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Classical morphological identification keys for Aphididae (Hemiptera) species in fruit orchards

Meyve ve bağlarda Aphididae (Hemiptera) türlerine yönelik klasik morfolojik tanımlama anahtarları

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A B S T R A C T

The accurate identification of pests is crucial for determining effective control measures against them. For this purpose, it is essential to know exactly which pests are present in the areas where agricultural production is carried out, and to create the necessary information, documentation, and methods to identify these pests quickly and accurately. Indeed, among plant pests, aphids (Aphidoidea: Hemiptera) represent an important group due to their ability to serve as vectors. They are polymorphic species that form many morphologically distinct forms within the same species. The presence of two or more distinct phenotypes within the same species population, along with morphology and biology that vary according to ecological conditions, creates challenges in both macroscopic and microscopic identification. Therefore, diagnoses are quite difficult. However, intraspecific variation also hinders safe and accurate diagnosis. Between 2016 and 2019, field studies conducted in Ankara province and its districts examined 1925 aphids from 301 samples collected at 133 locations, and 20 species were identified on fruit trees in Ankara province. The necessary data regarding the distinguishing morphological characteristics of the identified species were collected, and literature-supported keys were prepared. It is thought that this study could serve as a valuable resource for the accurate and rapid identification of harmful aphid species in fruit cultivation, which is an important part of economic entomology.

INTRODUCTION

One of the pests encountered in agricultural production is aphids. Aphids, which have a high number of generations, belong to the superfamily Aphidoidea in the order Hemiptera, and are a group of insects commonly seen in agricultural areas that cause significant damage to fruits and vineyards, depending on the host plant. They are also known colloquially as 'zenk' in our country. Due to the primary and secondary damages they cause to agricultural products, they can lead to economic losses. In addition to damaging plants by piercing and sucking, they can cause gall formations and secrete honeydew, which can lead to the growth of sooty mold. Furthermore, they are one of the most important

vector groups in the transmission of plant virus diseases (Toros 1973). The recent expansion of aphids' distribution areas, their rapid development of resistance to pesticides used in chemical control, and their negative effects on the vegetative growth and productivity of plants have made them increasingly important.

The Aphidoidea superfamily, commonly known as aphids, holds a significant place among insect groups in terms of species richness and population density. It is known that there are approximately 6081 species belonging to about 599 genera worldwide (Remaudiere and Remaudiere 1997, Blackman and Eastop 2026, Favret 2026).

In our country, numerous studies have been conducted to identify the species belonging to the Aphidoidea superfamily, with noteworthy additions made in the last five years. The identified species include aphids feeding on both cultivated plants and wild herbaceous plants. Approximately 689 species are recorded in Türkiye (Özdemir 2020, Çulcu et al. 2021, Kılıç et al. 2021, Kök and Özdemir 2021, Kök 2021, Zeybek and Tozlu 2022, Yılmaz and Kök 2023, Tayat and Özder 2023, Oğuzoğlu et al. 2023, Akyıldırım Beğen et al. 2023, Görür et al. 2023, Özdemir and Özdem 2024, Özdemir et al. 2024, Kök et al. 2024, Tayat and Özder 2024, Başer et al. 2024, Emir et al. 2025, Özdemir and Özdem 2025, Kök and Barjadze 2025, Görür et al. 2026).

It is necessary to increase the recognition of pest or natural enemy species encountered in agroecosystems. For this purpose, it is important and essential to provide researchers working on the subject with information prepared for specific groups of products, including the description of the pest, distinguishing characteristics from other species, identification keys, its status on the host, and the nature of the damage (Chapman 1971).

The purpose of this study is; many economically harmful species are known in fruit and vineyards in Türkiye. However, there are still no keys or catalogs prepared to facilitate the diagnosis of a specific product in our country. There are difficulties in morphologically distinguishing species of Aphids. Additionally, the identification keys belonging to this superfamily are insufficient, and the identification keys are mostly based on the close relationship of species with their host plants. The identification of species can only be performed by subject matter expert taxonomists using identification keys prepared for a whole group and identified comparative materials. When deciding on pest control in the field, more emphasis is placed on predicting pests that might be present on the crop or considering symptoms rather than directly identifying the species. The incorrect identification of the pest will lead to various negative outcomes such as the ineffectiveness of the selected control method, inability to prevent crop losses, and even the development of resistance over time due to excessive pesticide use. To solve this problem, it is necessary to clearly know the pests of any product group in a specific area. Morphology-based diagnostic characters have been prepared. The prepared diagnostic characters are supported by photographs. Thus, it will be possible to use them even by individuals who are not experts in the taxonomy of the group.

Creating a catalog, developing diagnostic keys or methods is quite challenging for areas that are not fully researched and contain complete uncertainty regarding the fauna inventory. Knowing at least partially the species targeted for the study is a positive situation in terms of the feasibility of the work. While the data regarding the diversity of fruit species grown in Ankara province and the pest aphid species dates back quite a while, when considering the existence of these species on a certain scale and the representativeness of this existing profile for the region, the chosen province for the project is correct and appropriate in terms of the project's objectives.

This study has identified the Aphidoidea species that cause damage in fruit crops and vineyards. A catalog has been prepared in book format, including descriptions of the identified species, distinctive morphological characteristics, the status of colonies on their host plants, and the damage they inflict. Accurate identification of pest aphid species in fruit crops and vineyards is considered to be an important resource for practical Entomology, the Ministry of Agriculture and Forestry's Technical Instructions for Agricultural Pest Control, and for the creation of potential publications such as books, brochures, leaflets, and other materials on this subject.

MATERIALS AND METHODS

The main materials of the study included aphid samples collected from areas of fruit and vineyard cultivation in Ankara, a camera, GPS (Global Positioning Systems) for recording elevation and coordinates, and laboratory equipment and materials.

Field studies

In the regions of Ankara Province where fruit and vineyard cultivation areas are concentrated, sampling was conducted primarily by recording elevation and coordinates. Aphid specimens were collected from fruit and vineyard plants. Samples were taken weekly or bi-weekly between May-June and September-October, while during other months, field visits were made as necessary for control purposes,

depending on climatic conditions, to collect samples from the leaves, stems, and root systems of plants observed to be infected with the pest. The sampling process was conducted between 2016 and 2019.

Laboratory studies

In the preparation of aphids, the methods applied by Hille Ris Lambers (1950) and Martin (1983) were used to carry out the preparation processes. Identification: During this study, the identifications of the collected aphids were made using references from Cottier (1953), Börner (1952), Bodenheimer and Swirski (1957), Hille Ris Lambers (1945, 1947a, 1947b, 1973), Börner and Heinze (1957), Tuatay and Remaudiere (1964), Shaposhnikov (1964), Stroyan (1957, 1961, 1963, 1969, 1977, 1984), Eastop (1971, 1972), Bissel (1978), Blackman and Eastop (1984, 1994, 2000, 2006, 2026), as well as Favret (2026).

RESULTS AND DISCUSSION

The aphid species described in the study are provided below along with their identification keys.

