Türk. entomol. derg., 2023, 47 (3): 317-328
DOI: http://dx.doi.org/10.16970/entoted.1272814

ISSN 1010-6960
E-ISSN 2536-491X

Original article (Orijinal araştırma)

Aphid species (Hemiptera: Aphidoidae) determined from Antalya, Karaman and Muğla with new aphid records[1]

Antalya, Karaman ve Muğla'dan belirlenen yeni kayıt afit (Hemiptera: Aphidoidae) türleri

Hayal AKYILDIRIM BEĞEN[2*] **Gazi GÖRÜR[3]** **Özhan ŞENOL[3]**

Gizem BAŞER[3] **Bengisu Venhar AKÇAY[3]**

Abstract

Aphids (Hemiptera: Aphidoidae) are obligatory phytophagous and many of them highly polyphagous pests and distributed almost all parts of the earth, especially temperature zone. Türkiye has a potential area for aphids because of its rich plant diversity and different climatic region. Most of the aphid species is specific to their host plant and both cause direct and indirect damages. So far, 654 aphid species have been determined on numerous host plants in Türkiye. As a result of the study conducted in Antalya, Karaman and Muğla provinces in Türkiye between March 2020 and September 2021, 12 aphid species were added to Türkiye aphidofauna. These species are *Amphorophora urtica* Essig, 1942 on *Urtica dioica* L., *Aphis crepidis* (Börner, 1940) on *Crepis capillaris* L. (Wallr.), *Chaitophorus utahensis* (Knowlton, 1928) on *Salix* sp., *Monelliopsis caryae* (Monell, 1879) on *Juglans regia* L., *Doraphis populi* (Maskell, 1898) on *Populus* sp., *Eulachnus mediterraneus* Binazzi, 1983 on *Pinus* sp., *Metopolophium montanum* Hille Ris Lambers, 1966 on *Rosa* sp., *Protaphis echinopis* (Hille Ris Lambers, 1948) on *Echinops viscosus* DC., *Prociphilus erigeronensis* (Thomas, 1879) on *Cichorium* sp., *Sitobion leelamaniae* (David, 1958) on *Poa* sp. and *Triticum* sp., *Tiliaphis pseudoshinae* Quednau, 1979 on *Tilia* sp. and *Uroleucon iranicum* Holman, 1980 on *Gundelia tournefortii* (L.). Türkiye aphidofauna has reached 666 species with this study. Detailed information of locality of new records are also given.

Keywords: Aphid, Antalya, Karaman, Muğla, Türkiye

Öz

Afitler zorunlu fitofag ve birçoğu yüksek oranda polifag zararlıdırlar ve ılıman iklimler başta olmak üzere dünyanın hemen her yerine dağılmışlardır. Türkiye, zengin bitki çeşitliliği ve farklı iklim bölgeleri nedeniyle afitler için potansiyel bir alana sahiptir. Afit türlerinin çoğu konak bitkiye özgüdür ve bitki üzerinde hem doğrudan hem de dolaylı zararlara neden olur. Bugüne kadar, Türkiye'de çok sayıda konukçu bitki üzerinden, 654 yaprak biti türü tespit edilmiştir. Antalya, Karaman ve Muğla (Türkiye) illerinde, Mart 2020 ve Eylül 2021 yılları arasında yapılan çalışmalar neticesinde, Türkiye yaprak biti faunasına 12 yaprak biti türü eklenmiştir. Bu türler, *Urtica dioica* L. üzerinden *Amphorophora urtica* Essig, 1942, *Crepis capillaris* L. (Wallr.), üzerinden *Aphis crepidis* (Börner, 1940), *Salix* sp. üzerinden *Chaitophorus utahensis* (Knowlton, 1928), *Juglans regia* L. üzerinden *Monelliopsis carya* (Monell, 1879), *Populus* sp. üzerinden *Doraphis populi* (Maskell, 1898), *Pinus* sp. üzerinden *Eulachnus mediterraneus* Binazzi, 1983, *Rosa* sp. üzerinden *Metopolophium montanum* Hille Ris Lambers, 1966, *Echinops viscosus* DC. üzerinden *Protaphis echinopis* (Hille Ris Lambers, 1948), *Cichorium* sp. üzerinden *Prociphilus erigeronensis* (Thomas, 1879), *Poa* sp. ve *Triticum* sp. üzerinden *Sitobion leelamaniae* (David, 1958), *Tilia* sp. üzerinden *Tiliaphis pseudoshinae* Quednau, 1979 ve *Gundelia tournefortii* (L.) üzerinden *Uroleucon iranicum* Holman, 1980. Türkiye afit faunası sayısı bu çalışma ile 666'ya ulaşmıştır. Yeni kayıtların lokasyonlarına ilişkin detaylı bilgiler de verilmiştir.

