Novel contribution to the Türkiye aphid fauna with new host plant associations

Aphids are one of the important agricultural pest groups as they cause a significant amount of crop loss around the world. Six thousand valid species in 703 genera placed in 30 subfamilies of Aphidomorpha have been described worldwide (Favret 2023). Türkiye aphid fauna is currently represented by 632 species belonging to 169 genera (Görür et al. 2023 a,b). Although many species have been added during the last 20 years, the number of the species listed in Türkiye aphid fauna does not reflect the real composition due to the floristic richness, climatic variability, and tremendous agricultural production of Türkiye. In connection with the above-detailed information, 12 aphid species were added to Türkiye aphid fauna as a result of the study conducted in Antalya, Karaman, and Muğla provinces.

This study was conducted in Antalya, Muğla, and Karaman provinces from March 2020 to July 2022 to determine the aphid species on any host plants grown naturally and cultured. The specimens were processed according to the protocol proposed by Martin (1983). The samples were identified with an Olympus BX51 microscope, according to the key offered by Blackman & Eastop (2023). The voucher specimens were deposited at Nigde Ömer Halisdemir University.

One genus and 12 species were determined as novel contributions to the Türkiye aphid fauna. Each newly recorded aphid species' features were given individually as follows.

Aphis (*Aphis*) *khrulevae*
Stekolshchikov & Buga, 2018

Mainly feed on shoot apices between flowers and undersides of rolled and crinkled leaves of *Veronica longifolia*. Adult apterae individuals are black, BL 2.0-2.3 mm (Blackman & Eastop 2023). Ten apterae individuals (♀) were collected on the undersides of the slightly rolled *Veronica anagallis-aquatica* on 21.IV.2022 from Antalya-Kaş-Saklıkent. Adult apterae are green, olive green blackish (Fig. 1a), BL 1.75 mm, URS 0.10 mm, PT/BASE 2.7.

Figure 1. a. *Aphis khrulevae* on *Veronica anagallis-aquatica*, general appearances, and features; b. General appearances of both apterae and alate individuals of *Dysaphis ferulae*; c. *Dysaphis pulverina* on *Plantago coronopus*, general; d. *Semiaphis anthrisci* on *Anthriscus caucalis*, general appearances, and features; e. *Reticulaphis asymmetrica* on *Ficus carica*, general appearances; f. *Phylloxera stellate* on *Quercus pubescens*

Dysaphis (*Dysaphis*) *ferulae*
(Nevsky, 1929)

Mainly feed on members of *Ferula* spp. and rarely on *Prangos pabularia*. Apterae individuals are pale brown with slight white wax, BL 2.0-2.08mm (Holman 2009, Blackman & Eastop 2023). Eight apterae (♀) were collected on petioles of the *F. communis* on 23.IV.2022 from Muğla-Bodrum. The individuals are green, BL 1.60 mm, PT/BASE 2.1, longest hairs on ANT III 1.4 x BD III, R IV+V 1.2 x HT II (Fig. 1b).

Dysaphis (*Dysaphis*) *pulverina*
(Nevsky, 1929)

Mainly feed on leaves of *Plantago major* and *P. media*, but also on *Veronica persica* and *Ceratocephalkus falcatus*. Apterae individuals are pale green, greenish-yellow, BL 1.8-2.4 mm (Blackman & Eastop 2023). Fifteen apterae (♀) were collected on the stem, stalk, and shoot apices of both *P. coronopus* and *P. media* on 29.V.2021 from Karaman-Centrum and Karaman-ayrancı-Kavaközü. *P. coronopus* was added to the host plant list of *D. pulverina*. Adult apterae are shiny black, dark green (Fig. 1c), BL 1.47 mm, SIP/Cauda 1.28, URS IV+V 0.12mm, HT II 0.12mm.

Rhopalosiphoninus (Neorhopalosiphoninus) staphyleae
(Koch, 1854)

Feed on members of Lamiaceae, Liliaceae, Iridaceae, Staphyleaceae, Apocynaceae, and Brassicaceae families, particularly on *Staphylea pinnata*, leaves curl and become mottled pale yellow. Adult apterae are pale yellow, BL 2.3-3.0mm (Blackman & Eastop 2023). Four alatae (♀) were collected on the lower part leaves of *Ficus carica* on 22.VI.2021 from Muğla-Göcek. Adult alatae and nymphs are pale green, BL 1.60 mm, SIPH swelled over distal 0.58 of length, PT/BASE 8.58, not heavily colonized host plant.

Semiaphis anthrisci
(Kaltenbach, 1843)

Feed on members of Umbelliferae/Apiaceae, slightly rolling the leaves. Adult apterae are dirty green and wax-powdered, BL 1.8-2.2mm (Blackman & Eastop 2023). Fifteen individuals (♀) were collected on leaves and inflorescence of *Anthriscus caucalis* on 23.IV.2022 from Muğla-Bayır. Adult apterae are grey-green, slightly with wax (Fig. 1d), BL is 1.92-1.98mm, SIP is about 0.55 x Cauda, and PT/BASE is about 1.9.

