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COMPARATIVE BIOLOGY OF MALLADA BONINENSIS (OKOMOTO) ON NATURAL HOST MANGO HOPPERS IDIOSCOPUS NIVEOSPARSUS (LETH) AND LABORATORY HOST RICE MOTH CORCYRA CEPHALONICA (STAINTON)

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Abstact: *Comparative biology of Mallada boninensis (Okomoto) on mango hoppers Idioscopus niveosparsus (Leth) and rice moth Corcyra cephalonica (Stainton) were studied under controlled temperature at $25^0C \pm 2^0C$ and 60 percent relative humidity in the Department of Agricultural Entomology, Dr. Balasaheb Sawant Konkan Krishi Vidhyapeeth, Dapoli during the year 2008-09 and 2009-10. The eggs of M. boninensis took slightly less incubation period when reared on C. cephalonica eggs than the natural host nymphs of I. niveosparsus. The larva of M.boninensis completes its development in a short period when fed with C. cephalonica eggs. The length and breadth of various instars of M. boninensis did not show any significant differences when reared on both the hosts. The longest pupal period of M. boninensis was recorded on I. niveosparsus while maximum weight of pupa was recorded on C. cephalonica eggs and the female survived longer than the male irrespective of food supplied during the larval stage and maximum fecundity of 294.00 eggs per female was noticed when the larvae were fed with the eggs of C. cephalonica.*

Key words: Biology, fecundity, *Mallada boninensis, Idioscopus niveosparsus, Corcyra cephalonica,* morphometrics.

INTRODUCTION

In India, Maharashtra is one of the major mango growing states and Konkan is the major area and famous mango producing region of Maharashtra. This crop is heavily attacked by different kinds of pests like mango hoppers, thrips, mealy bugs, scales, aphids, stem borer, leaf webber, fruit fly and stone weevil in Maharashtra. The population of *M. boninensis* has been found naturally occurring during the flowering period from October to February in the mango ecosystem of the Konkan region of Maharashtra. Use of different biological agents has proved as an alternative to the chemical pesticides. During last few decades, the chrysopids are reported to be the well-defined potential predators feeding on immature and adult stages of many soft-bodied insects like aphids, hoppers, whiteflies, thrips, scales, midge flies as well as eggs of Lepidopteron insects. While most of the adults of chrysopids are non predatory. The green lacewing a neuropteran insect has been found to be a potential predator (Mani and Krishnamoorty, 1989). Their comparative tolerance to commonly used pesticides for pest control has led to an interest towards utilizing them as ecofriendly and economical component of integrated pest management (Annonymous, 1992). However, biology of *M. boninensis* has not been properly studied on mango hoppers. Hence the present investigation was conducted to know the biology of *M. boninensis* on natural host i.e. mango hopper (*Idioscopus niveospaersus* Leth)

and laboratory host (*Corcyra cephalonica* Stainton).

Materials and Methods

The present investigation on comparative biology of *M. boninensis* on mango hoppers *I. niveosparsus* and rice moth *C. cephalonica* was carried out. Firstly the culture of predator *M. boninensis* was collected from the mango orchards of Dr. BSKKV, Dapoli and mass multiplied on Rice moth Corcyra eggs. Rice moth (*C. cephalonica*) was reared on sorghum grains and mass multiplied in the laboratory and used for study. While nymphal stages of *I. niveosparsus* were collected from the mango orchards daily early in the morning before sunrise. The transparent plastic bags were used for collection of mango hoppers. The alcoholic cotton was kept in plastic bag to control the activity of nymphs of mango hopper for some time. The known numbers of nymphs of *I. neviosparsus* transferred by using hair brush on mango seedling kept in the small glass chamber. Total thirty larvae of *M. boninensi*s were kept for recording the observations on larval period, pupal period, pupal weight and adult emergence while ten females and five males were kept for recording the fecundity and adult longevity for both the hosts in one set of experiment.

