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Detection of Whitefly (Hemiptera: Sternorrhyncha: Aleyrodidae) Species in the Thrace Province of Marmara Region, Türkiye

Marmara Bölgesi Trakya Yöresi Beyazsinek (Hemiptera: Sternorrhyncha: Aleyrodidae) Türlerinin Saptanması

Mehmet Rıfat ULUSOY [1], Asime Filiz ÇALIŞKAN KEÇE [2,*]

[1,2] *Çukurova University, Faculty of Agriculture, Department of Plant Protection, 01330, Adana, Türkiye*

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ABSTRACT

Species belonging to the Aleyrodidae family (Hemiptera: Sternorrhyncha) are phytophagous insects. So far, 1556 species belonging to this family have been identified within 161 genera worldwide. In this study conducted with the aim of uncovering the Aleyrodidae fauna of Türkiye, the investigation focused on the Thrace region of the Marmara Area in 2019-2022 years. During the study, sampling was carried out in both agricultural and non-agricultural areas of Istanbul, Tekirdağ, Edirne, and Kırklareli provinces. The study identified 12 whitefly species from 9 different genera. These species are *Acaudaleyrodes rachipora* (Singh), *Aleurochiton aceris* (Modeer), *Aleurolobus olivinus* Quaintance and Baker, *Aleurotuba jelinekii* (Frauenfeld), *Aleyrodes proletella* L., *Bemisia afer* Priesner & Hosny, *B. tabaci* Gennadius, *Dialeurodes citri* (Ashmead), *Siphoninus finitimus* Silvestri, *Siphoninus phillyreae* (Haliday), *Trialeurodes lauri* Signoret, and *T. vaporariorum* Westwood. Among these species, *Aleurochiton aceris* (Modeer), this study presents the first record of in Türkiye's insect fauna. This study contributed to Türkiye's whitefly fauna and insect biodiversity.

ÖZ

Aleyrodidae (Hemiptera: Sternorrhyncha) familyasına ait türler fitofag böceklerdir. Türkiye Aleyrodidae faunasını ortaya çıkarmak amacıyla 2019-2022 yılları arasında gerçekleştirilen bu çalışmada, Marmara Bölgesi'nin Trakya kesimi araştırılmıştır. Çalışma sırasında, İstanbul, Tekirdağ, Edirne, Kırklareli illerinin tarım ve tarım dışı alanlarında örneklemeler yapılmıştır. Çalışma sonucunda 9 cinse bağlı 12 beyazsinek türü tespit edilmiş olup bunlar; *Acaudaleyrodes rachipora* (Singh),

***Corresponding Author**

E-mail addresses: mrulusoy@cu.edu.tr (Mehmet Rıfat ULUSOY), afcaliskan@cu.edu.tr (Asime Filiz ÇALIŞKAN KEÇE),

Aleurochiton aceris (Modeer), *Aleurolobus olivinus* Quaintance and Baker, *Aleurotuba jelinekii* (Frauenfeld), *Aleyrodes proletella* L., *Bemisia afer* Priesner& Hosny, *B. tabaci* Gennadius, *Dialeurodes citri* (Ashmead), *Siphoninus finitimus* Silvestri, *Siphoninus phillyreae* (Haliday), *Trialeurodes lauri* Signoret ve *T. vaporariorum* Westwood'dur. Bu türlerden *Aleurochiton aceris* (Modeer) ilk kez bu çalışma ile ortaya çıkarılmış Türkiye böcek faunası için ilk kayıttır. Bu çalışma Türkiye'nin beyazsine faunası ve böcek biyoçeşitliliğine katkıda bulunmaktadır.

1. INTRODUCTION

Species belonging to the Aleyrodidae family (Hemiptera: Sternorrhyncha) are phytophagous insects. So far, 1556 species belonging to this family have been identified within 161 genera worldwide [1]. Among these species, about 30 are responsible for causing economic losses in cultivated plants, known as "Whiteflies" in Turkish. Adult and nymphal stages of Aleyrodids feed on plant sap, weakening the plants and causing them to die in high populations. Additionally, they can transmit plant viruses and cause fumagine due to the honeydew they secrete during feeding, leading to further damage.

