ATATÜRK ÜNİVERSİTESİ YAYINLARI
ATATURK UNIVERSITY PUBLICATIONS

Research Article *Araştırma Makalesi* DOI: 10.5152/AUAF.2024.23169

New Additions to the Aphid (Hemiptera: Aphididae) Fauna of Turkey from Erzurum Province

Türkiye Afit (Hemiptera: Aphididae) Faunasına Erzurum'dan Katkılar

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ABSTRACT

This study was conducted to have an idea about the aphid species of Erzurum province. Thirty aphid species and one subspecies were identified on 26 host plants. Among these species, four species were new records for the Turkey aphid fauna which are *Callipterinella tuberculata* (von Heyden, 1837); *Cinara* (*Cinara*) *sitchensis* Hottes, 1958; *Colopha graminis* (Monell, 1882); and *Macrosiphum* (*Macrosiphum*) *venaefuscae* Davis, 1914. With these new records, the number of the aphid species in Turkey aphid fauna was increased to 675 species. Furthermore, *Dysaphis* (*Dysaphis*) *crataegi aethusae* (Börner, 1950) was also determined as new subspecies records for the aphid fauna of Turkey.

Keywords: Aphid, Erzurum, new record, Turkey

ÖZ

Bu çalışma Erzurum ilinin yaprakbiti türleri hakkında fikir sahibi olmak amacıyla yapılmıştır. 26 konak bitki üzerinde 30 afit türü ve 1 alttür tespit edilmiştir. Bu türler arasında *Callipterinella tuberculata* (von Heyden, 1837); *Cinara* (*Cinara*) *sitchensis* Hottes, 1958; *Colopha graminis* (Monell, 1882) ve *Macrosiphum* (*Macrosiphum*) *venaefuscae* Davis, 1914 olmak üzere 4 tür Türkiye afit faunası için yeni kayıttır. Bu yeni kayıtlarla birlikte Türkiye afit faunasındaki afit türlerinin sayısı 675'e yükselmiştir. Ayrıca *Dysaphis* (*Dysaphis*) *crataegi aethusae* (Börner, 1950) alttürü de Türkiye afit faunası için yeni kayıt olarak belirlenmiştir.

Anahtar Kelimeler: Afit, Erzurum, yeni kayıt, Türkiye

Introduction

Aphid species are considered as an obligatory phytophagous insect because they cannot survive without the host plant; they feed on plant sap and are host specific. They cause a large amount of crop losses by feeding on plant sap directly, transmitting almost 60% of the plant viruses and causing fumagine indirectly. Aphids feeding on the host plant has a significant negative effect on the physiology, growth, flowering rate and appearance of host plants, thus causing an average of 35–40% product loss (Ruberson, 1999). Their unique life cycles and polyphenism, as well as their reproductive abilities, make this species an important group of insects to study insect–host plant relations and ecological result of global warming effects in terms of insect–host plant interactions (Vilcinskas, 2016).

Erzurum is one of the provinces with the highest altitude (1900 m) in Turkey. Erzurum has a harsh continental climate effect that is directly related with geographical location; the annual average temperature is around 6°C (Anonymous, 2023). Due to both the climatic conditions of Erzurum and the lack of adequate studies, the study will contribute to the aphid fauna. Studies conducted in recent years in Turkey (Görür et al., 2020; Kök & Özdemir, 2021; Patlar et al., 2021; Şenol et al., 2021) made significant contribution the number of aphid fauna of Turkey and is currently represented by 671 species (Görür et al., 2023a).

Received/Geliş Tarihi: 04.08.2023
Accepted/Kabul Tarihi: 07.10.2023
Publication Date/Yayın Tarihi: 25.01.2024

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Cite this article as: Başer, G., Görür, G., & Şenol, Ö. (2024). New additions to the aphid (Hemiptera: Aphıdidae) fauna of Turkey from Erzurum Province. *Research in Agricultural Sciences*, 55(1), 19-25.

Methods

This study was conducted in Erzurum provinces (Aziziye, Palandöken, Tortum, Uzundere, and Yakutiye districts) in September 2022, sampling were carried out during whole days of the month as much as possible to take samples from all host plants. During these field studies, 50 population (any colony on any host plant is called population) were sampled on 26 different plant species. Apterae, alatae, and immature individuals were taken with soft and fine-tipped brushes gently. Samples were preserved in Eppendorf tubes containing 96% alcohol. Any host plant sampling carried on that was brought into the laboratory pressed between two cartons. The preparations of the samples were made according to the principles stated in Martin (1983). Specimens on the permanent slides were identified with Olympus BX51 microscope according to key by Blackman and Eastop (2023) and current taxonomical status was checked by Favret (2023). Measurements of some common distinguishing characters were made for the identified species: body length (BL), sixth antennal segment processus terminalis/sixth antennal segment base (PT/BASE), length of rostrum segment VI+V/hind tarsus II segment length (RIV+V/HTII), and siphunculi length/cauda length (SIPH L/cauda). The voucher samples were stored at the Biotechnology Department of the Nigde Ömer Halisdemir University.