Anahtar sözcükler: Afit, Antalya, Karaman, Muğla, Türkiye

[1] This study was supported by TÜBİTAK; Project Number 119Z250.
[2] Artvin Çoruh University, Health Services, 08000, Artvin, Türkiye
[3] Niğde Ömer Halisdemir University, Science and Art Faculty, Department of Biotechnology, 51000, Niğde, Türkiye
* Corresponding author (Sorumlu yazar) e-mail: h.akyildirim@artvin.edu.tr
Received (Alınış): 29.03.2023 Accepted (Kabul ediliş): 30.09.2023 Published Online (Çevrimiçi Yayın Tarihi): 05.10.2023

Introduction

Aphids are the most important pest group, distributed throughout the world especially subtropical zone because of plant richness. This small and sap-sucking insect group has high fecundity, cyclical parthenogenetic reproduction, telescoping generation and produce lots of individuals in a short time. Aphids are specific to host plant and close relationship with them and morphological characters are used in the identification of aphids. About 5600 aphid species are defined in the world (Blackman & Eastop, 2023; Favret, 2023) and 654 species listed for Türkiye aphid fauna (Şenol et al., 2014, 2017, 2021; Özdemir & Barjadze, 2015; Görür et al., 2017, 2023 a, b, c; Kök & Kasap, 2019; Kök, 2021; Kök & Özdemir, 2021; Akyürek et al., 2022; Görür, 2022; Başer et al., 2023). Aphids are also economically important because of damaging cultural, naturally growing ornamental plants by feeding on them and invading other plants or zoo-geographic areas easily. In the world, 300 of 5600 aphids are considered severe economic pests (Rodrigez et al., 2017; Blackman & Eastop, 2023; Favret, 2023). They damage the plant species and they are reported to cause about 40-45% yield loses in developing countries, and 30-35% yield loses in developed countries (Ruberson, 1999). Also, biological activity and reproduction of aphids are affected by global warming (Hulle et al., 2010). Therefore, aphids are perfect group for studying effects of global warming.

Türkiye is located at the transition zone between Europe and Asia and has 7 different regions, climatic conditions and floristic features of which change according to localities and geographies. Each region has variable and rich plant diversity and 31% of these plants is endemic (Güner et al., 2012). Türkiye's plant richness is nearly equal to Europe. Therefore, Türkiye is the most popular and interesting area for aphids, but there are many areas that need to be studied in Türkiye (Görür et al., 2019).

Studies on aphids and their damage to host plants in Türkiye started in the early 1900s. Türkiye aphid diversity and host plant interaction were partially researched with other faunistic studies for a long time. Then, first revision of Türkiye was conducted by Çanakçıoğlu (1975). In his book "Aphidoidae of Turkey", 258 aphid species were listed. Remaudiere (2006) summarized all the studies on Türkiye aphid fauna and 417 aphid species were listed. Recently, many researchers listed about 60 new aphid record of Türkiye aphid fauna (Toper Kaygın et al., 2008, 2010; Görür et al., 2009a, b, 2011a, b; Eser et al., 2009; Akyürek et al., 2010, 2011; Barjadze et al., 2011). Checklist of Türkiye aphidofauna was published by Görür et al. (2012) (480 species in 141 genera) and then Kök & Özdemir (2021) (591 species in 147 genera). From that day until today, the number of studies has increased with new aphid records. As a result of these studies, Türkiye aphid fauna number has reached 654 (Barjadze et al., 2014a, b; Şenol et al., 2014, 2015a, b, 2017, 2021; Özdemir & Barjadze, 2015; Görür et al., 2017, 2023 a, b, c; Kök & Kasap, 2019; Kök, 2021; Akyürek et al., 2022; Başer et al., 2023). However, since each region of Türkiye has not been studied, these aphid species numbers do not reflect the real data about Türkiye aphidofauna.

In this study, aphid species from Antalya, Karaman and Muğla, which have different geographic and climatic features, were studied, aphids which affect different plant species were determined and 12 new records were added to the Türkiye aphidofauna. Host plant species and morphological features on the host plant were described.

Materials and Methods

This survey was conducted in Antalya, Karaman and Muğla provinces monthly (about 10 days for each month) from March 2020 to September 2020 and from March 2021 to September 2021. Both aptera and alatae viviparous individuals were sampled with "0" number brush sensitively on all host plants and transferred to 96% ethanol. Permanent slides of the samples were conducted according to method proposed by Martin (1983). The aerial parts of unidentified plants, especially herbaceous species were sampled, dried between cardboard and transferred to laboratory for an identification. Plant species were determined with a distinguishing key, Flora of Turkey (Davis, 1965-85). The definition of the aphid samples

preserved in a permanent slide were performed based on the identification key offered by Blackman & Eastop (2023). General features, worldwide distribution, host plant range of the each identified species were controlled in consistency with the regularly updated web page provided by Blackman & Eastop (2023). The recent taxonomic status of all the determined species was checked according to Favret (2023). Mounted specimens were examined by a with Olympus BX51 microscope. Colony appearances, sampled host plant and detected features of each determined species were provided as follows. The voucher specimens were deposited at the Biotechnology Department of Niğde Ömer Halisdemir University.

Results

Aphid samples were collected from Antalya, Karaman and Muğla Provinces, and as a result of the analyses of the permanently prepared slides, 12 species were determined as new records for Türkiye aphid fauna. For each identified species, worldwide distribution and collection localities, collection dates and biological features are given (Figure 1-13).

