Int.J.Curr.Microbiol.App.Sci (2020) Special Issue-11: 3099-3104

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-11 pp. 3099-3104**
Journal homepage: http://www.ijcmas.com

Original Research Article

Biology of the Green Lacewing *Chrysoper lazastrowi* (Stephens) (Neuroptera: Chrysopidae) in Laboratory Condition

Reetesh Pratap Singh*, Rajendra Singh, S. K. Sachan and Kamal Khilari

Department of Entomology, College of Agriculture, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut-250110, India
**Corresponding author*

A B S T R A C T

Chrysoper lazastrowi (Stephens) is known as golden eyes and aphid lions, is a cosmopolitan polyphagous and efficient predator commonly found in a wide range of agricultural habitat. It is an example of one of these species that is not predacious in the adult stage. Adults feed only on pollen, nectar and aphid honeydew. Larval stage of green lacewing is predatory stage, while in some species adults are also predator in nature. The present was carried out during November 2019 to March 2020 at Bio-control laboratory, Department of Entomology, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut. During the study, the green lacewing adults were collected from the flowers of different crop plants in Meerut region. It was observed that the incubation, larval, pupal period, male and female longevity lasted for average 3.00±0.10, 8.85±0.25, 6.95±0.15 days, 25.88±0.63 and 31.75±0.75 days, respectively.

Keywords

Chrysoper lazastrowi, Green lacewing

Introduction

Biological control is the involvement of parasitoids, predators and pathogens in maintaining of the 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 introduction and release of insect predators (Williamson and Smith, 1994). Biological control has been recognized as an important component of Bio-intensive Integrated Pest Management (BIPM) which is a holistic approach for IPM. Moreover, IPM programme would be most effective if the pesticides used were efficacious against the pest species and relatively safer for beneficial arthropods such as parasitoids and predators.

Green lacewing, *Chrysoper lazastrowi* (Stephens) (Neuroptera: Chrysopidae) is also known as golden eyes and aphid lions, is a cosmopolitan polyphagous and efficient

predator commonly found in a wide range of agricultural habitat. It is an example of one of these species that is not predacious in the adult stage. Adults feed only on pollen, nectar and aphid honeydew. Larval stage of green lacewing is predatory stage, while in some species adults are also predator in nature (Michaud, 2001). It is considered a prominent general predator that feeds on a variety of insect pests of field crops, vegetables and fruit orchards.

Because of its voracious feeding on soft bodied insects *e.g*. aphids, caterpillars, leafhoppers, psyllids, mealybugs, white flies, thrips, insect eggs, spiders and mites, It constitutes a prominent group of predators due to their amenability to mass production and potential for their use in varied ecosystems (Rashid *et al.*, 2012).

One larva may devour as many as five hundred aphids in its life and there is no doubt that they play an important part in the natural control of many small homopterous pests. Although, these larvae usually are not present in sufficient numbers in nature to manage aphids and other insect's populations by themselves, thus the importance of augmentation is essential which needs to develop the techniques of mass production in the laboratory.

The females lay several hundreds of small stalked eggs underneath the leaves or on shoots during hours of darkness. The larvae hatch in 3 to 6 days which eat voraciously and moult three times.

The larvae are predaceous, feeding on eggs and neonates lepidopteran larvae, nymphs and adults of whiteflies, aphids, thrips, scale insects, mealy bugs, mites etc. When food is scarce, they exhibit cannibalism. In a larval period of 2 to 3 weeks, mature larvae secrete silk and build round, parchment like cocoons and adults emerge after 10 to 14 days of pupation which possess green cylindrical body, transparent wings with light green veins, long filiform antennae, golden eyes and stalked eggs laid by adults offer protection from predation (Pedigo, 1989). The adults are generally free living and feed on honeydew and pollen grains. Adult longevity of female ranges from 7 to 24 days and for male it will be 6 to 18 days (Patel and Vyas, 1985).