Ordo: Hemiptera Linnaeus, 1758

Subordo: Sternorrhyncha Amyot and Serville, 1843

Aphidomorpha Bekker-Migdissova and Aizenberg, 1962 (Infraorder)

Superfamilia: Aphidoidea Latreille, 1802

Familia: Aphididae Latreille, 1802

Subfamilia: Aphidinae Latreille, 1802

Subtribe: Aphidina Latreille, 1802

Genus: *Aphis* Linnaeus, 1758

Subtribe: Rhopalosiphina Mordvilko, 1914

Species: ***Hyalopterus pruni*** (Geoffroy, 1762)

Identification: Wingless viviparous females are long oval in shape, light green in color, and covered with a white waxy substance. There are three dark green bands on the body: one in the middle and two on the sides. The antennae have six segments and extend to about halfway along the body. The cornicles are short, cylindrical, or slightly swollen in appearance. The cauda is cone-shaped and is about twice as long as the cornicles. The body length is approximately 2.0-3.0 mm. In winged viviparous females, the abdomen is green, while the head and thorax are darkish in color. The abdomen is covered with a white waxy substance. The body is slightly smaller than that of the wingless forms (Lodos 1982).

In winged viviparous females, the abdomen is green, while the head and thorax are darkish in color. The abdomen is covered with a white waxy substance. The body is slightly smaller than that of the wingless forms (Lodos 1982). It is stated that there is no significant morphological difference between *Hyalopterus amygdali* and other species within the *Hyalopterus* genus (Shaposnikov 1964, Blackman and Eastop 1994, Remaudiere et al. 2006). Those observed on plum and closely related host plants have narrower and longer cornicles and smaller lateral abdominal projections compared to those on apricot, peach, and almond, and therefore are considered separate species; however, it has been reported that this issue has not been fully clarified worldwide (Blackman and Eastop 1984).

Diagnostic characters: In apterae, the tergum is membranous. There are no secondary sensoria in apterae; in alatae, there are 10-34 on the 3rd antennal segment, 0-12 on the 4th segment, and 0-5 on the 5th segment. The hairs on the 3rd antennal segment are about half or shorter than the median diameter of the segment. The base of the terminal process is 2.5 times or more. The cornicles are short or equal to the second segment of the hind tarsus. The tip of the rostrum is shorter than the second segment of the hind tarsus (0.07-0.09 mm). In apterae, the body is light green with dark green stripes, covered with a powdery structure, with the cornicles being dark green-black and the cauda being green. In alatae, the head and thorax are dark brown-black, the abdomen is light green, covered with a powdery structure, and the cornicles and cauda are the same as in apterae. The powdery structure appears as dots and bands on the dorsum in both forms ..... ***Hyalopterus pruni***

Hosts: The species known as the Mealy plum aphid has been found on *Prunus amygdalus* L., *Prunus domestica* L. and *Prunus armeniaca* L. in our study.

Genus: ***Rhopalosiphum*** Koch, 1854

Species: ***Rhopalosiphum nymphaeae*** (Linnaeus, 1761)

Identification: In wingless viviparous females, the head is dark brown-black. The antennae are dark-colored. The eyes are between dark red and black. The cornicles and cauda are black. The cauda typically has some amount of a powdery substance on it. The dorsum of the body has a network pattern, and the patterns on the thorax and abdomen appear polygonal. The body length is 2.4-3.2 mm. In winged viviparous females, the head and thorax are black, and the abdomen is brownish. There is a yellowish-green or brownish band on both the dorsal and ventral sides of the prothorax. The areas where the wing vein begins are light-colored. Additionally, the base of the 3rd antennal segment is

quite light in color. The body length is 2-3 mm. The cornicles are slightly swollen at the tips. The cauda has a spiny pattern.

Diagnostic characters: The body is very or slightly oval. Cornicles are 0.1 times the body length or longer. They are short to medium-sized, at least 0.4 times or more the length of the body. The base of the terminal process is 3 times or more the length of the third antennal segment, with hairs that are few and shorter than medium diameter. The antennae generally consist of 6 segments. In apterous forms, the cornicles are swollen and have a smooth texture. The rostrum reaches the 3rd coxa, with the tip longer than the second segment of the hind tarsus (approximately 0.16-0.20 mm). The head, stigmal plates, cornicles, cauda (pale at the base), anal and subgenital plates are slightly sclerotized. There are distinct polygonal shapes on the thorax and abdomen. Marginal tubercles are present on the prothorax and on abdominal segments 1 to 7. The antennae are approximately 0.5-0.8 times the body length. The hairs on the 3rd antennal segment are about 0.30-0.54 times the average diameter of the segment. The cornicles are 0.11-0.18 times the body length. The cauda is 1/3 to 1/2 the length of the cornicles. The coloration can be green, brownish-green, reddish, or yellowish-brown, with the head and sometimes the thorax being darker; the cornicles and cauda are dark. In alatae forms, the cornicles are long, approximately 0.17-0.21 times the body length. The base of the terminal process is 3.5-5 times longer. The secondary sensory structures on the 3rd antennal segment range from 15-24, and on the 4th segment from 0-8. The cornicles are swollen. The cauda is 0.34-0.39 times the length of the cornicles. The head and thorax are black, while the abdomen is green or yellow; the cornicles are greenish-brown to brown, and the cauda is blackish-brown. The darker parts are sclerotized ..... ***Rhopalosiphum nymphaeae***

Hosts: In our country, *Nuphar* spp., *Prunus domestica*, *P. avium*, *P. salicina* and *Nymphaea alba* plant species have been identified (Giray 1974, Çanakcıoğlu 1975, Özdemir and Toros 1997). In this study, it has been detected on *Prunus armeniaca* L.

Species: *Rhopalosiphum padi* (Linnaeus, 1758)

Identification: In wingless viviparous females, the head is dark brown to black. The antennae are dark-colored. The eyes are between dark red and black. The cornicles and cauda are black. There is usually some waxy material on the cauda. The dorsal side of the body has a webbed pattern. The patterns on the thorax and abdomen appear polygonal. The body length is 2.4-3.2 mm. The wingless individual is flattened oval, olive green or darker greenish black. It is recognized by a rust-colored spot surrounding the base of the cornicle. The cornicle is longer than the cauda and dark in color. In winged viviparous females, the head and thorax are black, and the abdomen is brownish. There is a yellowish green or brownish band on the dorsal and ventral sides of the prothorax. The parts where the venation begins on the wing are light-colored. Again, the base part of the third antennal segment is quite light-colored. The body length is 2-3 mm. The cornicle is slightly swollen at the ends. The cauda has a spiny pattern.

Diagnostic characters: Fundatrix antennas segmented into 6. In the winged form, there are secondary sensory organs in the 3rd antenna segment, ranging from 19 to 33. The coloration can be green, gray waxy powdery, with a brown corniculate surrounding. They are longitudinally situated at the surface of the leaves and the tips of young shoots, in the margins. Transitions occur from the 3rd generation. Prunus and Poaceae (oats, wheat, barley, corn) ..... ***Rhopalosiphum padi***

Hosts: In our country, *Nuphar* sp., *Prunus domestica*, *P. avium*, *P. salicina* and *Nymphaea alba* plant species have been identified (Giray 1974, Çanakcıoğlu 1975, Özdemir and Toros 1997). For the first time in Türkiye, it was found on *Triticum* sp. in 1962 in Ankara province, and it was also noted that the primary host of the pest is *Prunus domestica* (Tuatay and Remaudiere 1964). In this study, it was recorded on *Malus domestica* L. and *Pyrus communis* L.