Results and Discussion

As a result of the evaluation of the aphid population were sampled on 26 plants, 30 aphid species and 1 subspecies were determined from the study area. Four species were new records for the Turkey aphid fauna.

Acyrthosiphon* (*Acyrthosiphon*) *malvae (Mosley, 1841); eight adult aptera individuals (♀) were green. Collected from leaves of *Cirsium* sp. Mill. (Asteraceae) from Erzurum/Aziziye/Börekli district on 13.09.2022. It is distributed all over the world (Blackman & Eastop, 2023; Holman, 2009). Recorded from Bitlis, Çanakkale, Rize, Samsun, and Van in Turkey (Kök & Özdemir, 2021).

Anoecia* (*Anoecia*) *corni (Fabricius, 1775); six adult aptera individuals (♀) were pale green, alatae individuals were black and attended by ants. Collected from leaves of *Cornus* sp. L. (Cornaceae) from Erzurum/Tortum/Pehlivanlı village on 14.09.2022. In Europe, North America, Asia, Africa, and Argentina (Blackman & Eastop, 2023). Recorded from Ankara, Bitlis, Çanakkale, Diyarbakır, Gümüşhane, Istanbul, Içel, Kayseri, Rize, Samsun, Trabzon, and Tekirdağ in Turkey (Kök & Özdemir, 2021).

Aphis* (*Aphis*) *gossypii Glover, 1877; 15 adult aptera individuals (♀) were yellow. Collected from under of leaves of *Cucurbita* sp. L. (Cucurbitaceae) and *Catalpa* sp. Scop. (Bignoniaceae) from Erzur um/Aziziye/Börekli district and Erzurum/Atatürk University Campus on 13.09.2022. It is distributed all over the world (Blackman & Eastop, 2023; Holman, 2009). It shows a wide distribution in Turkey (Kök & Ozdemir, 2021).

Aphis* (*Aphis*) *sambuci Linnaeus, 1758; ten adult aptera individuals (♀) were dark green and attended by ants. Collected from under of leaves of *Sambucus* sp. L. (Adoxaceae) from Erzurum/Atatürk University Campus on 9.09.2022. In America, Japan, Korea, and North Africa (Blackman & Eastop, 2023). Recorded from Afyonkarahisar, Ankara, Artvin, Bolu, Çanakkale, Erzurum, Giresun, İstanbul, İzmir, Kahramanmaraş, Kastamonu, Konya, Niğde, Rize, Sakarya, Samsun, Trabzon, and Yalova in Turkey (Kök & Özdemir, 2021).

Aphis* (*Aphis*) *spiraecola Patch, 1914; 16 adult aptera individuals (♀) were green and attended by ants. Collected from under of leaves of *Malus* sp. Mill. (Rosaceae) from Erzurum/Atatürk University Campus on 09.09.2022, and Erzurum/Tortum/Kaledibi district on 14.09.2022. It is distributed all over the world (Blackman & Eastop, 2023; Holman, 2009). It shows a wide distribution in Turkey (Kök & Özdemir, 2021).

Aphis* (*Aphis*) *pomi De Geer, 1773; ten adult aptera individuals (♀) were green and attended by ants. Collected from petiole and under of leaves of *Prunus* sp. L. (Rosaceae) from Erzurum/Atatürk University Campus on 12.09.2022, and Erzurum/Uzundere on 14.09.2022. In Europe, North Africa, America, and Asia (Blackman & Eastop, 2023; Holman, 2009). It shows a wide distribution in Turkey (Kök & Özdemir, 2021).

Callipterinella tuberculata (von Heyden, 1837); determined as a new record for the aphid fauna of Turkey. Eight adult aptera individuals (♀), collected from on leaves of *Betula* sp. L. (Betulaceae) (Fig 1.a) from Erzurum/Atatürk University Campus on 09.09.2022. In Europe, East Siberia, and China (Blackman & Eastop, 2023).

Description: Aptera individuals were pale green with brownish-red bands on the abdomen and attended by ants. Antenna has VI segment (Figure 1E). BL: 1.33 mm (Figure 1B). PT/BASE: 1.8 mm. HTI/HTII: 0.3 mm (Figure 1C). RIV+V: 0.10 mm (Figure 1D).

