

Research Article

## Aphids living on *Rosa* spp. (Rosaceae) in Iran: *Maculolachnus sijpkensi* Hille Ris Lambers, 1962 and *M. submacula* (Walker, 1848) (Hemiptera: Aphididae: Lachninae) as new records

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**Abstract:** More than 104 aphid species are living on *Rosa* spp. in the world. So far, only 14 of them were reported from Iran. In this study, besides the species already living on *Rosa* in Iran, two aphid taxa, i.e., *Maculolachnus sijpkensi* Hille Ris Lambers, 1962, and *M. submacula* (Walker, 1848) (Hem.: Aphididae) living on *Rosa beggeriana* are reported for the first time from Iran. Biometric data and biological characteristics of these two aphid species are given. An identification key to the apterous viviparous female aphids living on *Rosa* in Iran is provided.

**Keywords:** Lachnini, fauna, taxonomy, distribution, identification

### Introduction

The genus *Rosa* (Rosales, Rosaceae), commonly known as “Rose”, is one of the most important plant genera for humans worldwide. Roses are woody perennial flowering plants with more than 140 species and tens of thousands of cultivars primarily distributed in the northern hemisphere (Cairns, 2003). They form plants with various usages as ornamental plants, cut flowers, perfume, food and drink, medicine, art, and symbolism. Most species are native to Asia, with smaller numbers native to Europe, North America, and North-western Africa (Cairns, 2003). Twenty-five rose species have been reported in Iran, mainly grown to produce rose petals and extract rose water (Mozaffarian, 1998).

To date, about 104 aphid species have been known on *Rosa* worldwide (Blackman and Eastop, 2006; Holman, 2009; Blackman and Eastop, 2021), of which 14 aphid species have been reported from Iran, all belonging to the subfamily Aphidinae (Table 1) (Hodjat, 1993; Rezwani *et al.*, 1994; Rezwani, 2004; Mehrparvar, 2005). Amongst the species, *Macrosiphum rosae* (Linnaeus, 1758) is the most important pest on roses worldwide, except for East and Southeast Asia (Blackman and Eastop, 2021).

As the aphid fauna of Iran has not yet been studied extensively, there is a possibility to discover more species as new to the aphid fauna of Iran (Mosapour *et al.*, 2019). The importance of aphids in agriculture, horticulture, and forestry is because of their ability to cause economic damages and transmit virus diseases (van Emden and Harrington, 2007). Hence, developing an effective control or a reliable management strategy for aphid pests requires precise knowledge of their taxonomy and biology (Farahpour-Haghani *et al.*, 2015).

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In studies of the aphid fauna of Iran, since 2006, many aphid samples were collected and identified on roses. Among the collected samples, two aphid species, *Maculolachnus sijpkensi* Hille Ris Lambers, 1962 and *M. submacula* (Walker, 1848), belonging to the subfamily Lachninae and

related to *Lachnus*, but associated with Rosaceae, were collected on *Rosa beggeriana*, which are here reported as new records for aphid fauna of Iran. In this paper, an identification key to the apterous viviparous females of aphid species living on *Rosa* (Rosaceae) in Iran is provided.

**Table 1** Aphid species living on *Rosa* spp. in Iran based on collected specimens by the authors and previously published resources (Hodjat, 1993; Rezwani *et al.*, 1994; Rezwani, 2004; Mehrparvar, 2005).

Aphid species	Subfamily	Tribe
<i>Acyrtosiphon ignotum</i> Mordvilko, 1914	Aphidinae	Macrosiphini
<i>Amphorophora catharinae</i> (Nevsky, 1928)	Aphidinae	Macrosiphini
<i>Aphis craccivora</i> Koch, 1854	Aphidinae	Aphidini
<i>Aphis fabae</i> Scopoli, 1763	Aphidinae	Aphidini
<i>Aphis gossypii</i> Glover, 1877	Aphidinae	Aphidini
<i>Chaetosiphon chaetosiphon</i> (Nevsky, 1928)	Aphidinae	Macrosiphini
<i>Chaetosiphon tetraerhodum</i> (Walker, 1849)	Aphidinae	Macrosiphini
<i>Longicaudus trirhodus</i> (Walker, 1849)	Aphidinae	Macrosiphini
<i>Macrosiphum euphorbiae</i> (Thomas, 1878)	Aphidinae	Macrosiphini
<i>Macrosiphum rosae</i> (Linnaeus, 1758)	Aphidinae	Macrosiphini
<i>Metopolophium dirhodum</i> (Walker, 1849)	Aphidinae	Macrosiphini
<i>Myzaphis rosarum</i> (Kaltenbach, 1843)	Aphidinae	Macrosiphini
<i>Rhodobium porosum</i> (Sanderson, 1900)	Aphidinae	Macrosiphini
<i>Wahlgreniella nervata</i> (Gillette, 1908)	Aphidinae	Macrosiphini

