

# Investigation of aphids on Rosaceae in Ghamsar region, Kashan

Zeinab Maranjian<sup>1\*</sup>, Alireza Shayestehfar<sup>1</sup>, Seyed Mahdi Talebi<sup>1</sup>, Seyed Nourollah Mousavi<sup>2</sup>

<sup>1</sup> Department of Biology, Faculty of Basic Sciences, Arak University, Arak, Iran

<sup>2</sup> Department of Mathematics, Faculty of Basic Sciences, Arak University, Arak, Iran

**Received:** April 27, 2022; **Accepted:** May 10, 2022; **Published online:** August 30, 2022

---

**Abstract:** Many studies have shown that aphids are one of the most important pests of plants. At the same time, not much information is available about aphids on plants in the Ghamsar region of Kashan. Based on this, the present study examines the existing aphids on the Rosaceae in the Ghamsar region of Kashan in 2019. During this basic research, aphid samples from leaves and branches infected with aphids of Rosaceae plants in the Kashan Ghamsar region were collected monthly in 2019 and transferred to the Arak University laboratory for microscopic slides. At the same time, samples were taken from the host plants. The aphid samples were collected and their host plants were identified to the species level using the available identification keys. In this study, 6 species of aphids from 5 genera belonging to the Aphididae were identified from 8 species of the Rosaceae. Among the identified species, *Wahlgreniella nervata* had the highest host diversity and distribution.

**Keywords:** Aphids, Rosaceae, Ghamsar region of Kashan

---

## 1 Introduction

The Rosaceae is a flowering and dicotyledonous plant belonging to the order Rosales. So far, about 4828 species of this family are known, which are scattered all over the world, especially in the northern temperate regions. This family is considered one of the 6 economically important crop family that is considered because of its popular fruits and ornamental shrubs of high value (Liu et al., 2020). Studies show that the Rosaceae, like other plants, is exposed to several adverse biological factors, including pests (Rak and Litvinova, 2020). Aphids are one of the most important pests (Nalam et al., 2019). Aphids are small insects

---

\*e-mail: Zeinab\_maranjian1994@yahoo.com

and suckers of plant sap that belong to the Aphidoidea family. This group of insects is considered a very successful group of living organisms from an ecological point of view due to its ability to increase numbers rapidly through asexual reproduction. So far, more than 5,000 species of aphids have been identified around the world, especially in temperate regions, of which 450 species of aphids cause damage to plants grown in these areas. In addition to weakening plants by sucking sap, aphids also act as carriers of plant viruses and also kill ornamental plants with honey sediments followed by the growth of sooty molds (Blackman and Eastop, 2017). The initial report on Iranian aphids was made by Theobald (Theobald, 1920) and among Iranian researchers, the first step in introducing Iranian aphids was taken by introducing several aphid species to the list of fruit tree pests (Afchar, 1937). In the study entitled "Checklist of important economic insects in Iran", 50 species of aphids are introduced as pests that damage agricultural products (Farahbakhsh, 1961). Also, in recent extensive studies, 543 species of aphids have been reported on different plant families in Iran (Shahraki et al., 2019). Also, different studies indicate the existence of different types of aphids on different plants of the Rosaceae in Iran (Mehrparvar and Lashkari, 2021) and other parts of the world (Singh and Singh, 2017; Amin et al., 2019). Due to the widespread prevalence of aphids as plant pests on vegetation in different parts of the world (Dedryver et al., 2010) and Iran (Rezwani, 2004) and also due to the effects of plant infection with aphids that reduce the quality and quantity of plant products And it becomes an economic loss (Tatchell, 1989) and also considering that the main vegetation of Ghamsar region of Kashan is composed of Rosaceae plants and there is no complete information about the fauna and geographical distribution of aphids on this plant genus in this region. Based on this, the present study investigates the identification of aphids in the Rosaceae of the Ghamsar region of Kashan in 2019, and the results of this study are of special importance in the field of animal biosystematics and agriculture and can be used in pest control Plant and also be used in recognizing their biological excretion factors.