Tribe: Macrosiphini Wilson, 1910

Genus: *Brachycaudus* van der Goot, 1913

Subgenus: *Appelia* Börner, 1930

Species: *Brachycaudus (Appelia) schwartzi* (Börner 1931)

Identification: The wingless individual varies in color from bright yellow-brown to dark brown and has dark spots on the dorsal side of the abdomen.

Diagnostic characters: The wingless body length is 1.4-2.1 mm, with a broad dorsal black sclerotization and is bright yellow-brown to dark brown in color; the pre-adult individuals are yellow-brown. Wingless individuals have antennae with 23-36 secondary sensoria distributed on the III segment, 6-17 on the IV segment, and 0 (-1) on the V segment ..... ***Brachycaudus (Appelia) schwartzi***

Hosts: *B. (A.) schwartzii*, referred to as *B. p.* ssp. *schwartzii* by Remaudiere and Tuatay (1964). It was first detected in our country on *Prunus persica* at Göztepe, Istanbul, in 1961. In this study, it is recorded on *Prunus domestica* L. Without host changes, they complete their life cycle; spring colonies cause severe curling and damage to peach leaves.

Known as the peach leaf curl aphid, *Brachycaudus (Appelia) schwartzi* causes heavy damage to nectarine, peach, and plum. In autumn and winter, *B. schwartzi* reproduces parthenogenetically. Although males are present, winter eggs have not been detected.

Subtribe: *Brachycaudus* van der Goot, 1913

Species: *Brachycaudus helichrysi* (Kaltenbach, 1843)

Identification: The color in *Brachycaudus helichrysi* can be quite variable. In the initial spring population on primary host plants, the wingless individuals may be green, brown, greenish-brown, or brownish-yellow. The body surface has a slightly waxy, glossy appearance. The wingless individuals in the summer population on secondary hosts are quite small in size, and are green, pale yellow, or whitish. Body length ranges from 0.9 to 2.0 mm. Antennae are short and about half the length of the body. The head, legs, and siphon gills (cornicles) are black. A black spot may sometimes be present at the end of the abdomen.

Winged forms are long-oval in shape and the body is covered with a white waxy substance. The head and thorax are black, the abdomen and cauda are green or greenish yellow, and the siphon gills are brown. Body length ranges from 1.1 to 2.2 mm (Avidov and Harpaz 1969, Blackman and Eastop 1984)

Diagnostic characters: The base of the last segment of the antenna's terminal process is 1.6-2.5 times. There are no lateral tubercles in the abdomen (sometimes a small one in the 4th segment). The dorsal side of the abdomen has pale or variable (usually mottled or scattered) pigmentation. There are 6-9 hairs on the 8th abdominal tergite, each 25-60 µm long ..... ***Brachycaudus helichrysi***

Hosts: It was first recorded in Türkiye by Tuatay and Remaudiere (1964) on *Pyrus* sp. In this study, it was identified on *Prunus domestica* L., *Prunus armeniaca* L., *Prunus avium* L., *Prunus cerasus* L. and *Prunus persica* L.

Subgenus: *Prunaphis* Shaposhnikov 1964

Species: *Brachycaudus (Prunaphis) cardui* (Linnaeus, 1758)

Identification: *B. cardui*, which is found within *Acaudus*, the largest subgenus of the genus *Brachycaudus*, has wingless individuals that are colored green, yellow, or reddish, and on the secondary host during summer generations, there is a broad, shiny black sclerotic spot on the dorsal abdomen. In the spring generations on the primary host, the color appears more matte. This dark spot is not seen on *Prunus*. Sometimes it can also be found underground, on the roots. The body length of wingless individuals is about 1.9-2.6 mm, while in winged individuals, it is around 1.6-2.3 mm (Blackman and Eastop 2000, 2026).

The wingless individuals of *cardui*, which are included in *Acaudus*, the largest subgenus of the genus *Brachycaudus*, have a coloration that is green, yellow, or reddish. On the secondary host, there is a broad sclerotic spot of bright black color on the dorsal side of the abdomen, while on the primary host, the color appears more matte (Blackman and Eastop 1984). This dark spot is not seen in *Prunus*. Sometimes, it can also be found under ground, on the roots.

Diagnostic characters: The last rostral segment is not longer than 0.18 mm. There is variable pigmentation on the dorsal abdomen, fairly pale. The cauda is helmet-shaped, shorter than or equal to the width of the base. The cornea is pale or dark. Dorsal abdomen shows widespread black pigments .... ***Brachycaudus (Prunaphis) cardui***

Hosts: The first record in our country was made in 1939 in Ankara on *Prunus domestica* and *Carduus* sp. (Bodenheimer and Swirski 1957). In this study, it was recorded on *Cydonia oblonga* L., *Amygdalus communis* L. and *Prunus persica* L.

Subgenus: *Scrophulaphis* Andreev, 1982

Species: *Brachycaudus (Scrophulaphis) persicae* (Passerini, 1860)

Identification: Wingless adult individuals vary in color from bright dark brown to black. The corniculus appears black. In winged individuals, there is a secondary sensoria on the III, IV, and V antennal segments. This feature distinguishes this genus from other species. Body length in wingless individuals is approximately 1.5–2.2 mm, while in winged individuals it is approximately 1.7–2.1 mm (Blackman and Eastop 2000, Toros et al. 2002).

Diagnostic characters: The distal part of the last antennal segment is considerably longer than the basal part. The last rostral segment is shorter than 0.175 mm. The dorsal side of the abdomen is densely sclerotized, appearing as a black shell. The corniculi are black and expand from the tip towards the base ..... ***Brachycaudus (Scrophulaphis) persicae***

Hosts: In our country, *Onobrychis viciifolia*, *Prunus cerasus*, *P. domestica*, *P. persica*, *P. spinosus*, *Prunus* spp., and *Pyrus communis* have been found (Çanakçıoğlu 1975, Düzgüneş et al. 1982, Toros et al. 2002, Çota 2007, Kaygın et al. 2008). *Prunus* species particularly prefer *P. persicae*, but they also use *P. domestica* and *P. spinosus*. It has been reported that it was detected on *Pyrus communis* (Görür 2004). In this study, it has been recorded on *Prunus domestica* L.

Subgenus: *Thuleaphis* Hille Ris Lambers, 1960

Species: *Brachycaudus (Thuleaphis) amygdalinus* (Schouteden, 1905)

Identification: The wingless individual has a thick, dwarf-like body and short antennae and legs. It measures about 1.6–2.1 mm. The abdomen of the winged individual bears a dark blotch (Blackman and Eastop 1984). *Brachycaudus* (*Appelia*) *tragopogonis* exhibits colors ranging from bright gray-brown to dark brown. It is noted that *Brachycaudus* (*A.*) *tragopogonis*, *Brachycaudus prunicola*, and *Brachycaudus schwartzii* belong to a complex of closely related species, whose taxonomic confusion and host relationships involve a host-switch between *Tragopogon* and *Prunus*; those that show host-switch between *Tragopogon* and *Prunus* may correspond to the form of *Brachycaudus prunicola* (Blackman and Eastop 1984, 2000).