Cavariella* (*Cavariella*) *theobaldi (Gillette & Bragg, 1918); six adult aptera individuals (♀) were green-yellow and attended by ants. Collected from petiole and on leaves of *Salix* sp. L. (Salicaceae) from Erzurum/Atatürk University Campus on 11.09.2022. In Europe, Eastern Siberia and Western Siberia, Kazakhstan, Iran, North Africa, and Northeastern United States (Blackman & Eastop, 2023; Holman, 2009). Recorded from Ankara, Bolu, Erzincan, Kütahya, Malatya, Niğde, Uşak, and Trabzon in Turkey (Kök & Özdemir, 2021).

Chaitophorus parvus Hille Ris Lambers, 1935; eight adult aptera individuals (♀) were black. Collected from under of leaves of *Salix* sp. L. (Salicaceae) from Erzurum/Dadaşkent on 09.09.2022. In Northern Europe and Spain (Blackman & Eastop, 2023). Record is being only given from Muğla in Turkey (Görür et al., 2022).

Chaitophorus populeti (Panzer, 1801); eight adult aptera individuals (♀) were green and attended by ants. Collected from on leaves of *Populus* sp. L. (Salicaceae) from Erzurum/Atatürk University Campus on 12.09.2022. In Mediterranean region, Afghanistan, and Western Siberia (Blackman & Eastop, 2023). Recorded from Afyon, Ankara, Artvin, Bartin, Bursa, Edirne, Erzurum, İstanbul, Izmir, Kütahya, Samsun, and Tekirdağ in Turkey (Kök & Özdemir, 2021).

Chaitophorus populialbae (Boyer de Fonscolombe, 1841); ten adult aptera individuals (♀) were green and attended by ants. Collected from on leaves of *Populus* sp. L. (Salicaceae) from Erzurum/Atatürk University Campus on 09.09.2022. In the Palearctic region, Africa, and North America (Blackman & Eastop, 2023). Recorded from Ankara, Artvin, Bartın, Istanbul, Icel, Isparta, Konya, Rize, and Samsun in Turkey (Kök & Ozdemir, 2021).

Cinara* (*Cinara*) *pinea (Mordvilko, 1895); six adult aptera individuals (♀) were dark brown and attended by ants. Collected from on the branch of *Pinus* sp. L. (Pinaceae) from Erzurum/Atatürk University Campus on 13.09.2022. In Europe, Georgia, Kazakhstan, eastern Siberia, China, and North America (Blackman &

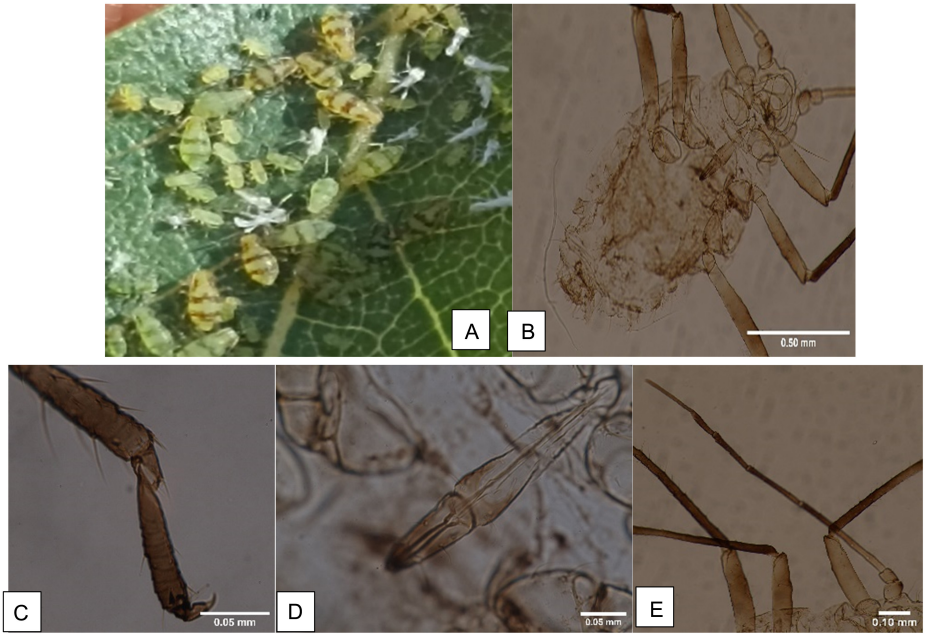

Figure 1.
(A) Callipterinella tuberculata on Betula sp. (B) Body of aptera female. (C) HTI and HTII of aptera female. (D) RIV+V of aptera female. (E) Whole antenna of aptera female.

Eastop, 2023). Recorded from Ankara, Antalya, Artvin, Bolu, Giresun, İstanbul, Isparta, Kastamonu, and Tekirdağ in Turkey (Kök & Özdemir, 2021).