Materials and Methods

The experiments were carried out under laboratory conditions at room temperature with 26±2^{o}C and 65-75±5 Relative humidity. To study the biology of *C. zastrowi* initial culture was started with few pair of field collected *Chrysoper lazastrowi.* A collection of five pairs *Chrysoper lazastrowi* adults was placed in a rearing glass cage (30x30) and provide with flower twigs of mustard, caster etc. plant as egg laying substrate.

Honey + protienex and distilled water on cotton swab, caster pollen and mustard flowers were provided as food for adult *Chrysoper lazastrowi.* Every day newly flower twigs were provided in the glass cage. The *Chrysoper lazastrowi* female laid the eggs on the flower twigs and black muslin cloths. The eggs were removed every day from flower twigs and muslin cloths.

Study of incubation period

Total ten homeopathic vials each with one egg were taken to determine the incubation period of *Chrysoper lazastrowi* eggs. This experiment was repeated two times. These eggs were checked twice per day *i.e.* 10 am and 5 pm to know number of eggs hatched. Each neonate larvae hatched from the egg was collected and kept in separate vials for second experiment.

Study of larval period (first to thirdinstar)

The ten homeopathic vials each with one larva were taken to determine the larval period of *Chrysoper lazastrowi*. This experiment was repeated two times.

The larval period was recorded from the day of hatching. Rearing of larva was carried out individually in homeopathic vials and the eggs of *Corcyra cephalonica* were provided to larva as food every morning. The duration of all larval instars were recorded continuously from first to third instar.

Study of pre-pupal and pupal period

The pre-pupal period *i.e.* the period when the third instar larva stopped feeding up to the period when it was completely transformed in to pupa was also observed.

Study of emergence period of adult from pupa (pre-oviposition period)

For studying the pupal period, freshly formed pupa from the individuals of the larva used for determine the pupal period. Observation on the emergence of *Chrysoperlazastrowi* adults from the pupae were recorded every day. This experiment was repeated two times.

Study of oviposition period and adult longevity

Newly emerged adults were released with pair in rearing cage to observe the duration of mating and oviposition period. It was observed that the males were smaller than the females in general. After pairing, their mating behaviour was also studied by daily visual observations. To study adult longevity, newly emerged adults were kept in rearing glass cage and honey + protienex + distilled water solution on cotton swab, caster pollen and mustard flowers were provided as food material. Fresh food was provided every day and if any observation on the mortality was recorded.

Results and Discussion

Biology of predator *Chrysoper lazastrowi*

The field collected *Chrysoper lazastrowi* adults were kept in rearing units and provided pollen grains (marigold and castor flowers) and artificial diet (honey+protienex) as food.

Mating of adults normally occurred early morning and evening. After 4-5 days of mating, the female of *Chrysoper lazastrowi* started laying eggs. The freshly eggs were collected from rearing unit and the eggs placed in vials and kept at larval rearing units with *Corcyra cephalonica* eggs as larval food. The freshly laid eggs of common green lacewing were pale green in colour, but after hatching eggs became grey in colour (Table-1).

Development

The predator green lacewing comes under the order Neuroptera which is having complete metamorphosis, comprising four stages in their life cycle *viz*. egg, larva, pupa and adult. The observations on development of *C. zastrowi* were given under the following heading.

Mating behaviour

The present study carried out on mating behaviour of *C. zastrowi*. Generally the mating process occurred in early morning and evening time. To attract the mates green lacewing relies on auditory signals produced by moving the abdomen to vibrate the surface on which they sit. During the mating process, the female and male green lacewing adults abdominal portion get attached to each other.

Fecundity

The predator green lacewing female started laying eggs after 4-5 days of mating. The observation on fecundity showed that the eggs were generally laid (attached) to the top of a hair like filament (silken stalk), on black muslin cloth, wall of rearing cage, and also on flower twigs. The total number of eggs laid by the green lacewing female varied from species to species and their food.

