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Predatory potential of ladybird beetle, *Propylea sp.* (Coccinellidae: Coleoptera) on Lucerne aphid, *Acyrtosiphon pisum* (Harris) (Aphididae: Hemiptera) under laboratory conditions

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Abstract

The experiment was conducted at PG Research Laboratory, Department of Agricultural Entomology, N.M. College of Agriculture, Navsari Agricultural University, Navsari. The results revealed that mean consumption of aphids per larva of *Propylea sp.* was 10.16 ± 1.93 , 26.66 ± 7.59 , 52.86 ± 12.87 , 75.06 ± 4.32 aphids were consumed during 1st, 2nd, 3rd and 4th instars, respectively. Total larval consumption was 164.74 ± 26.71 aphids. A male beetle consumed 475.34 ± 34.09 aphids. While, female beetle consumed 659.96 ± 47.47 aphids during adult period. Total feeding potential of *Propylea sp.* on *A. pisum* was 732.39 ± 36.74 aphids.

Keywords: Feeding potential, ladybird beetle, *Propylea sp.*, Lucerne aphid, *Acyrtosiphon pisum* (Harris)

Introduction

Lucerne, *Medicago sativa* L. is one of the important forage crop. It was first observed to be cultivated in Iran before 700 BC. Lucerne has the highest feeding value among all commonly grown hay crops. It is consumed by most of the herbivores and omnivores, including all classes of livestock and big game animals. Like most of plants, Lucerne can be attacked by various pests. Some pest, such as alfalfa weevil, aphids, armyworm and leafhopper can reduce alfalfa yield Natwick and Lopez ^[4]. Among these pests, pea aphid (PA), *A. pisum* causes severe yield losses both in qualitative and quantity Ingawale and Tambe ^[3].

Coccinellids are beneficial insects because of their predaceous nature. These insects are considered as the most economical and eco-friendly alternatives of the hazardous pesticides. Ladybird beetle, *Propylea sp.* is one of the potential predator of many aphid species Pervez and Omkar ^[6]. In evolving eco-friendly strategy using the bio-agents for the management of Lucerne aphid, Ladybird beetle, *Propylea sp.* could be a potential predator. For the effective use of predaceous coccinellids in the integrated pest management programme, a complete investigation on their predatory potential is most importance. The present study was therefore under taken under laboratory conditions to gather relevant information on predation of lady bird beetle, *Propylea sp.* on Lucerne aphid. The result obtained would be helpful for the planning of future research aspects for the management of lucerne aphid.

Materials and Methods

The adults of *Propylea sp.* collected from Forage Research Scheme, College farm, NAU, Navsari and reared on the Lucerne aphid, *A. pisum*. To study the larval feeding potential of *Propylea sp.* on *A. pisum*, a set of fifty neonate larvae were reared separately in plastic vials (6 x 4 cm) right from the hatching to pupation. Each larval instar was provided with a counted number of aphids (nymphs and adults) to know the feeding potential. The numbers of aphids were increased as the larva entered in to next instar. The number of aphids consumed by the larva in 24 h was recorded. Thus, the larval feeding potential was worked out for each instar as well as for entire larval period.

To study the adult feeding potential, newly emerged adults of *Propylea sp.* beetles were kept separately in plastic containers (6 x 4 cm). A set of fifty adults were provided with counted number of aphids. Numbers of aphids consumed during 24 hours was obtained by subtracting the

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number of aphid left over from the total number of aphid supplied. The fresh new aphids were reintroduced daily during present investigation. Thus, feeding potential of an adult was worked out.

Results and Discussion

Larva

Experimental data on the feeding potential of larvae and adult of *Propylea sp.* on the Lucerne aphid, *A. pisum*. Are presented in Table-1. Data indicated that total number of aphids, *A. pisum* consumed by the larvae during its first, second, third and fourth instars were 4 to 13, 16 to 21, 26 to 71 and 62 to 83 aphid with an average of 10.16 ± 1.93 , 26.66 ± 7.59 , 52.86 ± 12.87 , 75.06 ± 4.32 aphids, respectively. The predatory capacity during entire larval duration varied from 108 to 188 aphids with an average of 164.74 ± 26.71 aphids. Earlier, Chowdhury, *et al.* [2] recorded that the first, second, third and fourth instar grubs of *Cheilomenes sexmaculata* Fab. consumed 21.70 ± 5.81 , 27.10 ± 7.42 , 72.60 ± 5.32 and 186.30 ± 24.59 aphid, respectively, during their developmental period. Saleem *et al.* [8] recorded consumption rate by first, second, third and fourth instar larva of *Menochilus sexmaculata* Fab. were 7 to 10 aphids (Av. 8.40 ± 0.50), 10 to 16 (Av. 13.60 ± 0.81), 25 to 33 (28.60 ± 1.50) and 45 to 71 (Av. 57.40 ± 4.67), respectively. Yousufzai *et al.* [10] noted that predatory potential of first, second, third and fourth instar of *Coccinella undecimpunctata* L. varied from 9.28 ± 1.47 , 15.21 ± 1.97 , 21.26 ± 2.06 and 42.69 ± 3.89 aphids. The slight variation in feeding potential might be due to different predatory insect and host insects used in their study as well as prevailing climatic conditions existing in a particular locality.