## 2 Materials and Methods

In this basic research, aphid samples were randomly collected from the leaves and branches infected with aphids of plants of Rosaceae in the Ghamsar region of Kashan every month in 2019. Infected plant parts were gently removed with garden shears and placed inside a zippered bag and information about the time and place of the collection was recorded on the bag. The samples were transferred to the laboratory of Arak University and the aphids were gently transferred to numbered microtype tubes containing 7% glycol alcohol using a brush.

### 2.1. Preparation of microscopic slides

Slides were prepared from several adult female insects from each sample for a detailed study of differential characteristics. To prepare slides from aphids, different methods have been mentioned in different sources such as Blackman and Eastop, 2000; Rezwani, 2001. In this study, the following method was used, which is a combination of the above methods.

First, the adult aphids were separated and placed in a watch glass with their abdomen

pointing upwards. Then, with a fine needle, a hole was made in the area between the cornices and near the tail so that the contents of the abdomen and the nymphs would come out of the abdomen of the adult aphid and the potash would penetrate well into the sample body. The aphids were then transferred to microtube tubes containing 10% potash, and after the tubes were secured with paper glue, they were placed in a hot bath at 75 °C for 15 to 20 minutes to dissolve the contents of the abdomen. After removing the samples from the potash, the samples were washed twice and each time for 5 minutes with distilled water so that all the potash was removed from the sample body. After washing with distilled water, dehydration was performed twice with 75% and 96% ethyl alcohol, respectively, and each time for 2 to 3 minutes. After the ethanol washing step, the samples were transferred to small watch glasses containing clove oil to eliminate the brittleness created in the ethanol step and soften the aphid's body and shape it in later steps. The time required for this step is at least 15 minutes. Then put about 2 drops of antelope glue on the slide and with a fine needle, a transparent aphid was placed inside this drop, so that its abdomen is upwards; Then, with a fine needle, the legs and tentacles were arranged under the loop. The lamellae were then placed on the sample and the samples were transferred to an incubator for drying and placed at 15 °C for 10 days to dry.

## 2. 2. Identify samples

A light microscope and stereomicroscope were used to examine the morphological characteristics of the samples to match the identification and imaging keys of the samples. Finally, the samples were identified by existing identification keys such as Blackman and Eastop, 1994; Blackman and Eastop, 2000; Rezvani, 2001 and Rezvani, 2004 up to species level.

## 2. 3. Identify host plants

Host plants were also sampled for identification. For this purpose, different parts of the plant, including flowers, leaves, and stems, were separated by garden shears and placed in a numbered plastic bag. Then, the herbarium was prepared from plant samples and the researcher made a preliminary identification of the collected plant flora based on available sources such as Assadi, 2010; Assadi, 1988 and Ghahraman, 1975-2003 by the researcher.

# 3 Results and Discussions

The morphological study of aphids and identification keys showed that there are 6 species of aphids of the family Aphididae in this area on different hosts of the Rosaceae. The following is a list of identified species and their microscopic images.

- *Aphis craccivora* (Koch, 1854) (Aphididae: Aphidinae: Aphidini)

The living specimens have a glossy black or dark brown body without wax on their dorsal surface but the nymphs are light greenish-brown and lightly dusted with wax.

- *Aphis pomi* (De Geer, 1773) (Aphididae: Aphidinae: Aphidini)

Wingless females of living specimens have a pear-shaped bright green or yellowish-green body, undusted with wax particles and the cornicles are brown and long and more than twice the length of the tail.

- *Hyalopterus peruni* (Geoffroy, 1762) (Aphididae: Aphidinae: Aphidini)

Living specimens, with an elongate shape, are usually pale green with a fine darker green mottling, covered with white waxy powder. The antennae are quite short and the siphunculi are shorter than the tail.