Diagnostic characters: They are green with variably developed dark dorsal markings, have a compact body, and have quite short pale legs and antennae; the body length is 1.6-2.1 mm. In winged individuals, there is a dark central abdominal spot, and there are secondary sensoria distributed as III 12-21, IV 0-1 (spring migrants) or III 9-16, IV 0 (gynoparae) on the antennae ..... ***Brachycaudus (Thuleaphis) amygdalinus***

Hosts: In our country, it has been recorded under the name *Aphis prunina* on *Tragopogon* (Düzgüneş and Tuatay 1956). It is also noted to be collected with the name *Brachycaudus amygdalus* from *Amygdalus communis* and *Polygonum aviculare* (Tuatay and Remaudiere 1964). Düzgüneş et al. (1982) also reported identifying this species on *P. amygdalus* and *Prunus* sp. In our country, it has also been detected on *Tragopogon* spp. and an unidentified weed, as well as *Tragopogon longirostris*, *T. coloratum*, and *Tragopogon* spp. (Tuatay 1988). Toros et al. (2002) identified it on *Tragopogon angustifolium* and *Prunus spinosa*. In spring, colonies cause the folding of young almond or peach leaves and the dwarfing of new growth. *Polygonum* (especially small-leaved) species migrate to *Persicaria maculosa* and *Fagopyrum cymosum*. In *Polygonum aviculare*, they feed by hiding under the fine parentheses surrounding the nodes (Talhouk 1977). *Prunus* spp., especially *P. dulcis* or *P. persica*, and *Polygonaceae* act as host switches. At the same time, even where primary hosts are present, anholocenicity is frequently observed in Polygonaceae.

Genus: *Dysaphis* Börner, 1931

Species: *Dysaphis devecta* (Walker, 1849)

Identification: Wingless females are 1.5–3.0 mm long, large, and exhibit a range of colors from dark green to pinkish, pinkish-brown, and gray-purple. The body surface is covered with a whitish waxy powder. In individuals that have just shed their exoskeleton, this waxy layer is not visible. The cornicles are long and black, the antennae are as long as the body, and the cauda is very short and enlarges triangularly toward the base.

Winged females have a head and thorax that are glossy black, and the abdomen is rusty brown. There is a broad black spot on the abdomen. The cornicles are cylindrical with a dark-colored tip. The cauda is very short and slightly pointed at the end, and dark in color. Also known as the pink apple aphid, this aphid overwinters on the 2–3 year-old shoots of its winter host, apple trees, laying eggs in the bud near the buds. The aphid appears bluish-gray in color and dusty due to the same-colored waxy secretion. It shows monoecious holocyclic life on Malus communis. Additionally, after producing 3–4 generations on the host, it typically gives rise to sexual individuals by mid-summer and lays the winter eggs again in early spring (Hille Ris Lambers 1945).

Diagnostic characters: The hairs found in antenna segment III are long. There is no thoracic sclerotization in the true wing with only sparse abdominal pigmentation .... ***Dysaphis devecta***

Hosts: The first record in Türkiye was made in 1959 in Malatya on *Pyrus malus* (Tuatay and Remaudiere 1964). The species known as the apple red gall aphid was found in this study on *Malus domestica* L.

Subgenus: *Pomaphis* Börner, 1939

Species: *Dysaphis (Pomaphis) plantaginea* (Passerini, 1860)

Identification: Wingless viviparous females are pale pink, amber, pink, pinkish-brown, purplish-gray, purplish-gray, or gray-black in color, with a dusty appearance on the body. The cauda is very short and blunt; the caudal horn is cylindrical. The tip of both the horn and the cauda is dark. Body length is approximately 1.8–2.5 mm.

Winged viviparous females have a head and thorax that are shiny, with color ranging from dark brown to black. The abdomen is rust-brown in color. There is a broad black spot on the abdomen. The third, fourth, and fifth antennal segments contain a large number of secondary sensory structures. Compared to the wingless forms, the head is somewhat larger. The horn is cylindrical with a dark tip. The cauda is very short and slightly pointed toward the tip, darker in color. Wing venation is normal. Body length is about 2.0–2.4 mm. (Avidov and Harpaz 1969, Düzgüneş and Toros 1978, Toros et al. 2002).

Diagnostic characters: Antenna with 5 or 6 segments. Tarsi with 2 equal claws. Cornicles dark, tube-like, longer than the cauda, a bit shorter than 3 times its length. Not longer than the width of the cauda base. Antennal tubercles do not exceed the height of the middle part of the forehead. There are marginal tubercles on many segments of the abdomen. In apterae, the distance from the antenna to the base of the cornicle is as long as the body length in alatae, approximately equal to the body length. In apterae, there is no pigmentation on the abdominal tergites in front of the cornicle ..... ***Dysaphis (Pomaphis) plantaginea***

Hosts: The first record in our country was made in 1939 in Ankara on *Prunus amygdalus* and in Gaziantep on *Pyrus malus* (Bodenheimer and Swirski 1957). The species known as the apple gray aphid was recorded in the study on *Malus domestica* L.

Species: ***Dysaphis (Pomaphis) pyri*** (Boyer de Fonscolombe, 1841)

Identification: Ranging in size from approximately 1.7 to 3.2 mm (Blackman and Eastop 1984), it is colorless and comes in shades from brownish red to dark brown without wings, and has a dusty appearance covered with a waxy secretion. The body is black in color.

Diagnostic characters: The Kornikıl black has diameters in the range of 3.4-4.1 at the midpoint. The marginal tubercles are hemispherical. In the anterior, the secondary sensory counts are 23-36 in III, 2-10 in IV, and 0-1 in V. .... ***Dysaphis (Pomaphis) pyri***

Hosts: The first record in our country was made in 1939 on *Pyrus communis* in Ankara (Tuatay et al. 1967, 1972). This study was recorded through *Malus domestica* L. and *Pyrus communis* L.

Genus: ***Myzus*** Passerini, 1860

Species: ***Myzus cerasi*** (Fabricius, 1775)

Identification: They are small to medium-sized aphids. Their colors vary from quite bright, to dark brown to black. The dorsum has a sclerotic appearance. The legs and antennae are bi-colored, yellow and black. The cornicles and cauda are also bright black. Wingless individuals are 1.5-2.6 mm long, while winged individuals are 1.4-2.1 mm long (Blackman and Eastop 2000).

Diagnostic characters: The base of the 6th antenna segment of the terminal process is 2.75-4.75 times larger (rarely less than 3). There are 4-21 sensory organs in the 3rd antenna segment. The body length is 4-6.5 times that of the corniculs. The black areas on the dorsal side of the abdomen are more numerous, pale-colored, and have a tiled structure. The cauda is triangular or tongue-shaped, with the dorsal side appearing larger than the underside ..... ***Myzus cerasi***

Hosts: It was first identified in Türkiye in 1940 on *Prunus cerasus* and *P. prunarium* in Iznik (Bodenheimer and Swirski 1957). In this study, it was identified on *Prunus avium* L. and *Prunus cerasus* L.

Species: ***Myzus lythri*** (Schrank, 1801)

Identification: The wingless individual appears to be yellowish-green with long dark green stripes, measuring about 2 mm in size. The winged forms are darker in color and have a rectangular dark spot on the dorsal abdomen (Blackman and Eastop 1994).