Description of different stages of green lacewing

Egg

The green lacewing freshly laid eggs were pale green, oval shaped about 0.3-0.6 mm long. The females of *C. zastrowi* laid their eggs individually or in groups of 10 to 12 on top of the hair like stalk to avoid the cannibalisms and stalk size is 11-26 mm long. The colour of eggs changed from green to grey towards hatching. The female laid the eggs on black muslin cloth, flower twigs, and wall of oviposition cage (adult rearing cage). During peak of the oviposition period, a single female of green lacewing laid 9-23 eggs per day.

Egg incubation period

The results in Table-1 indicate that the incubation period of eggs of green lacewing was 3.00±0.10 (2-4) days. According to Sattar *et al.,* (2011) the egg incubation period was recorded in range of 2.25 to 3.85 days.

Larva

The newly hatched larva had three pairs of legs and was observed white to pale yellow in colour. Upon emerging, the larva immediately searches for food. They grow up to about 9-12 mm in length. *Chrysoper lazastrowi* passes through three larval instars to become a pupa. The descriptions of various larval instars are as follows.

First instar larva

The first instar larva measuring 3.13 mm in length and 0.864 mm in width and the colour of first instar larva was white to pale yellow.

The first instar larva start elongating in size with tapering gradually toward the head and the body had small bristles on lateral side. The first instar larval duration was completed in 2.90±0.10 (2-4) days. According to Sattar *et al.,* (2011) the first instar larval duration was recorded 2.5-4.0 days.

Second instar larva

The second instar larva resembles the first instar larva except size and colour. The second instar larva was larger in size and darker in colour.

Prominent stripes with grey or brown colour was also appeared distinctly on the head and thoracic region of larvae. The length and width of second instar larva was 5.65 and 2.42 mm. The second instar larval duration was recorded 2.95±0.05 (2-4) days.

Third instar larva

The third instar larva was larger in size and dark in colour. The prominent stripes with grey or brown colour were also appeared distinctly on the whole body region of larva. The fulll grown larval body had distinctly bristles on lateral side. The mature larvae possess the sickle shaped mandibles with well developed proboscis which was used to capture and draw fluid from their prey. The length and width of third instar larva was 6.31 and 3.19 mm long.

Table.1 Development period of green lacewing, *Chrysoper lazastrowi*

S. No.	Developmental stage	Duration (Days)	
		Range	Mean
1.	Egg (incubation period)	2-4	3.00±0.10
2.	Larvae First instar Second instar Third instar	 2-4 2-4 2-4	 2.90±0.10 2.95±0.05 3.00±0.10
3.	Total larval period	7-11	8.85±0.25
4.	Pupal period	5-8	6.95±0.15
5.	Adult longevity (a) Female 1.Pre-oviposition period 2.Ovipositionperiod 3.Post-oviposition (b) Male	 30-34 4-8 20-23 4-7 24-28	 31.75±0.75 5.58±1.08 20.92±0.25 5.25±0.83 25.88±0.63
6.	**C. D. at 5%**		**1.45**
7.	**S. E. (m)**		**0.46**

The third instar larval duration was recorded 3.00±0.10 (2-4) days. These findings are similar to those of Afzal and Khan (1978) who observed that the first, second and third instar lasted for 3.2 (±0.49), 2.8 (±0.2) and 6.9 (±0.44) days, respectively, giving a total larval stage of 12.9 (±0.69) days. Similar result reported by Sattar *et al.*, (2011).

Pupa

The present observation shows that the full grown larva spun a white coloured spherical cocoon with 6 mm diameter and pupated inside, which covered with silken threads. The cocoons became green in colour in a day before adult emergence. The pupal period was completed in 6.95±0.15 (5-8) days. Similar observation was given by Chakraborty and Korat (2010) who reported that the pupal stage was lasted for 5-8 days. Balasubramani and Swamiappan (1994) observed that the pupal developmentperiod was quicker on *B. tabaci* and *A. biguttula* (7.40 days). Sharma and Verma (1994) observed that the pupal period was lasted for 7 to 9 days. El-Baity and Habashan (2013) observed that the pupal period was lasted for 11.2 days on fresh eggs *S. cerealella* and 9.4 days on cooled eggs of *S. cerealella.*