Cinara* (*Cinara*) *pinivora (Wilson, 1919); four adult aptera individuals (♀) were grey wax with black head. Collected from at the tip of the branch of *Pinus* sp. L. (Pinaceae) from Erzurum/Atatürk University Campus on 13.09.2022. In Australes, the eastern United States, Canada, Argentina, Brazil, and Africa (Blackman & Eastop, 2023). Recorded from Artvin, Afyon, Kütahya, and Uşak in Turkey (Kök & Özdemir, 2021).

Cinara* (*Cinara*) *sitchensis Hottes, 1958; determined as a new record for the aphid fauna of Turkey. Eight adult aptera individuals (♀) collected from on the branch of *Picea* sp. L. (Pinaceae) (Figure 2A) from Erzurum/Atatürk University Campus on 13.09.2022. In America (Blackman & Eastop, 2023).

Description: Aptera individuals were brown, slightly wax-dusted and attended by ants. Appearance in life specified for the first time. BL: 2.02 mm (Figure 2B). PT/BASE: 0.5 mm. SIPH diameter 0.13 mm (Figure 2C). Antenna has VI segment (Figure 2D). ANT VI: 0.15 mm. ANT V: 0.15 mm. HTII: 0.2 mm (Figure 2E).

Cinara* (*Cupressobium*) *tujafilina (Del Guercio, 1909); ten adult aptera individuals (♀) were brown and attended by ants. Collected from on branch of *Thuja* sp. L. (Cupressaceae) from Erzurum/Palandöken on 14.09.2022. It is distributed all over the world (Blackman & Eastop, 2023). Recorded from Artvin, Ankara, Adana, Adıyaman, Afyonkarahisar, Çanakkale, İstanbul, Konya, Malatya,

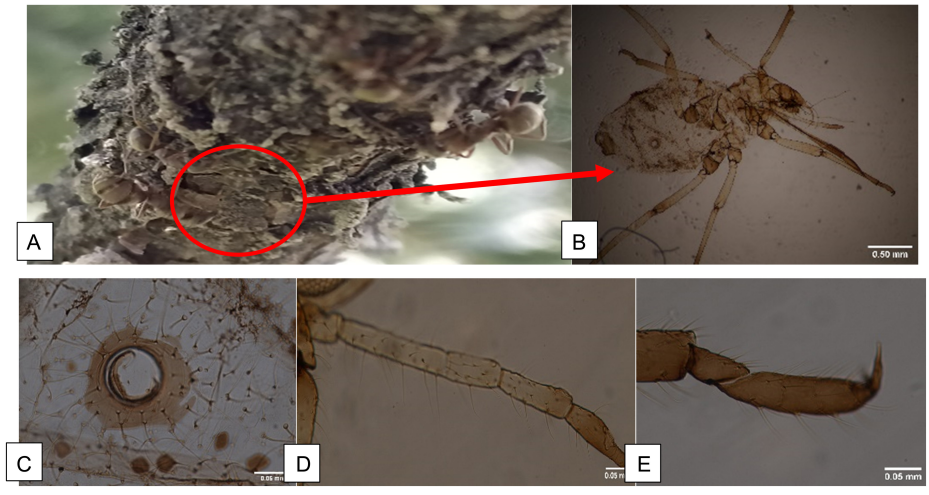

Figure 2.
(A) Cinara (Cinara) sitchensis on Picea sp. (B) Body of aptera female. (C) SIPH of aptera female. (D) Whole antenna of aptera female. (E) HTI and HTII of aptera female.

Niğde, Samsun, Şanlıurfa, and Trabzon in Turkey (Kök & Özdemir, 2021).

Cinara* (*Schizolachnus*) *pineti (Fabricius, 1781); six adult aptera individuals (♀) were grey wax. Collected from on needles of *Pinus* sp. L. (Pinaceae) from Erzurum/Atatürk University Campus on 12.09.2022. In Europe, Kazakhstan, Eastern Siberia, and China (Blackman & Eastop, 2023). Recorded from Artvin, Ankara, Afyonkarahisar, Bolu, Giresun, Istanbul, Kütahya, Malatya, Muğla, Trabzon, Rize, Samsun, and Uşak in Turkey (Kök & Özdemir, 2021).

Colopha graminis (Monell, 1882); determined as a new record for the aphid fauna of Turkey. Ten adult aptera individuals (♀) collected from roots of *Setaria* sp. L. (Poaceae) (Figure 3A) from Erzurum/Tortum/Kaledibi district on 14.09.2022. In North America (Blackman & Eastop, 2023).

Description: Aptera individuals were yellow. Antenna has V segment (Figure 3E). Tarsi 1-segment (Figure 3D). BL: 1.22 mm (Figure 3B). PT/BASE: 0.25 mm. RIV+V/HTI: 1.25 mm. RIV+V: 0.10 mm (Figure 3C).

