

Predatory capacity of the green lacewing *Chrysoperlazastrowi*(Esben-Petersons) on different species of aphids under laboratory conditions

Abstract

Green lacewing, *Chrysoperlazastrowi*(Esben-Petersons) (Neuroptera: Chrysopidae) is the most effective polyphagous predator of different species of aphids and is commonly known as "aphid lion." During the study, the green lacewing adults were collected from the flowers of different crop plants in Meerut region. The experiment on feeding potential of green lacewing was studied in the Bio-control Laboratory of Department of Entomology, Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut from November 2019 to March 2020. The known number of predatory larvae of green lacewings were fed with known number of six different species of live aphids. The total food consumption of a single larva of *C. zastrowi* were found to be in order of 180.00±1.24 *A. craccivora*, 171.33±4.42 *A. gossypii*, 157.67±1.49 *B. brassicae*, 142.67±2.36 *L. erysimi*, 131.34±2.19 *R. maidis* and 119.67±2.94 *M. persicae*. Results revealed that the third instar were found more voracious than other two instar.

Keywords: *Chrysoperlazastrowi*; Green Lacewing; Aphids.

Introduction

"Insects and diseases are major problems acting against the quantity and quality of crops yield. Among all insect pests, aphids and mites are the most important and serious insect pests that are affecting the crops"^[5]. "The aphids damage the various crops in which they habitat. They not only damaging the crops by sucking sap from plant but they are transferring the viral diseases to healthy plants as well. Farmers are using various types of pesticide in alternating manner to minimizing the population of insect pest in their field"^[5]. "Although, consumption of pesticides in India is comparatively low, but indiscriminate use of pesticides in the agricultural crops have created many problems, resulting into developing resistance against insecticides, pesticides residue on food, air, water and soil, pest resurgence, killing of natural enemies, harmful effect on non-target organisms including pollinators and disruption of ecosystem"^{[11][20]}. "These negative effects of using insecticides on human health and environment, have led to realize the need to introduce some alternative methods, which are environmentally friendly, economically viable and sustainable method of insect pest management"^{[2][7][10]}.

Biological control is relatively safe, lasting, economical and environmentally friendly. It can be defined as "the action of parasites, parasitoids, predators and pathogens to keep the pest populations at a lower average than the economic injury level." "The safety of biological control

is exceptionally good because, natural enemies are host-specific or limited to a few closely related species. Hence, the non-target species are not affected^[4]. 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^[14]. In India, 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 zastrowi* (Esben-Petersen) has been recorded as an effective generalist predator of aphids, coccids, mites and mealybugs^{[17][20]}. The larvae of *Chrysoperla* are voracious on aphids and consume all life stages. 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^{[9][19]}. Adults feed on flower nectar and pollen. Complete destruction of *A. gossypii* colonies was recorded^[6]. Therefore, green lacewing is a major cosmopolitan predator of aphid and some whitefly. 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 aim of the present study was to evaluate six different prey species of aphids as food for *C. zastrowi* in terms of consumption under laboratory conditions. Such information would be helpful for optimizing the mass rearing of this predator.

Materials and methods-

The experiment on predatory potential of green lacewing on six natural hosts was conducted in Bio-control Laboratory, Department of Entomology of Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, (U.P.). “The experiment was performed in a completely randomized design consisting of six treatments and each treatment was comprised of three replicates. The natural hosts were *Aphis craccivora*, *Aphis gossypii*, *Lipaphis erysimi*, *Rhopalosiphum maidis*, *Brevicoryne brassicae* and *Myzus persicae*. The hosts were collected from field on daily basis. The freshly hatched *C. zastrowi* larvae were kept in petri dishes for each treatment and provided with 20 number of hosts per day. After providing hosts. The number of each prey consumed by the predatory larvae was recorded by counting the live preys after every 24 hrs”. [21] Then, fresh aphids were provided in each treatment. Counting method was adopted by Memon *et al.*^[8]. All the recorded data were subjected to statistical analysis (one-way analysis of variance, ANOVA).