Family: Aphididae

Subfamily: Aphidinae

Tribe: Aphidini

Subtribe: Aphidina

Genus: *Aphis* L., 1758

***Aphis* (*Aphis*) *crepidis* (Börner, 1940)**

Material examined. Muğla, Marmaris, National Park-Nimara cave, 36°48'47" N, 28°17'48" E, 134m, 24.IV.2021, apt. 5♀♀, *Crepis capillaris* (Asteraceae).

Description. Light green individuals (Figure 1), BL 1.70mm, ABD TERG 2-5 usually with dome-shaped MTu, have 3-7 secondary rhinaria on ANT III.

Distribution. Europe, Iran, Italy (Blackman & Eastop, 2023).

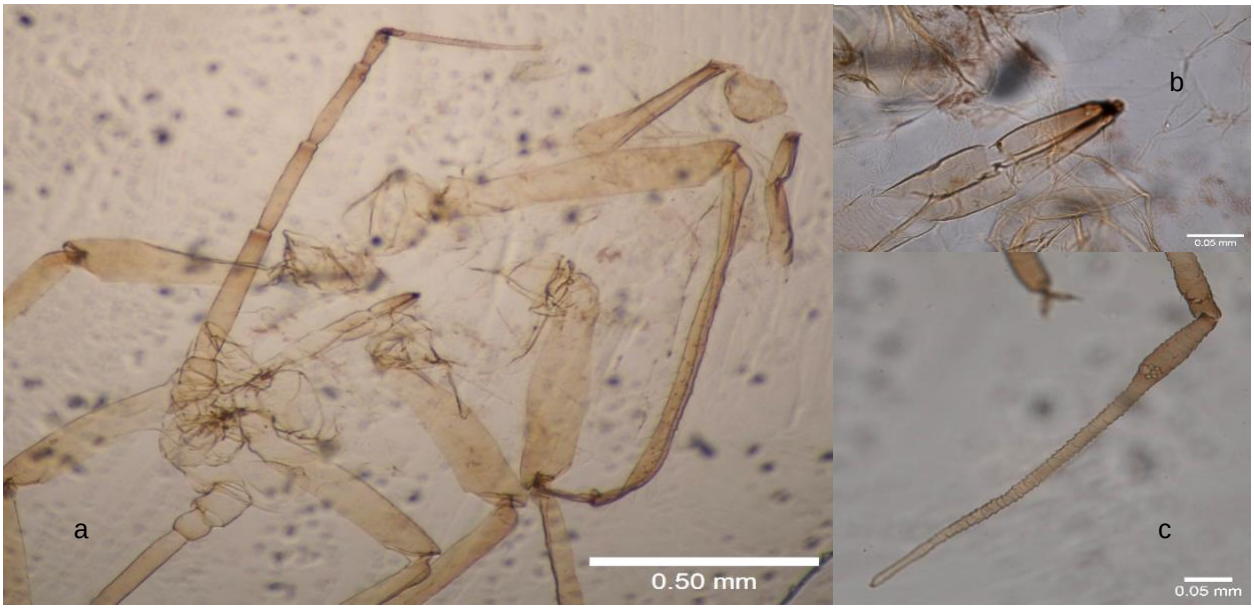

Figure 1. Morphological characters of *Aphis* (*Aphis*) *crepidis*: a) general view, b) rostrum, c) PT / base.

Genus: *Protaphis* Börner, 1952

***Protaphis echinopis* (Hille Ris Lambers, 1948)**

Material examined. Muğla, Menteşe, Muratlar, 37°15'40" N, 28°37'56" E, 616 m, 4.VII.2020, apt. 7♀♀, *Echinops viscosus* (Asteraceae).

Description. Blackish-green individuals, hairs on ANT III 14-18 µm long, BL 0,73 mm without secondary rhinaria (Figure 2).

Distribution. North-East Africa, Central Asia and Middle East (Blackman & Eastop, 2023).

Figure 2. Morphological characters of *Protaphis echinopis*: a) head, b) rostrum, c) rhinnaria on antenna.

Tribe: Macrosiphini

Genus: *Amphorophora* Buckton, 1876

***Amphorophora (Amphorophora) urtica* Essig, 1942**

Material examined. Muğla, Fethiye, 36°40'28" N, 29°07'44" E, 67 m, 26.IV.2021, apt. 15♀♀, *Urtica dioica* (Urticaceae) (Figure 3).

Description. Dark red aptera individuals (Figure 3), ANT III with 1-4 rhinaria, BL 3.4-3.5 mm, cauda with 9-14 hairs.

Distribution. Western North America (Blackman & Eastop, 2023).

Figure 3. *Amphorophora urtica* individuals on *Urtica dioica*.

Genus: *Metopolophium* Mordvilko, 1914

***Metopolophium* (*Metopolophium*) *montanum* Hille Ris Lambers, 1966**

Material examined. Muğla, Dalaman, 36°45'20" N, 28°48'04" E, 11 m, 22.VI.2021, apt. 8♀♀, *Rosa* sp. (Rosaceae) (Figure 4).