- *Macrosiphum rosae* (Linnaeus, 1758) (Aphididae: Aphidinae: Macrosiphini)

Wingless adults of living specimens have a spindle-shaped body and range in color from green to pink and reddish-brown. The antennae and legs are relatively long, and the siphunculi are long, tapered, and black.

- *Pterochloroides persicae* (Cholodkovsky, 1899) (Aphididae: Lachninae: Lachnini)

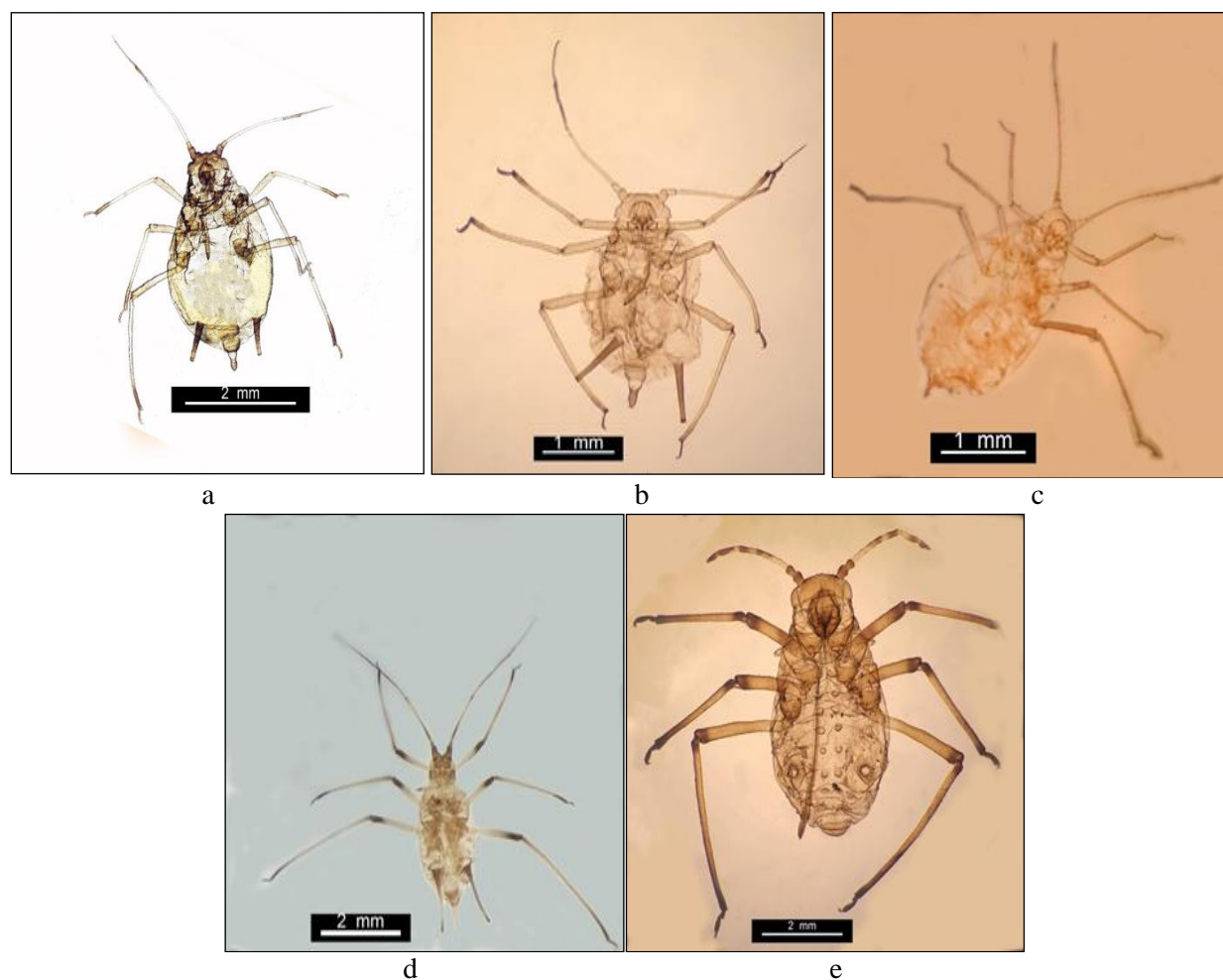
Adult apterae of *P. persicae* are oval with a double row of large pigmented spinal tubercles on the dorsum. The body color of living specimens is grey with transverse rows of dark spots with brown centers.