The per day consumption by predatory larva on *A. pisum* during individual instar were 3.50 to 6.50 aphids (Av. 5.22 ± 0.69), 8.00 to 13.67 (Av. 10.44 ± 1.29), 19.00 to 23.57 (Av. 21.25 ± 1.00) and 20.67 to 26.67 (Av. 25.02 ± 1.44), respectively. The per day predatory capacity of *Propylea sp.* during total larval duration varied from 51.17 to 70.50 aphids

with an average of 61.93 ± 4.42 aphids (Table-1). Rakhshan and Ahmad [7] noted that per day consumption of first, second, third and fourth instars grub of *C. sexmaculata* were 9.2 ± 0.37 , 29.8 ± 1.88 , 36.8 ± 2.46 and 49.2 ± 1.71 aphids, respectively. The discrepancy in findings might be due to the influence of different hosts, adopted methodology and rearing conditions on the predator.

Adult

Data presented in Table -1 revealed that male beetle consumed 403.0 to 561.0 aphids (Av. 475.34 ± 34.08 aphids) during adult period. While, female beetle consumed 552.0 to 762.0 aphids (Av. 659.96 ± 47.47 aphids). The present findings are similar with the report of Shinde [9] who recorded total consumption of male and female adult of *C. sexmaculatus* was 491.60 ± 33.05 and 789.92 ± 32.72 aphids, respectively when reared on *Apis craccivora* (Koch).

Data on per day consumption ability of *Propylea sp.* revealed that the male beetle consumed 13.42 to 17.53 (Av. 15.07 ± 0.07) aphids while female beetle consumed 17.91 to 21.77 (Av. 19.55 ± 4.65) aphids when fed on *A. pisum* (Table-1). This finding are more or less similar with the report of Pandi *et al.* [5] who noted that average rate of predation by the male and female of *C. sexmaculata* was 20.8 ± 1.16 and 23.0 ± 0.95 aphids/day, respectively when reared on *Lipaphis erysimi* (Kaltenbach).

The total feeding potential of *Propylea sp.* on *A. pisum* during whole lifespan varied from 646.0 to 804.0 aphids with an average of 732.39 ± 36.74 . Rakhshan and Ahmad [7] revealed that total feeding potential of *C. sexmaculata* were 655.8 ± 3.64 aphids. Chakraborty and Korat [1] found that *Coccinella septempunctata* L. consumed 528.47 ± 11.79 aphids during its entire life. The findings of above workers are more or less in conformity with the present investigation.

The study indicated that aphid consumption increased with the change in the larval instar and it was highest in 4th instar larvae followed by female and male adults.

Table 1: Feeding potential of larva and adult of *Propylea sp.* on *A. Pisum*

Stages	No. observed	Total aphids consumed			Per day aphids consumption		
		Min.	Max.	Av. \pm S.D.	Min.	Max.	Av. \pm S.D.
Larva							
I instar	50	4	13	10.16 ± 1.93	3.50	6.50	5.22 ± 0.69
II instar	50	16	21	26.66 ± 7.59	8.00	13.67	10.44 ± 1.29
III instar	50	26	71	52.86 ± 12.87	19.00	23.67	21.25 ± 1.00
IV instar	50	62	83	75.06 ± 4.32	20.67	27.67	25.02 ± 1.44
Total consumption	200	108	188	164.74 ± 26.71	51.17	71.50	61.93 ± 4.42
Adult							
Male	50	403	561	475.34 ± 34.08	13.42	17.53	15.07 ± 0.07
Female	50	552	762	659.96 ± 47.47	17.91	21.77	19.55 ± 4.65
Total consumption during entire lifespan	300	646.0	804.0	732.39 ± 36.74	-	-	-

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