Eucarazzia elegans (Ferrari, 1872); eight adult aptera individuals (♀) were pale green and attended by ants. Collected from under of leaves of *Mentha* sp. L. (Lamiaceae) from Erzurum/Aziziye/Börekli district on 13.09.2022. In the Mediterranean area, Madeira, Middle East, Central Asia, Pakistan, northern India, southern Poland, Australia, Africa south of the Sahara, and America (Blackman & Eastop, 2023). Recorded from Ankara, Istanbul, Izmir, and Trabzon in Turkey (Kök & Özdemir, 2021).

Eulachnus thunbergii Wilson, 1919; six adult aptera individuals (♀) were green. Collected from on needles of *Pinus* sp. L. (Pinaceae) from Erzurum/Atatürk University Campus on 12.09.2022. In India, Vietnam, China, Japan, Korea, Siberia, Taiwan, Java, Philippines, and Australia (Blackman & Eastop, 2023). Recorded from Afyon and Kütahya in Turkey (Kök & Özdemir, 2021).

Hyalopterus arundiniformis Ghulamullah, 1942; 20 adult aptera individuals (♀) were green and attended by ants. Collected from under of leaves of *Prunus armeniaca* L. (Rosaceae) and *Prunus persica* (L.) Batsch (Rosaceae) from Erzurum/Dadaşkent on 09.09.2022; Erzurum/Atatürk University Campus on 12.09.2022; Erzurum/Tortum on 14.09.2022. Spain, Italy, Greece, Iran, Iraq, Georgia, China, Afghanistan, and Algeria (Blackman & Eastop, 2023). Recorded from Afyon, Kahramanmaraş, Kütahya, and Uşak in Turkey (Kök & Özdemir, 2021).

Hyalopterus pruni (Geoffroy, 1762); 12 adult aptera individuals (♀) were green. Collected from under of leaves of *Prunus armeniaca* L. (Rosaceae) and *Prunus domestica* L. (Rosaceae) from Erzurum/Dadaşkent; Erzurum/Atatürk University Campus on 10.09.2022. It is distributed all over the world (Blackman & Eastop, 2023). It shows a wide distribution in Turkey (Kök & Özdemir, 2021).

Macrosiphum* (*Macrosiphum*) *euphorbiae (Thomas, 1878); ten adult aptera individuals (♀) were dark brown. Collected from under of leaves of *Rumex* sp. L. (Polygonaceae) from Erzurum/Atatürk University Campus on 13.09.2022. It is distributed all over the world (Blackman & Eastop, 2023). It shows a wide distribution in Turkey (Kök & Özdemir, 2021).

Macrosiphum* (*Macrosiphum*) *venaefuscae Davis, 1914; determined as a new record for the aphid fauna of Turkey. Eight adult aptera individuals (♀) collected from under of leaves of *Rumex* sp. L. (Polygonaceae) from Erzurum/Atatürk University Campus on 13.09.2022. In eastern North America (Blackman & Eastop, 2023).

Description: Aptera individuals were dark brown. Antenna has VI segment. BL: 2.98 mm (Figure 4A). PT/BASE: 4.58 mm (Figure 4E). BASE/RIV+V: 0.8 mm. SIPH L/cauda: 2.32 mm (Figure 4C). Longest hair on ANT III/BD III: 1 mm. HTII: 0.14 mm (Figure 4D). RIV+V: 0.15 mm (Figure 4B).

Myzus* (*Myzus*) *cerasi (Fabricius, 1775); 16 adult aptera individuals (♀) were black and attended by ants. Collected from under of leaves of *Prunus avium* L. (Rosaceae) and *Amaranthus* sp. L. (Amaranthaceae) from Erzurum/Atatürk University Campus 12.09.2022 and Erzurum/Tortum/Kaledibi district on 14.09.2022. In Europe, Pakistan, Australia, New Zealand and North America

Figure 3.
(A) Colopha graminis on Setaria sp. (B) Body of aptera female. (C) RIV+V of aptera female. (D) HTI of aptera female. (E) Whole antenna of aptera female.