Description. Light green individuals, SIPH 2.0 × cauda, R IV+V 0.75-0.85, BL 1.7-1.8 mm.

Distribution. Switzerland, Austria, France and Spain (Blackman & Eastop, 2023).

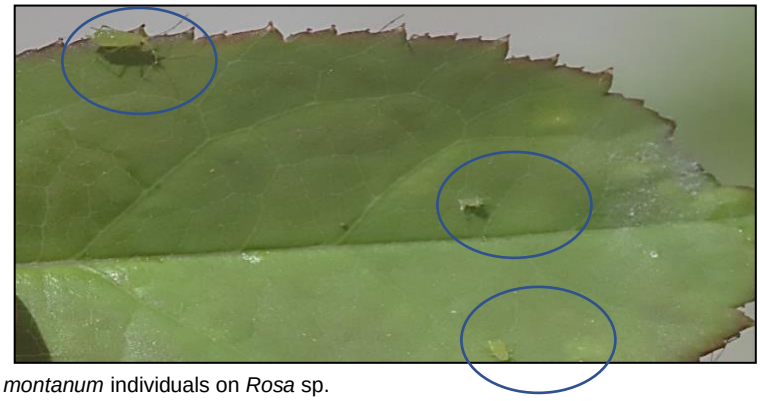

Figure 4. *Metopolophium montanum* individuals on *Rosa* sp.

Genus: *Sitobion* Mordvilko, 1914

***Sitobion* (*Sitobion*) *leelamaniae* (David, 1958) Banded Cereal Aphid**

Material examined. Muğla, Fethiye, 36°40'39" N, 29°10'09" E, 111 m, 30.V.2020, apt. 7♀♀, *Poa* sp. (Poaceae) (Figure 5): Antalya, Gündoğmuş, Ortaköy 36°50'41" N, 32°09'26" E, 1397 m, 15.III.2020, apt. 9♀♀, *Triticum* sp (Poaceae).

Description. Green individuals (Figure 5), antennae ringed with brown, siphunculi pale brown, darker towards apices, legs pale, BL 1.6-2.3 (2.45 mm) mm.

Distribution. South India, Sri Lanka and Southern Africa (Blackman & Eastop, 2023).

Figure 5. *Sitobion leelamaniae* individuals on *Poa* sp.

Genus: *Uroleucon* Mordvilko, 1914

***Uroleucon (Uroleucon) iranicum* Holman, 1980**

Material examined. Karaman, Ermenek, Aşağıakın village, 36°53'41" N, 33°01'30" E, 993 m, 30.V.2021, apt. 2♀♀, *Gundelia tournefortii* (Asteraceae).

Description. Green individuals, BL 2.35 mm, first tarsal segments are unusual for a *Uroleucon* in having only 3 hairs (Figure 6).

Distribution. Iran (Blackman & Eastop, 2023).

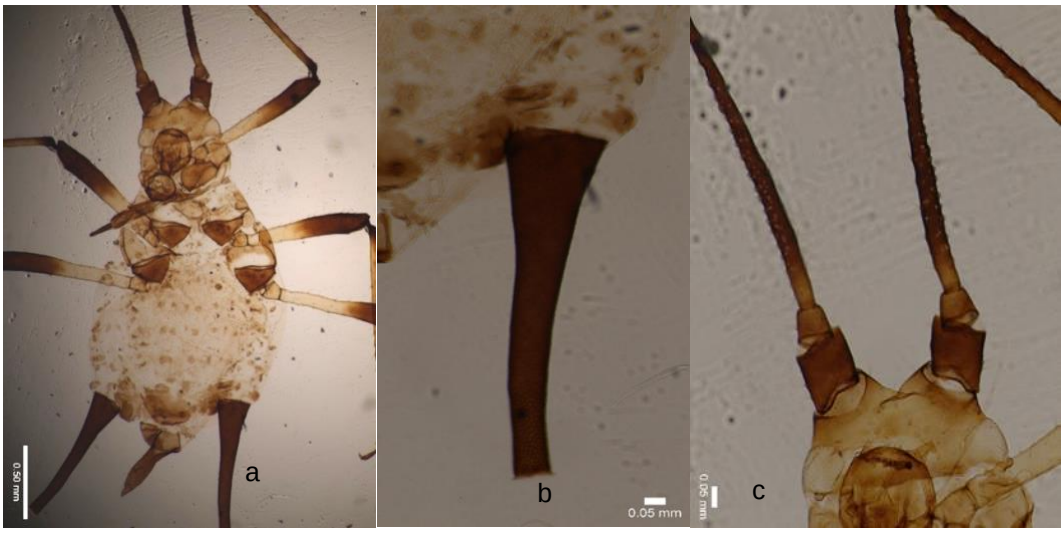

Figure 6. Morphological characters of *Uroleucon (Uroleucon) iranicum*: a) general view, b) siphinculi, c) antenna.

