



New data on the distribution and hosts of *Dinocampus coccinellae* (Hymenoptera: Braconidae) in Iran

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Abstract. Three ladybird (Coleoptera: Coccinellidae) species, *Coccinella septempunctata* L., *C. undecimpunctata* L. and *Hippodamia variegata* (Goeze), were recorded as hosts of *Dinocampus coccinellae* (Schrank, 1802) (Hymenoptera: Braconidae) in the Iranian provinces of Khuzestan and Kurdistan. *Coccinella undecimpunctata* is a new host of this parasitoid in the country and both provinces are its new distribution records. The rates of emergence of *D. coccinellae* from field-collected *C. septempunctata* and *H. variegata* were very low (below 1%), while *C. undecimpunctata* was parasitized to a much higher degree (26.7%).

Keywords: parasitoid, natural enemy, host association, biological control

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Dinocampus coccinellae (Schrank) (Hymenoptera: Braconidae) is an endoparasitoid of ladybirds (Coleoptera: Coccinellidae) that reproduces by thelytokous parthenogenesis and has an almost cosmopolitan distribution. It has been reported to parasitize numerous species of Coccinellidae, mainly from the tribe Coccinellini and less often Chilocorini (Ceryngier *et al.*, 2012, 2023; Maqbool *et al.*, 2018). Like many other members of the Braconid subfamily Euphorinae, *D. coccinellae* preferentially oviposits into adult hosts, although larvae and/or pupae can also be parasitized, especially when adults are scarce. The female parasitoid lays an egg into the host hemocoel, where embryonic and larval development of the parasitoid takes place. Regardless of the stage at which the host is attacked,

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the fully grown *D. coccinellae* larva always emerges from the host when it is in the adult stage. The larva spins a cocoon between the host's legs and pupates to emerge as an adult wasp after about 10 days (Ceryngier *et al.*, 2012).

In Iran, *D. coccinellae* has so far been found in 11 provinces as a parasitoid of two ladybird species: *Coccinella septempunctata* L. and *Hippodamia variegata* (Goeze) (Biranvand *et al.*, 2020). This note provides new data on the distribution and hosts of *D. coccinellae* in Iran.

Approximately 2,500 adults of three ladybird species, *Coccinella septempunctata*, *C. undecimpunctata* L. and *H. variegata*, were collected in Dezful (Khuzestan province) and Marivan and Sarvabad (Kurdistan province) between June 2021 and December 2022. Distinguishing characters and a key for the identification of these common species can be found in Abdolahi *et al.* (2017). Once transferred to the laboratory, the ladybirds were kept in transparent plastic containers with perforated lids at 25°C and 16:8 (L:D) and provided with a diet consisting of banana powder and sugar solution. Parasitoids emerging from the reared beetles were placed in 96% ethanol for further examination. Parasitism rates were calculated as the ratio of the number of hosts from which the parasitoid emerged to the total number of hosts collected, multiplied by 100.

The three aforementioned ladybird species were found to be hosts of *D. coccinellae* (Fig. 1, Table 1). In most cases, the parasitism rates were very low, below 1%, except for a sample of *C. undecimpunctata*, where the rate reached 26.7%. That sample, however, was relatively small (N=30), much smaller than those of the remaining two species. While *C. septempunctata* and *H. variegata* have previously been reported as hosts of *D. coccinellae* in Iran (Bagheri, 1998; Alimohammadi *et al.*, 2012; Tavoosi Ajvad *et al.*, 2012; Farahani *et al.*, 2013; Soleimani & Madadi, 2015; Biranvand *et al.*, 2020), the parasitism of *C. undecimpunctata* by *D. coccinellae* is reported from Iran for the first time.