## Materials and Methods

The foliage was scrutinized for colonies to find aphids on the host plant. After finding aphid colonies on the host plant, the infested plant parts were cut and placed into plastic bags. Sometimes it was challenging to locate aphids directly on the plant, so it was needed to use some indicators such as the existence of aphid's honeydew, ants' attendance, and predators. When there was no trace of aphids on plants, beating onto a white tray placed underneath the plant was very useful. Then the aphids were carefully collected by a paintbrush, and specimens were preserved in ethanol 75 %. Then, in the laboratory, the specimens were mounted on microscopic slides for identification. The specimens are deposited in the Aphid Collection of Aphidology Research Group, Institute of Science and High Technology and

Environmental Sciences, Graduate University of Advanced Technology (KGUT), Kerman, Iran. The collected specimens, since 2006, were identified using related resources (e.g., Heie, 1986; Heie, 1992; Heie, 1994; Heie, 1995; Blackman and Eastop, 2006; Blackman, 2010; Blackman and Eastop, 2021).

Abbreviations used in the text are as follows: ANT, antennae length; ANTI, ANTII, ANTI, ANTI, ANTI, ANTI, ANTI, ANTI, ANTI, ANTI, antennal segments I, II, III, IV, V, and the base of antennal segment VI, respectively; PT, processus terminalis; URS, ultimate rostral segment; 2HT, the second segment of hind tarsus; and SIPH, siphunculus.

### *Maculolachnus sijpkensi* Hille Ris Lambers, 1962 (Aphididae: Lachninae: Lachnini) (Figs. 1-3)

**Apterous viviparous female:** Body color in living specimen dark brown to blackish (Fig. 1). Color in specimens mounted on slide: head,

thorax, and abdomen pale; ANTI and ANTII brown, ANTIII-ANTVI pale brown; URS, trochanter, and coxa dark brown; femora dark brown with pale basal part; tibiae brown with basal and distal parts dark brown; tarsi, SIPH, and anal plate brown; abdominal segments pale with some pigmentation; dorsal hairs not arising from dark basal scleroites (Fig. 2).



**Figure 1** Colony of *Maculolachnus sijpkensi* Hille Ris Lambers, 1962 (Aphididae: Lachninae: Lachnini) on lower parts of shoots of *Rosa beggeriana* (Rosaceae) which is attended by ants.



**Figure 2** Habitus of apterous viviparous female of *Maculolachnus sijpkensi* Hille Ris Lambers, 1962 (Aphididae: Lachninae: Lachnini).



**Figure 3** Dorsal hairs of *Maculolachnus sijpkensi* Hille Ris Lambers, 1962 (Aphididae: Lachninae: Lachnini).

**Morphological characters:** Body oval with numerous hairs, 2.27 mm long; head smooth without antennal tubercles; Antennae six-segmented and shorter than body length. Rostrum long and approximately reaching SIPH. Dorsal body hairs are fine (Fig. 3). Biometric data and proportional measurements are presented in Table 2.

**Table 2** Biometric data of *Maculolachnus sijpkensi* Hille Ris Lambers, 1962 (Aphididae: Lachninae: Lachnini) apterous viviparae collected in Iran.

Characters	Measurements
Body length (mm)	2.27
ANTI	0.37
ANTIV	0.12
ANTV	0.17
ANTVIb	0.15
PT	0.03
URS	0.18
URSBW	0.07
2HT	0.23
HFemora	0.82
HTibia	1.33
PT/ANTVIb	0.2
ANTI/ANTIV	3.08
URS/2HT	0.78
URS/URSBW	2.57
Rhin. on ANTI	0

Abbreviations: ANTI, ANTIV, ANTV, ANTVIb, antennal segments III, IV, V, and the base of antennal segment VI, respectively; PT, processus terminalis; URS, ultimate rostral segment; URSBW, basal width of the ultimate rostral segment; 2HT, the second segment of hind tarsus; HFemora, hind femur length; HTibia, hind tibia length, and Rhin., rhinaria.