- *Wahlgreniella nervata* (Gillette, 1908) (Aphididae: Aphidinae: Macrosiphini)

Body color, when alive, is yellowish or green sometimes mottled with reddish anteriorly. The antennal tubercles have their inner faces divergent and smooth. Their siphunculi are slightly swollen rather symmetrically about their inner and outer faces and have dark tips and a small flange.

**Table1.** Identified Species along with host plants and their collection place.

No.	Species	Host plants	Collection Place
1	<i>Aphis craccivora</i>	<i>Rosa multiflora</i>	Jashnvare Square 33°45' N 51°26' E
2	<i>Aphis pomi</i>	<i>Malus domestica</i>	Motahari Street 33°44' N 51°25' E
		<i>Cydonia oblonga</i>	Farfahan 33°45' N 51°25' E
3	<i>Hyalopterus peruni</i>	<i>Amygdalus communis</i>	Motahari Street 33°44' N 51°25' E
			Mazgan 33°44' N 51°24' E
4	<i>Macrosiphum rosae</i>	<i>Rosa damascena</i>	Motahari Street 33°44' N 51°25' E
			Jazavand 33°45' N 51°24' E
5	<i>Pterochloroides persicae</i>	<i>Prinus armenica</i>	Motahari Street 33°44' N 51°25' E
6	<i>Wahlgreniella nervata</i>	<i>Rosa hybrid perpetual</i>	Motahari Street 33°44' N 51°25' E
		<i>Rosa centifolia</i>	Jashnvare Square 33°45' N 51°26' E
			Motahari Street 33°44' N 51°25' E
		<i>Rosa damascena</i>	Farfahan 33°45' N 51°25' E
			Jazavand 33°45' N 51°24' E
			Mazgan 33°44' N 51°24' E
Motahari Street 33°44' N 51°25' E			
		Damask Rose garden 900 acres of at the beginning of Ghamsar 33°48' N 51°29' E	



**Figure 1:** Microscopic slide images of identified aphids. a: *A. craciiivora* (ob,x10), b: *A. pomi* (ob,x4), c: *H. peruni* (ob,x4), d: *M. rosae* (ob,x2.5), e: *P. persicae* (ob,x4).

Many studies have shown that having sufficient knowledge about the pest insect fauna on the vegetation of an area is of particular importance in determining and recognizing their biological control factors (Miller and Footitt, 2017; Singh and Singh, 2016). In this regard, the results of the present study show that the species *A. craciiivora*, *A. pomi*, *H. peruni*, *M. rosae*, *P. persicae*, *W. nervata* on hosts of the Rosaceae including *A. communis*, *C. oblonga*, *M. domestica*, *P. armenica*, *R. centifolia*, *R. damascena*, *R. hybrid perpetual*, *R. multiflora* which are the dominant vegetation of the Ghamsar region of Kashan.