The neonate larvae were reared separately in transparent plastic vials (4 cm in diameter and 5 cm in height) to study the feeding duration of development in case of *Corcyra* while small glass chamber along with seedling were used in case of *I. neviosparsus* study. The larvae of *M. boninensis* were reared individually on the on *Corcyra* eggs and nymphal stages of *I. neviosparsus*. In case of of *I. neviosparsus* the neonate larvae of *M. boninensi*s did not accept the nymphal stages of mango hoppers as its prey. Therefore they were offered nymphs of mealy bugs in the beginning of first instar of *M. boninensi*s and then they were shifted on the nymphs of *M. boninensi*s upto pupation. The feeding behaviour of the larva was closely observed and duration of larval development at each instar was recorded. The larval instar was determined by recording exuva of the larva. The measurement of different instar larvae were also recorded with the help of ocular micrometer and scale. Freshly formed cocoons of *M. boninensis* were kept in plastic container that was already used for larval rearing. The weight of each cocoon taken separately on electronic weighing balance and the emergence of adults was recorded. The unhatched pupa after 20 days was considered as a dead. The fecundity of the adults of chrysopa, *M. boninensis* were studied by keeping one female and two males in small plastic mating chamber (500 ml capacity). The adult diet was given daily to the adults. Two shoots of glyricidia along with aphid colonies were kept in each mating chamber to facilitate natural conditions for egg laying. The eggs laid by each female were recorded regularly until the death of female in the mating chamber. The observations on preoviposition, oviposition and post oviposition periods were also recorded. The death of the females was recorded to study the longetivity of adult female. Number of males and females emerged from pupae were recorded to work out male and female sex ratio. The experiment was conducted in two sets and pooled data used for analyzed and presented.

Results and Discussions:

The data recorded on influence of hosts like *I. Niveosparsus* and C. *cephalonica* on different life stages of *M. boninensis* are presented in table 1.

Incubation Period and Hatching percentage:

The incubation period of M. *boninensis* ranged between was ranged between 3.18 and 4.12 days with an average of 4.00 when reared on *I. niveosparsus* while it was ranged between 3.18 and 4.18 days with an average of 3.96 ± 0.24 days on *C. cephalonica*. This indicated that the eggs of M. *boninensis* took slightly less incubation period when

reared on C. *cephalonica* than *I. Niveosparsus.* Gurav *et al.* (2004) studied the biology of *Apterochrysa* sp. bug, *Phyllonistis citri* in the laboratory and revealed the hatching percentage was 90% with 3.50 days incubation period.

Larval duration:

The larval duration of *M. boninensis* ranged between 12.00 and 15.06 days with an average of 13.76 ± 0.76 days when larva of *M. boninensis* fed with nymphs of *I. niveosparsus.* The duration of second instar in the range 5.18 days with an average of 4.70 ± 0.47 days and third instar with an average of 3.00 to 4.12 days with an average of 3.47 ± 0.44 days while the larval period of *M. boninensis* ranged in between 11.00 and 14.00 days with an average of 12.16 ± 0.60 days when reared on eggs of *Corcyra*. The duration of first instar was in the range of 4.00 to 5.18 days with an average of 4.44 ± 0.45 days, second instar in the range of 3.18 to5.06 days with an average of 4.12 ± 0.21 days and third instar in the range of 3.00 to 4.00 days with an average of 3.11 ± 0.13 days. The larval period of the *M. boninensis* was more when fed on *I. niveosparsus* than *C. cephalonica.* In each species total larval development period was recorded as 13.76 ± 0.76 and 12.16 ± 0.67 days, respectively on *I. niveosparsus* and *C. cephalonica.* These observations are in more or less conformity with the findings of earlier workers namely Bansode and Sarode (2000) recorded 6.52 and 6.95 days larval period of C. *carnea* on preys of sterilized and unsterilized eggs of *C. cephalonica,* respectively. The average duration of first, second and third instars of *C. carnea* reared on C. *cephalonica* were 3.20 ± 0.41, 4.06 ± 0.25 and 5.13 ± 0.51 days, respectively. (Deole *et al.* 2002). While Gurav *et al.* (2004) recorded average larval duration of *Apterochrysa* sp. on mealy bug, *Phyllonistis citri* was 9.00 days in the laboratory. The minimum and maximum length of first instar larva was 1.70 mm and 2.90 mm with an average length 2.06 ± 0.18 and 2.03 ± 0.12 mm, the average length of second instar larva was 4.03 ± 0.33 and 4.13 ± 0.16 mm, average breadth measured 2.10 ± 0.09 and 2.12 ± 0.15 mm, the length of third instar larva was 7.61 ± 0.55 and 7.98 ± 0.50 mm and breadth of third instar larva was 3.78 ± 0,24 and 3.76 ± 0.21 mm on *I. niveosparsus* and *C. cephalonica,* respectively.

