Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(2): 84-86

Received: 22-01-2020
Accepted: 24-02-2020

Razique Ali Nahiyoon
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tando Jam, Pakistan

Rashid Ali Lashari
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tando Jam, Pakistan

Zarnain Rajput
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tando Jam, Pakistan

Hira Mannan Shaikh
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tando Jam, Pakistan

Maqsood Ali Laghari
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tando Jam, Pakistan

Qurban Ali Nahiyoon
Department of Plant Breeding and Genetics, Faculty of Crop Production, Sindh Agriculture University Tando Jam, Pakistan

Corresponding Author:
Razique Ali Nahiyoon
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tando Jam, Pakistan

Different host consumption by *Chrysoperla carnea* (Green lacewing) under laboratory conditions

Razique Ali Nahiyoon, Rashid Ali Lashari, Zarnain Rajput, Hira Mannan Shaikh, Maqsood Ali Laghari and Qurban Ali Nahiyoon

Abstract
The study was carried out on different hosts at IPM laboratory Tandojam during 2018-2019. The duration of various life stages i.e., eggs, larvae and pupae on aphid, eggs of Angoumois grain moth and mealy bug were observed. The fecundity female, longevity of female were recorded on various hosts. The predatory behaviour of larvae of *Chrysoperla Carnea* was recorded daily by offering them a known number of aphids, eggs of Angoumois grain moth and mealy bug. The increase in the weight of larvae of *C. carnea* after consumption of food was daily recorded in 3rd instar. The mean larval emergence from the eggs was observed as 16.4±1.60, 16.4±1.50 and 16.2±1.28 on Angoumois grain moth, cotton aphid and mealy bug respectively. The pupal period was 112.6±14 on Angoumois grain moth, cotton aphid and mealy bug respectively. The fecundity of female on three hosts comes out to be 1490.4±40.78, 1594.6±53.28, 1402.6±42.81 on Angoumois grain moth, cotton aphid and mealy bug respectively. The weight recorded in 3rd instar on three different hosts were aphid 0.0720±0.004, mealybug 0.018±0.003 Sitotroga *Cereallela* 0.0625±0.002 on Angoumois grain moth, cotton aphid and mealy bug respectively.

Keywords: *Chrysoperla carnea*, green lacewing, angoumois grain, pupal period

Introduction
In many developing countries including Pakistan, the indiscriminate use of pesticides has resulted in the environmental pollution on large scale besides, containing food and food products. It is also observed that after application, the pesticides have been accumulating in the soil, air and water to a critical stage. This calls for a safe and cheap control methods. This target can only be achieved by the practice of integrated Pest Management (IPM), which ensures the higher production and environmental safety (Lohar, 2001) [1]. The IPM includes biological control, cultural control and the chemical control as a last resort. Among others the biological control is one of the major components of IPM, it occupies central position in IPM programs (De-Bach, 1974) [2]. The biological control by insects is always insured by predators and parasitoids. Generally the predators are free living insects in both, the immature and adult stages, and often attack the same species of prey throughout their entire life history (Hoffman and Frodsham, 1993) [3]. One of the important example of insect predators is the lady bird beetle (Coccinellidae: Coleoptera), these beetles may consume several hundred aphids during their life. Another most common example of predators are the green lacewings, *Chrysoperla spp.* (Chrysopidae: Neuroptera), these insects are also called aphid lions they can consume several hundred aphids during their larval stage (Henn and Weinzieral, 1990; and Krishnamorthy 1982) [4, 5] The green lacewing *Chrysoperla spp*. long have been considered important naturally occurring predatosr in many horticultural and agricultural cropping systems, including vegetables, fruit, nuts, fiber and forage crops, ornamentals, green house crops, and forests (Hoffmann and Frodsham 1993; McEwen, 1995) [3, 6]. For this purpose, significant new developments were made in artificial larval diets, mechanized production methods, long term storages, and reliability on mass reared *Chrysoperla* spp. This has revealed the way for improving the ability to attract and retain the population of these predators in agricultural situations. The lacewings are general predators, being less specific to aphids than some other predators. They are often more important when other aphid predators are inactive. In addition to aphids, lacewing larvae fee on mites, thrips, soft scales, Lepidopteran eggs and other soft bodied prey (Mani and Krishnamoorthy, 1999) [7]. The purpose of present study is to understand, on which diet the larvae of *Chrysoperla carnea* grow well and which diet effect positively on their weight, size, egg laying male, female ratio etc.

