International Journal of Farm Sciences **4(3)** : 145-151, 2014

Bionomics of *Chrysoperla carnea* (Stephens) on eggs of *Corcyra cephalonica* (Stainton)

G SRASVAN KUMAR, DR THAKARE, A RAMA DEVI and M NAGAMALLIKADEVI

Department of Entomology
College of Agriculture, Nagpur 440001 Maharashtra
Email for correspondence: srasvanento@gmail.com

ABSTRACT

The present study entitled 'Bionomics of *Chrysoperla carnea* (Stephens) on eggs of *Corcyra cephalonica* (Stainton)' was conducted in the laboratory at 26.5^{0}C temperature and 65.5 per cent RH at the College of Agriculture, Nagpur during the year 2012-13. Biology of *C carnea* on *Corcyra* eggs was studied in laboratory and the observations were recorded on the parameters viz incubation period, 1st, 2nd and 3rd instars, total larval duration, pupal duration, total development period (egg to adult), sex ratio (M:F) pre-oviposition, oviposition, fecundity, post-oviposition period, adult longevity (male and female) were recorded as 3.23, 3.15, 2.08, 3.51, 8.43, 20.62, 1:1.5, 3.97, 32.11, 268.66 (number eggs/female), 2.81, 29.7 and 38.23 days respectively. The average hatching percentage of eggs of *C carnea* was recorded as 86.2 on *Corcyra* eggs. The average length and width of different stages of *C carnea* viz egg, 1st, 2nd and 3rd instar, male and female were recorded as 0.86, 3.70 (pedicel), 2.65, 5.25, 7.19, 3.87 (pupal diameter), 7.77 and 8.38 mm respectively and 0.35, 0.59, 1.22, 2.28, 1.16 and 1.63 mm respectively.

Keywords: Eggs; larvae; biology; hatching; life stages

INTRODUCTION

Biological control is the action of parasitoids, predators and pathogens in maintaining other organisms density at a lower average level than would occur in their absence (DeBach 1965). The predators are scattered in about 167 families of 14 orders of class Insecta. Among the predacious insect orders Coleoptera, Neuroptera, Hymenoptera, Diptera and Hemiptera contain exclusively predators and parasitoids (natural enemies). It is estimated that possibly up to one third of the successful biological insect pest control programmes are attributable to the introduction and release of insect predators (Williamson and Smith 1994).

Green lacewing constitutes a prominent group of predators due to their amenability to mass production and potential for use in varied ecosystems. IPM has lead to considerable interest in the use

of *Chrysoperla carnea* because of its broad distribution, presence of adults throughout the year, easy rearing in captivity, tolerance to some insecticides and potential to adapt to many crop environments. It is very much essential to mass produce *C carnea* in the laboratory and then release in the fields as the natural population is not so adequate to suppress the pest population.

C carnea plays a prominent role in suppressing pest at early stages of crops (Saminathan et al 2003). It controls the pests and is widely recommended on tomato, potato, cotton, sunflower, tobacco and ground nut etc (Canard and Principi 1984, Singh and Jalali 1991). *C carnea* is widely used and studied for its host preference (Gerling et al 1997) and reproductive and feeding potential on different pest species (Balasubramani and Swamiappan 1994). However the information on survival and feeding potential of this predator and the requirement of host eggs of *Corcyra cephalonica* for this species is lacking. During the last two decades the role of chrysopids (green lacewing) as predator of pests has been appreciated all over the world in IPM programmes.

MATERIAL and METHODS

The initial culture was obtained from the already established culture of *C carnea* in the bio-control laboratory at entomology section, College of Agriculture, Nagpur and it was further multiplied on the host of eggs of *C cephalonica*. The 24 h old eggs taken from laboratory kept in plastic vials and a set of ten plastic vials was used for rearing of treatment and was replicated thrice. After hatching the individual larva of *Chrysopa* was provided with eggs of *C cephalonica* in the morning at 9 am and in the evening at 5 pm. The days taken for completion of 1^{st}, 2^{nd}, 3^{rd} instar larvae, pupae and adult emergence were observed. The emerged adults from pupae were kept in mating chamber covered with nylon cloth to which artificial diet (equal volume of protinex, honey and powdered yeast dissolved in little quantity of distilled water) was provided. After mating the males and females were identified based on the shape of abdomen. They were kept in separate chambers to obtain data regarding longevity of males and females and fecundity of females. Inner sides of female chamber (oviposition chamber) were wrapped with black paper on which eggs were laid. The eggs were counted and kept in plastic vials to measure the per cent hatchability and egg (incubation) period. The length and width of different life stages of *C carnea* were measured by Stereomicroscope APOS8 LEICA Software available at Central Institute of Cotton Research Centre, Nagpur.