In Türkiye, the first record of Aleyrodidae was *Bemisia tabaci* (Gennadius) in 1928, followed by *Aleurolobus olivinus* Quaintance and Baker, *Trialeurodes vaporariorum* Westwood, *Siphoninus phillyreae* (Haliday), *Dialeurodes citri* (Ashmed), and *Parabemisia myricae* (Kuwana) [2], [3], [4], [5]. Subsequent faunistic studies revealed a total of 41 species, including *Bemisia afer* Priesner & Hosny, *Aleyrodes lonicerae* Walker, *Aleyrodes proletella* (L.), *Aleurothrixus floccosus* (Maskell), *Paraleyrodes minei* Iaccarino, *Dialeurodes kirkaldyi* Kotinsky, *Trialeurodes abutiloneus* Haldeman, and *Singhiella simplex* (Singh), which are important in agricultural areas [6], [7], [8], [9], [10].

Aleyrodidae species have been extensively studied in developed countries due to their economic importance, focusing on faunistic, systematic, biological, ecological, and related aspects. However, in Türkiye, faunistic and systematic studies have primarily been conducted in the Mediterranean, Central Anatolia, Southeast Anatolia, Aegean Regions, as well as in the provinces of Bartın and Kastamonu [5], [6], [7], [8], [9], [10], [11]. No studies have been conducted in the richly biodiverse Marmara and Black Sea Regions (except for Bartın and Kastamonu) and Eastern Anatolia. This study aims to uncover Aleyrodidae species in the "Thrace" part of the Marmara Region, which has not been previously studied for its whitefly fauna.

2. MATERIAL AND METHOD

2.1 Collection of Whiteflies

This study was conducted between 2019 and 2021 in agricultural and non-agricultural areas of the Thrace region in the Marmara Region. During field trips coinciding with the pandemic, efforts were

made to determine the geographical distributions of Aleyrodidae species and their host plants. Species identification of whiteflies was carried out by the first author using classical methods, utilizing morphological characteristics of the pupal stage. Habitats, host plants, and geographical distributions of the species were recorded. The Thrace region, covering the geographical boundaries of Istanbul, Tekirdağ, Kırklareli, and Edirne provinces, is located on the European continent of Türkiye and experiences a partly temperate and partly subtropical climate. The region is divided into three sub-regions: coastal, plain, and mountainous areas.

As a coastal region; Dalyans are formed by sand dunes and saline marshlands starting from the sea, as a plain region; the areas start 5 km from the sand dunes and extend up to an elevation of 200 m, and as a mountainous region; agricultural and non-agricultural areas up to the elevation where plant diversity ceases, which is 200 elevations, have been delimited. In these sub-regions, all plants that could serve as hosts for whiteflies in agricultural and non-agricultural areas have been controlled through non-periodic field trips. Sampling was conducted by visiting each sub-region within the boundaries of each province twice, until late summer (August) and mid-autumn (October). All plants in the sampling area were inspected, and the leaves of plants with whitefly pupae were snipped using scissors. Subsequently, these leaves were placed first into paper bags, then into nylon bags, with necessary label information (date, location, elevation, host plant name, etc.) written, and were brought to the laboratory in a cooler box. The most important morphological characters used for whitefly species identification are the opening called "vasiform orifice" present in the fourth larval stage known as pupa, the margin with an edge, and the tracheal and caudal grooves. Therefore, care was taken to ensure that the majority of the samples were taken during this stage.

2.2 Preparation of Whiteflies

Pupal preparations of whiteflies were made based on [12], [13], and [14] using puparіums of emerged adult whiteflies. Pupal cases were boiled in 5-10% NaOH or 5% KOH for 5-10 minutes and then placed in glacial acetic acid. After approximately 10 minutes, the samples were briefly heated in a mixture of chloral hydrate and phenol to remove any remaining waxy substances and then transferred back to glacial acetic acid. Since most whitefly species are light-colored, they were stained in acid fuchsin for 5-10 minutes. Following staining, the samples were washed in glacial acetic acid, followed by immersion in xylene for 10-15 minutes and then in kerosene for 5 minutes to become transparent. After these procedures, the prepared samples were mounted on slides with Canada balsam. Identification of pupal cases was performed using an Olympus (SZ61) binocular microscope.

The identified species were compared with previously diagnosed and existing collection species by the first author of this article.

3. THE RESEARCH FINDINGS

Except for the regions of Thrace close to the Black Sea, where non-agricultural areas have been preserved, the destruction of all non-agricultural areas and the near disappearance of natural vegetation can be attributed to the preference for field agriculture over other agricultural practices. Limited sampling has been conducted in the last remaining forests around the Istranca Mountains, İğneada, and Çatalca, as well as in parks and gardens. The observed uniformity in plant diversity in these areas has led to the belief that it negatively affects insect biodiversity, including whiteflies. Indeed, in this study conducted in the Thrace region of the Marmara Region, 12 whitefly species belonging to 9 genera were identified. These species are listed below in alphabetical order.