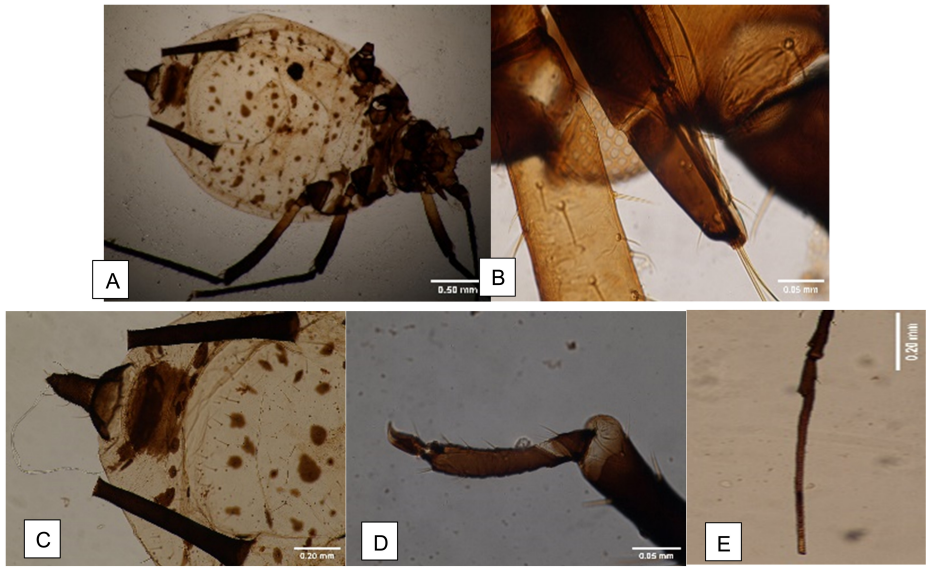

Figure 4.
(A) Body of aptera female. (B) RIV+V of aptera female. (C) SIPH and cauda of aptera female. (D) HTI and HTII of aptera female. (E) ANT VI (PT+BASE) of aptera female.

(Blackman & Eastop, 2023). It shows a wide distribution in Turkey (Kök & Ozdemir, 2021).

Myzus* (*Nectarosiphon*) *persicae (Sulzer, 1776); 12 adult aptera individuals (♀) were black and attended by ants and wasp. Collected from under of leaves of *Prunus avium* L. (Rosaceae) Erzurum/Tortum on 14.09.2022. It is distributed all over the world (Blackman & Eastop, 2023). It shows a wide distribution in Turkey (Kök & Özdemir, 2021).

Paracletus bykovi (Mordvilko, 1921); ten adult aptera individuals (♀) were pale yellow-white. Collected from roots of *Poa* sp. L. (Poaceae) from Erzurum/Atatürk University Campus on 13.09.2022. In Poland, Ukraine, Transcaucasia, Kazakhstan, and Uzbekistan (Blackman & Eastop, 2023). Recorded from Izmir in Turkey (Çanakçıoğlu, 1975).

Pterochloroides persicae (Cholodkovsky, 1898); 15 adult aptera individuals (♀) were dark brown and attended by ants and bee. Collected from the branch and trunk of *Prunus* sp. L. (Rosaceae) (*P. domestica, armeniaca, salicina*) Erzurum/Atatürk University Campus on 11.09.2022; *Prunus armeniaca* L. (Rosaceae) from Erzurum/Tortum on 14.09.2022. In Southern Europe, North Africa, Central Asia, Romania, Tunisia, India, Pakistan, and Indonesia (Blackman & Eastop, 2023). It shows a wide distribution in Turkey (Kök & Özdemir, 2021).

Rhopalosiphum maidis (Fitch, 1856); seven adult aptera individuals (♀) were green and attended by ants. Collected from on leaves of *Zea* sp. L. (Poaceae) Erzurum/Aziziye/Börekli district on 13.09.2022. It is distributed all over the world (Blackman & Eastop, 2023). It shows a wide distribution in Turkey (Kök & Özdemir, 2021).

Tinocallis* (*Sappocallis*) *ulmicola (Matsumura, 1919); six adult aptera individuals (♀) were pale yellow. Collected from under of leaves of *Ulmus* sp. L. (Ulmaceae) Erzurum/Dadaşkent on 10.09.2022. In Japan, China, Korea, and eastern Siberia (Blackman & Eastop, 2023; Holman, 2009). Record is being only given from Antalya in Turkey (Görür et al., 2022).

Uroleucon* (*Uroleucon*) *murale (Buckton, 1876); eight adult aptera individuals (♀) were dark brown. Collected from on receptacle and petiole of *Crepis* sp. L. (Asteraceae) Erzurum/Uzundere on 14.09.2022. In Europe, eastward to Byelorussia, Ukraine, and Iran (Blackman & Eastop, 2023). Record is being only given from Adiyaman in Turkey (Görür et al., 2019).

Dysaphis* (*Dysaphis*) *crataegi aethusae (Börner, 1950); determined as a new subspecies for the aphid fauna of Turkey. Twelve adult aptera individuals (♀) collected from root and near the root of *Aethusa* sp. L. (Apiaceae) Erzurum/Uzundere on 14.09.2022.

Description: Aptera individuals were pale white. Antenna has VI segment. Cauda helmet-shaped (Figure 5C). No subracaudal process. BL: 1.40 mm (Figure 5A). RIV+V: 0.13 mm (Figure 5B). PT/BASE: 3.6 mm (Figure 5D).