Consistent with this finding, other studies have shown that there are different types of aphids as a pest on the Rosaceae in different regions. The host plants belong to the Rosaceae (Rezwani and Radjabi, 1987). Also in another study called aphids of Rosa plants from the Rosacea of Iran, among 16 species reported, three species of *A. craciiivora*, *M. rosae*, and *W. nervata* have been mentioned (Mehrparvar and Lashkari, 2021). In the phonetic study of aphids of the Aphidoidea family and related hunting ladybugs in Yazd orchards, 13 species of aphids were collected, among which the name of *P. persicae* on *P. armenica* and *M. rose* on *R. hybrida* (Heidari Latibari et al., 2018)

Also in the study of aphid fauna in the southern regions of the Zagros mountains during

2020 and 2021, 66 species of aphids from the family Aphididae were identified, among which *A. cracciivora* on plants of the families Fabaceae, Nyctaginaceae, and Asteraceae, *A. pomi* on *Malus* sp, *M. rose* and *W. nervata* were reported on *Rosa* spp (Mehrparvar et al., 2021). Also, a study of aphids in Tashkent, Uzbekistan, shows that most of the aphids in this region specialize in feeding on Rosaceae plants. Among them, the names of the species identified in the present study are other than *W. nervata* (Mansurkhudjaeva et al., 2021).

This study was conducted to identify aphids in the Rosaceae of the Ghamsar region of Kashan in 2019 and has some limitations in terms of detailed study of biometric traits of identified aphids and identification of parasitoids and their pathogens. The researchers of this project suggest that in the continuation of this study, the study of biometric traits and the identification of parasitoids of identified aphids be considered.

## 4 Conclusion

The results of this study showed that 6 species of aphids belonging to five genera of the family Aphididae were collected on the plants of Rosaceae in the Ghamsar region of Kashan in 2019, with the highest diversity of hosting and distribution belonging to *W. nervata*. The findings of this study can be used in the field of biosystematics and plant pest management in agriculture.

## Acknowledgments

This paper is taken from the master's thesis entitled "Ecophonistic study of aphids on Rosaceae in Ghamsar region of Kashan" approved by the Faculty of Basic Sciences of Arak University. The Vice-Chancellor for Research of Arak University is hereby thanked for supporting this research.

## References

- Amin, M., Mahmood, K., & Bodlah, I. (2019). Systematics, Host Plants and Distribution of Aphids (Hemiptera: Aphididae) Infesting Tree Flora in Azad Kashmir, Pakistan. *Sarhad Journal of Agriculture*, 35(3). <http://dx.doi.org/10.17582/journal.sja/2019/35.3.847.855>
- Afshar, D. J. (1937). *Les Insectes Nuisibles aux Arbres Fruitiers en Iran*. Ministry of Agriculture, Iran, 112 pp.
- Assadi, M. (1988). *Plan of the Flora of Iran*. Research Institute of Forests and Rangelands Publications, Tehran.
- Assadi, M. (2010). A taxonomic revision of Cousinia sect. Chaetocephalae (Asteraceae). *The Iranian Journal of Botany*, 16(2), 191-196.

