BIOLOGICAL ASPECTS OF THE IMMATURE STAGES OF *CHRYSOPERLA CARNEA* ON *SITOTROGA CEREALELLA* EGGS UNDER LABORATORY CONDITION

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ABSTRACTS: Biology of the immature stages of *Chrysoperla carnea* on *Sitotroga cerealella* eggs were studied under laboratory conditions. Duration and viability of the embryonic period, development of the larval stages, pre pupal, pupal and egg-adult period and viability were recorded. The eggs required 3.90 ± 0.06 days to hatch and viability was 88%. The first instar lasted for 3.20 ± 0.09 days second mistar lasted for3.40 ± 0.05 and the third instar lasted for 4.70 ± 0.08 days giving a total larval stage of 11.30 ± 0.37 days with viability 97.72, 84.88 and 82.95% respectively. The pre pupal and pupal stages lasted for 2.80 ± 0.16 and 9.00 ± 0.24 days with viability, 88.33 and 62.26% respectively. Duration of the biological cycle was 27.00 ± 0.29 days on an average with total of 33% viability from egg to adult emergence.

Key words: *Chrysoperla Carnea, Sitotroga cerealella, Biology, Immature stages.*

INTRODUCTION

Chrysopids are of common occurrence in Pakistan and by virtue of their voracious feeding habits posse's great potentiality for being effectively used in control of soft bodied insects (Afzal *et.al.,*1978). *Chrysoperla carnea* also known as aphid lions is by far the most intensively studied species of Chrysopids, because of its abundance and broad habitat range (Tauber *et al.,* 2000). They are voracious predators of a wide variety of soft bodied arthropds including insects eg. aphids, caterpillars, leafhoppers, whiteflies, thrips, and Insect eggs. (Carrillo and Jagadish 2004). A thorough knowledge of the life history and food habits of *C.carnea* is a necessary prerequisite for their proper utilization in combating or at least reducing the wide spread attack of insect pests. Smith (1992) conducted studies on some biological aspects of *C. aculata.* Jagadish and Jayaramaiah (2004) studied life cycle and feeding potential of the *C. carnea* on tobacco aphid, *Myzus nicotianae.* In the Indo-Pakistan sub continent, Rehman (1940) very briefly reported the life history and hosts of *C. scelestes.*

The duration of the development and the surviaval of green lace wing are influenced by a number of factors, such as temperature, relative humidity, photoperiod, food quality and quantity, (Adane *et al.,* 2001) The influence of these factors was studied by (Ridway, *et al.,* 1970; Lenardo *et al.,* 2002; Burk and Matin 1956; Sengonae and Henze 1992; Santa, *et al.,* 1997) for different species of Chrysopids considering that information on the biological aspects of lacewing is a pre requisite for success when using these predators in biological control program.

The present work is intended to bring some basic information on the biology of *C.carnea,* on *Sitatroga Cerealella* eggs under laboratory condition, which could be usefully employed in increasing the efficiency of this insect as predator.

MATERIALS AND METHODS

Rearing host: The Angoumis grain moth, *S. Cerealella* was reared in glass jars (4 liters) containing wheat grains as food for larvae under the laboratory condition of 25 ± 2 °C and 60 ± 5 % relative humidity at Insect Pest Management Programme, NARC, during 2006.Adults were kept in oviposition jars placed in dishes containing starch for oviposition. The eggs laid in starch are separated and provided as a fresh food for *C. carnea* larvae daily.

REARING *CHRYSOPERLA CARNEA*: Adult *Chrysoperla carnea* was reared in transparent plastic cages. Upper top portion of the cage were lined with a sheet of black papers as substrate for oviposition. Adults were fed yeast + honey solution in distal water. Two hours fresh eggs of *Chrysoperla carnea* were kept with in transparent petri dishes (6cm x 11.5 cm), with a moist filter paper at a density of 10 eggs per petri dish with 10

replication, a total of 100 eggs were placed in Petri dishes, each petri dish was covered with a piece of muslin cloth, held in a position with a rubber band. On hatching the larvae of *C.carnea* were fed *S.cerealella* eggs up to third instars. The old eggs of *S. cerealella* were replenished with fresh eggs every morning at the time of observation. The insect remained in the same petri dish for observation on various biological aspects until it emerged as an adult. The following parameters were recorded daily, embryonic period and egg viability, duration and viability of each larval instars, pre pupal - pupal stages and period from egg to adult. The period (days) was registered pre pupal stage from the beginning of cocoon spinning to the last larval exuvia observed inside the cocoon. off after 2.8 ± 0.16 days with 88.33% viability (Table 1), which was packed into one end of the harbouring cocoon. This skin could seen through the thin cocoon wall as a dark disc like structure and its presence was used as an indication that the pupation had occurred. Mean duration of the pupal stage was 9.0 ± 0.24 days (Table 1). The average viability for the pupal stage were 62.26%, where as reported an average mean duration for the pupal stage were 10.2 days with 64.32% viability for noted the combined pre pupal and pupal stage as 10.2 days in *C. zastrawi.*