Diagnostic characters: Rostrum IV+V 1.2-1.4 × Hind Tibia II, 2 accessory hairs. 5-6 hairs in the caudal area and approximately 3 x caudal in the corniculate ..... ***Myzus lythri***

Hosts: According to national records, it was first collected in Ankara in 1939 through *Prunus mahalep* (Tuatay and Remaudiere 1964). In this study, it was identified on *Amygdalus communis* L., *Prunus domestica* L. and *Prunus cerasifera* L.

Subgenus: ***Nectarosiphon*** Schouteden, 1901

Species: ***Myzus (Nectarosiphon) persicae*** (Sulzer, 1776)

Identification: Wingless viviparous females: body color ranges from whitish yellowish green to grayish green, pale yellow-green, or pinkish and reddish-green. Antennae are slightly shorter than the body, and antennal tubercles are prominent. The tips of the antennae and the horn are darkly shaded, and the horn is cylindrical or slightly swollen. The cauda is pointed and shorter than the horn. Body length is about 1.86–2.0 mm.

Winged viviparous females: abdomen is rather shiny, and the head and thorax are blackish. Antennae are dark brown or black and of average body length. The horn color is dark brownish-black and cylindrical. The cauda is slightly keeled with three pairs of marginal setae. Body length is about 1.8–2.1 mm. (Düzgüneş and Tuatay 1956, Blackman and Eastop 1984)

Diagnostic characters: The cornicle is knob-like, and the body length is 4.5-7 times that of the cornicle. The subapical diameter of the cornicle is equal to the base diameter. The last rostral segment is 0.8-1.1 times that of the second segment of the hind tarsus. There are 8-17 sensory structures in the third antennal segment. There are no spines on the hind tibia during the nymph stage ..... ***Myzus (Nectarosiphon) persicae***

Hosts: The first record of *Myzus* (*Nectarosiphon*) persicae in our country was made in 1938 in Ankara on *Spinacia oleracea* L. (Bodenheimer and Swirski 1957). In this study, it has been recorded on *Prunus avium* L., *Prunus cerasus* L., and *Prunus persica* L.

Species: *Ovatus crataegarius* (Walker, 1850)

Identification: Small, oval, yellow-green to green leaf aphids. In winged viviparous females, the abdomen in the wingless forms does not have black lines on the dorsal side. Body length is 1.1–1.9 mm in wingless forms, and 1.5–2.1 mm in winged forms (Blackman and Eastop 2000). In wingless viviparous females, the body is small and yellowish-green in color. Body length is up to 1.1–1.9 mm.

Diagnostic characters: Antenna with 5 or 6 segments. There are 2 equal claws on the tarsi. Antenna tubercles are well developed. The inner surface of the antenna tubercles is parallel or extends towards each other. There is no polygonal pattern in the cornicula. The cornicula taper from the base to the edge. The cornicula are pale in colour ..... ***Ovatus crataegarius***

Hosts: In our country, this type of *Crataegus* sp., *Crataegus orientalis*, *Malus communis* and *Cydonia vulgaris* has been found (Tuatay 1991, Ölmez 2000, Çobanoğlu 2000). In this study, it has been recorded on *Malus domestica* L. and *Pyrus communis* L.

Subfamilia: Calaphidinae Oestlund, 1919

Genus: *Myzocallis* Passerini, 1860

Subgenus: *Myzocallis* Passerini, 1860

Species: *Myzocallis coryli* (Goeze, 1778)

Identification: In wingless viviparous females, the body bears long hairs. The body is transparent yellow, light green, or pale white. Antennae are as long as the body and transparent. The cornicles and cauda are pale yellowish. Body length is 1.3–1.6 mm.

In winged viviparous females, the body hairs are sharp and sparse. The body color is pale straw yellow-green or white. The wings are transparent and the cauda is rounded. Body length is 1–1.5 mm (Düzgüneş and Tuatay 1956).

Diagnostic characters: There is no transverse ventral black band at the beginning. The cauda is knobbed, and the anal plate is bilobed. The cornicles are small, shaped like truncated cones. The ratio of the length of the terminal process of the antenna to its basal base is greater than 2.0 ..... ***Myzocallis coryli***

Hosts: Some researchers have recorded this species in Ankara, Istanbul, and Trabzon in Türkiye (Düzgüneş and Tuatay 1956, Bodenheimer and Swirski 1957, Çanakçıoğlu 1967). It has also been found through *Corylus* sp. in this study.

Subtribe: Panaphidina Oestlund, 1923

Species: *Chromaphis juglandicola* (Kaltenbach, 1843)

Identification: Adults exhibit parthenogenetic reproduction and are in the winged form. They are light lemon yellow or yellowish-brown and relatively large, measuring 1.5–2.5 mm. Antennae are short, and the terminal process (processus terminalis) appears thick. The cauda is knob-like. All nymphs of *Chromaphis juglandicola* are winged as adults. The fourth-instar nymphs are yellow or yellowish-white, and many of the abdominal tergites bear paired brown spots. The pale brown to tan thoracic lobes of the winged individual are yellowish-white. In autumn, winged individuals show paired brown markings on abdominal tergites 4 and 5. Antennae have dark brown tips and are about half the body length. The terminal process length is 0.2 times the length of the basal segment of the last antenna. The cornicles are conical and smooth (Düzgüneş and Tuatay 1956).

Diagnostic characters: The cauda is pale or brown, tuberous. In adults, all with wings have a process terminalis / base length less than 1.5. The anal plate has only shallow indentations. Hairs on the hind tibia are shorter, the longest is 2 times smaller than the middle diameter of the tibia. The wings have no dark spots at the tips of the veins ..... ***Chromaphis juglandicola***

Hosts: The first record in our country was made by Düzgüneş and Tuatay (1956) on *Juglans regia* L. without specifying location and date. In this study, the same host plant has also been identified.

Genus: *Panaphis* Kirkaldy, 1904

Species: *Panaphis juglandis* (Goeze, 1778)

Identification: It is approximately 3.5-4 mm in size. In ***P. juglandis***, which has all parthenogenetic forms with wings, the veins on the wings have brown edges and there are dark transverse bands on the abdomen.

Diagnostic characters: Body length greater than 3.0 mm. Most tergites have quite a wide dark cross-banded dorsal abdomen. The cauda is in a spherical knob shape. Abdomen tergites 1 and 2 have broken pigmentation. The forewings have bordered veins ..... ***Panaphis juglandis***

Hosts: In the country records, Düzgüneş and Tuatay (1956) first mention that it was collected from *Juglans regia* without recording the location and date.

Subfamilia: Eriosomatinae

Tribe: Eriosomatini

Genus: ***Eriosoma*** Leach, 1818

Species: ***Eriosoma lanigerum*** (Hausmann, 1802)

Identification: The body length of this species ranges between 1.8 and 2.8 mm. Wingless viviparous females have a plump oval body, usually dark purplish to dark reddish brown in color, covered with a layer of powdery and cotton-like threads. In live individuals, the body is covered with long white cottony secretions, which conceal its actual body color. On its host plant, it can easily be recognized by this cottony appearance. The antennae are short and consist of six segments. The cornicles are greatly reduced, taking a ring-like shape, surrounded by fine hairs. When examined microscopically, the wax glands arranged on the body in a distinct pattern are characteristic. In winged viviparous females, the body length is about 2 mm. The head and thorax are dark brownish-black, while the abdomen is covered with the same white cottony substance as in wingless females. The cornicles are also similar to those in the wingless forms (Düzgüneş and Tuatay 1956, Avidov and Harpaz 1969, Toros et al. 2002).