**Biology:** This aphid lives in sparse colonies on the lower parts of shoots of *Rosa beggeriana* (Rosaceae) and is attended by ants (Fig. 1). This species is monoecious holocyclic with apterous males.  $2n = 10$  (Blackman and Eastop, 2021).

**Distribution:** This aphid species is recorded, so far, from North America and Mongolia (Mamontova, 2012; Blackman and Eastop, 2021).

**Materials examined:** one apterous viviparous female; (ARG00262), Iran: Kerman province, Bid-Khon, N 29°37' E 56°30', 2627 m. a.s.l., *Rosa beggeriana* (Rosaceae), 14 June 2015, leg. M. Mehrparvar.

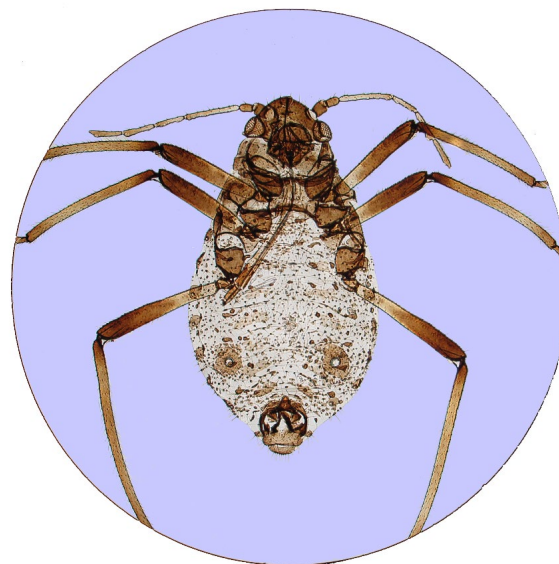
***Maculolachnus submacula* (Walker, 1848) (Aphididae: Lachninae: Lachnini) (Figs. 4-6)**

**Apterous male:** The body color in the living specimen is blackish. Colour in specimen mounted on slide: head dark brown, thorax brown and abdomen pale; ANTI dark brown and ANTII brown, ANTIII-ANTVI pale brown with darker apices; URS, trochanter, and coxa dark brown; femora dark brown with pale basal part; tibiae brown with basal parts dark brown; tarsi, SIPH, and anal plate brown; abdominal segments pale with some pigmentation (Fig. 4). Dorsal abdominal hairs arising from dark scleroites (Fig. 5). Aedeagus dark brown (Fig. 6). Details on male genitalia were discussed and illustrated by Wiczorek et al. (2012).

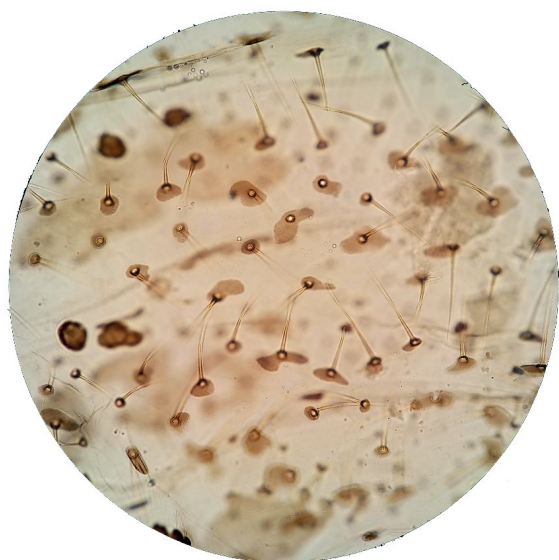
**Morphological characters:** Body oval, 2.29 mm long; head smooth without antennal tubercles; Antennae six-segmented and shorter than body length. Rostrum long and overcome hind coxa. Body with numerous fine hairs (Figs. 4 & 5). Biometric data and proportional measurements are presented in Table 3.