- Blackman, R. K., & Eastop, V. F. (1994). *Aphid on the world's tree*. London: Natural History Museum.
- Blackman, R. K., & Eastop, V. F. (2000). *Aphid on the world's crops*. London: Natural History Museum.
- Blackman, R. K., & Eastop, V. F. (2017). Taxonomic issues. In *Aphids as Crop Pests*. 2nd. London: CABI Publishing.
- Dedryver, C. A., Le Ralec, A., & Fabre, F. (2010). The conflicting relationships between aphids and men: a review of aphid damage and control strategies. *Comptes Rendus Biologies*, 333(6-7), 539-553. <https://doi.org/10.1016/j.crv.2010.03.009>
- Farahbakhsh, G. (1961). A checklist of economically important insects and other enemies of plants and agricultural products. *Publications of Department of Plant Protection, Ministry of Agriculture, Tehran, Iran*, 1, 164.
- Ghahraman, A. (1975-2003). *Colored Flora of Iran*. Research Institute of Forests and Rangelands Press, Tehran.
- Heidari Latibari, M., Zare Khormizi, M., Sahamian, E., Dehghan Dehnavi, L., & Moravvej, G. H. (2018). Faunistic survey of Aphidoidea (Hemiptera) and associated predatory ladybirds in orchards, Yazd Province, Iran. *EPPO Bulletin*, 48(1), 160-163. <https://doi.org/10.1111/epp.12456>
- Liu, Z., Ma, H., Jung, S., Main, D., & Guo, L. (2020). Developmental mechanisms of fleshy fruit diversity in Rosaceae. *Annual Review of Plant Biology*, 71, 547-573. <https://doi.org/10.1146/annurev-arplant-111119-021700>
- Mansurkhudjaeva, M. U., Ganieva, Z. A., Zokirov, I. I., & Mirzaeva, G. S. (2021). Biotenotic Relations of Aphids (Homoptera, Aphidoidea) With Acclimatized Trees and Shrubs. *Nveo-Natural Volatiles & Essential Oils Journal | NVEO*, 8(4) 4778-4790.
- Mehrpavar, M., & Lashkari, M. (2021). 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. *Journal of Crop Protection*, 10(3), 565-573. URL: <http://jcp.modares.ac.ir/article-3-48833-en.html>
- Mehrpavar, M., Rakhshani, E., & Rokni, M. (2021). A Survey of Aphid (Hemiptera: Aphididae) Fauna in Southern Parts of the Zagros Mountains and a New Record for Aphid Fauna of Iran. *Taxonomy and Biosystematics*, 13(2), 48-86. <http://dx.doi.org/10.22108/tbj.2021.130437.1176>

- Miller, G. L., & Foottit, R. G. (2017). The Taxonomy of Crop Pests: The Aphids. *Insect Biodiversity: Science and Society*, 627-639. <https://doi.org/10.1002/9781118945568.ch20>
- Nalam, V., Louis, J., & Shah, J. (2019). Plant defense against aphids, the pest extraordinaire. *Plant Science*, 279, 96-107. <https://doi.org/10.1016/j.plantsci.2018.04.027>
- Rak, N. S., & Litvinova, S. V. (2020). Invertebrates Damaging Foliage of Introduced Plants of the Family Rosaceae in the Dendrological Collection of the Polar-Alpine Botanical Garden-Institute. *Entomological Review*, 100(1), 19-27. <https://doi.org/10.1134/S0013873820010030>
- Rezvani, A. (2001). Key to the aphids (Homoptera: Aphidinea) in Iran. *Agricultural Research, Education and Extension Organization, Ministry of Jihad-e-Agriculture*.
- Rezwani, A. (2004). Aphids on trees and shrubs in Iran. *Agricultural Research, Education Organization, Tehran. [In Persian.]*
- Rezwani, A., & Radjabi, G. (1987). The species of the Aphididae family injuring rosaceous fruit trees in Iran. *Entomologie et Phytopathologie Appliquées*, 54(1-2).
- Shahraki, F. M., Minaei, K., & Barjadze, S. (2019). Checklist of Iranian Aphids (Hemiptera: Stenorrhyncha: Aphidomorpha). *Journal of Insect Biodiversity and Systematics*, 5(4), 269-300. <https://www.biotaxa.org/jibs/article/view/74059>
- Singh, G., & Singh, R. (2017). An updated checklist of host plants of Calaphidinae (Aphididae: Hemiptera) in India. *International Journal of Contemporary Research and Review*, 8(2), 20171-20190. <http://dx.doi.org/10.15520/ijcrr/2017/8/02/111>
- Singh, R., & Singh, G. (2016). Aphids and their biocontrol. In *Ecofriendly Pest Management for Food Security* (pp. 63-108). Academic Press. <https://doi.org/10.1016/B978-0-12-803265-7.00003-8>
- Tatchell, G. M. (1989). An estimate of the potential economic losses to some crops due to aphids in Britain. *Crop Protection*, 8(1), 25-29. [https://doi.org/10.1016/0261-2194\(89\)90095-1](https://doi.org/10.1016/0261-2194(89)90095-1)
- Theobald, F. V. (1920). Aphidoidea of Persia. *Entomological Research*, 11, 153-157.