Subfamily: Chaitophorinae

Tribe: Chaitophorini

Genus: Chaitophorus Koch, 1854

***Chaitophorus utahensis (*Knowlton, 1928)**

Material examined. Muğla, Seydikemer-Karabel gateway, 36°47'12" N, 29°35'56" E, 1179 m, 23.VI.2021, apt. 20♀♀, *Salix* sp. (Salicaceae) (Figures 7 & 8).

Description. BL 1-2 mm, have dark wing veins and dark dorsal abdominal cross-bands, hind femora much darker than tergum, nymphs are brown, mature individuals are blackish colors (Figures 7 & 8).

Distribution. Western USA (Blackman & Eastop, 2023).

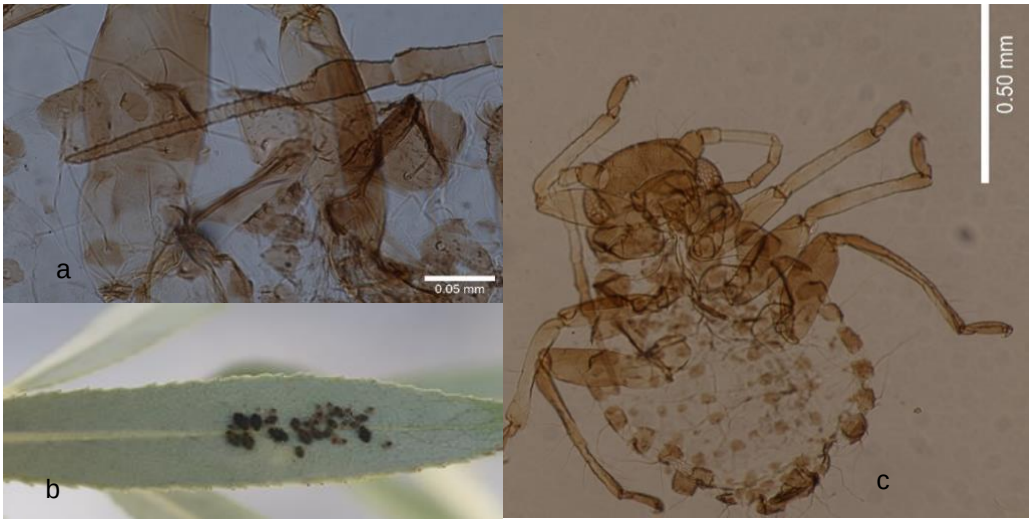

Figure 7. Morphological characters of *Chaitophorus utahensis*: a) antenna, b) individuals on plant, c) general view.

Figure 8. *Chaitophorus utahensis* individuals on *Salix* sp.

Subfamily: Calaphidinae

Tribe: Panaphidini

Genus: *Monelliopsis* Richards, 1965

***Monelliopsis caryae (*Monell, 1879)**

Material examined. Muğla: Ortaca, 36°49'41" N, 28°45'47" E, 25 m, 3.VI.2020, apt. 8♀♀, *Juglans regia* (Juglandaceae).

Description. Light yellow individuals, siphinculi brown, ANT PT/BASE 1.0-1.2, BL 1.0-1.2 mm (Figure 9).

Distribution. North America and Europe (Blackman & Eastop, 2023).

Figure 9. Dark siphinculi of *Monelliopsis caryae*.

Genus: *Tiliaphis* Takahashi, 1961

***Tiliaphis pseudoshinae* Quednau, 1979**

Material examined. Antalya: Korkuteli, 37°03'22" N, 31°13'08" E, 971 m, 7.VII.2020, apt. 10♀♀, *Tilia* sp. (Malvaceae).

Description. Dense green individuals, R IV+V less than 0.8× HT II, BL 1.65-2.1 mm.

Distribution. Korea and eastern Siberia (Blackman & Eastop, 2023).

Subfamily: Hormaphidinae

Tribe: Hormaphidini

Genus: *Doraphis* Matsumura and Hori, 1929

***Doraphis populi* (Maskell, 1898)**

Material examined. Karaman, Sarıveliler 36°36'25" N, 32°35'14" E, 1694 m, 1.IX.2021, apt. 15♀♀, *Populus* sp. (Salicaceae) (Figure 10).

