{-1} with eggs of rice moth and eggs and nymphs of citrus blackfly, respectively.

Feeding potential :

During the present investigation the lowest feeding potential was observed with nymphs of *D. citri* (120.00) and eggs of *A. woglumi* (120.60) and both of these treatments were at par with each other. In other treatments, it was observed as 155.00, 275.33, 445.00, 471.60, 545.60 and with nymphs of *U. compositae*, *L. erysymi, A. craccivora, A. gossypii* and *A. woglumi* respectly 736.60 eggs of *C. cephalonica*.

The results of present findings are in conformation with the studies of Unnikrishnan (1995) who reported feeding potential of 700-730 eggs larva^{-1} with rice moth. Joshi and Yadav (1990) recorded 628.72 eggs larva^{-1} with eggs of rice moth. Similarly, Bavanthade (1997) reported feeding potential of 117.00 eggs larva^{-1} with eggs of citrus blackfly. Similarly, Ramkumar (2002) reported 742.7 eggs larva^{-1} with rice moth.

Table 1. Average period (days) and weight (mg) required to complete different life stages of *M. boninensis* and its feeding potential on different hosts

Parameters	Different hosts (Treatments)										
	Eggs of *A. woglumi*	Nymphs *of A woglumi*	Nymphs of *D. citri*	Nymphs of *A. gossypii*	Nymphs of *L. erysymi*	Nymphs of *U. compos -itae*	Nymphs of *A. cracci -vora*	Eggs of *C. cephal -onica*	"F" test	SE ± (m)	C D at 5%
Larval duration											
I instar	6.23	6.16	3.50	3.66	4.50	3.03	3.33	2.19	Sig.	0.09	0.27
II instar	3.30	4.53	2.36	3.86	2.66	4.76	3.80	3.00	Sig.	0.09	0.27
III instar	3.13	4.63	7.10	3.60	4.46	8.60	4.90	3.36	Sig.	0.10	0.32
Total larval duration	12.66	15.36	13.46	11.13	11.63	16.66	12.00	8.55	Sig.	0.21	0.65
Larval weight	7.70	7.80	6.90	7.22	6.91	7.47	7.17	7.40	Sig.	0.03	0.10
Pupal duration	8.26	8.50	8.73	10.46	10.40	12.00	10.63	10.73	Sig.	0.08	0.25
Pupal weight	7.59	7.60	6.70	7.07	6.56	7.32	7.04	7.17	Sig.	0.02	0.06
Adult longevity											
Male	35.16	37.06	19.11	18.83	16.88	20.47	18.33	30.00	Sig.	0.35	1.06
Female	43.50	44.46	30.08	49.41	37.00	45.33	45.72	53.22	Sig.	0.34	1.03
Pre-oviposition	3.75	4.40	8.93	12.01	8.97	11.95	9.95	6.97	Sig.	0.07	0.23
Oviposition	33.25	35.93	19.50	35.91	24.66	30.66	41.21	46.60	Sig.	0.53	1.60
Incubation	3.41	4.53	3.03	3.00	3.98	4.01	4.21	3.98	Sig.	0.12	0.36
Fecundity	341	349.3	75.33	121.60	96.66	108.00	114.60	315.33	Sig.	0.16	0.50
	(18.46)	(18.68)	(8.67)	(11.02)	(9.82)	(10.36)	(10.70)	(17.74)			
Feeding potential	120.60	545.60	120.00	471.60	275.33	155.00	445.00	734.66	Sig.	0.24	0.72
	(10.98)	(23.37)	(10.95)	(21.71)	(16.58)	(12.44)	(21.09)	(27.06)			

(The values in parenthesis are square root transformation values)

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