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Feeding potential of *Chrysoperla zastrowisillemi* (Esben-Petersen) on different hosts

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Abstract
Laboratory experiments were conducted at Department of Agricultural Entomology, VNMKV, Parbhani during 2020-2021 to study feeding potential of green lacewing, *Chrysoperla zastrowisillemi* (Esben-Petersen) on Unsterilized and sterilized eggs of *Corcyra cephalonica, Aphis craccivora, Aphis gossypii, Brevicoryne brassicae* and *Uroleucon compositae*. Consumption capacity of first, second and third instar larvae revealed that highest consumption was noticed for sterilized eggs of *Corcyra cephalonica* with 47.69, 102.45 and 196.52 eggs, respectively and total consumption observed was 346.66 eggs in a developmental period of 9.46 days whereas, feeding capacity on different hosts ranged from 311.95 eggs to 169.57 aphids. These results unfold that eggs of *Corcyra cephalonica* are found to be most suitable for laboratory rearing of the predator, *Chrysoperla zastrowisillemi*.

Keywords: Feeding potential, *Chrysoperla zastrowi sillemi*, unsterilized eggs of *Corcyra cephalonica, Aphis spp., Brevicoryne brassicae*

1. Introduction
The biological control with the increasing knowledge about it, is playing a major role in suppressing the insect pests. Chrysopids (Green lacewing) has been found as a potential polyphagous predator belonging to Order Neuroptera and Family Chrysopidae. This order consists of 6000 species which are soft-bodied with relatively few specialized features. They have strong mandibles suitable for chewing, two pairs of wings similar in size and shape which rest along the abdomen in a roof-like position. In India, 65 Chrysopid predator species have been reported from different ecosystems belonging to 21 genera (Singh and Jalali, 1994) [7]. The most common ones are *Chrysoperla carnea* (Stephens), *Mallada boninensis* (Okamoto) and *Apertochrysacrassinervium* (Burke and Martin, 1956) [2]. The common green lacewing, *Chrysoperla sp*., often known as Aphid lion or Golden eyes, is extremely important for controlling sucking pests in a variety of crops. (Balakrishnan *et al*., 2005) [1].
During the last two decades, the role of Chrysopids (Green lacewing) as a predator has been appreciated all over the world in Integrated Pest Management programme due to resistance to insecticides. This led to an interest in using them as an eco-friendly, economic and social sound approach in Integrated Pest Control. Therefore, to exploit the importance of Chrysopids, present study was based on feeding potential of *Chrysoperla zastrowisillemi* different hosts in laboratory to develop eco-friendly mass production technology.

2. Materials and Methods
The rearing of predator was done in the Laboratory of Insect Parasitology Research Scheme, Department of Agricultural Entomology, VNMKV, Parbhani during 2020 - 2021. Different hosts *viz.*, Sterilized and unsterilized eggs of *Corcyra cephalonica*, Cabbage aphid *Brevicoryne brassicae*, Cowpea aphid *Aphis craccivora*, Cotton aphid *Aphis gossypii* and Safflower aphid *Uroleucon compositae* were used as preys for studying feeding potential of *Chrysoperla zastrowisillemi* in the laboratory.

2.1 Rearing of predator
Mass rearing of *Chrysoperla zastrowi sillemi* was done in the laboratory to obtain pure, hygenic and required culture. The initial culture of eggs of *Chrysoperla zastrowi sillemi* was procured from ICAR - NBAIR (National Bureau of Agricultural Insect Resources) Bangalore, Karnataka, India. The eggs after hatching were reared individually on different preys in vials as food. The vials were cleaned everyday and preys are provided to the larvae until pupation.

After the adult emergence, adults were immediately placed in the oviposition chamber. Adults were fed with castor pollens and cotton swabs dipped in drinking water, 50 percent honey solution, and proteinex mixture (equal parts of proteinex, honey, and yeast with tiny amount of water) maintained in the lids of plastic containers. Oviposition cage was wrapped with black paper sheet from inside and it was replaced every day. It was covered with cloth on the top. Adult female starts laying eggs on the black paper sheet and these sheets were replaced daily. The stalks of egg from black paper sheets were cut off with sharpened blade and eggs were transferred into plastic vials. These freshly laid eggs were used for further study.

2.2 Rearing of Preys

2.2.1 Rearing of *Corcyra cephalonica*

Eggs of *Corcyra cephalonica* were obtained through the culture multiplied on large scale under laboratory conditions. The culture was maintained on sorghum based artificial diet.

2.2.2 Procurement of hosts from different crops

Cabbage, Cotton and Safflower aphids were collected from pesticide free fields located at Department of Agricultural Entomology, Parbhani. Cowpea local variety was sown in a small plot for obtaining aphids. This plot was maintained untreated. These aphids were collected daily from these plots with the help of camel hair brush in vials which were utilized for feeding.

2.2.3 Feeding potential on different hosts

The studies on feeding potential of *Chrysoperla zastrowi sillemi* on sterilized and unsterilized eggs of *Corcyra cephalonica, Aphis gossypii, Aphis craccivora, Brevicoryne brassicae* and *Uroleucon compositae* were carried out under laboratory conditions. Fifty larvae of *Chrysoperla zastrowisillemi* comprising of 10 larvae in each replication were used to feed upon preys *viz.*, sterilized and unsterilized eggs of *Corcyra cephalonica, Aphis gossypii, Aphis craccivora, Brevicoryne brassicae* and *Uroleucon compositae* separately. The predator larvae were fed with known number of preys until they pupated.