RESULTS and DISCUSSION

The data on the duration of different life stages of *C carnea* viz 1^{st} instar, 2^{nd} instar, 3^{rd} instar, total larval duration, pupal, total development period (egg to adult),

pre-oviposition, oviposition, post-oviposition and adult longevity (male and female) have been presented in Table 1.

The mean duration of 1st, 2nd and 3rd instar larvae was recorded as 3.15, 2.08, 3.51 days respectively and these results were corroborated with the results of Dhepe (2001), Mangrule (2002) and Balakrishnan et al (2005).

The average pupal and total development period of *C carnea* was recorded as 8.43 and 20.62 days respectively. These results are in agreement with those of Geethalakshmi et al (2000), Balasubramani and Swamiappan (1994).

The mean pre-oviposition, oviposition, post-oviposition and incubation period of *Chrysoperla carnea* were recorded at 3.76, 32.11, 2.81 and 3.23 days respectively. Similar observations were made by Dhepe (2001) and Mangrule (2002).

The average longevity of male and female and fecundity of *C carnea* were recorded at 29.7 and 38.23 days respectively and 268.66 (eggs/female). The results of longevity of male and female were similar with the findings of Mangrule (2002).

The data in respect of sex ratio (M:F) of *C carnea* are presented in Table 2.

In the present study the sex ratio (male:female) of *C carnea* was recorded as 1:1.5 when fed on *Corcyra* eggs.

Geethalakshmi et al *(*2000) and Dola and Korat (2010) reported the sex ratio of *C carnea* as 0.95:1 (M:F) and 1:1.46 (M:F) respectively. The present findings are in accordance with the results of Dola and Korat (2010).

The data on the hatching percentage of eggs of *C carnea* have been presented in Table 3. The average hatching percentage of eggs was recorded as 86.2 on *Corcyra* eggs and these results are similar to the findings of Dola and Korat (2010).

The data on length and width of different life stages of *C carnea* are presented in Table 4.

The average length of different stages of *C carnea* viz egg, pedicel, 1st instar, 2nd instar, 3rd instar, pupae (diameter), male and female were 0.86, 3.70, 2.65, 5.25, 7.19, 3.87, 7.77 and 8.38 mm respectively. According to the present investigations eggs had minimum length and females had maximum length. The results of the findings are in confirmation with the findings of Dola and Korat (2010).

The average width of different life stages viz egg, 1st instar, 2nd instar, 3rd instar, male and female (abdomen) was 0.35,

Table 1. Mean duration of different life stages of *C carnea* on eggs *of C cephalonica* (in days)

Stage	Mean	Stage	Mean
Egg	3.23	Total development	20.62
Larvae	8.74	Pre-oviposition	3.76
1st instar	3.15	Oviposition	32.11
2nd instar	2.08	Post-oviposition	2.81
3rd instar	3.51	Female longevity	38.23
Pupae	8.43	Male longevity	29.7

Table 2. Sex ratio of *C carnea* (M:F) on *C cephalonica*

#Adults observed	# Males	# Females	Sex ratio (M:F)
30	12	18	1:1.5

Table 3. Hatching percentage of eggs of *C carnea* at different days after oviposition

Period of study	# Eggs observed	Hatching of eggs on different days				Hatching (%)
		1st	2nd	3rd	4th	
20-24/09/12	60	-	5	18	30	88.33
26-30/09/12	110	-	11	32	59	92.72
01-04/10/12	80	-	7	23	37	83.75
08-12/10/12	95	-	9	28	39	80.00
Mean						86.20

Table 4. Measurement of length (mm) and breadth of different life stages of *C carnea* on *C cephalonica*