RESULTS AND DISCUSSION

Mean duration of the egg stage was 3.90 ± 0.06 days with 88% viability (Table 1). reported that eggs of *C. lanta* required 5.30 ± 0.10 days to hatch. reported closely related results of 4.00 ± 0.08 for *C.cubana*, kept at 25 C° and 70 ± 10% relative humidity, while Barness (1975) reported an average mean duration of an egg stage was 6.00 ± 2.10 days when placed at 25.3 C° which indicates the occurance of a slight variation of the embryonic period for different species of this genus. The average viability for this period was (88%), lower than that (97.7%) reported by but higher than reported 80.4% for *C. everes* feeding *S.cerelella* eggs (Lenardo *et al.,* 2002)

The insect passes through three larval instars before transforming in to pre pupa. The average duration of the first, second and third instars were 3.20 ± 0.09, 3.4 ± 0.05 and 4.70 ± 0.08 days, respectively (Table 1). (Afzal and 1978). reported the duration of the first, second and third instars of *C. carnea* larvae feeding ahids were 3.2 ±0.49, 2.8 ± 0.20 and 6.9 ± 0.49 days respectively. The viability for the first, second and third instars were 97.72, 84.88 and 82.95% (Table 1). (Lenard *et al.,* 2002) reported viability for first, second and third instars were 93.3, 100 and 89.5% respectively for *C.everes* feeding *Sitotroga cerelella* eggs. The mean duration for the larval stage was 11.3 ± 0.37 days (Table 1) reported mean duration for *C.cubana* larvae were 15 ± 0.46 days., where as (Afzal and 1978). reported mean duration for larval stage of *C.carnea* were 12.9 ± 0.69 days.

These divergent values found for different species of the genus Chrysopids, should be due to differences in the environmental condition under which the experiments were carried out, and the capacity of each species to utilize a given type of prey. The larvae completed two moults during the active feeding period and passed the last moult with in the cocoon. This period has been designated as the pre pupal period.The pre pupal skin was cast

The average duration of the period from eggs to adult was 27 ± 0.29 days with an average viability of 33%.

In the present study although *C.carnea* larvae fed *S.cerealella* eggs showed high viability values for different instars, there was malformation of pupae and consequently lower emergence of adults (33%). Larval prey quality has considerable influence on the biology and behavior of Chrysopids, (Canard and Principi 1984; Santa *et al.,*1997) & verified that the percentage of adults of *C.# cubana* emerging was 75% and 95% when the larvae were fed eggs of *A.kuehniella* only or supplemented with the Pinnaspis (Hemiptera: Diaspididae) However, when this lacewing was fed Pinnaspis sp. only the viability was 50% only, thus showing the importance of food during the larval stage upon the subsequent stages. This suggests the need to supplement this diet. The avid consumption of some species of prey by green lacewings does not necessarily indicate that those prey species are nutritionally adequate. This was evidenced when eggs of *Sitotroga cerealella*, a highly accepted prey by the three instars of *C carnea*, induced high pupal mortality. Considering the mass rearing of *Chrysoperla carnea,* on *Sitotroga cerealella* eggs the results demonstrate the need for food supplementation for efficient and quality production of this predator under laboratory condition.

Table 1: Mean duration in days (⬅ SE), Range (days) & Viability of the different developmental stages of *Chrysoperla carnea*

Development	n	Duration (days) ±SE	Range	Viability %
Embryonic period	100	3.9⬅ 0.06	(3-4)	88.00
1st instar	88	3.2⬅ 0.09	(3-5)	97.72
2nd instar	86	3.4⬅ 0.05	(3-5)	84.88
3rd instar	73	4.7⬅ 0.08	(4-6)	82.95
Larval stage	73	11.3⬅ 0.37	(11-15)	82.19
Pre-pupal stage	60	2.8⬅ 0.16	(2-3)	88.33
Pupa	53	9.0⬅ 0.24	(8-11)	62.26
Period from eggs to adult	33	27⬅ 0.29	(26-29)	33.00

S.E = Standard error of the mean, n = Number of insect used

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