3. Results and Discussion

The results regarding this aspect presented in Table 1 indicated that *Chrysoperla zastrowisillemi* larva when fed on different preys passed through three larval instars and they were found statistically significant to each other. During the course of development larvae consumed significantly highest number of sterilized eggs of *Corcyra cephalonica* to the extent of (47.69, 102.45 and 196.52) of first, second and third instar larva respectively over the unsterilized eggs of *Corcyra cephalonica* (38.17, 98.95 and 174.83), *Aphis craccivora* (30.48, 62.74 and 114.89), *Aphis gossypii* (25.59, 57.32 and 101.21), *Uroleucon compositae* (19.47, 49.42 and 100.67) and *Brevicoryne brassicae* (22.26, 50.00 and 89.57).

The data on feeding potential of three instars of *Chrysoperla zastrowi sillemi* on different preys revealed that highest number of sterilized eggs of *Corcyra cephalonica* 346.66 were consumed by the larvae of *Chrysoperla zastrowi sillemi* in order to complete its development in a period of 9.46 days. It was followed by unsterilized eggs of *Corcyra cephalonica* (311.95) with total larval developmental period of 9 days, *Aphis craccivora* (208.17) with larval developmental period of 10.10 days, *Aphis gossypii* (184.12) with larval period of 10.59 days, *Uroleucon compositae* (169.57) with total larval period of 11.17 days and *Brevicoryne brassicae* (161.84) with larval period of 10.50 days.

Similar studies carried out by Mhaske *et al.* (2019) [5] and Naruka *et al.*, (2017) [6] found that average number of eggs consumed by *Chrysoperla zastrowi arabica* on *Corcyra cephalonica* during larval period of first, second and third instar were 24.65, 75.43 and 198.17 whereas average number of eggs consumed during different instars was 298.24. Kumar *et al.*, (2019) [4] recorded that average number of preys consumed during first, second and third instar larva was 30.67, 53.00 and 123, total consumption was 206.66 on *Aphis craccivora* whereas first, second and third instar larva consumed 36.37, 75.50 and 89.59 preys and total preys consumed during different instars was 204.76 on *Aphis craccivora* (Naruka *et al.*, 2017) [6].

The results on per day predatory potential of *Chrysoperla zastrowisillemi* on different hosts was presented in Table 2. It is evident from Table 2 that first, second and third instar larvae of *Chrysoperla zastrowi sillemi* consumed 14.50, 35.75 and 48.57 eggs of unsterilized eggs of *Corcyra cephalonica* per day which was at par with sterilized eggs of *Corcyra cephalonica* consumed 16.51, 36.84 and 51.91 eggs per day, respectively. It was followed by *Aphis craccivora*9.84, 21.53 and 28.17, *Aphis gossypii* 7.72, 18.78 and 23.95, *Uroleuconcompositae*5.66, 16.35 and 21.39 and *Brevicorynebrassicae*5.07, 15.76 and 17.73 per day, respectively. The results are in conformity with the findings of Chakraborty and Korat (2010) [3] who found that average number of preys consumed per day during first, second and third instar larva of *Chrysoperla carnea* were 12.20, 16.40 and 24.63 respectively on *Uroleucon compositae* and similar results observed by Vivek *et al.* (2013) [8].

4. Conclusion

From the above, it can be concluded that factitious host *i.e.*, eggs of *Corcyra cephalonica* was found to be most suitable for laboratory rearing of *Chrysoperla zastrowisillemi.* In absence of factitious host, field hosts like *Aphis craccivora* and *Aphis gossypii* can be utilized. This results clearly indicate that *Chrysoperla zastrowisillemi* can be used as an efficient biocontrol agent in eco-friendly management of aphids on agricultural crops. It enhances potential of predators.

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Table 1: Feeding potential of *Chrysoperla zastrowi sillemi* on different preys

Preys	Average no. of preys consumed			I to III Instar	
	I Instar	II Instar	III Instar	Duration (days)	Total Consumption
Unsterilized *Corcyra* eggs	38.17	98.95	174.83	9.00	311.95
Sterilized *Corcyra* eggs	47.69	102.45	196.52	9.46	346.66
B. brasicae	22.26	50.00	89.57	10.50	161.84

A. gossypii	25.59	57.32	101.21	10.59	184.12
A. craccivora	30.48	62.74	114.96	10.10	208.17
U. compositae	19.47	49.42	100.67	11.17	169.57
S.E ±	1.04	2.10	3.03	0.12	4.17
C.D at 5%	3.04	6.13	8.85	0.35	12.19

Table 2: Larval consumption of *Chrysoperla zastrowi sillemi* per day during different instars

Preys	Larval consumption per day during different instars		
	I	II	III
Unsterilized *Corcyra* eggs	14.50	35.75	48.57
Sterilized *Corcyra* eggs	16.51	36.84	51.91
B. brasicae	5.07	15.76	17.73
gossypii	7.72	18.78	23.95
A. craccivora	9.84	21.53	28.17
U. compositae	5.66	16.35	21.39
S.E ±	0.34	0.50	0.42
C.D at 5%	0.98	1.46	1.22

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