Diagnostic characters: In apterae, there are transverse wax plates at the terminal part of the abdomen. On the 8th abdominal tergite, the size and number of wax plates are reduced. The last rostral segment is about 0.17 mm long, approximately one-third the length of the hind tibia. In alatae, the 3rd antennal segment measures 0.34–0.45 mm, bearing 13–16 sensoria and 4–9 setae. On the 4th antennal segment there are 3–7 secondary sensoria, on the 5th segment 3–6, and on the 6th segment 0–2. The subgenital plate carries 13–20 setae. The body length is about 1.9–2.5 mm ..... ***Eriosoma lanigerum***

Hosts: The first record of *E. lanigerum* was made in 1938 on *Malus communis* in Sürmene/Trabzon and Aksu (Schmitschek 1944). The species, known as the woolly apple aphid, was also recorded in this study on *Malus domestica* L.

Subfamilia: Lachninae Herrich-Schaeffer, 1854

Tribe: Lachnini Herrich-Schaeffer, 1854

Genus: ***Pterochloroides*** Mordvilko, 1914

Species: ***Pterochloroides persicae*** (Cholodkovsky, 1899)

Identification: The wingless individual is 2.7 mm in size, dark brown in color, with a dusty appearance on its thorax and abdomen. The winged individual is 4.2 mm in size (Blackman and Eastop 1994), shiny, oval-shaped, and has pigmented areas on the forewings. Their bodies are soft, plump, and have a slightly dusty appearance.

Diagnostic characters: The cauda is rounded, triangular, or finger-like, sometimes ending with a constriction, but not with an apical knob. The anal plate is complete, rounded, and without indentations. Cornicles are present in various forms, either hairy, hairless, or absent. In apterous forms, the cornicles appear as large pores situated on broad dark hairy cones. The dorsum bears paired rows of large pigmented spinal tubercles. In alate forms, the forewing has a short, blunt pterostigma ..... ***Pterochloroides persicae***

Hosts: The first record related to this type was provided by Düzgüneş and Tuatay (1956). In this study, it was found on *Prunus persica* L.

In short, if we want to conclude, this study will facilitate the morphological identification of aphid species in fruit orchards. This study aims to address the challenges encountered in the diagnosis of aphid species that cause problems in fruit and vineyard crops. The primary objectives include the development of rapid identification methods, thus preventing erroneous practices stemming from misidentification. Additionally, diagnostic characters based on morphology have been prepared to aid in species recognition. The prepared diagnostic characters are supported by identification keys, making them accessible even to individuals who are not experts in taxonomy.

Creating catalogs, developing identification keys, or methodologies for areas that are largely unknown or where the fauna inventory has not been previously established is quite challenging. It is advantageous for the feasibility of this study that the target species are known, at least in part. Given that the diversity of fruit species in Ankara province is well-documented, though the data on pest aphid species dates back several years, the presence of these species on a certain scale and the representability of this existing profile make this province a suitable and sound choice for the project's objectives. This study has successfully identified the aphid species belonging to the family Aphidoidae that damage fruit and vine crops. For each identified species, descriptions including defining morphological characteristics, the status of colonies on hosts, and details pertinent to their identification have been prepared. Data obtained from phylogenetic studies, as well as assessments of host preferences of the species, have been utilized in this process.

The results report of the project and the catalog to be prepared are expected to serve as important resources for the accurate identification of pest aphid species in fruit and vineyard crops. These outputs could be beneficial for applied entomology, the Ministry of Agriculture and Forestry's

Technical Instructions for Agricultural Pest Control, as well as for the preparation of books, brochures, leaflets, and other publications related to this subject.

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Author's Contributions

Authors declare that each author's contribution is equal.

Statement of Conflict of Interest

The authors have declared no conflict of interest.

ÖZET

Zararlının doğru olarak teşhisi zararlı ile mücadelenin belirlenmesinde büyük öneme sahiptir. Bunun için tarımsal üretimin gerçekleştirildiği alanlarda hangi zararlıların bulunduğunun kesin olarak bilinmesi, bu zararlıların hızlı ve kesin bir şekilde tanınabilmesi için gerekli bilgi, doküman ve metotların oluşturulması önem arz etmektedir. Nitekim bitki zararlıları içerisinde vektör olabilme özelliği ile de önemli bir grubu temsil eden yaprakbitleri (Aphidoidea: Hemiptera) polimorfik türler olup, aynı tür içinde birbirlerinden belirli şekilde morfolojik olarak farklı birçok form meydana getirirler. İki veya daha fazla farklı fenotipin aynı tür popülasyonunda bulunması özelliği ile ekolojik koşullara göre değişebilen morfoloji ve biyolojileri makroskobik ve mikroskobik tanıda güçlükler oluşturmaktadır. Dolayısıyla da teşhisleri oldukça zordur. Bununla birlikte tür içi varyasyon da güvenli ve doğru teşhisi engellemektedir. 2016-2019 yılları arasında Ankara ili ve ilçelerine yapılan arazi çalışmalarında 133 lokaliteden 301 örneğe ait 1925 adet yaprakbiti incelenmiş, Ankara ilinde meyve ağaçlarında 20 tür belirlenmiştir. Tespit edilen türlerin morfolojik karakterlerinin ayırt edici özellikleri ile ilgili gerekli veriler toplanmış ve literatür destekli anahtarlar hazırlanmıştır. Çalışmanın, ekonomik entomolojinin önemli bir bölümünü kapsayan meyve bahçelerinde zararlı yaprakbiti türlerinin doğru ve hızlı olarak teşhis edilmesinde kaydadeğer bir kaynak olabileceği düşünülmektedir.

Anahtar kelimeler: Aphidoidea, meyve, konukçu bitki, teşhis anahtarı

REFERENCES

Akyıldırım Beğen H., Görür G., Şenol Ö., Başer G., Akçay B.V., 2023. Aphid species (Hemiptera: Aphidoidae) determined from Antalya, Karaman and Muğla with new aphid records. Turkish Journal of Entomology, 47 (3), 317-328. http://dx.doi. org/10.16970 /entoted.1272814.

Avidov Z., Harpaz I., 1969. Plant pests of Israel. Israel University Press, Jerusalem, 549 pp.

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

Bissel T.L., 1978. Aphids on Juglandaceae in North America. Maryland Agricultural Experiment Station, 78 pp.

Blackman R.L., Eastop V.F., 1984. Aphids on the world's crops: an identification guide. A Wiley. Intenscience Publication, 466 pp.

Blackman R.L., Eastop V.F., 1994. Aphids on the world's trees. an identification and information guide. CAB International, Wallingford, 1004 pp.

Blackman R.L., Eastop V.F., 2000. Aphids on the world's crops: an identification guide. Second Edition. A Wiley. Intenscience Publication, 414 pp.

Blackman R.L., Eastop V.F., 2006. Aphid's on the world's herbaceous plants and shrubs: an identification and information guide. Wiley, Chichester, 1460 pp.

