



Research Article

Predatory potential of green lacewing, *Chrysoperla zastrowi sillemi* (esben - petersen) (Neuroptera: Chrysopidae) on pomegranate aphid *Aphis punicae* passerini (Homoptera: Aphididae)

K. ELANGO* and S. SRIDHARAN

Department of Agricultural Entomology, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore - 641003, Tamil Nadu, India

*Corresponding author E-mail: elaento@gmail.com

ABSTRACT: The predatory potential of aphid lion, *Chrysoperla zastrowi sillemi* (Neuroptera: Chrysopidae) against *Aphis punicae* in pomegranate was studied and the observation showed that all the larval stages of the predator were found to feed on *A. punicae*. Furthermore, the third instar grub of *C. zastrowi sillemi* with the developmental period of 3.4 days had consumed a maximum of 106.3 aphids followed by second and first instar grubs of the predator which consumed a maximum of 68.1 and 30.7 aphids during their development period of 3.2 and 2.7 days, respectively. Further, single *C. zastrowi sillemi* grub was found to consume a total of 205.1 aphids during its total larval period of 9.3 days. The results obtained indicate the potential of *C. zastrowi sillemi* as an effective predator of pomegranate aphid.

KEY WORDS: *Aphis punicae*, biological control, *Chrysoperla zastrowi sillemi*, pomegranate, predatory potential

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INTRODUCTION

Pomegranate (*Punica granatum* L.) is gaining popularity in arid and semiarid regions of India due to its hardy nature, high yield, low maintenance cost and good keeping quality of the fruit (Khodade *et al.*, 1990). It is cultivated on commercial scale in the states of Maharashtra, Gujarat, Andra Pradesh, Tamil Nadu, and Karnataka. The yield in pomegranate is decreasing in certain areas due to several insect pest problems. Cultivation of high yielding varieties of pomegranate under high density intensive care and management aimed for early stage exploitation of plant has lead to certain severe sucking pest problems. Among them, infestation by sucking pests like aphids, thrips, whiteflies, mealy bugs, scale insects and mites resulting in reduction of pomegranate fruit yield and quality (Ananda *et al.*, 2009).

Among several insects that attack pomegranate aphid, *Aphis punicae* Passerini (Homoptera: Aphididae) is economically an important pest. The adults and nymphs colonize on tender shoots, flower buds, flowers and young fruits and suck sap causing severe damage. The affected parts get discoloured and severe infestation results in stunted growth

and drying of tender parts. In addition, the excretion of honeydew by aphids harbor sooty mould, which hinders the photosynthetic activity (Sreedevi *et al.*, 2006). All these syndrome affect the development of fruit. The pomegranate fruit is used for table purpose as well as for medicinal value. Both the skin and grains in the fruit are utilized. Hence, the use of biological control agent to control the pests will be appropriate as the use of chemical pesticides leave pesticide residues.

The use of Green lacewing, *Chrysoperla zastrowi sillemi* (Esben - Petersen) (Neuroptera : Chrysopidae) has gained importance in pest management in India. It has long been considered as an important natural predator because of its potential to control a variety of soft bodied insects like aphids, whiteflies, coccids, mealybugs and thrips (Rao and Satyanarayana, 1984; Henry *et al.*, 2010). The observation in our research study in pomegranate ecosystem under high density planting in different locations of Coimbatore districts showed that *C. z. sillemi* was active. Therefore, studies were conducted to determine the feeding efficiency of the predator on *A. punicae* for effective control of the pest.

MATERIALS AND METHODS

Source of test insects

Laboratory experiments were conducted in the department of Agricultural Entomology, TNAU, Coimbatore, India during 2015-2016 to determine the predatory potential of different larval instars of *C. z. sillemi* on pomegranate aphid. Freshly laid eggs of *C. z. sillemi* were collected from field and the mass cultured in biological control laboratory.