Stage	Mean length	Mean breadth
Egg	0.86	0.35
Pedicel	3.7	-
1st instar larva	2.65	0.59
2nd instar larva	5.25	1.22
3rd instar larva	7.19	2.28
Pupa (diameter)	3.87	-
Male	7.77	1.16*
Female	8.38	1.63**

*Male abdomen width **Female abdomen width

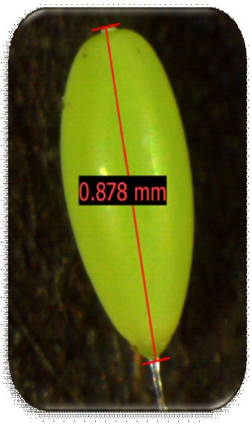

Plate 1. Egg length of *C carnea*

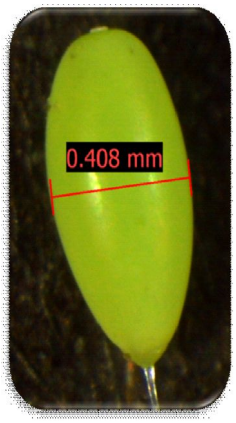

Plate 2. Egg width of *C carnea*

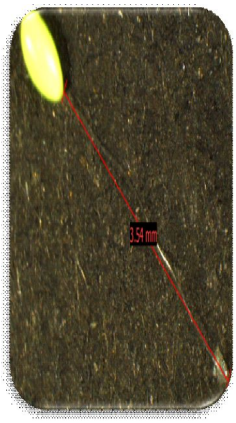

Plate 3. Pedicel length of *C carnea*

Plate 4. 1st instar length and width of *C carnea*

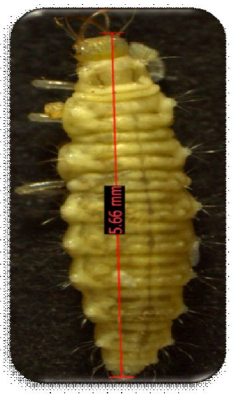

Plate 5. 2nd instar length of *C carnea*

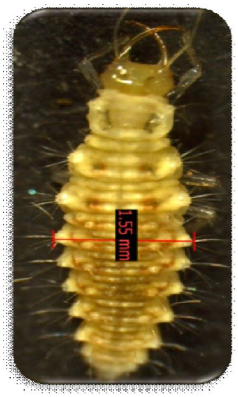

Plate 6. 2nd instar width of *C carnea*

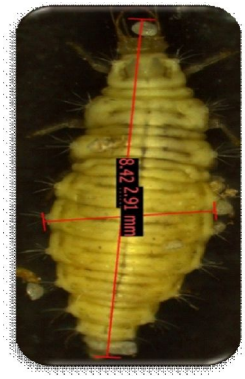

Plate 7. 3rd instar width and length of *carnea*

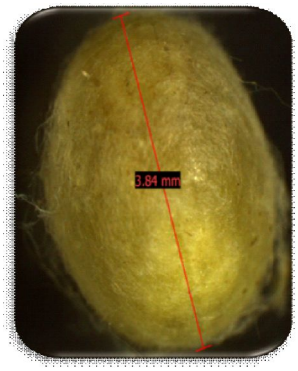

Plate 8. Pupal diameter of *C carnea*

Plate 9. Width of male *C carnea*

Plate 10. Length of male *C carnea*

Plate 11. Width of female *C carnea*

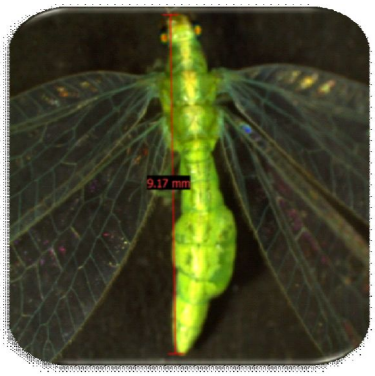

Plate 12. Length of female *C carnea*

0.59, 1.22, 2.28, 1.16 and 1.63 mm respectively on *C cephalonica*. The data in Table 6 depict that of all the life stages of *C carnea* egg had minimum width and 3rd instar had maximum width. These results are in agreement with the findings of Dola and Korat (2010).

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Received: 20.4.2014 ***Accepted: 7.7.2014***