Conclusion

Turkey is a country where aphid fauna is expected to be rich due to reasons such as being a transition region between continents, seeing different climate types, and the high number of endemic plant species. Recent studies added new records to the Turkey aphid fauna (Başer & Tozlu, 2020; Görür, 2022; Kök, 2021; Oğuzoğlu et al., 2023; Yayla, 2022; Özdemir, 2020), and it is currently represented by 671 species (Görür et al., 2023a). With this study conducted only in such a small area in Erzurum, the species *Callipterinella tuberculata* (von Heyden, 1837); *Cinara* (*Cinara*) *sitchensis* Hottes, 1958; *Colopha graminis* (Monell, 1882); and *Macrosiphum* (*Macrosiphum*) *venaefuscae* Davis, 1914 were determined as new records for Turkey. With these new records, the aphid fauna of Turkey increased to 675 species. *Dysaphis* (*Dysaphis*) *crataegi aethusae* (Börner, 1950) was also recorded as new subspecies records for the aphid fauna of Turkey, thus increasing to 28 subspecies. Findings presented here were derived from very small geographical locality in Erzurum; therefore, they do not reflect whole Erzurum province aphid composition. Recording four species and one subspecies as a new record for Turkey aphid fauna in such a small locality strongly indicated the importance of detailed studies to find out current composition of the Turkey

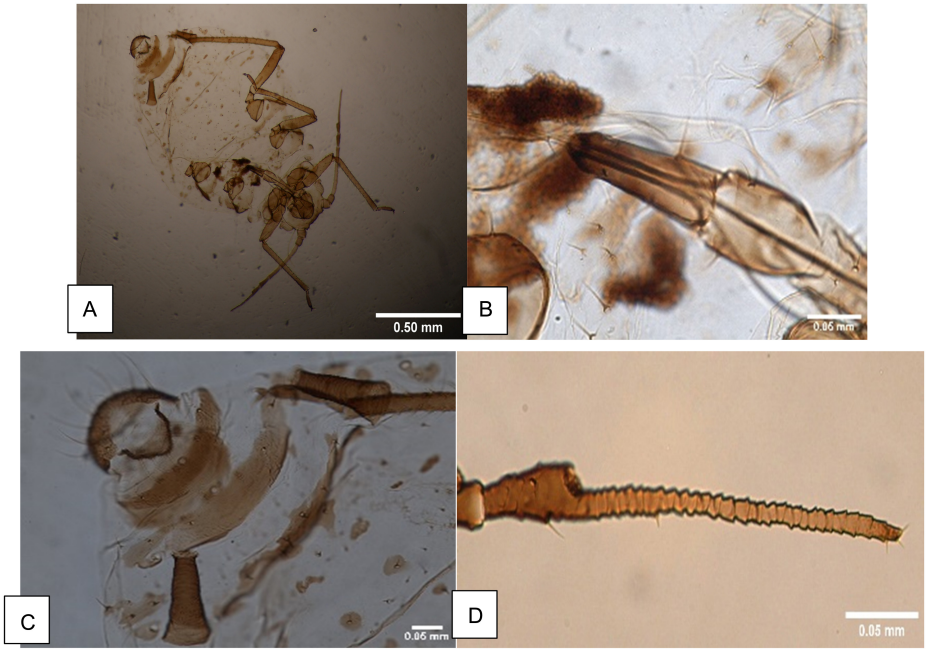

Figure 5.
(A) Body of aptera female. (B) RIV+V of aptera female. (C) SIPH and cauda of aptera female. (D) ANT VI (PT+BASE) of aptera female.

aphid fauna. In addition, recent climatic changes also provokes researchers to study Turkey aphid fauna since aphid might have an ability to produce two to six more generations and more damage to the host plants by turning global warming effects into the advantage (Görür et al., 2023b). Agricultural production in Turkey contributes in a large manner to the country's development; therefore, inventorying the Turkey aphid fauna plays an important role, as aphids are the one of the most important groups of insects recognized as severe pests around the world.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – G.B., G.G., Ö.Ş.; Design – G.B., G.G., Ö.Ş.; Supervision – G.B., G.G., Ö.Ş.; Resources – G.B., G.G., Ö.Ş.; Materials –G.B., G.G., Ö.Ş.; Data Collection and/or Processing – G.B., G.G., Ö.Ş.; Analysis and/or Interpretation – G.B., G.G., Ö.Ş.; Literature Search – G.B., G.G., Ö.Ş.; Writing Manuscript – G.B.,G.G., Ö.Ş.; Critical Review – G.B., G.G., Ö.Ş.

Declaration of Interests: The authors declare that they have no competing interest.

Funding: The authors declared that this study has received no financial support.