Predatory potential of *Chrysoperla zastrowi sillemi* against *Aphis punicae*

Freshly emerged twenty one grubs starved for 2 h were placed individually in plastic container and fifty mixed population of *Aphis punicae* kept in the terminal shoots of pomegranate leaves were presented daily as prey. The number of *A. punicae* nymphs consumed by the grub was recorded at every 24 h interval. Each instar of grub stage was considered as one treatment and there were three treatments replicated seven times maintained to assess the predatory potential of grub.

Statistical analysis

The data were subjected to statistical analysis adopting completely randomized block design with 3 treatments and 7 replications and the mean values of treatments were separated by Least Significant Difference (LSD) (Gomez and Gomez, 1984) using AGRES ver. (7.01), Pascal International Solutions.

RESULTS AND DISCUSSION

Table 1 represents the results of the laboratory experiment on predatory potential of *C. zastrowi sillemi* on *A. punicae*. It was observed that the third instar grub of *C. zastrowi sillemi*, with the developmental period of 3.4 days had consumed a maximum of 106.3 aphids followed by second and first instar grubs which consumed a maximum of 68.1 and 30.7 aphids during their development period of 3.2 and 2.7 days, respectively. An individual grub of the predator consumed a total of 205.1 aphids during its total larval period of 9.3 days. The grubs fed with aphids were allowed for pupation and the average pupal period spent was



(a)



(b)

Figure 1. Predatory potential of *Chrysoperla zastrowi sillemi* on *Aphis punicae* in pomegranate. (a) *Chrysoperla z. sillemi* on *A. punicae*. (b) *Chrysoperla z. sillemi* grub (III instar) feeding *A. punicae*.

5.71±0.7 days. Further, adults emerged from the pupa was allowed for mating and the mated female was observed for egg laying which extended up to a period of 6.57±0.9 days with total eggs of 135-170 eggs per female.

Table 1. Predatory potential of *Chrysoperla zastrowi sillemi* on *Aphis punicae* in pomegranate

Instar of <i>C. zastrowi sillemi</i>	Developmental period (Days)	Consumption of <i>A. punicae</i>	
		Total aphids consumed	Aphids consumed per day
First instar	02.7 (1.64) ^b	030.7 (5.54) ^c	11.4 (3.37) ^c
Second instar	03.2 (1.78) ^a	068.1 (8.25) ^b	20.8 (4.56) ^b
Third instar	03.4 (1.84) ^a	106.3 (10.31) ^a	31.4 (5.60) ^a
Total	09.3	205.1	21.2
SE d	0.0766	0.2597	0.0944
CD	0.1610	0.5457	0.1984

*Mean of seven replications. Values in the parentheses are square root transformed values. In a column, means followed by the common letter(s) are not significant in DMRT @ 5% level of significance.

The consumption of the prey increased with the growth stages of the predator as observed with the third instar larva of *C. zastrowi sillemi* consumed maximum aphids. This can be attributed to the capacity of the predator to handle the prey in less time (Figure 1). In addition, increase in the feeding rate of older grubs might be due to their increased nutritional requirement. Third instar grub of *C. zastrowi sillemi*, with development period of 3.4 days consumed a maximum of 106.3 aphids with the total consumption of 205.1 aphids during its total larval period of 9.3 days. The above finding was in line with the findings of Karuppuchamy *et al.* (1998) who determined the feeding capacity of *C. z. sillemi* larvae with consumption of 423 nymphs or 216 adults of aphid *A. punicae* during the entire larval period. Similar findings of Singh and Hamid (1998) who reported that the *C. carnea* consumed an average of 21.68, 76.92 and 160.92 cabbage aphids in its first, second and third instar larva, respectively was in line with the present finding. Likewise the studies of Rana and Srivastava (1998) reported that the larva of *C. carnea* consumed a maximum of 349.80 *L. erysimi* aphids and Aravind *et al.* (2012) revealed that third instar of *C. z. sillemi* grub feeds 213 aphids *A. gossypii* (Glover) on bhendi further strengthen the present results. Further studies under field condition for the establishment of predator and pomegranate aphid population need to be taken up.

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