Materials and Methods

The biology of green lacewing following procedure was adopted. The stock, culture of adult predator *Chrysoperla carnea* were obtained from the IPM laboratory, ARC, Tandojam and reared under the laboratory conditions as soon as the pupae become adults. The three pairs of adults were placed in the glass chimney. The damp cotton wool with extra water was placed in the glass chimney to ensure the humidity. Small bottle was kept in the glass chimney filled with water and having small stock of cotton plant to provide proper environment to the adults. The top of glass chimney was covered with black muslin cloth so that the egg laying could be easily be visible. The adults were fed on the artificial diet composing of 40 gm of yeast, 70 gm of sugar and 50 ml of water. This artificial diet was spread on the meter scale in the form of drops. In this way observations of five replications with each twenty larvae were taken by feeding them with three hosts. In the first instars the individual larvae were fed with 10 aphids, 10 mealy bugs and 0.3372 eggs of Angoumois grain moth. In this way the amount of food was increased as the instars increased. The feeding potential on all three hosts were observed up to pupation. After the pupation the adult emerged, fecundity, fertility of female was recorded with longevity and mortality rate and pupal period was observed. In this way three experiments with five replications were done and food consumed by each larva of the three experiments was observed in 5 replications also the growth and biology was recorded. The data was statistically analyzed.

Results and Discussion

Eggs

The data in table-1 shows that the eggs survival to adult stage, adult fecundity and fertility. The mean larval emergence from the eggs was observed as 16.4±1.60. This was the result of the pair feeding previously on Angoumois grain moth eggs when in larval instar. The pair fed on cotton aphid in their larval stage. The mean larval emergence was recorded as 16.4±1.50 from the eggs. The eggs hatching from pair which ware fed on mealy bug in their larval instars. The mean larval emergence from the eggs of this pair was 16.2±1.28. Hence the result was non-significant. Whereas Balasubramani and Swamiappan (1994) [8] conducted laboratory experiment and result revealed that larval development was rapid on eggs of *C. cephalonica* (8.20 days) and prolonged on neonates of *H. annigera* (11.10 days). Pupal development period was quicker on *B. tabaci* and *A. biguttula* (7.40 days) and prolonged on neonates of *H. annigera* (8.40 days).

Survival to Adult stage

The mean male adults emerged was recorded as 5.2±0.73. The table also reveals that the mean female adult emergence was recorded as 7.6±0.92. This was the pupae of larvae fed on Angoumois grain moth eggs. The table reveals the adult emergence from the pupae whose larvae was fed on cotton aphid. The mean male adult emerged was recorded as 4.8±0.58. The mean female adult emergence was recorded as 8.6±104. The table shows the adult emergence from the pupae those were fed by mealy bug in their larval instar. The table shows that the mean number of male adult's emergence was recorded as 4.8±0.73. The mean female adults emerged were recorded as 8.2±0.66. The result shows significant difference.

Fecundity of Females

The adults of *Chrysoperla carnea* are not predaceous but they fed on the honey dew, plant sap and pollen. The adults are green in colour and soft bodied insects. Their antennae are long and very slender. The wings are transparent and also about equal in size. The wings have clear wing venation on them. The hind pair of wings is narrow at base. The data in the Table-2 reveals fecundity of *Chrysoperla carnea* females on the artificial diet. Each female laid on average of 1490.4±40.78 eggs. It was the fecundity of female which fed on Angoumois grain moth in larval instar. The Table also shows females the mean number of eggs laid by each female was as 1594.6±53.28. It was fed on aphid in larval instar. The table also shows the results of the female which fed on mealy bug with average of mean 1402.6±42.81 eggs per female. Hence the results is significant but Jagadish and Jayaramaiah (2004) [9] studied the life cycle of predator C. *carnea* on the tobacco aphid. The gravid female laid an average 385.2 eggs in her life span.

