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# Feeding potential of *Chrysoperla carnea* (Steph) on different host

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**Abstract**
*Chrysoperla carnea* (Steph.) is a major, cosmopolitan predator of some whitefly and Aphid. It is now commonly reared in laboratory and used extensively all over the country and has significant potential for commercialization and use against a variety of crop pests in combination with other insect pest management tactics. The data in this indicated that *C. carnea* appeared in the field of cotton crop just after the resurgence of insect pests. *B. tabaci* appeared in very early stage of the crop of cotton. The result showed that the soft bodied insect pests such as *B. tabaci*, and *A. gossypii* appeared at various growing stages of cotton crop in summer. It is reported that *C. carnea* consumed more aphid in all its stage than the white fly. The first instar of *C. carnea* consumed 4.3, 3.37, 6.35 and 6.14 number of *B. tabaci*. Whereas 14.44, 23.44, 28.16 and 6.44 number of *A. gossypii*. The third instar of *C. carnea* had consumed more third instar of aphid of about 67.14. The consumption goes on increasing the instar stage of *C. carnea*, but decreased after third instar stage of the host insects.

**Keywords:** Prey, *Chrysoperla carnea*, population, host preference, feeding potential

## Introduction
Biological control of insect pest is natural one (natural control), for better efficiency man is exploiting this and commercially rearing these predators and released to the agricultural fields. From last two decades the biological control playing a major role in controlling the insect pests. 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 (natural enemies) predators (Sattar *et al*., 2011) [11, 12].

India too enriched with plenty of biocontrol agent in that 65 species of *Chrysopids* belonging to 21 genera have been recorded from various crop ecosystems. The genus *Chrysoperla* contains several important species of predatory insects of which the common green lacewing, *Chrysoperla carnea* (Stephens) is a potential predator on many soft bodied insects (Chakraborty and Borat, 2010; Sattar and Abro, 2011) [3, 11, 12]. They commonly feeds on jassids, whiteflies, thrips, aphids and mites (Singh and Manoj, 2000; Venkatesan *et al*., 2002) [13, 14]. Adults feed on flower nectar and pollen (Kareim, 1998) [7]. Saminathan and Baskaran (1999) [10] reported that before inflorescence, they eat honeydue excretion of *A. gossypii* as their diet. Its larvae are voracious on *A. gossypii*s and consume all life stages. Complete destruction of *A. gossypii* colonies was recorded by (Jagadish and Jayaramaiah, 2004) [6]. *C. carnea* (steph.) is a major, cosmopolitan predator of some whitefly and Aphid. It is now commonly reared in laboratory and used extensively all over the country and has significant potential for commercialization and use against a variety of crop pests in combination with other insect pest management tactics.

## Materials and Method
To study the feeding potential of *C. carnea* initial rearing started by collecting the grubs from the field. They are reared individually in multi cavity trays to avoid cannibalism and are fed with the natural hosts like *Aphis gossypii* and *Bemicia tabaci* which are collected from the cotton ecosystem or fed with *Corcyra cephalonica* egg in off season until they have became adults.

**Adult rearing:** From the rearing tray the adults of *C. carnea* are collected from the grubs trays and mixed sex (approximately 1:1) were placed in plastic cage (35cm × 20cm × 20cm), covered with a plastic lid, for maintaining the culture (Mudassar *et al*., 2013) [9]. A sheet of

black paper stretched across the top of the cage, acted as an oviposition substrate. Holes were present in the cage for good ventilation. These adults were fed on the eggs of *Corcyra cephalonica* or semisolid artificial diet comprising yeast, honey, sugar and water (1:1:1:4). The diet was pasted on plastic strips placed horizontally in adult rearing cage. Wet soaked cotton in Petri dish was placed inside the cage to provide moisture inside the cage (Ashfaq *et al*., 2004; Chakraborty and Korat, 2010) [3]. Eggs laid on black sheet by females were collected on alternate days with razor. Proper sanitation of cage was ensured (Ashfaq *et al*., 2004). The adults lay eggs on the brown sheet. From the old troughs or cage, the brown paper sheets along with *Chrysoperla* eggs are removed.

**Storage and destalking of eggs**: All collected egg sheets are stored at 10°C in B.O.D. incubator or refrigerator for about 21 days, they serve as stock materials. When the eggs are required for culturing, the egg sheets are kept at room temperature for a day and the eggs during this period turn brown and hatch on 3 days later.