**Biology:** This species was found in sparse colonies on lower parts of shoots (near the ground) of *Rosa beggeriana* (Rosaceae) and attended by ants. This species is monoecious holocyclic.  $2n = 10$  (Blackman and Eastop, 2021).

**Distribution:** This aphid has been reported from Europe, Central Asia, Pakistan, and India (Blackman and Eastop, 2006; Mamontova, 2012; Wiczorek et al., 2019; Blackman and Eastop, 2021).



**Figure 4** Habitus of apterous male of *Maculolachnus submacula* (Walker, 1848) (Aphididae: Lachninae: Lachnini).



**Figure 5** Dorsal hairs and pigmentation of *Maculolachnus submacula* (Walker, 1848) (Aphididae: Lachninae: Lachnini).



**Figure 6** Genitalia of apterous male of *Maculolachnus submacula* (Walker, 1848) (Aphididae: Lachninae: Lachnini).

**Table 3** Biometric data of *Maculolachnus submacula* (Walker, 1848) (Aphididae: Lachninae: Lachnini) apterous male collected in Iran.

Characters	Measurements
Body length (mm)	2.29
ANTIII	0.36
ANTIV	0.20
ANTV	0.22
ANTVIb	0.18
PT	0.035
URS	0.17
2HT	0.25
HFemora	0.84
HTibia	1.33
PT/ANTVIb	0.19
ANTIII/ANTIV	1.80
URS/2HT	0.68
Rhin. on ANTIII	5
Rhin. on ANTIV	3-4

Abbreviations: ANTIII, ANTIV, ANTV, ANTVIb, antennal segments III, IV, V, and the base of antennal segment VI, respectively; PT, processus terminalis; URS, ultimate rostral segment; 2HT, second segment of hind tarsus; HFemora, hind femur length; HTibia, hind tibia length, and Rhin., rhinaria.

**Materials examined:** One apterous male was examined; (ARG00147), Iran: Kerman province, Lalehzar, N 29°30' E 56°49', 2924 m. a. s. l., *Rosa beggeriana* (Rosaceae), 03 November 2006, leg. M. Mehrparvar.

**Key to the apterous viviparous females of aphid species living on *Rosa* (Rosaceae) in Iran**

- 1 SIPH with reticulation on distal part .....2
- SIPH without reticulation on distal part .....3
- 2 SIPH pale .....*Macrosiphum euphorbiae*
- SIPH entirely dark .....*Macrosiphum rosae*
- 3 PT less than 0.3 times ANTVIb; SIPH as pores .....4
- PT more than 0.5 times ANTVIb; SIPH tubular .....5
- 4 Dorsal abdominal hairs are not arising from dark scleroites .....*Maculolachnus sijpkensi*
- Dorsal abdominal hairs arising from dark scleroites .....*Maculolachnus submacula*
- 5 SIPH 0.28-0.41 times shorter than cauda .....*Longicaudus trirhodus*
- SIPH at least 0.8 times cauda .....6
- 6 Dorsal body hairs long and thick with expanded apices .....7
- Dorsal body hairs with blunt or pointed apices 8
- 7 SIPH with several long capitate hairs .....*Chaetosiphon chaetosiphon*
- SIPH without capitate hairs .....*Chaetosiphon tetra-rhodum*
- 8 Dorsal thoracic and abdominal cuticle strongly rugose; PT 1.2-1.75 times longer than ANTVIb; SIPH clavate .....*Myzaphis rosarum*
- Dorsal cuticle smooth; PT more than 1.8 times longer than ANTVIb; .....9
- 9 Head with numerous spicules. ANTIII with 5-18 secondary rhinaria in a row.....*Rhodobium porosum*
- Head without spicules .....10
- 10 Antennal tubercles absent or weakly developed; abdominal tergites 1 and 7 with marginal tubercles .....11
- Antennal tubercles well developed, with divergent inner faces; abdominal tergites 1 and 7 without marginal tubercles .....13
- 11 Dorsal abdomen with an extensive black patch; SIPH and Cauda dark.. *Aphis craccivora*