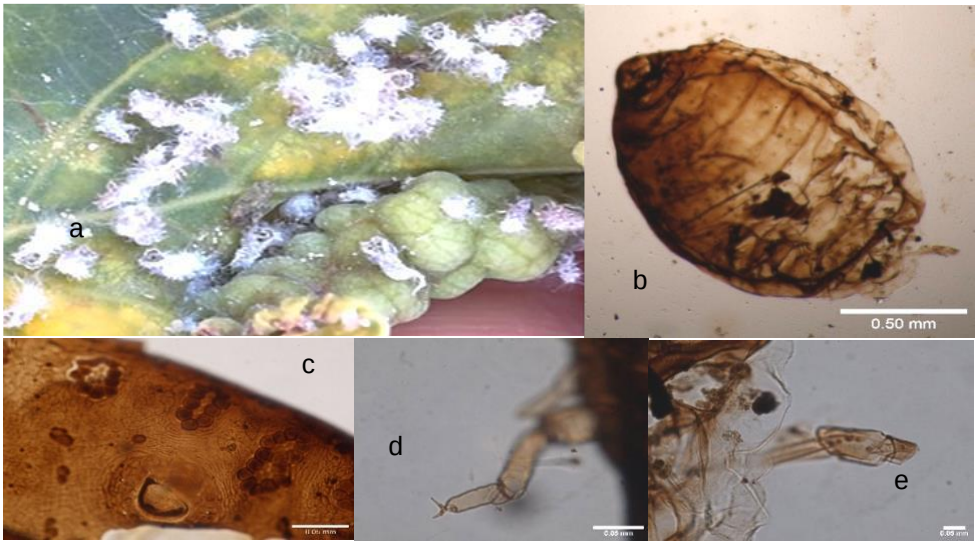

Figure 10. *Doraphis populi* individuals on *Populus* sp.: a) individuals on *Populus* sp., b) general view, c) siphunculi, d) hind tibia, e) rostrum.

Description. Blackish and powdery individuals, body either aleyrodiform, BL 1.5- 2.2 mm (Figure 10).

Distribution. China, Japan, India, Korea and Siberia (Blackman & Eastop, 2023).

Subfamily: Lachninae

Tribe: Eulachinini

Genus: *Eulachnus* Del Guercio, 1909

***Eulachnus mediterraneus* Binazzi, 1983**

Material examined. Muğla, Dokuzçam, Yılanlıdağ plateau, 37°23'12" N, 28°29'05" E, 1037 m, apt. 20.VI.2021, 10♀♀, *Pinus* sp. (Pinaceae).

Description. Grayish green individuals, BL 1.8-2.7 (2.40 mm) mm, longest hairs on ANT III 40-70 µm (Figure 11).

Distribution. Western Mediterranean (Blackman & Eastop, 2023).

Figure 11. Morphological characters of *Eulachnus mediterraneus*.: a) general view, b) antenna, c) rostrum, d) hind tibia and hind tarsus.

Subfamily: Eriosomatinae

Tribe: Pemphigini

Genus: *Prociphilus* Koch, 1857

***Prociphilus* (*Prociphilus*) *erigeronensis* (Thomas, 1879)**

Material examined. Muğla, Centre, 37°12'29" N, 28°22'07" E, 644 m, 20.VI.2021, apt. 15♀♀, *Cichorium* sp. (Asteraceae).

Description. Blackish individuals, BL 2.05-2.1 mm, R IV+V 0.13-0.15 mm (Figure 12).

Distribution. USA (Blackman & Eastop, 2023).

Figure 12. Morphological characters of *Prociphilus (Prociphilus) erigeronensis*: a) general view, b) last antenne segment, c) URS VI/V, d) hind tibia.

Discussion

Aphids cause intense damage to natural and exotic plant species in our country as well as all over the world. Damage levels can be high, especially in agriculture-dependent countries like ours. Türkiye aphid fauna has reached 654 with the recent studies (Kök, 2021; Şenol et al., 2021; Görür, 2022; Görür et al., 2023 a, b, c; Başer et al., 2023). It has been thought that under normal conditions there should be positive correlation between aphid species diversity and plant species diversity in any particular locality. Also, the influence of climate and geography is also great. For example, 68 aphid species were sampled from Artvin and 77 from Trabzon. Whereas there are 2727 plants in Artvin where 3 different climate types are seen, 2100 plants are distributed in Trabzon where the Black Sea climate prevails (Eminağaoğlu, 2015; Görür et al., 2019). In study area, Antalya, Muğla and Karaman, there are many plant species such as thistle, Rosary tree, Gum tree, Sycamore tree, Heather, Spruce, while there are special flowers and grain plants such as Tokuz grass, Gooseberry thistle, *Chrysanthemum, Asparagus*. Dense aphids were sampled from each plant, although not all new records were taken from these plants. As these areas have different geographical and climatic characteristics, it is usual that aphid diversity is high and new records are encountered.

12 new aphid records were given with this study and Türkiye's aphid fauna reached 666. *Prociphilus erigeronensis, Chaitophorus utahensis, Amphorophora urtica* species have been observed only in the USA so far and are given as a new record from Türkiye. Other new records are distributed in Europe and the Mediterranean (Blackman & Eastop, 2023). *Amphorophora* genus has a rich diversity in America, especially on the Pacific coast (Essig,1942). In our country, this species was sampled on *Urtica dioica*. *P. erigeronensis* individuals are determined on different genera (*Lactuca, Aster* and *Ambrosia,* (Asteraceae), *Poa, Triticum, Agrotis* (Poaceae), and *Arachis, Trifolium, Phaseolus* (Fabaceae), *Crataegus* (Rosaceae), and a variety of other ornamentals. *Monelliopsis caryae* (walnut aphid) species was given as a new record for Bulgaria in

2006 and widely distributed in North America (Tasheva-Terzieva et al., 2006). Walnut aphids reduce walnut yield by reducing nut quality, inhibiting the growth of seedlings and causing sooty mould to grow because of the abundant honeydew production. Since walnut trees have a wide distribution in our country, it is important to monitor these species and develop control methods.

