

## BIOLOGICAL CONTROL

# Population abundance of pomegranate aphid, *Aphis punicae* (Homoptera: Aphididae), predators in Southwest of Iran

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## Abstract

Pomegranate aphid, *Aphis punicae* Passarini (Hom., Aphididae) is an important pest of pomegranate in Iran. Predators play critical role in natural control of the pest. In this study, seasonal population dynamics of the aphid predators were investigated during two years (2016/2017) in Ilam province, southwest of Iran. Samplings were bi-weekly performed in an experimental pomegranate orchard. Four insect predators, *Coccinella septempunctata* L., *Oenopia congelobata* L. (Col., Coccinellidae), *Xanthogramma pedisseguum* Haris (Dip., Syrphidae) and *Chrysoperla carnea* Stephens (Neu., Chrysopidae) were identified as predators of *A. punicae* in Ilam. The natural enemies occurred during March to May in both years. The highest and the lowest densities were belong to *X. pedisseguum* and *O. congelobata*,

respectively. Results of the study can be used for developing integrated pest management program of *A. punicae* in pomegranate orchards.

## Introduction

The pomegranate tree, *Punica granatum* L. is attacked by several insect species which decrease the quality and quantity of its product (Rouhani *et al.*, 2013). The pomegranate aphid, *Aphis punicae* Pass (Homoptera: Aphididae), is a major pest of pomegranate groves in Iran (Rouhani *et al.*, 2013; Ahmadi & Pour Javad, 2016). Adults and nymphs of the pest feed on leaves, inflorescences and fruits. Infestation by aphids result in pale and curled leaves; retard development and fallen flowers (Moawad & Al-Barty, 2011).

Natural enemies (NEs) play an important role in natural control of aphids (Smith *et al.*, 1997). Many arthropod predators, especially insect predators, attack the pests in agro-ecosystem (Rotheray, 1989). Information about the NEs is critical for developing integrated pest management program especially for conservation and release of the beneficial organisms (Pedigo, 2002). Seasonal population dynamics of some predators of *A. punicae* were previously studied in India (Mani & Krishnamoorthy, 1995; Sreedevi *et al.*, 2006) and Libya (Amin, 2002). However, no previous study has been performed about seasonal population fluctuations of *A. punicae* predators in Iran. Therefore, the objective of this study was to investigate seasonal population dynamics of the pest predators in southwest of Iran.

## Materials and Methods

The research was carried out at an experimental pomegranate orchard, one hectare area, in Sirvan district, Ilam province, southwest of Iran (N 49°49', 12.299", E 33°33', 52.535"). This orchards included 700 trees, six years old, of pomegranate, *Punica granatum* cv. Malase shirin. Cultural practices were carried out according to normal practice and no pesticides were applied during the study period.

Samplings were usually carried out at bi-weekly intervals from February 2016 to November 2017. At each sampling date, twenty trees were randomly chosen. From three heights (1, 1.5 and 2 m) of each main canopy direction (north, south, east and west), three shoots, and a total of 12 shoots from each sampled tree, were

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randomly taken. Therefore, in each sampling date, 240 pomegranate shoots were taken from 20 selected trees. The shoots were transported to laboratory, then species of the NES and their numbers were separately recorded under stereomicroscope.

## Results and Discussion

Totally, four insect predators, *Coccinella septempunctata* L., *Oenopia congelobata* L. (Col., Coccinellidae), *Xanthogramma pedisseguum* Haris (Dip., Syrphidae) and *Chrysoperla carnea* Stephens (Neu., Chrysopidae), fed on *S. ceratoniae* colony in Sirvan district.

Seasonal population dynamics of the predators are shown in Figure 1. Among the species, the syrphid fly, *X. pedisseguum*, had the highest density. It was first observed in early of April 2016 and end of March 2017. Population density of the fly peaked at 20 and 21 April 2016 and 2017, respectively. Then, population density of the predator gradually decreased and no syrphid fly found in sampling at 21 May 2016 and 22 May 2017.

*C. septempunctata* presented in aphid colony during 21 March to 21 May 2016 and 21 March to 22 May 2017. Population peaks of the predator were recorded at 20 April 2016 and 21 April 2017. *O. pedisseguum* was firstly observed at 4 April 2016 and 21 March 2017. The predator density rapidly increased and peaked at 20 April 2016 and 21 May 2017. No *O. pedisseguum* was sampled after 21 May 2016 and 5 May 2017.

*C. carnea* was firstly sampled at 21 March 2016 and 2017. Population peaks of the predator occurred at 20 April 2016 and 21 May 2017. *C. carnea* was not observed after 20 April and 5 May 2016 and 2017, respectively.