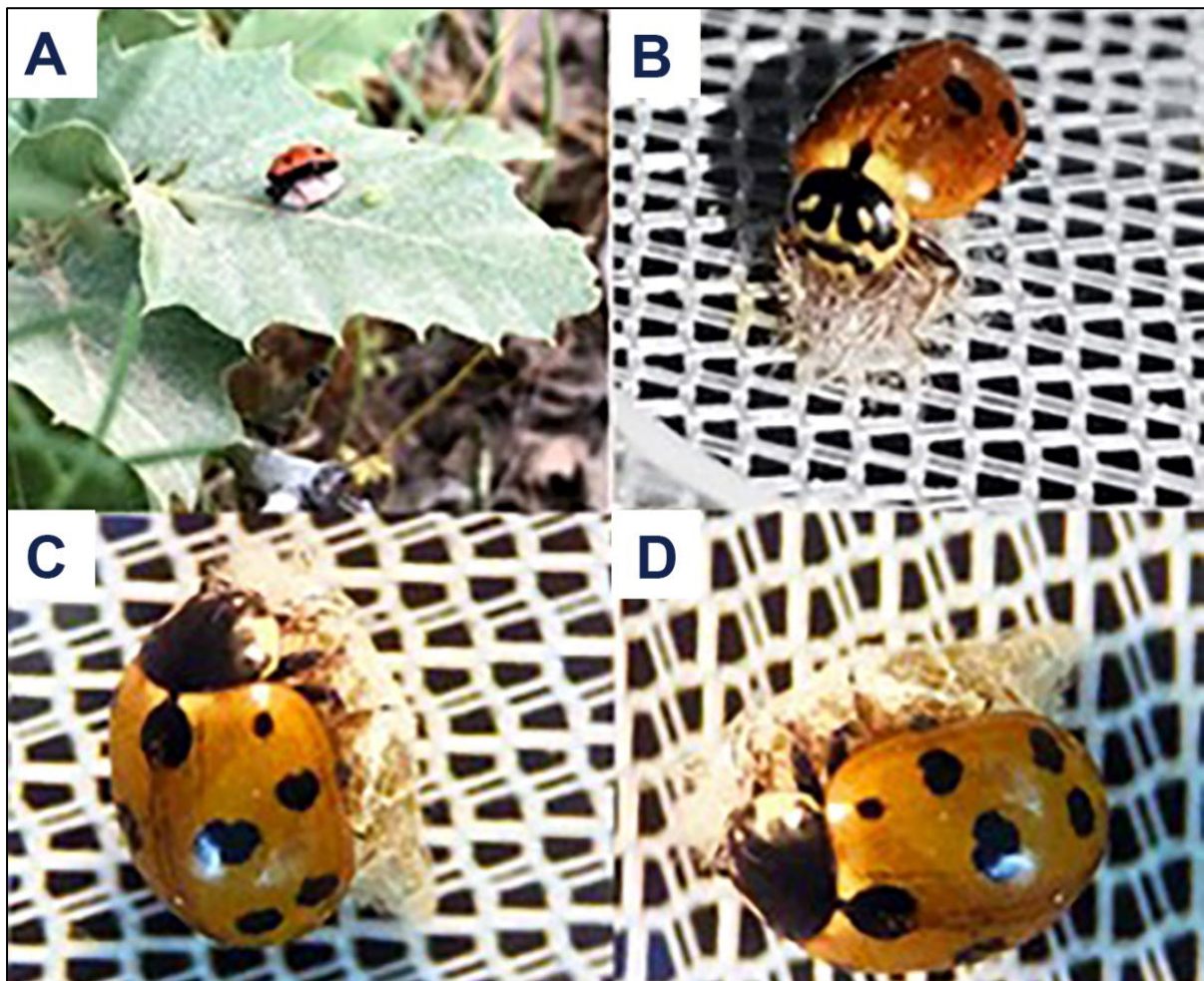


Fig. 1. The hosts of *Dinocampus coccinellae* with a parasitoid cocoon between their legs. A: *Coccinella septempunctata* in the field, B: *Hippodamia variegata* in the laboratory, C-D: *Coccinella undecimpunctata* in the laboratory from different angles.

Table 1. Parasitism rates of *Dinocampus coccinellae* of three ladybird species in two provinces of Iran in 2021-2022.

	Dezful (Khuzestan)			Marivan and Sarvabad (Kurdistan)		
	N collected	N parasitized	% parasitized	N collected	N parasitized	% parasitized
<i>Coccinella septempunctata</i>	655	2	0.3	500	3	0.6
<i>Coccinella undecimpunctata</i>	30	8	26.7	-	-	-
<i>Hippodamia variegata</i>	1000	0	0	300	1	0.3

Also, the provinces of Khuzestan and Kurdistan are new distribution records of *D. coccinellae* (Fig. 2). Following these additions, *D. coccinellae* is currently known to occur in 13 of 31 Iranian provinces.

At least 72 species of Coccinellidae are hosts of *D. coccinellae* worldwide (Ceryngier *et al.*, 2023). The three species found in Iran are among the hosts commonly recorded both within and outside their native (Palearctic) range. *Coccinella septempunctata* has been reported to be parasitized by *D. coccinellae* throughout the Palearctic as well as in the Nearctic (USA, Mexico) and Indomalayan (India, Taiwan) realms, *H. variegata* in the Palearctic, Afrotropical (South Africa) and Neotropical (Chile) realms, and *C. undecimpunctata* in parts of the Palearctic (Finland, Germany, Britain, Egypt, Kashmir), Nearctic (USA) and Antarctic (New Zealand) realms (Ceryngier *et al.*, 2023, online supplementary material). According to a compilation by Ceryngier *et al.* (2023), *C. septempunctata* is the most often recorded host of *D. coccinellae* worldwide, while *H. variegata* ranks fifth and *C. undecimpunctata* sixth in terms of the number of records. Certainly, in addition to these three ladybird species, some other Iranian ladybirds may serve as hosts of *D. coccinellae*. Of the species of Coccinellidae reported as occurring in Iran by Abdolahi Mesbah *et al.* (2016) and Biranvand *et al.* (2019), 18 are also included in the list of hosts of *D. coccinellae* compiled by Ceryngier *et al.* (2023). Thus, not counting the three species reported here, at least 15 other species are potential hosts of *D. coccinellae* in Iran.