Conclusion

As a result of this study, Türkiye aphid fauna has reached 666 species belonging to 160 genera. Because of climatic and geographic properties of study area and rich plant diversity, this number is expected to increase further. Results presented here is the part of an ongoing project, and thus it is possible to add more aphid species to Türkiye aphid fauna, and in turn strongly emphasize the importance of the conducting such studies to observe composition of Türkiye aphid fauna.

Acknowledgements

The authors thank to the Scientific and Technological Research Council of Türkiye (TÜBİTAK; Project Number 119Z250).

References

Akyürek, B., 2022. New additional aphid (Hemiptera: Aphidoidea: Aphididae) records for Samsun (Turkey) province. International Journal of Science Letters, 4 (1): 169-182.

Akyürek, B., Ü. Zeybekoğlu & G. Görür, 2010. New records of aphid species (Hemiptera: Aphidoidea) for the Turkish fauna from Samsun province. Turkish Journal of Zoology, 34 (2): 421-424.

Akyürek, B., Ü. Zeybekoğlu & G. Görür, 2011. Further contributions to the Türkiye Aphid (Hemiptera: Aphidoidea) fauna. Journal of the Entomological Research Society, 13 (3): 101-106.

Bahşi, N. & E. Çetin, 2020. Determining of agricultural credit impact on agricultural production value in Turkey. Ciência Rural, Santa Maria, 50 (11): e20200003.

Barjadze, S., G. Japoshvili, İ. Karaca & I. Özdemir, 2014b. Aphids (Hemiptera: Aphidoidea) of Gölcük Natural Park (Isparta Province, Turkey). Munis Entomology & Zoology Journal, 9 (1): 206-213.

Barjadze, S., İ. Karaca, B. Yaşar & G. Japoshvili, 2011. The yellow rose aphid *Rhodobium porosum*: a new pest of Damask Rose in Turkey. Phytoparasitica, 39 (1): 59-62.

Barjadze, S., I. Özdemir & R. Blackman, 2014a. Two new species of Aphidini *Latreille,* 1802 (Hemiptera: Aphididae) from Turkey. Zootaxa, 3873 (2): 197-194.

Başer, G., G. Görür, Ö. Şenol & H. Akyildirim Beğen, 2023. New contributions to Türkiye aphid fauna with invasive species. Munis Entomology & Zoology (In press).

Blackman, R. & V. F. Eastop, 2023. Aphids on the World's plants: An online identification and information guide. (Web page: http://www.aphidsonworldsplants.info) (Date accessed: June 2023)

Çanakçıoğlu, H., 1975. The Aphidoidea of Turkey. JFFIU İstanbul, 309 pp.

Eminağaoğlu, Ö., 2015. Artvin'in Doğal Bitkileri (Native Plants of Artvin). İstanbul: Promat 256 pp (???? in Turkish with abstract in English).

Eser, S. İ., G. Görür, İ. Tepecik & H. Akyıldırım, 2009. Aphid (Hemiptera: Aphidoidea) species of the Urla district of İzmir region. Journal of Applied Biological Sciences, 3 (1): 99-102.

Essig, E. O., 1942. College Entomology, The MacMillan Company, N.Y., 900 pp.

Favret, C., 2023. Aphid Species File. (Web page: http://aphid.speciesfile.org) (Date accessed: June 2021)

Görür, G., M. Işık, B. Akyürek & Ü. Zeybekoğlu, 2009a. New Records of Aphidoidea from Turkey. Journal of the Entomological Research Society, 11 (3): 1-5.

Görür, G., Ü. Zeybekoğlu, B. Akyürek, M. Işık & H. Akyıldırım, 2009b. Trabzon, Rize ve Artvin İllerinin Afit (Homoptera: Aphididae) Faunasının Belirlenmesi. Turkish Scientific Research Council (Unpublished) Project, Project Number 107T450 (in Turkish with abstract in English).

Görür, G., İ. Tepecik, H. Akyıldırım & G. Olcabey, 2011. Additions to the Turkish Aphid fauna (Hemiptera: Aphidoidea: Aphididae). North-Western Journal of Zoology, 7 (2): 318-321.

Görür, G., H. Akyıldırım, G. Olcabey & B. Akyürek, 2012. The aphid fauna of Turkey: An updated checklist. Archives of Biological Sciences, 64 (2): 675-692.

Görür, G., Ö. Şenol, G. Gezici, H. Akyıldırım Beğen & D. Parmaksız, 2017. New aphid (Hemiptera: Aphidoidea) records from South Eastern Parts of Turkey. Journal of Insect Biodiversity and Systematics, 3 (3): 257-264.

Görür, G., H. Akyıldırım Beğen & Ö. Şenol, 2019. Determined aphid-host plant relations from Eastern Black Sea regions of Turkey. Turkish Journal of Biodiversity, 2 (2): 34-38.

Görür, G., 2022. Contribution to the aphid fauna of the Ordu province with first record of an exotic aphid species, *Euceraphis gillettei* Davidson, 1915, in Turkey. Turkish Journal of Zoology, 46 (5): 418-422.