Four species, *Scymnus castaneus* Sicard, *S. latemaculatus* Motschulsky, *Monochilus sexmaculatus* Fabricius (Col., Coccinellidae) and *Paragus serratus* Fabricius (Dip., Syrphidae) were reported as predator of *A. punicae* in India (Mani and

Krishnamoorthy, 1995). Also, eleven species of insect predators were collected from *A. punicae* in Lybia. The species belong to families Coccinellidae, Anthocoridae, Syrphidae, Cecidomyiidae and Chrysopidae. The predators occurred during two periods, the first period occurred from April to mid-June and the second period occurred from mid-September to early November (Amin, 2002). The first activity period of the predators is agree with our result. Natural enemies of sucking pests of pomegranate trees were investigated in India by Ananda (2007). They showed that five species of predators, *Scymnus coccivora* Ayyar, *Cheilomenus sexmaculata* Fabricius, *Hippodamia variegata* Geoze, *C. septempunctata* (Col., Coccinellidae) and *C. carnea* were collected from aphid colonies. The predators presented from December to March in pomegranate orchards. The different results may be due to different climate conditions of the research places. Some insect predators including *H. variegata*, *Adalia tetraspilota* Hope, *Propylea luteopustulata* Mul. (Col., Coccinellidae) and Syrphid flies was reports as predators of *A. punicae* in Kashmir (Khan *et al.*, 2017). The major predators preyed on *A. punicae* in pomegranate ecosystem of Banglor, India, were *Chilomenes sexmaculata* Fabricius, *Scymnus* sp., *Pseudaspidemerus circumflexo* Motsch., *P. serratus*, *Isciodon scutellaris* Fabricius and *Chrysopa* sp. The aphidophagus insects showed two peaks, first peak was during January-February and second peak was during August-September (Sreedevi & Verghese, 2007).

## Conclusions

The activity period of the predators may be affected by aphid activity period or environmental conditions especially temperature and relative humidity (RH). For all predators, the highest activity was occurred when the means of temperature and RH were 13-25 and less than 30%. Sreedevi *et al.* (2006) demonstrated that abundance of *A. punicae* predators significantly affected by environmental factors especially temperature and RH.

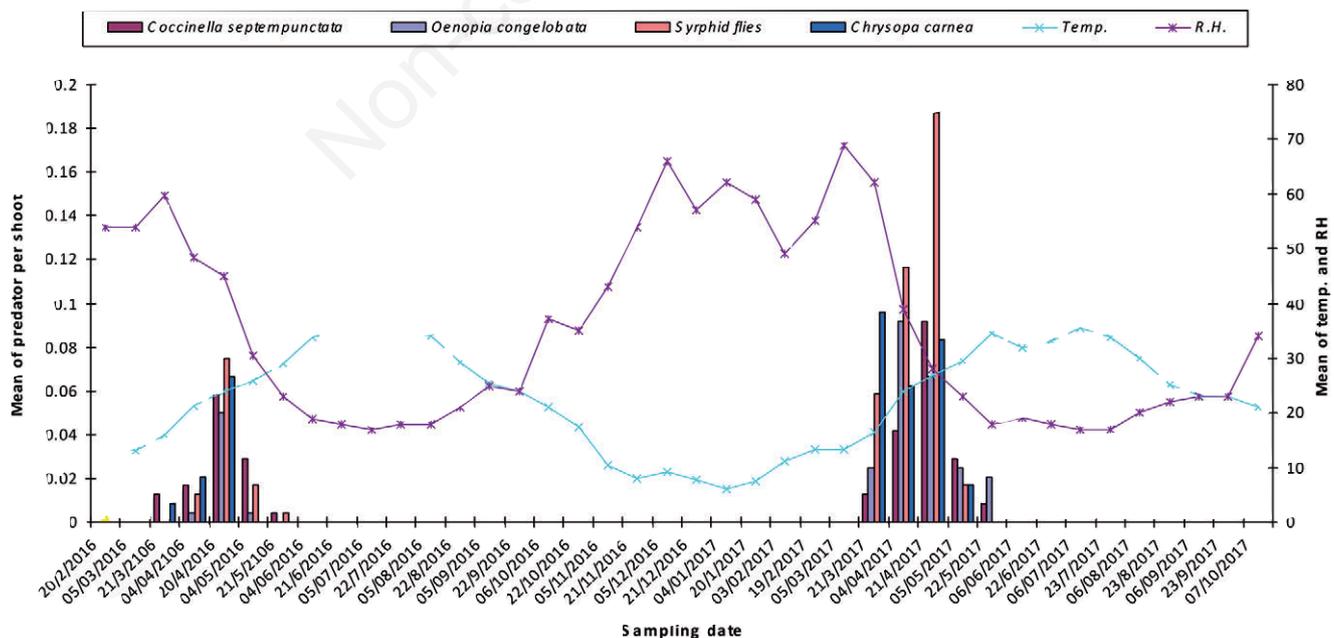


Figure 1. Seasonal population dynamics of *Aphis punicae* predators in pomegranate orchards of Sirvan district, southwest Iran.

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