- Dorsal abdomen without an extensive black patch .....12  
**12** Cauda dark like SIPH and bearing 7-24 hairs; Dorsal abdomen with dark markings; abdominal tergites 7 and 8 with dark cross-bands .....*Aphis fabae*  
 - Cauda pale, dusky, or dark and bearing 4-7 hairs; Dorsal abdomen usually without dark markings anterior to SIPH; abdominal tergites 7 without dark cross-band .....*Aphis gossypii*  
**13** SIPH very long and more than 0.35 times longer than body length.....  
 .....*Amphorophora catharinae*  
 - SIPH less than 0.35 times longer than body length .....**14**  
**14** SIPH distinctly clavate.....  
 .....*Wahlgreniella nervata*  
 - SIPH tapering or cylindrical .....**15**  
**15** SIPH 0.15-0.24 times shorter than body length and 1.35-1.75 times longer than cauda .....  
 .....*Metopolophium dirhodum*  
 - SIPH 0.25-0.33 times shorter than body length and 1.7-2.0 times longer than cauda .....  
 .....*Acyrtosiphon ignotum*\*  
 \* = this species is recorded by Rezwani *et al.* (1994), but the presence of this species on roses is doubtful and more investigations are needed.

## Discussion

In Iran, 14 aphid species (see Table 1) were reported on *Rosa* spp. (Hodjat, 1993; Mehrparvar, 2005; Rezwani, 2010), and with this study, the number of species increased to 16; however, the presence of *Acyrtosiphon ignotum* on roses is doubtful, and more complementary studies are needed. So far, only aphids belonging to the subfamily Aphidinae have been reported on roses from Iran. Still, the present study reports two species from the subfamily Lachninae for the first time from Iran and reports the genus *Maculolachnus*. The currently known distribution of *Maculolachnus sijpkensi* stretches from North America and Mongolia (Mamontova, 2012; Blackman and Eastop, 2021). With the new record from Iran, the known distributional range of *M. sijpkensi* is

considerably expanded southwards, so that here it is the first report of the aphid species from the Middle East. *Maculolachnus submacula* has been recorded from Europe, Central Asia, Pakistan, and India, and the missing chain link of its distribution, i.e., Iran, is found by this report. So far, there are no reports of these species as being a worldwide pest.

Iran comprises an extensive area in West Asia with a great diversity of environment and plant species, rich flora, various climatic conditions, indigenous geographic characteristics. With this perspective, only about 540 aphid species have been reported from Iran (Hodjat, 1993; Rezwani *et al.*, 1994; Rezwani, 2004; Mehrparvar and Rezwani, 2007; Rezwani, 2010; Goodarzfifar *et al.*, 2016; Mehrparvar, 2016; Mehrparvar, 2017; Kanturski and Barjadze, 2018; Sedighi *et al.*, 2018; Sedighi *et al.*, 2020b; Sedighi *et al.*, 2020a). Despite numerous studies on the aphid fauna of Iran, many regions have remained unexplored, and there is a chance that with more extensive investigations, the number of species will increase in the future.

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## Statement of conflicting interests

The authors state that there is no conflict of interest.

## Authors' contributions

MM and ML conceived the project, MM collected the specimens and identified them, MM wrote the first draft of the manuscript, and ML contributed substantially to revisions.

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شته‌های گیاهان جنس *Rosa* spp. (Rosaceae) در ایران: گزارش دو گونه جدید *Maculolachnus*  
*M. submacula* (Walker, 1848) (Hemiptera: و *sijpkensi* Hille Ris Lambers, 1962  
Aphididae: Lachninae) برای ایران

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**چکیده:** تاکنون ۱۰۴ گونه شته از روی گیاهان متعلق به جنس رز در دنیا گزارش شده است که در این بین فقط ۱۴ گونه از آن‌ها از ایران گزارش شده‌اند. در این مطالعه علاوه بر معرفی شته‌های فعال روی گیاهان جنس رز در ایران، دو گونه شته بنام‌های *Maculolachnus sijpkensi* Hille Ris Lambers, 1962 و *M. submacula* (Walker, 1848) (Hem.: Aphididae) که روی گیاه *Rosa beggeriana* فعالیت دارند برای اولین بار از ایران گزارش می‌شوند. در این مقاله داده‌های بیولوژیک و بیومتریک این دو گونه شته ارائه و کلید شناسایی شته‌های بالغ بی‌بال فعال روی گیاهان جنس رز تهیه شده است.

واژگان کلیدی: فون، تاکسونومی، پراکنش، شناسایی، Lachnini