Hatching or and fertility of eggs laid by female feeding on 3 different hosts

The table-2 shows the mean no. of eggs hatched was 1359.8±32.4 there was the eggs laid by female which fed on Angoumois grain moth. The table also shows the eggs fertility of the female which fed on cotton aphid was 1514.8±67.6. The table also reveals the results of fertility of female which fed on mealy bug. The mean fertility observed was 1293.6±44.40. Hence the result shows significant difference.

Duration of larval instars and pupal period, incubation period and adult longevity

Table-2 shows the duration of larval and pupal periods with incubation, adult longevity on the Angoumois grain moth, aphid and mealy bug. In the treatment one i.e., Angoumois grainmoth the incubation period of the eggs laid by female was 3.4±0.24, the larval duration in 1st instar observed was 49.2±6.00, in 2nd instar was 55±7.17 and in 3rd instar 50.4±6.45. The pupal period was observed as 112.6±14 with adult longevity of 59.8±2.94. In the treatments i.e., when fed on cotton aphid the incubation observed was 3±0.31 with the mean larval duration of 60.43±6.63 in 1st instar 73±5.94 in 2nd instar and 73.6±5.9 in 3rd instar. The mean pupal period was recorded as 120.6±14.4. The table also shows the results when fed on mealy bug with the mean incubation period of 2.8±0.374 with 61.6±5.6 larval duration in 1st instar, 67.8±6.74 in 2nd instar and 56.2±6.95 in 3rd instar and the mean pupal period was recorded as 110.6±11.30. The adult longevity when fed by cotton aphid was 57.8± 2.15 and when fed by mealy bug adult longevity was observed as 61.2± 4.70. The female incubation period and longevity shows non-significant result while larval and pupal duration shows significant difference.

Food consumed by Larvae of *C. carnea* in three instars

The Table-3 shows the results of different hosts fed by the larvae of *C. carnea* in the 1st, 2nd and 3rd instar and weight of larvae in 3rd instar. Mean number of eggs of Angoumois grain consumed by the larvae of *C. carnea* was recorded as 0.088±0.0054. The mean number of cotton aphid consumed by the larvae of *C. carnea* was observed as 7.13±0.0007. The mean number of mealy bug consumed by the larvae was observed as 6.62±0.009. The Table also reveals the hosts consumption by *C. carnea* larvae in its 2nd instar. The mean number of eggs of Angoumois grain moth eaten by 2nd instar larvae was recorded as 0.1758±0.00895 and the mean number

of cotton aphid consumed was 15.00004±0.01905. The mean number of mealy bug consumed was observed as 14.68±0.0128. The Table shows that the mean number of eggs of Angoumois grain moth consumed by larvae of *C. carnea* in 3rd instar was recorded as 0.2794±0.0003. The mean number of aphid consumed was observed as 24.48±0.0191. The mean number of mealy bug consumed by the larvae is 3rd instar was recorded as 23.31±0.379. Mari *et al.* (2000) [10] studied the predatory efficiency of *Chrysoperla carnea* (Stephens) in laboratory conditions. The feeding rate showed that predation by 3rd instars was highly significant.

Weight of Larvae in 3rd instar

The table shows the results of *C. carnea* larvae weight in its 3rd instar. The mean weight in the 3rd instar when feeding on eggs of Angoumois grain moths was recorded as 0.0652 ± 0.002. The mean of weight of *C. carnea* larvae when feeding of cotton aphid was recorded as 0.072 ± 0.004. The mean of weight of *C. carnea* larvae when feeding on mealy bug was observed as 0.018 ± 0.003.

Table 1: Duration of larval instar and pupal period, incubation period and adult longevity under laboratory conditions.

Treatment	Incubation period	Adult longevity	1st Instar	2nd instar	3rd instar	Pupal period
S. cerealella	3.4± 0.24(a)	59.8± 2.94(a)	49.2± 6.00(b)	55± 7.17(b)	50.42± 6.45(b)	112.6± 14(a)
A. gossypii	3± 0.31(a)	57.8± 2.15(a)	60.43± 6.63(b)	73± 5.94(b)	73.6± 5.9(b)	120.6± 14.4(a)
P. solanopsis	2.8± 0.37(a)	61.2± 4.70(a)	61.6± 5.6(b)	67.8± 6.74(b)	56.2± 6.95(b)	110.6± 11.30(a)

Table 2: Egg survival, survival to adult, fecundity and fertility of female of *C. carnea* when fed on artificial diet under laboratory conditions.