Results and Discussion-

The data presented in (Table-1) indicates the feeding potential of different larval instars among various hosts. The analysis of variance revealed that the third instar larva consumed significantly high numbers of prey than first and second instar. The per day consumption pattern of

Chrysoperla zastrowi larva varied from prey to prey depending on the larval age. The consumption by third instar larva was found to be in the order of *A. craccivora* followed by *A. gossypii*, *B. brassicae*, *L. erysimi*, *R. maidis* and *M. persicae*. Consumption of prey by second instar larva was found to be in order of *A. craccivora*, followed by *A. gossypii*, *B. brassicae*, *L. erysimi*, *R. maidis* and *M. persicae*. Consumption of prey by first instar larva was found to be in the order of *A. craccivora* followed by *A. gossypii*, *B. brassicae*, *L. erysimi*, *R. maidis* and *M. persicae*. The total food consumption of a single larva of *C. zastrowi* was 180.00±1.24 *A. craccivora*, 171.33±4.42 *A. gossypii*, 157.67±1.49 *B. brassicae*, 142.67±2.36 *L. erysimi*, 131.34±2.19 *R. maidis* and 119.67±2.94 *M. persicae* (Table-1).

According to Shah *et al.*^[15] the feeding preference of predator found in the order of *A. craccivora*>*A. gossypii*>*R. maidis*>*L. erysimi*. Yadav and Pathak^[19] reported that the green lacewing larva consumed prey host in range of 173.8±8.04 to 320.5±22.79 *A. craccivora* and 143.3±1.25 to 239.2±3.19 *L. erysimi*. The maximum predation rate of green lacewing larva found on *A. craccivora* followed by *A. gossypii*, *M. persicae* and *L. erysimi*. While these findings are in agreement with those of Satpathy *et al.*^[13] reported that the green lacewing larva fed significantly highest number of prey units (415.50 eggs/grub) of *C. cephalonica* eggs which was significantly more than the *A. craccivora* (119.00 aphids/grub). Similarly, Balakrishnan *et al.*^[3], Adane and Gautam^[1] revealed that the prey consumption was more by third instar larva with the order of *Corcyra cephalonica*, *A. craccivora* & *L. erysimi*. Saminathan *et al.*^[12] reported the predatory potential of *C. zastrowi*, using two prey densities of 100 and 200 per day of *Corcyra cephalonica* eggs, *Aphis gossypii* and *A. Craccivora*. The maximum consumption rate was recorded with *A. craccivora*, while the minimum was recorded with *L. erysimi*.

Table-1 Feeding potential of green lacewing on different hosts.

Treatments	Instar wise feeding potential of <i>C. zastrowi</i> (prey host/larva)			
	I st instar Mean±S.E.	II nd instar Mean±S.E.	III rd instar Mean±S.E.	Total Consumed
<i>Aphis craccivora</i>	46.00±0.58	60.67±0.33	73.33±0.33	180.00±1.24
<i>Aphis gossypii</i>	43.33±1.76	59.00±2.08	69.00±0.58	171.33±4.42
<i>Lipaphis erysimi</i>	37.00±0.58	49.67±1.20	56.00±0.58	142.67±2.36
<i>Rhopalosiphum maidis</i>	35.67±0.33	43.67±0.33	52.00±1.53	131.34±2.19

<i>Brevicoryne brassicae</i>	42.00±0.58	55.00±0.58	60.67±0.33	157.67±1.49
<i>Myzus persicae</i>	32.00±0.58	36.67±1.20	51.00±1.16	119.67±2.94
C. D. at 5 %	2.83	3.43	2.59	
S. E. (m)	0.93	1.12	0.85	

Conclusion

The present findings demonstrate that the third instar larvae of *C. zastrowi* are more voracious as compared to other instars. It is revealed that the *Aphis craccivora* were more preferred host of *C. zastrowi*, hence, it can be utilized as mass rearing diet of this predator. These findings would be helpful to entomologists to consider the *C. zastrowi* as efficient bio-control agent in eco-friendly management of aphids on agricultural crops.

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