**Individual rearing of grubs**: In the first step of larval rearing, 120 three day old *Chrysopid* eggs are mixed with 0.75 ml of *Corcyra* eggs (the embryo of *Corcyra* eggs are inactivated by keeping them at 2 feet distance from 15 watt ultraviolet tube light for 45 minutes) in a plastic container (27x18x6 cms). On hatching, the larvae start feeding. On third day the larvae are transferred to 2.5 cm cubical cells of plastic louvers @ one per cell or transferred to multi cavity trays. *Corcyra* eggs are provided in all the cells of each louver by sprinkling through the modified salt shaker. Feeding is provided in two doses. First feeding of 1.5 ml *Corcyra* eggs for 100 larvae and second feeding of 2 ml for 100 larvae with a gap of 3-4 days is done. Total quantity of *Corcyra* eggs required for rearing 100 *Chrysopid* larvae is 4.25 ml

***Corcyra* egg requirement:** The eggs of *Corcyra cephalonica* is given as feeding material for the larvae in the laboratory. Total quantity of C*orcyra* eggs required for rearing of 100 larvae is 4.25 ml. *i.e* 0.0425ml/grub.

**Feding potential on its natural hosts:** Infested leaves of cotton or tomato with *Bemicia tabaci* and infested tiny leaves of cowpea with Aphid *Aphis gossypii* were placed in separate petri dishes (7.5×1.5 cm). Then newly emerged larvae; they were released separately into dishes containing leaves infested by each prey species. Whiteflies and aphid-infested leaves were replaced with fresh ones daily. Each dish was checked for the number of intact nymph every 24 hour for 30 days (Mahmoud *et al*., 2012) [8]. All experiments were conducted at 25±50C, 60±5% RH and photoperiod of 16:8 (L: D) h.

**Reading parameters:** The consumption rate was studied only using whitefly and aphid as prey. Newly laid eggs of adults were removed from stock culture and transferred to petri dishes. Hatching time and fertility rate of eggs were determined by daily observations. Individual larvae was confined in petri dishes on pieces leaf disks infested with third nymphal stages of *B.tabaci* and *Aphis gossypii* and semi artificial diet daily. Because of cannibalistic behavior of larvae on sibling larvae and eggs, the larval *C. carnea* was separated as soon as they became active. Newly enclosed adult females and males were also randomly transferred to petri dishes supplied whit fresh prey. The number of eggs laid, egg viability and adult mortality were recorded daily. Sex ratio was determined in 100 adults reared on each diet using morphological characters to identify the sexes (Mahmoud *et al*., 2012) [8].

## Results and Discussion

Dhawan (2000) mentioned *A. devastans, A. gossypii* and *B. tabaci as* the important key pests of cotton. The data in this indicated that *C. carnea* appeared in the field of cotton crop just after the resurgence of insect pests. *B. tabaci* appeared in very early stage of the crop of cotton. The result showed that the soft bodied insect pests such as *B. tabaci*, and *A. gossypii* appeared at various growing stages of cotton crop in summer. It is reported that *C. carnea* consumed more aphid in all its stage than the white fly. The first instar of *C. carnea* consumed 4.3, 3.37, 6.35 and 6.14 number of *B. tabaci*. Whereas 14.44, 23.44, 28.16 and 6.44 number of *A. gossypii*. The third instar of *C. carnea* had consumed more third instar of aphid of about 67.14. The consumption goes on increasing the instar stage of C. carnea, but decreased after third instar stage of the host insects. These findings are in confirmed with the complete destruction of *A. gossypii* colonies was recorded by (Jagadish and Jayaramaiah, 2004) [6]. Similarly, Chakraborty and Korat (2010) [3] reported that *A. gossypii* is the most preferred host of *C. carnea*, followed by *Uroleucon compsoitae*, *Lipaphis erysimi* (Kalt.), *Brevicoryne brassicae* Linn. *Aphis craccivora* Koch. and *Aphis nerii.* In contrast to the results, Haider (1999) [4] and Balakrishnan (2005) [2] mentioned voracity of *C. carnea* on *A. devastans.* The results further indicated that *C. carnea* fed on all types of soft bodied insect pests and their eggs found in cotton and mustard crops as well. These findings are in agreement with those of Hoftman and Frodsham (1993) [5].

**Table 1:** Feeding potential of green lace wing, *C. carnea* on different hosts in the laboratory condition.

| ***C. carnea* larval stage** | **Prey** | **Consumption rate on various life stages** | | | |
|---|---|---|---|---|---|
| | | **1st Instar** | **2nd Instar** | **3rd Instar** | **4th instar** |
| 1st Instar | *B. tabaci* | 3.3 ± 0.39 | 4.37±0.78 | 6.35±0.81 | 6.14±0.81 |
| | *A. gossypii* | 14.44±2.33 | 23.44 ±2.49 | 28.16±1.82 | 6.44±0.64 |
| 2nd Instar | *B. tabaci* | 14.56±2.08 | 17.12±1.32 | 19.66±1.44 | 21.38±1.06 |
| | *A. gossypii* | 27.42±3.14 | 43.66±3.18 | 46.11±2.66 | 29.62±0.56 |
| 3rd Instar | *B. tabaci* | 35.14±3.22 | 35.44±2.82 | 32.44±2.14 | 39.80±1.44 |
| | *A. gossypii* | 56.14±4.41 | 61.11±3.76 | 67.14±2.18 | 45.13±0.22 |

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