

SCIENTIFIC NOTE

**Coccinellid Biodiversity on the Coniferous trees *Thuja orientalis* and *Pinus mugo* in Urban Landscape of Mashhad, Razavi Khorasan Province, Iran**

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**ABSTRACT**

The present study deals with coccinellid biodiversity on coniferous trees *Pinus mugo* and *Thuja orientalis* trees during 2014 and 2015 in urban landscape of Mashhad district, Iran. A total of nine species belong to six genera were identified. *Coccinella septempunctata* L. showed the highest population density on both tree species with relative frequencies of 43.2 and 41.7%, respectively. It was also the dominant species according to Simpson Index showing indices of 0.69 and 0.75 on both trees, respectively. This study demonstrated that lady birds are one of the most important biological control agents in urban habitat of Mashhad, Iran.

**Key words:** Coccinellidae, Diversity, Coniferous trees, Urban landscape, Iran.

Ornamental shrubs, such as the dwarf mountain pine (*Pinus mugo*) and the thuja (*Thuja orientalis*) in Mashhad habitat, Iran show high resistance to urban and industrial pollution as well as to drought. Coccinellid diversity may provide a suitable biological control possibility for pest management in urban landscapes that help avoiding pesticide applications. Coccinellid samples were collected weekly from March 2014 to September of 2015 from parks, squares, gardens and other green areas within Mashhad District (Iran: 36°15'N, 59°38'E). Different groups of predatory species mainly coccinellids, found associated with aphids, were collected from both trees. Collection of coccinellid larvae was accomplished by shaking trees branches on white dish or by hand picking directly from the trees. Specimens were maintained in a 70% alcohol solution. After dissection, genitalia were cleared using 10% KOH, and dehydrated in alcohol of varying concentrations. Permanent mounts were preserved on slides by Hoyer's solution and used for identification. Specimens were identified, using the keys of Raimundo and Harten (2000) and identifications were confirmed by Dr. Guy Hanley, Minot State University, Minot, North Dakota, USA. Abundance of the collected coccinellid species was estimated. Data were subjected to Chi-Squared test to compare coccinellids' diversity on tree species. Dominant coccinellid species were determined using Simpson's diversity index. Simpson's diversity index (D) is a measure of diversity represented by the following formula:

$$D = 1 - \left( \frac{\sum n(n-1)}{N(N-1)} \right)$$

Where:  $n_i$  = total number of organisms of each individual species,  $N$  = total number of organisms of all species. The value of  $D$  ranges from 0 to 1. With this index, zero represents infinite diversity and 1 no diversity, the bigger the value the lower the diversity. As this does not seem intuitive or logical, so some may use derivations of the index, such as the inverse ( $1/D$ ) or the difference from 1 ( $1-D$ ) (Magurran, 1988).

A total of nine coccinellid species, belong to six genera, were identified. The species were: *Coccinella septempunctata* (Linnaeus, 1758), *Exochomus nigromaculatus* (Goeze, 1777), *Clitostethus arcuatus* (Rossi, 1794), *Oenopia oncina* (Olivier, 1808), *Chilocorus bipustulatus* (Linnaeus 1758), *Oenopia conglobata* (Linnaeus, 1758) (with color morph), *Hippodamia variagata* (Goeze, 1777) and *Coccinella undecimpunctata* (Linnaeus, 1758). *C. septempunctata* (represented by 43.2% on *P. mugo* and 41.7% on *T. orientalis*) was the frequent species as the Simpson's diversity indices of 0.69 and 0.75, respectively, were calculated (Table 1).

Results of Chi-Square test indicated that significant difference was detected among frequencies of the species on both trees ( $X^2 = 50.06$ ,  $df = 8$   $P < 0.01$ ).

Among various predators, coccinellid beetles are regarded as major biocontrol agents widely used to control populations of various phytophagous pests such as aphids, coccids, aleyrodids, etc. (Pervez and Omkar, 2011 and Nelaballe and Meruva, 2015). Members of Coccinellidae are present in many diverse habitats ranging

Table (1): Abundance of collected ladybird species on both the coniferous trees in urban landscape of Mashhad, Iran during 2014 and 2015