Adult

Adults were soft bodied, usually light green in colour with transparent wings. The wing span of male and female are larger than the body length. In male, the abdomen was narrow and tapering while in female it was 2 to 3 times broader than the males. Compound eyes were copper or golden in colour. In the present study, the duration of the female longevity was observed 30 to 34 days with an average of 31.75±0.75 days. The pre-oviposition, oviposition and post-oviposition periods were observed 5.58±1.08, 20.92±0.25 and 5.25±0.83 days, respectively. The longevity of male was in range of 24 to 28 days with an average of 25.88±0.63 days (Table-1). According to the results obtained by Chakraborty and Korat (2010) the longevity of male was observed 21 to 35 days and while the longevity of female was

observed 21 to 40 days. Duration of male and female noticed in present studies corroborate with the report of Jalali and Singh (1992).

References

Afzal, M. and Khan, M. R. (1978). Life history and feeding behaviour of green lacewing, *Chrysoper lacarnea* Stephens (Neuroptera: Chrysopidae). *Pakistan Journal of Zoology*, 10(1): 83-90.

Balasubramani, V. and Swamiappan, M. (1994). Development and feeding potential of the green lacewing, *Chrysoper lacarnea* Steph.on different insect pests of cotton. *Anzeigerfuer Schaedlingskunde Pflanzenschutz Umweltschutz*, 67(8): 165-167.

Chakraborty, D. and Korat, D. M. (2010). Biology of green lacewing, *Chrysoper lacarnea* (Stephens) in middle Gujarat condition. *Karnataka Journal Agri. Sci*., 23(3): 500-502.

DeBach, P. (1965). Some biological and ecological phenomena associate with colonizing entomophagous insects. In: *Genetics of colonizing species* (eds. H.G. Baker and G. L. Stebbins), Academic Press, New York. Pp. 287-306.

El-Baity, S. O. and Habashan, M. A. (2013). Rearing of the predator Green lacewing, *Chrysoper lacarnea* (Stephen) on *Sitotroga cerealella* (Oilvier) eggs under laboratory conditions. *University of Aden Journal of Natural and Applied Sciences*, 17(3): 539- 544.

Jalali, S. K. and Singh, S. P. (1992). Biology and feeding potential of *Curinuscoeruleus* (Mulsant) and *Chrysoper lacarnea* (Stephens) on subabulpsyllid, *Heteropsylla cubana* Crawford. *Journal Insect Sci.*, (5): 89-90.

Michaud, J. P. (2001). Evaluation of green lacewings, *Chrysoperlaplorabunda* augmentative release against *Toxoptera citricida* (Homoptera: Aphididae) in citrus. *Journal of Applied Entomology*, 122: 383-388.

Patel, K. G. and Vyas, H. N. (1985).Biology of green lacewing, *Chrysoper lascelestes* (Neuroptera: Chrysopidae) an important predator in Gujarat. *Gujarat Agricultural University Research Journal*, 11(1): 18-23.

Pedigo, L. P. (1989).Common green lacewing. *In. Entomology and Pest Management.* Prentice Hall.317-318.

Rashid, M. M. U., Khattak, M. K., Abdulla, K., Amir, M., Tariq, M. and Nawaz, S. (2012). Feeding potential of *Chrysoper lacarnea* and *Cryptolaemus montrouzieri* on *Phenacoccus solenopsis. The Journal of Animal & Plant Sciences*, 22(3): 639-643.

Sattar, M., Abro, G. H. and Syed, T. S. (2011).Effect of different hosts on biology of *Chrysoper lacarnea* (Stephens) in laboratory condition. *Pakistan J. Zool*., 43(6):1049-1054.

Sharma, P. K. and Verma, A. K. (1994). Biology of *Chrysoper lacarnea* (Stephens) (Neuroptera: Chrysopidae) in Himachal Pradesh. *Journal of Biological Control*, 5(2): 81-84.

Williamson, F. A. and Smith, A. (1994). Agro report (DS 95) biopesticides in crop protection. *PJB Publications*, 120.