Treatment	Eggs survival	Survival to adult stage		Fecundity	Fertility
		Male	Female		
S. cerealella	1.64±1.60(a)	5.2±0.73(b)	7.6± 0.92(b)	1490.4± 40.7(b)	1359.8± 32.4(b)
A. gossypii	1.64±1.50(a)	4.8±0.58(a)	8.6± 1.04(a)	1594.6± 53.2(a)	1514.8± 67.6(a)
P. solanopsis	1.62±1.28(a)	4.8±0.73(a)	8.2±0.66(a)	1402.6± 42.8(c)	1293.6± 44.4(b)

Table 3: Food consumed and weight of larvae in 3rd instar of *C. carnea* under laboratory condition

Treatment	Food consumed			Weight grain
	1st instar	2nd instar	3rd instar	
S. cerealella	0.08±0.005(b)	0.17±0.008(b)	0.27±0.0003(b)	0.0652±0.002(a)
A. gossypii	7.13±0.0007(a)	15.00±0.019(a)	24.4±0.019(b)	0.0720±0.004(a)
P. solanopsis	6.62±0.009(a)	14.6±0.012(a)	23.3±0.37(a)	0.18±0.003(b)

Conclusion

It could be concluded that the green lacewing *C. carnea* larvae was on efficient predator, it's feeding and weight increased with its age of predator. The larvae feed and grow well on aphid as compared to other two hosts. The female which fed on aphid laid more eggs as compared to other two female which fed on Angoumois grain moth and mealy bug and the eggs laid by female which fed on aphid were more fertile then other.

Acknowledgment

We are thankful to Qurban Ali Nahiyoon (Department of PBG, SAU, Tandojam) for helping in analyzing the data.

References

1. Lohar MK. Applied Entomology (2nd Edition) Kashif Raza Publications Hyderabad, 2001, 242.
2. De-Bach P. Rincon_Vitova Insectaries, Inc. Leaflet on *Chrysoperla carnea*. Quoted in: Biological Control by Natural Enemies. Cambridge University Press, Cambridge, England. 1974, 323.
3. Hoffman MP, Frodsham AC. Natural Enemies of Vegetable Insect Pests. Cooperative Extension, Cornell University, Ithaca, NY. 1993, 63.
4. Henn T, Weinzieri R. Alternatives in insect pest management. Beneficial insects and mites. University of Illinois, Circular. 1990; 1298:24.
5. Krishnamoorthy A, Mani M. Feeding potential and development of *Chrysopa scelestes* Banks on *Heliothis armigera* (Hubn.) under laboratory conditions. Entomon. 1982; 7(4):385-388.
6. McEwan PK, Kidd NAC. Relationship between non olive vegetation and lacewing eggs in a Spanish olive orchard. Antenna (London), 1995, 148-150.
7. Mani M, Krishnamoorthy A. Development and predatory potential of the green lacewing. *Mallada astur* (Banks) (Neuroptera: Chrysopiae) on the spiraling whitefly, *Aleurodicus disperses* Russell Homoptera: Aleurodidae). Journal of Biological Control. 1999; 13(1, 2):45-49.
8. Balasubramani V, Swamiappan M. Development and feeding potential of the green lacewing *Chrysoperla carnea* Steph. (Neur: Chrysopiae) on different insect pests of cotton. Anzeiger fur Schadlingskunde, Pflanzenschutz, Umweltschutz. 1994; 67(8):165-167.
9. Jagadish KS, Jayaramaiah M. Biology and predatory potentiality *of Chrysoperla carnea* (Neuroptera) on the tobacco aphid, *Myzus nicotianae* (Homoptera). Journal of Ecobiology, 2004; 19(3, 4):241-244.
10. Mari JM, Nizamani IA, Shar MU. Predatory efficiency of *Chrysoperla carnea* (stepb. Qns) on mustard and wheat aphid. Pakistan Journal of Agriculture, Agricultural Engineering and Veterinary Sciences. 23(1):28-30