Species	<i>Pinus mugo</i>		<i>Thuja orientalis</i>	
	Abundance	Frequency (%)	Abundance	Frequency (%)
<i>Coccinella septempunctata</i>	172	43.2	138	41.7
<i>Hippodamia variegata</i>	7	1.7	6	1.8
<i>Oenopia conglobata</i>	113	28.4	53	16.0
<i>Oenopia oncina</i>	5	1.2	5	1.5
<i>Chilocorus bipustulatus</i>	62	15.4	37	11.2
<i>Oenopia conglobata</i> color-morph	8	2.0	25	7.6
<i>Coccinella undecimpunctata</i>	5	1.2	4	1.2
<i>Exochomus nigromaculatus</i>	18	4.5	50	15.1
<i>Clitostethus arcuatus</i>	10	2.4	13	3.9
Total	400	100	331	100

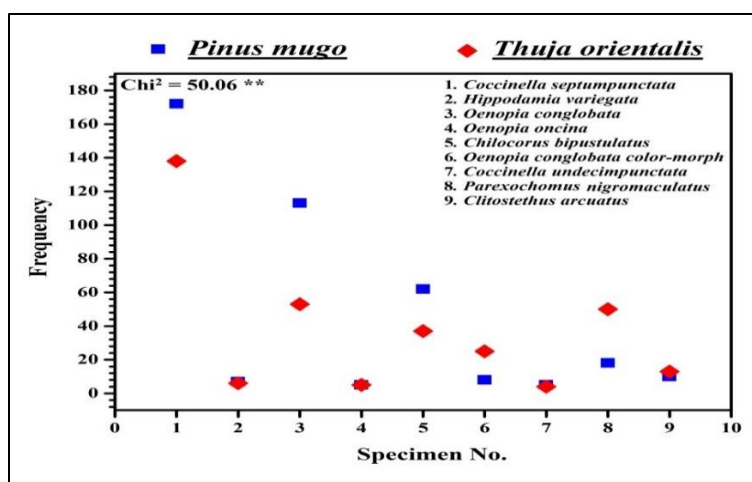


Fig. (1): Relative frequencies of the coccinellid species on coniferous trees in urban landscape of Mashhad, Iran.

widely from stenotopic to eurytopic species. They may survive in all geocentric ecosystems including tundra, forest and grassland agro-ecosystems. Diversity pattern of adult ladybird communities feeding on *Agonoscyta pistaciae* Burckhardt and Lauterer (Hemiptera: Psylloidea: Rhinocolinae), on pistachio trees in southern parts of Iran was studied. Among 20 ladybird species identified, *H. variegata*, *C. septempunctata* and *S. syriacus* were the most abundant ones (Salehi *et al.*, 2013). During a survey of ladybirds associated with *Aphis punica* (Hom: Aphididae) on pomegranate trees in season 2012-13, a total of 11 species was recorded (Mohammad poor *et al.*, 2013). In a study of biodiversity and distribution of predaceous lady birds at Hamedan province, Iran on different woody and grassy plants, *H. variegata* (63.68%) and *C. septempunctata* (31.07%) were recorded as the most abundant species as well as widely distributed in all regions (Akhavan *et al.*, 2013). Ladybird fauna of the crop lands in the vicinity of Mashhad in the northeastern province of Khorasane Razavi, Iran was studied and *Pharoscyms brunneosignatus* and *Scymnus schmidtii*, were reported as new recorded for the Iranian beetle fauna (Ebrahimi *et al.*, 2014).

Natural enemies of the lettuce aphid, *Nasonovia ribisnigri* (Hemiptera: Aphididae) and their population fluctuations in Ahvaz, Iran were studied. *Scymnus levaillanti*, *Coccinella novemnotata*, *C. septempunctata*, *C. undecimpunctata* were recorded, among them *C. septempunctata* appeared earlier than other coccinellid species, but its population increased very slowly (Farsi *et al.*, 2014). Investigation on the diversity and distribution of coccinellids in Lorestan province, Iran showed that 22 species were found; *Oenopia conglobata* (24%) was the most abundant one as well as widely distributed all over the regions (Biranvand *et al.*, 2014). Lady birds' fauna at Khatam County (Yazd Province) was studied. A total of 13 species, belong to 9 genera, was identified, among them *Hyperaspis reppensis* (Herbst, 1783) was reported as a new record from Iran (Zare Khormizi *et al.*, 2014).

Iran consisted of rich agricultural areas, deserts, marshes, rivers and mountain habitats. More researches on ladybirds in horticultural areas could help to better management of pests in different agro-ecosystems and to reduce insecticide usage, especially in urban green regions.

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