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 predatory efficiency was calculated by counting the number of consumed hosts per day. 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 diseasesare major constraints acting against the quality and quantity of crops yield. Out of many insect pests, aphids and mites are the most important and serious insect pests of crops [5]. The aphids are one that damages the various crops in which they habitat. They damage crops by sucking sap from plant and transferring viral diseases to healthy plants. Aphids infest wide range of several agricultural crops in horticulture, cereal crops, oilseed crops etc.Farmers are using more than one pesticide in alternating manner to suppress insect pest in their field [5]. Although, use of pesticides rate in India is lower, but indiscriminate use of chemical pesticides in the agricultural crops have created many problems. Resulting that development of resistance to 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 impacts of chemical pesticides on human health and environment, have led to realize the need for alternative method, which is environmentally friendly, economically viable and sustainable method of insect pest management [2][7][10].

Biological control is relatively permanent, safe, 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 outstanding because many natural enemies are host-specific or restricted to a few closely related species. Therefore, 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]. 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, *Chrysoperlazastrowi*(Esben-Petersons) has been recorded as an effective generalist predator of aphids, coccids, mites and mealy bugs etc. [17][20].Its larvae 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]. *C.zastrowi*(Esben-Peterson.) 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 aim of the present study was to evaluate three different prey species as food for *C. zastrowi*in terms consumption under laboratory conditions to determine the potential of this predator. Such information would be helpful for optimizing the mass rearing *of C. zastrowi*.

Materials and methods-

The predatory potential of green lacewingon six natural hosts was studied 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*, *Lipaphiserysimi*, *Rhophalosiphummaidis*, *Brevicorynebrassicae* and *Myzuspersicae*. 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. 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). Five percent significance level was considered for 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 *Chrysoperlazastrowi*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 finding are in agreement with those of Satpathy*et al.*[13] reported that the green lacewing larva preyed 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 consumed more by third instar larva was in 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 *C. zastrowi*(prey host/larva)**			
	Ist instar Mean±S.E.	**IInd instar Mean±S.E.**	**IIIrd instar Mean±S.E.**	**Total Consumed**
Aphis craccivora	46.00±0.58	60.67±0.33	73.33±0.33	180.00±1.24
Aphis gossypii	43.33±1.76	59.00±2.08	69.00±0.58	171.33±4.42
Lipaphiserysimi	37.00±0.58	49.67±1.20	56.00±0.58	142.67±2.36

Rhophalosiphummaidis	35.67±0.33	43.67±0.33	52.00±1.53	131.34±2.19
Brevicorynebrassicae	42.00±0.58	55.00±0.58	60.67±0.33	157.67±1.49
Myzuspersicae	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 research finding demonstrates that the third instar larvae of *C. zastrowi* are more voracious as compare to 1st and 2nd instars. It is evident that the *Aphis craccivora*were more preferred host of *C. zastrowi* hence; it can be utilized as mass rearing diet of this predator. The predatory larvae fed on different aphid species and hence, this potential to utilize for biological control agent for management of the aphids. This result guides the entomologist to consider the *C. zastrowi* as efficient bio-control agent in eco-friendly management of aphids on agricultural crops and so, enhancing the potential of predators.

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