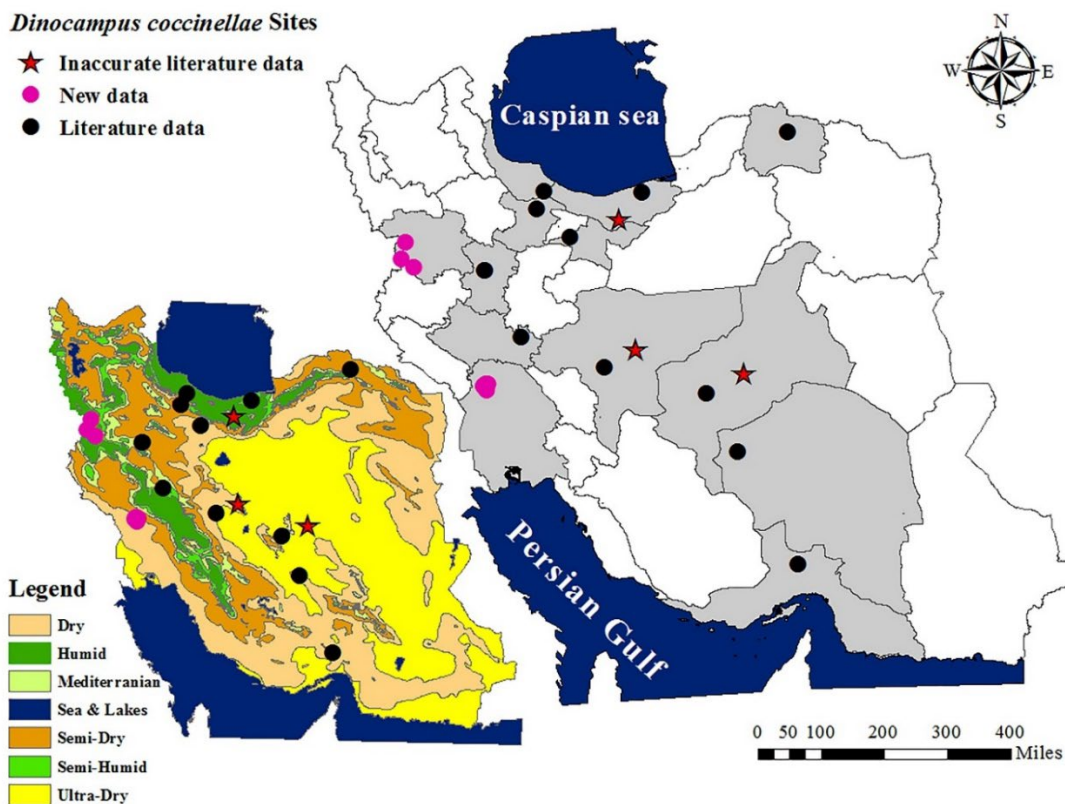


Fig. 2. Distribution records of *Dinocampus coccinellae* in Iran (Inaccurate literature data = only name of province).

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اطلاعات تکمیلی در مورد پراکنش و میزبان‌های *Dinocampus coccinellae* (Hymenoptera: Braconidae)

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چکیده

سه گونه کفشدوزک *Coccinella septempunctata* L.، *C. undecimpunctata* L. و *Hippodamia variegata* (Goeze) (Coleoptera: Coccinellidae) به عنوان میزبان‌های زنبور پارازیتوئید *Dinocampus coccinellae* در استان‌های خوزستان و کردستان ایران ثبت شدند. کفشدوزک *C. undecimpunctata* به عنوان میزبان جدید برای زنبور *D. coccinellae* در کشور معرفی شده و این دو استان، به محدوده گسترش زنبور پارازیتوئید افزوده می‌شوند. نرخ پارازیتوئید در نمونه‌های جمع‌آوری شده *C. septempunctata* و *H. variegata* بسیار پایین (زیر یک درصد) و در *C. undecimpunctata* بالا (۲۶٪ درصد) بود.

کلمات کلیدی: دشمن طبیعی، ارتباط میزبانی، کنترل بیولوژیک، پارازیتوئید

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