Tinocallis (Sappocallis) ulmicola
(Matsumura, 1919)

Mainly feed on undersides of leaves of *Ulmus* spp and *Alnus serrulatoides*. Adult alatae individuals are greenish white, BL 1.4-1.6 mm (Blackman & Eastop, 2023). Ten adult alatae (♀) were collected on the undersides of leaves of *Ulmus minor* on 31.V.2020 from Antalya-Manavgat Waterfall. Adult alatae and immatures are yellow, whitish yellow. BL is about 1.3 mm; PT/BASE is about 0.9.

Tinocallis (Tinocallis) ulmiparvifoliae
Matsumura, 1919

Mainly feed on undersides of leaves of *Ulmus* spp and *Zelkova formosana*. Adult alatae individuals are pale blueish-green, BL 1.6-2.7 mm (Blackman & Eastop 2023). Four adult alatae (♀) were collected on the undersides of leaves of *Ulmus minor* on 20.VI.2021 from the Muğla-Kavaklıdere-Dokuzçam area, not heavily colonized leaves, adult alatae are whitish yellow. BL is about 1.7, and PT/BASE is about 1.1.

Chaitophorus pustulatus
Hille Ris Lambers, 1960

Mainly feed on leaves of *Salix* sp., there is no clear information provided for colony appearances, BL 1.0-1.9 mm (Blackman & Eastop 2023). Twelve apterae individuals (♀) were collected on leaves of *Salix* sp. on 22.VI.2022 from Karaman-Başyayla. It is the first appearance in life that they are dark green, and ant attendance was provided; BL is about 1.1 mm, PT/BASE is about 1, CaL/CaW is about 0.36, mixed with the *Chaitophorus parvus*.

Drepanosiphum acerinum
(Walker, 1848)

Feed on under lower leaves of *Acer* spp, especially on *A. pseudoplatanus*, usually in the shade, adult alatae individuals are whitish-green, yellow, BL 2.1-3.3mm (Blackman & Eastop 2023). Six adult alatae individuals (♀) were collected under the leaves of the lower parts of the *Acer pseudoplatanus* on 22.VI.2022 and 23.VI.2022 from both Karaman-Mehmetbey University Campuse and Karaman-Sarıveliler respectively. Adult alatae are yellowish and active, BL is 2.1mm, PT/BASE is about 7.7, URS IV+V is about 0.12 mm, and PT is about 0.84 x ANT III.

Reticulaphis asymmetrica
Hille Ris Lambers & Takahashi, 1959

Feed on undersides of leaves of *Ficus septica*, and adult elliptical individuals are blackish, BL 0.46-0.57mm (Blackman & Eastop, 2023). Ten adult aptera (♀) were collected on the undersides of leaves of *Ficus carica* on 23.X.2020 from Muğla-Marmaris-İncekum. Adult apterae individuals are a mix of blackish, yellow, and pale individuals (Fig. 1e) and are visited by ants even though there is no apparent honeydew production. *F. carica* was added to the host plant range of the *R. symmetrica*. BL is about 0.52 mm and about 1.5 times as long as its maximum width.

Diphyllaphis (*Nymphaphis*) *quercus*
(Takahashi, 1960)

Mainly feed on undersides of leaves of *Quercus* spp, curling the tips of the leaves, causing necrosis. Adult apterae are whitish with flocculent wax, BL 1.4-1.6 mm (Blackman & Eastop 2023). Eight apterae (♀) were collected on the undersides of leaves of the *Quercus* sp. on 23.VI.2022 from Karaman-Ermenek-Güzelyurt. Adult apterae are pale green with white wax, a mixed colony with *Diphyllaphis mordvilkoi*. BL is about 0.5 mm; PT/BASE is about 0.8; SIP pore is about 0.22 mm; ANT II is about 1.5 x ANT I.

Phylloxera stellata
Duncan, 1922

Feed on the undersides of the leaves of *Quercus* sp. causes brown spots; BL is about 0.5 mm, and there is no information on colony color, other morphs, or life cycles (Blackman & Eastop 2023). Fifteen adult aptera (♀) were collected on the undersides of leaves of *Quercus pubescens* on 03.IX.2021 Antalya-Ibradi-Altınbeşik Cave. Brown reddish apterae

individuals, that is the first-time detected colony color, heavily colonized undersides of leaves and caused easily recognizable yellowish-brownish spots (Fig. 1f). BL is about 0.35 mm; URS IV+V is about 0.05 mm, PT/BASE is about 0.2.

Türkiye has about 12000 plant species with 31% endemic composition (Güner et al. 2012). As a result of the contributions of recent studies, the species in Türkiye aphid fauna increased to 632 (Patlar et el. 2021, Özdemir 2022, Oğuzoğlu et al. 2022, Yayla 2022, Görür 2022, Görür et al. 2023 a, b). Recently, extended their feeding period on host plants by about two months, with 2-6 more generations in Türkiye, was reported of some aphid species (Görür et al. 2023c). The predicted global warming scenario and floristic composition of Türkiye can be a driving force for researchers to focus on the current composition of aphid fauna just before possible changes. More detailed studies should be carried out to find out the real composition of aphids in the country, as vast landscapes are waiting to be studied.

Acknowledgment
The authors express their gratitude to TUBİTAK (Project 119Z250).

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Keywords: Aphid, fauna, host plant, new record, Türkiye.

Article No.: e237304
Received: 11 March 2023 / Accepted: 21 April 2023
Available online: August 2023 / Printed: December 2023

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