Görür, G., Ö. Şenol, H. Akyıldırım Beğen & B. Akyürek, 2023a. Turkish aphid. (Web page: www.turkishaphid.com) (Date accessed: July 2022).

Görür, G., G. Başer, H. Akyildirim Beğen, Ö. Şenol & B. Akyürek, 2023b. Sıcaklık Değişkenliğinin Afitlerin Yaşam Döngüsüne Etkileri: Dört Örnek Tür. Osmaniye Korkut Ata Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 6 (1): 68-77 (in Turkish with abstract in English).

Görür, G., H. Akyildirim Beğen, Ö. Şenol & G. Başer, 2023c. Novel contribution to the Türkiye aphid fauna with new host plant associations. North-Western Journal of Zoology, 19 (2): 257-264.

Güner, A., S. Aslan, T. Ekim, M. Vural & M.T. Babaç, 2012. Türkiye Bitkileri Listesi (Damarlı Bitkiler). Nezahat Gökyiğit Botanik Bahçesi ve Flora Araştırma Derneği Yayını, İstanbul, 1290 pp (in Turkish).

Hulle, M., A. Cœur d'Acier, S. Bankhead-Dronnet & R. Harrington, 2010. Aphids in the face of global changes. Comptes Rendus Biologies, 33: 497-503.

Kök, Ş. & İ. Kasap, 2019. Aphid (Hemiptera: Aphididae) species of the South Marmara Region of Turkey including the first record of *Dysaphis radicola meridialis* Shaposhnikov, 1964 for the aphid fauna of Turkey. Turkish Journal of Entomology, 43 (1): 63-78.

Kök, Ş., 2021. Diversity and plant interactions of aphids (Hemiptera: Aphidomorpha) adjacent to Çardak Lagoon with new aphid and host records for Turkey. Turkish Journal of Entomology, 45 (4): 425-439.

Kök, Ş. & I. Özdemir, 2021. Annotated Systematic Checklist of the Aphids (Hemiptera: Aphidomorpha) of Turkey. Zootaxa, 4925 (1): 1-74.

Martin, J. H., 1983. The identification of common aphid pests of tropical agriculture. Tropical Pest Management, 29 (4): 395-411.

Özdemir, I. & S. Barjadze, 2015. Some new records of aphid species (Hemiptera: Aphididae) from the Middle East and the Caucasus. Turkish Journal of Zoology, 39: 712-714.

Remaudière, G., S. Toros & I. Özdemir, 2006. New contribution to the aphid fauna of Turkey (Hemiptera, Aphidoidea). Revue Française d'Entomologie, 28 (2): 75-96.

Rodrigez, G.S., P.A. Brown, J. Ortego, S.L. Ciruelos & J.M. Nieto Nafria, 2017. Aphis species (Hemiptera, Aphididae) living on Mulinum (Apiaceae) in South America, with a description of a new species. Zootaxa, 4216 (1): 47-54.

Ruberson, J.R., 1999. Handbook of Pest Management. Published by Marcel Dekkar Inc., New York, 842 pp.

Şenol, Ö., H. Akyıldırım Beğen, G. Görür & E. Demirtaş, 2014. New records for the aphid fauna hemiptera aphidoidea of Turkey. Acta Zoologica Bulgarica, 66 (1): 133-136.

Şenol, Ö., H. Akyıldırım Beğen, G. Görür & E. Demirtaş, 2015a. New additions and invasive aphids for Turkey's aphidofauna (Hemiptera: Aphidoidea). Turkish Journal of Zoology, 39: 39-45.

Şenol, Ö., H. Akyıldırım Beğen, G. Görür & G. Gezici, 2015b. Some new aphid records for the Turkish aphidofauna (Hemiptera: Aphidoidae). Zoology in the Middle East, 61 (1): 90-92.

Şenol, Ö., G. Görür & H. Akyıldırım Beğen, 2017. Recent findings on aphid fauna from east and south eastern parts of Turkey. Biodiversity Conservation, 10 (3): 76-78.

Şenol, Ö., G. Görür, G. Başer & H. Akyıldırım Beğen, 2021. Contributions to the Turkish aphid fauna from Aegean and Mediterranean part of Turkey. Journal of Applied and Natural Science, 25 (3): 717-720.

Tasheva-Terzieva, E., P. B. Mirchev, G. T. Georgiev, P. S. Petkov & M. Todorov, 2006. The dew produce, *Monelliopsis caryae* (Monell ex Riley and Monell, 1879) (Hemiptera:Aphididae) - new species for aphidofauna of Bulgaria. Acta entomologica Bulgarica, 1 (2): 60-63.

Toper Kaygın, A., G. Görür & F. Çota, 2008. Contribution to the Aphid (Homoptera: Aphididae) species damaging on woody plants in Bartın, Türkiye. International Journal of Engineering Science and Application, 2 (1): 83-86.

Toper Kaygin, A., G. Gorur & F. Cota, 2010. New records of aphid fauna in Turkey. Journal of Insect Science, 10 (1): 1-5.