Hakem Değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Fikir – G.B., G.G., Ö.Ş.; Tasarım – G.B., G.G., Ö.Ş.; Denetleme – G.B., G.G., Ö.Ş.; Kaynaklar – G.B., G.G., Ö.Ş.; Malzemeler – G.B.,G.G.,Ö.Ş.; Veri Toplanması ve/veya İşlemesi – G.B.,G.G., Ö.Ş.; Analiz ve/veya Yorum – G.B., G.G., Ö.Ş.; Literatür Taraması – G.B.,G.G., Ö.Ş.; Yazıyı Yazan – G.B.,G.G.,Ö.Ş.; Eleştirel İnceleme – G.B., G.G., Ö.Ş.

Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

References

Anonymous (2023). https://erzurum.ktb.gov.tr/TR-56063/cografya.html

Başer, G., & Tozlu, G. (2020). Atatürk Üniversitesi Kampüsü (Erzurum)'da bazı yabancı otlar üzerinde bulunan afit (Hemiptera: Aphididae) türlerinin belirlenmesi. *Bitki Koruma Bülteni*, *60*(2), 99–110. [CrossRef]

Blackman, R., & Eastop, V. (2023). *Aphids on the World's Plants: An Online Identification and Information Guide*. http://www.aphidsonworldsplants.info

Çanakçıoğlu, H. (1975). *The Aphidoidea of Turkey* (309p). Istanbul University Faculty of Forestry Publications.

Favret, C. (2023). *Aphid Species File*. http://Aphid.SpeciesFile.org.

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. [CrossRef]

Görür, G., Şenol, Ö., Akyıldırım Beğen, H., & Akyürek, B. (2023a). *Turkish Aphid*. [CrossRef]

Görür, G., Başer, G., Akyıldırım Beğen, H., Şenol, Ö., & Akyürek, B. (2023b). Effects of temperature fluctuations on aphids life cycle: Four case species. *Osmaniye Korkut Ata Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, *6*(1), 68–77. [CrossRef]

Görür, G., Şenol, Ö., & Akyıldırım Beğen, H. (2019). Evaluation of aphid species determined from Adıyaman, Malatya and Şanlıurfa provinces in terms of their contributions to Turkey's aphid fauna, Selçuk University Faculty of Science. *Journal of Science*, *45*(2), 103–115.

Görür, G., Şenol, Ö., Akyıldırım Beğen, H., & Akyürek, B. (2020). Foresights derived from recent studies conducted on Turkey aphid fauna, Atatürk University. *Journal of Agricultural Faculty*, *51*(1), 63–68. [CrossRef]

Görür, G., Şenol, Ö., Akyıldırım Beğen, H., Başer, G., & Akçay, B. V. (2022). *Investigation of aphid (Hemiptera:Aphidoidea) fauna in Antalya, Karaman and Muğla provinces*. TUBITAK project (project no:119Z250).

Holman, J. (2009). *Host Plant Catalog of Aphids, Palearctic region* (1216p). Springer, Branisovska.

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. [CrossRef]

Kök, Ş., & Özdemir, I. (2021). Annotated systematic checklist of the aphids (Hemiptera: Aphidomorpha) of Turkey. *Zootaxa*, *4925*(1), zootaxa.4925.1.1. [CrossRef]

Martin, J. H. (1983). The identification of common aphid pests of tropical agriculture. *Tropical Pest Management*, *29*(4), 395–411. [CrossRef]

Oğuzoğlu, Ş., Avcı, M., & Şenol, Ö. (2023). New contributions to the Turkish aphid fauna and species composition (Hemiptera: Aphididomorpha)

in Isparta forests. *Turkish Journal of Entomology*, *46*(4), 453–467. [CrossRef]

Özdemir, I. (2020). Some new records on aphid (Hemiptera, Aphididae) fauna of Turkey and aphid host plant interactions. *Journal of the Entomological Research Society*, *22*(2), 191–201.

Patlar, G., Oğuzoğlu, Ş., Avcı, M., & Şenol, Ö. (2021). Aphid (Hemiptera: Aphididae) species in Burdur urban parks with three records for the fauna of Turkey, their host plants and predators, Turkish. *Journal of Entomology*, *45*(3), 381–397. [CrossRef]

Ruberson, J. R. (1999). *Handbook of pest management*. Marcel Dekkar Inc.

Şenol, Ö., Görür, G., Başer, G., & Akyıldırım Beğen, H. (2021). Contributions to the Turkish aphid fauna from Aegean and Mediterranean part of Turkey. *Süleyman Demirel Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, *25*(3), 717–720. [CrossRef]

Vilcinskas, A. (2016). *Biology and ecology of aphids* (282p). CRC Press.

Yayla, M. (2022). New record of *Pentalonia nigronervosa* Coquerel, 1859 (Hemiptera, Aphididae) in Turkey. *Gazi Entomolojik Arastirmalar Dernegi*, *24*(3), 281–290. [CrossRef]