Blackman R.L., Eastop V.F., 2026. Aphids on the world's plants. an online identification and information guide. Available from: http://www.aphidsonworldsplants.info (accessed date: 02.03.2026).

Bodenheimer F.S., Swirski E., 1957. The Aphidoidea of the Middle East. The Weizmann Science Press of Israel, Jerusalem, 378 pp.

Börner C., 1952. Europae Centralis Aphides. Die Blattläuse Mitteleuropas, Namen, Synonyme, Wirtspflanzen, Generationszyklen. In: Mitteilungen der Thüringischen Botanischen Gesellschaft, 3 (1), 1–259 pp.

Börner C., Heinze K., 1957. Aphidina. Part 4 (Homoptera II) (Aphidoidea). Handbuch der Pflanzen krankheiten (Ed. Sorauer), 5 th Ed., 402 pp.

Chapman R.F., 1971. The insects: structure and function. Elsevier, New York., 819 pp.

Cottier W., 1953. Aphids of New Zealand. New Zealand Department of Scientific and Industrial Research Bulletin, No:106, 382 pp.

Çanakçıoğlu H., 1967. Research on Aphids (Aphidoidea) affecting forest trees in Turkey. Republic of Turkey Ministry of Agriculture, General Directorate of Forestry Publications, Publication No: 466, Series No: 22, VIII., 151 pp.

Çanakçıoğlu H., 1975. The Aphidoidea of Turkey. İstanbul Üniversitesi Orman Fakültesi Yayınları, O.F. Yayın Seri A, Cilt: XXII, Sayı:1.

Çobanoğlu S., 2000. Aphididae (Hom.) Species of Edirne province (Thrace part of Turkey). Entomologist's monthly magazine, 45-52 pp.

Çota F., 2007. Aphidoidea species causing damage in the Bartın region. Zonguldak Karaelmas University, Institute of Science, Department of Forestry Engineering. Master's Engineering Thesis, Zonguldak, 201 p.

Çulcu M., Babaroğlu E.N., Özkan M., Akci E., Özdemir M., Özdemir I., Umar S., Diler H., Demir Özden E., Atakan E., 2021. Pest fauna in corn cultivation areas of Konya province. 8th International Plant Protection Congress, August 24-28, oral presentation, online.

Düzgüneş Z., Tuatay N., 1956. Turkish aphids. Ministry of Agriculture, Ankara. Agricultural Research Institute. No: 4, 63 pp.

Düzgüneş Z., Toros S., 1978. Research on the aphid species found on apple trees in Ankara province and surrounding areas and their short biology. Turkish Journal of Plant Protection, 1 (3), 151-175.

Düzgüneş Z., Toros S., Kılınçer N., Kovancı B., 1982. Identification of parasites and predators of Aphidoidea species found in Ankara province. Ministry of Agriculture and Forestry, Directorate of Agricultural Control and Quality, Publication Department, 251 pp.

Eastop V.F., 1971. Keys for the identification of *Acyrtosiphon* (Hemiptera: Aphididae). Bulletin of the British Museum (Natural History), Entomology, 26 (1),115 pp.

Eastop V.F., 1972. A taxonomic review of the species of *Cinara Curtis* occurring in Britain (Hemiptera: Aphididae). Bulletin of the British Museum (Natural History), Entomology, 27 (2), 186 pp.

Emir Z., Bayındır Erol A., Özdemir I., 2025. Determination of aphid (Hemiptera: Aphidoidea) species on vegetable and fruit fields in central districts of Konya province. International Journal of Agriculture, Environment and Food Sciences, 9 (1), 22-26. https://doi.org /10.31015/2025.1.3.

Favret C., 2026. Aphid species file. Version 5.0/5.0. Available from: http://Aphid.SpeciesFile.org (accessed date: 02.03.2026).

Giray H., 1974. The first list of Aphididae (Homoptera) family species in the vicinity of İzmir and notes on their hosts and damage forms. Ege University, Faculty of Agriculture Journal, 11 (1), 39-69.

Görür G., 2004. Aphid (Homoptera: Aphididae) species on pome fruit trees in Nigde province of Turkey. Türkiye Entomoloji Dergisi, 28 (1), 21-26.

Görür G., Özhan Ş., Akyıldırım Beğen H., Başer G., Akçay B.V., 2023. A further contribution to the Aphid (Hemiptera: Aphidoidea) fauna of Turkey including a description of a new host plant associations and colony appearances. Journal of the Entomological Research Society, 25 (1), 181–191. https://doi.org /10.51963/jers.v25i1.2306.

Görür G., Şenol Ö., Akyıldırım Beğen H., Akyürek B. 2026. Turkish aphid. www.turkishaphid.com (accessed date: 13.02.2026)

Hille Ris Lambers D., 1945. De bloedvlekkenluis van appel, *Sappaphis devecta* (WLK.). *Tijdschrift Over Plantenziekten* 51, 57–72. https://doi.org/10.1007/BF02002497

Hille Ris Lambers D., 1947. Contributions to a monograph of the Aphididae of Europe III. The genera *Pharalis* Leach, 1826; *Microsiphum* Chol., 1902; *Anthracosiphon* nov. gen.; *Delphiniobium* Mordv., 1914; *Corylobium* Mordv., 1914; *Acyrthosiphon* Mordv., 1914; *Subacyrthosiphon* nov. gen.; *Silenobium* Börner, 1939; *Titanosiphon* Nevsky, 1928; *Metopolophium* Mordv., 1914; *Cryptaphis* nov. gen.; *Rhodobium* nov. gen.; *Impatientinum* Mordv., 1914; *Aulacorthum* Mordv., 1914. Temminckia. 7, 179-319.

Hille Ris Lambers D., 1947. On some mainly western European aphids. Zoologische Mededeelingen. 28, 291-333.

Hille Ris Lambers D., 1950. On mounting aphids and other soft-skinned insects. Entomologische Berichten, 13 (298), 55-58.

Hille Ris Lambers D., 1973. Notes on some oriental aphids, with descriptions of a new genus and four new species (Homoptera: Aphididae). Oriental Insects, 7 (2), 239-258.

Kaygın A.T., Görür G., Çota F., 2008. Contribution to the aphid (Homoptera: Aphididae) species damaging on woody plants in Bartın, Turkey. International Journal of Natural and Engineering Sciences, 2 (1), 83-86.

Kılıç T., Hacıalioğlu Y., Özdemir M., Özdemir I., 2021. Important pests identified in artichoke (*Cynara scolymus* Linnaeus) (Asteraceae) cultivation in the Aegean region. 8th International Plant Protection Congress, August 24-28, poster presentation, online.

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

Kök Ş., Özdemir I., 2021. Annotated systematic checklist of the aphids (Hemiptera: Aphidomorpha) of Turkey. Zootaxa, 4925 (1), 001–074. https://doi.org/ 10.11646 /zootaxa. 4925.1.1

Kök Ş., Karabacak E., Yaşar İ., Kasap İ., Barjadze S., 2024. A new species of *Aphis* Linnaeus, 1758 (Hemiptera: Aphididae) from the northwestern Türkiye with a key to the species of the subgenus *Bursaphis* Baker, 1934, Zootaxa, 5551 (3), 569-579.

