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Predatory Capacity of the Green Lacewing *Chrysoperla zastrowi* (Esben-Petersons) on Different Species of Aphids under Laboratory Conditions

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Green lacewing, *Chrysoperla zastrowi* (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

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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: Chrysoperla zastrowi; green lacewing; aphids.

1. 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" [1]. "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" [1]. "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" [2-3]. "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 [4-6].

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" [7]. 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 [8]. 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-Petersons) has been recorded as an effective generalist predator of aphids, coccids, mites and mealybugs" [9,10]. 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 [11-12]. Adults feed on flower nectar and pollen. Complete destruction of *A. gossypii* colonies was recorded [13]. 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 aphid as food for *C. zastrowi* in terms consumption under laboratory conditions. Such information would be helpful for optimizing the mass rearing *of* this predator.

2. 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*, *Rhophalosiphum 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

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
Lipaphis erysimi	37.00 ± 0.58	49.67 ± 1.20	56.00 ± 0.58	142.67 ± 2.36
Rhophalosiphum maidis	35.67 ± 0.33	43.67 ± 0.33	52.00 ± 1.53	131.34 ± 2.19
Brevicoryne brassicae	42.00 ± 0.58	55.00 ± 0.58	60.67 ± 0.33	157.67 ± 1.49
Myzus persicae	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	

recorded by counting the live preys after every 24 hrs". [14] Then, fresh aphids were provided in each treatment. Counting method was adopted by Shah et al. [15]. All the recorded data were subjected to statistical analysis (one-way analysis of variance, ANOVA).

3. 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.* [16] the feeding preference of predator found in the order of *A. craccivora>A. gossypii> R. maidis> L. erysimi*. Jagadish and Jayaramaiah [12] 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 Balakrishnan et al. [17] 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, Adane and Gautam*.* [18], Saminathan et al. [19] revealed that the prey consumption was more by third instar larva with the order of *Corcyra cephalonica, A*. *craccivora & L. erysimi*. Saminathan *et al.* [20] 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.*

4. CONCLUSION

The present findings demonstrate that the third instar larvae of *C. zastrowi* are more voracious as compare 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 entomologist to consider the *C. zastrowi* as efficient bio-control agent in eco-friendly management of aphids on agricultural crops.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. ED. Annual report 2069/2070 (2012/13) Entomology Division, NARC, Khumaltar, Lalitpur, Nepal. 2013;90.
2. Palikhe BR. Challenges and options of pesticide use: In the context of Nepal. Landschaftsökologie and Umweltforschung. 2002;38:130-141.
3. Zaki FN, Gesraha MA. Production of the green lacewing, *Chrysoperla zastrowi* (Esben-Peterson.) (Neuroptera: Chrysopidae) reared on semi-artificial diet based on the algae, Chlorella vulgaris, Journal of Applied Entomology. 125(1-2):97-98
4. Akter A, Kabir MR, Roni MZK and Uddin AJ. Control of mustard aphid (*Lipaphis erysimi*) using different botanical insecticides. Bangladesh Res Pub J. 2015;10(4):298-303.
5. Kafle K. Management of mustard aphid, *Lipaphis erysimi* (Kalt.) (Homoptera: Aphididae). International Journal Applied Sciences and Biotechnology. 2015;3(3):537-540.
6. Neupane FP. Crop pests and their management. 5th Eds., Sajha Prakashan, Lalitpur, Nepal. 2010;584.
7. De Bach P, Hagen KS. Manipulation of entomophagous species. In: Biological control of insect pests and weeds (Ed. P. DeBach). Reinhold, New York. 1964;429-458.
8. Sattar M, Abro GH and Syed TS. Effect of Different Hosts on Biology of *Chrysoperla zastrowi* Esben-Peterson (Neuroptera: Chrysopidae) in Laboratory Conditions. Pakistan J Zool. 2011;43(6):1049-1054.
9. Singh NN, Manoj K. Potentiality of *Chrysoperla zastrowi* in suppression of mustard aphid population. Ind. J. Ent. 2000;62:323-326.
10. Michaud JP. Evaluation of green lacewings, *Chrysoperla plorabunda* (Fitch) (Neuroptera) augmentative release against *Toxoptera citricida* (Homoptera: Aphididae) in citrus. J. Appl. Ent. 2001;122:383-388.
11. Yadav R, Pathak PH. Effect of temperature on the consumption capacity of *Chrysoperla zastrowi* reared on four aphid spp. International Quarterly Journal of Life Science. 2010;5(2):271-274.
12. Jagadish KS, Jayaramaiah M. Biology and predatory potentiality of *Chrysoperla zastrowi* on the tobacco *A. gossypii*, *Myzus nicotianae* (Homoptera). J Ecobiol. 2004;16(3):161-167.
13. Rana LB, Mainali RP, Regmi H, RajBhandari BP. Feeding efficiency of green lacewing, Chrysoperla carnea (Stephens) against different species of aphid in laboratory conditions. International Journal of Applied Sciences and Biotechnology. 2017;5(1):37-41.
14. Memon AS, Omar D, Muhamad R, Sajap AS, Asib N and Gilal AA. Functional responses of green lacewing, *Chrysoperla nipponensis* (Neuroptera: Chrysopidae) reared on natural herb based artificial diet. Journal of Entomology and Zoology Studies. 2015;3(6):80-83.
15. Shah V, Bishwajeet P, Pandi GGP, Shankarganesh, K. Biology and predatory potential of green lacewing, *Chrysoperla* spp. (*zastrowi* group) on different aphid species. Annals of Plant Protection Sciences. 2013;21(1):9-12.
16. Satpathy S, Kumar A, Shivalingaswamy TM, and Rai AB. Effect of prey on predation, growth and biology of green lacewing (*Chrysoperla zastrowi*). Indian Journal of Agricultural Sciences. 2012;82 (1): 55-58.
17. Balakrishnan N, Baskaran RKM and Mahadevan NR. Development and predatory potential of green lacewing, *Chrysoperla zastrowi* (Esben-Petersons) (Neuroptera: Chrysophidae) on different prey insects. Agricultural Science Digest. 2005;25(3):194-197.
18. Adane T, Gautam RD. Biology and feeding potential of green lacewing, *Chrysoperla carnea* on non-rice moth prey. Indian Journal of Entomology. 2002;64(4):457-464.
19. Saminathan VR, Mahadevan, NR and Muthukrishnan, N. Influence of prey density on the predatory potential and development of *Chrysoperla*

carnea. Indian J. Ent. 2003;65(1):1-6.

20. Sharma DR, Thapa RB, Manandhar HK, Shrestha SM & Pradhan SB. Use of pesticides in Nepal and impacts on human health and environment. The Journal of Agriculture and Environment. 2012;13:67-74.

21. Venkatesan T, Singh SP, Jalali SK, Joshi S. Evaluation of predatory efficiency of *Chrysoperla zastrowi* (Esben-Petersons) reared on artificial diet against tobacco aphid, *Myzus persicae* (Sulzer) in comparison with other predators. J Entomol. Res. 2002;26:193-196.

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