Pupal period and pupal weight:

The pupal period of *M. boninensis* was 10.42±0.47 days and in the range of 9.12 to 13.06 days when larva fed with *I. niveosparsus* nymphs, the pupal period ranged in between 9.06 to 12.06 days with an average of 10.38 ± 0.47 days when larva fed with *C. cephalonica* eggs. The pupal weight was 9.08 ± 0.35 and 9.61 ± 0.60 mg when larva reared on *I. niveosparsus* and *C. cephalonica,* respectively. The same result was recorded by Kapadia and Puri (1992) while studing the biology of *Chrysoperla carnea* on B. *tabaci* and *Rhophalosiphum maidis* (Fitch) under laboratory conditions. The pupal periods of *C. carnea* were longer on *Bemicia tabaci* as compared to aphids. All the larvae and pupae reared on B. *tabaci* succeeded cent per cent development. Similarly Deole *et al.* (2002) reported that the average pupal period of 7.20 ± 0.41 days C. *camea* reared on C. *cephalonica* which is in the close agreement with the present findings.

Adult longetivity and fecundity:

The adult female longetivity was recorded as 27.50 and 29.60 days while male survived for 23.00

and 27.00 days, respectively when larva was fed on *I. niveosparsus* and *C. cephalonica*. In general, in respective prey species adult female survived longer than the male. The average preoviposition period of *M. boninensis* on *I. niveosparsus* and *C. cephalonica* was 10.60 and 11.30 days, the average oviposition period was 15.20 and 16.50 days and average postoviposition period was 1.15 and 1.90 days when reared on *I. niveosparsus* and *C. cephalonica,* respectively. The fecundity *of M. boninensis* was influenced due to food variation at larval stage besides age. The mean fecundity of *M. boninensis* was higher 294.00 on *C. cephalonica* as compared with 257.30 on *I. niveosparsus.* The present findings are in conformity with the earlier workers Lee and Shih (1981) reported that the type of prey influenced the life cycle of *M. boninensis* when reared on the nymphs of the psyllid, *Paurocephala psylloptera* (Crawford) and eggs of *C. cephalonica* and found that the life cycle was shorter on the latter host.

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Table 1: Comparative Biology of *Mallada boninensis* (Okomoto) on Mango hoppers *Idioscopus niveosparsus* (Leth) and Rice moth *Corcyra cephalonica* (Stainton) (Pooled)

No.	Stages of *M. boninensis*	Biology of *M. boninensis* on mango hoppers *Idioscopus niveosparsus*				Biology of *M. boninensis* on rice moth *Corcyra cephalonica*			
		No. of stages	Duration of different stages			No. of stages	Duration of different stages		
			Average	Min.	Max.		Average	Min.	Max.
1.	**Incubation period (Days)**	30	4.00±0.19	3.18	4.12	30	3.96±0.24	3.18	4.18
	Hatching percentage	50	100.00%	-	-	50	98.00%	-	-
2.	**Larval period (Days)**								
	I instar	30	5.02±0.35	4.12	6.00	30	4.44±0.45	4.00	5.18
	II instar	30	4.70±0.47	4.00	5.18	30	4.12±0.21	3.18	5.06
	III instar	30	3.47±0.44	3.00	4.12	30	3.11±0.13	3.00	4.00
	Total Larval Period	30	13.76±0.76	12.00	15.06	30	12.16±0.67	11.00	14.00
3.	**Morphometrics of larva**								
	I instar (Length mm)	30	2.06±0.18	1.70	2.90	30	2.03±0.12	1.80	2.30
	II instar (Length mm)	30	4.03±0.33	3.20	4.50	30	4.13±0.16	3.40	4.80
	II instar (Breadth mm)	30	2.10±0.09	2.00	2.30	30	2.12±0.15	1.80	2.50
	III instar (Length mm)	30	7.61±0.55	6.70	8.40	30	7.98±0.50	6.80	8.90
	III instar (Breadth mm)	30	3.78±0.24	3.00	4.40	30	3.76±0.21	3.10	4.10
4.	**Pupal period (Days)**	26	10.42±0.47	9.12	13.06	28	10.38±0.47	9.06	12.06
5.	**Pupal weight (mg)**	30	9.08±0.35	6.00	13.00	30	9.61±0.60	6.00	13.00
6.	**Adult emergence (%)**	26	91.66	-	-	26	98.33	-	-
7.	**Adult period (Days)**								
	a. Pre oviposition period	10	10.60	9.00	13.00	10	11.30	8.00	17.00
	b. Oviposition period	10	15.20	11.00	21.00	10	16.50	10.00	25.00
	c. Post oviposition period	10	1.15	0.00	9.00	10	1.90	0.00	10.00
	Total Life period (Female)	10	27.50	20.00	42.00	10	29.60	18.00	48.00
8.	**Sex ratio (m/f)**	26	1:1.75	-	-	28	1:1.80	-	-
9.	**Fecundity**	10	257.30	160.00	364.00	10	294	215	372