Kök Ş., Barjadze S., 2025. A new species of Aphis Linnaeus, 1758 (Hemiptera: Aphididae) from north-western Türkiye. Zootaxa, 5729 (3), 489-497.

Lodos N., 1982. Turkey Entomology II. General, Applied and Faunistic. Ege University Agricultural Faculty Publications, No. 429, Izmir, 591 pp.

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

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. https://doi.org/10.16970/entoted.1149093.

Ölmez S., 2000. Identification of Aphidoidea (Homoptera) species and their parasitoids and predators in the province of Diyarbakır. Çukurova University, Institute of Science, Master's Thesis, Adana, 109 pp.

Özdemir I., Toros, S., 1997. Harmful Aphidoidea (Homoptera) species in seasonal ornamental plants in Ankara parks. Turkish Journal of Entomology, 21 (4), 283-298.

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.

Özdemir I., Özdem A., 2024. New records on aphid (Hemiptera: Aphididae) species in fruit orchards. I. International Mardin Scientific Research and Innovation Congress, 23-25 December 2024, Mardin, Turkey.

Özdemir I., Karakaya A., Özdemir M., Bayram S., 2024. The status of aphids (Hemiptera: Aphididae) observed in poplars in our country In: modern approaches in plant protection I. Polat, A. (Ed.). 490 p., Chapter 11, İksad Publications, Ankara, Turkey, 316-353.

Özdemir I., Özdem A., 2025. The change in species composition of vector aphids (Hemiptera: Aphididae) in fruits and vineyards: a case study from Ankara province (Oral Presentation). 8th Ispec International Congress on Modern Scientific Research, 01-08 July 2025, Scandinavia (Norway, Denmark, Sweden).

Remaudiere G., Remaudiere M., 1997. Catalogue des Aphididae du Monde (of the World's Aphididae) Homoptera, Aphidoidea, Preface Par V.F. Eastop, INRA Editions, 473 pp.

Preface Par V. F. Eastop, INRA Editions, 473 pp.

Remaudiére G., Toros S., Ozdemir I., 2006. New contribution to the aphid fauna of Turkey [Hemiptera, Aphidoidea]. Revue française d'Entomologie, 28 (2), 75–96.

Shaposhnikov G.K., 1964. Suborder Aphidinea-plant lice. In: keys to the insects of the European part of the USSR. Bei-Bienko, G. (Ed.). Moscow and Leningrad, 616-799.

Schimitschek E., 1944. Forstinsekten der Türkei und Ihre Umwelt. Volk und Reich Verlag Prag, 371 pp

Stroyan H.L.G., 1957. The British species of *Sappaphis* Matsumura, Part 1, Introduction and Subgenus *Sappaphis* Sensu Stricto. Her Majesty's Stationery Office, London, 59 pp.

Stroyan H.L.G., 1961. Identification of aphids living on citrus. FAO Plant Protection Bulletin, 9 (4), 45-65.

Stroyan H.L.G., 1963. The Britisch species of *Dysaphis* Börner (*Sappaphis auctti* Nec Mats.) Part II. Her Majesty's Stationery Office, London, 119 pp.

Stroyan H.L.G., 1969. Transactions of the society for British Entomology. Published for the society by the British Trust for Entomology Ltd. Vol. 18, Part 10, 246 pp.

Stroyan H.L.G., 1977. Homoptera, Aphidoidea (Part), Chatophoridae and Callaphidae. Handbooks for The Identification of British Insects. II, Part 4 (a), Royal Entomological Society of London, 130 pp.

Stroyan H.L.G., 1984. Aphids–Pterocommatinae and Aphidinae (Aphidini) Homoptera: Aphididae. Handbooks for the Identification of British Insects. Vol. II, Part 6, Royal Entomological Society of London, 232 pp.

Talhouk A.S., 1977. Contribution to the knowledge of almond pests in East Mediterranean countries. V. Fruit-feeding insects, *Eurytoma amygdali* and *Anarsia lineatella*. Zeitschrift für Angewandte Entomologie, 83, 145-154.

Tayat E., Özder N., 2023. Research on the morphological and molecular diagnosis of *Hyalopterus pruni* (Geoffroy). Tekirdağ Ziraat Fakültesi Dergisi, 20 (3), 723-730.

Tayat E., Özder N., 2024. Aphid (Hemiptera: Aphididae) species on the herbaceous host plants in the Tekirdağ Province (Türkiye). Turkish Journal of Entomology, 48 (1), 15-33.

Toros S., 1973. Transmission mechanism of plant pathogenic viruses by aphids. Plant Protection Bulletin, 13 (2), 83-105.

Toros, S., Uygun N., Ulusoy R., Satar S., Özdemir I., 2002. Aphidoidea species of the Eastern Mediterranean region. Republic of Turkey, Ministry of Agriculture and Rural Affairs, General Directorate of Agricultural Research, Ankara, 108 pp.

Tuatay N., Demirtola A., Kaldelen A., Çağatay N., 1967. Insect catalogue of the plant protection museum (1961–1966). Republic of Turkey, Ministry of Agriculture, Directorate General of Plant Protection and Quarantine Publications, Professional Books Series. Ayyıldız Printing House, Ankara, 66 pp.

Tuatay N., Kalkandelen A., Aysev N., 1972. Insect catalogue of the plant protection museum (1961–1971). Republic of Turkey, Ministry of Agriculture, Directorate General of Plant Protection and Quarantine Publications, Professional Books Series. Yenigün Printing House, Ankara, 119 pp.

Tuatay N., 1988. Aphids of Turkey (Homoptera: Aphididae): I. Aphidinae: *Macrosiphini* (Part I). Plant Protection Bulletin, 28 (1–2), 1–28.

Tuatay N., 1991. Aphids of Turkey (Homoptera: Aphididae): III. Aphidinae: *Macrosiphini* (Part III). Plant Protection Bulletin, 31 (1–4), 3–18.

Tuatay N., Gül S., Demirtola A., Kalkandelen A., Çağatay N., 1967. Catalogue of the Plant Protection Museum (1961–1966). Republic of Turkey, Ministry of Agriculture, Directorate General of Plant Protection and Quarantine Publications, Professional Books Series. Ayyıldız Printing House, Ankara, 66 pp.

Tuatay N., Kalkandelen A., Aysev N., 1972. Insect Catalogue of the Plant Protection Museum (1961–1971). Republic of Turkey, Ministry of Agriculture, Directorate General of Plant Protection and Quarantine Publications, Professional Books Series. Yenigün Printing House, Ankara, 119 pp.

Tuatay N., Remaudiere G., 1964. Première Contribution au Catalogue des Aphididae (Hom.) de la Turquie. Rev. Path. Vegveale et D'entomologie Agricole de France. 43 (4), 243-278.

Yılmaz B., Kök Ş., 2023. The diversity and host interactions of aphids (Hemiptera: Aphididae) on different plant communities in an urban ecosystem. Türkiye Entomoloji Dergisi, 47 (4), 457-468.

Zeybek E., Tozlu G., 2022. The population dynamics and predators of the harmful *Tinocallis* (*Sappocallis*) *saltans* (Nevsky, 1929) (Hemiptera: Aphididae) on elm trees (*Ulmus glabra* Hudson) in Erzurum province. Tekirdağ Agriculture Faculty Journal, 19 (3), 554-570.

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