***Acaudaleyrodes rachipora* (Singh), 1962**

Synonym: *Aleurotrachelus raciphora* Singh, *Aleurotrachelus citri* Priesner & Hosny; *Acaudaleyrodes raciphora* (Singh), [15]; *Acaudaleyrodes citri* (Priesner & Hosny); *Aleurotrachelus alhagi* (Priesner & Hosny).

Studied material: 2 pupae from *Phillyrea latifolia* L., Haliçköy (Malkara/Tekirdağ), September 14, 2019.

Host plants: This species has been recorded on more than 40 plant species from 16 families [16], [8].

Global distribution: Chad, South Africa, India, Iraq, Iran, Israel, Cameroon, Canary Islands, Kenya, Cyprus, Liberia, Madagascar, Egypt, Niger, Nigeria, Sierra Leone, Saudi Arabia, Sudan, Türkiye, Jordan [16], [8].

Distribution in Türkiye: Recorded in Adana, Adıyaman, Antalya, Aydın, Balıkesir, Bursa, Çanakkale, Diyarbakır, Gaziantep, Hatay, İzmir, Mardin, Mersin, Muğla, Osmaniye, Siirt, and Şanlıurfa [8]. In this study, it was only found in Tekirdağ (Haliçköy/Malkara) province.

***Aleurochiton aceris* (Modeer), 1966**

Synonym: *Chermes aceris ovatus* Geoffroy, *Coccus aceris* Modeer, *Lecanium complanatum* Baerensprung, *Aleurodes aceris* Bouche, *Aleyrodes acerum* Kirkaldy, *Aleurochiton complantus* (Baerensprung) Schumacher, *Aleurochiton aceris* (Modeer) Danzig [16], [12], [17], [18].

Studied material: 4 pupae from *Acer campestre* L., Vize (Kırklareli), September 12, 2019.

Host plant: *A. campestre*

Global distribution: France, Netherlands, Switzerland, Germany, Austria, Czech and Slovak Republics, England, Denmark, Hungary, Poland, Yugoslavia [16].

Distribution in Türkiye: First recorded on *A. campestre* in this study, in Vize-Kırklareli. This is the first record for Türkiye.

***Aleurolobus olivinus* Quaintance and Baker, 1914**

Synonym: *Aleurodes olivinus* Silvestri (Syntypes. Italy: on *Olea* sp. (Oleaceae), IESP); *Aleurolobus olivinus* (Silvestri) Quaintance and Baker [16].

Studied material: 5 pupae from *Olea oleaster* Hoffman & Hoffman, Eyüpsultan (Istanbul), September 12, 2019; 3 pupae from *O. oleaster*, Silivri (Istanbul), August 27, 2021.

Host plants: Reported as an oligophagous species on plants belonging to the Oleaceae family; *Olea europa* (Gomez-Menor), *O. oleaster* Hoffman & Hoffman, and *P. latifolia* [16], [8].

Global distribution: China, Morocco, France, Spain, Israel, Italy, Cyprus, Egypt, determined to be present in Türkiye [16], [8].

Distribution in Türkiye: Recorded in Adana, Antalya, Aydın, Balıkesir, Bursa, Çanakkale, Hatay, İçel, İzmir, Kahramanmaraş, Muğla, and Şanlıurfa provinces [8]. In this study, it was found on wild olive trees (*Ziziphus spina-christi* (L.)) in Istanbul (Silivri).

***Aleurotuba jelinekii* (Frauenfeld), 1978**

Synonym: *Aleurotrachelus jelinekii* Frauenfeld; *Frauenfeldiella jelinekii* Frauenfeld [16]; *Aleurotuba jelinekii* (Frauenfeld) Tremblay & Iaccarino [19].

Studied material: 7 pupae from *Arbutus andrachne* L., Silivri (Istanbul), August 27, 2021.

Host plants: *Viburnum tinus* L., *V. rotundifolia* L., *A. andrachne*, *A. unedo* L., *Myrtus communis* L. [20], [21].

Global distribution: USA, Germany, France, Netherlands, England, Iran, Spain, Italy, Colombia, Portugal, Romania, Türkiye, Former USSR, Yugoslavia, Greece [22].

Distribution in Türkiye: Found on *V. tinus*, *A. unedo*, and *A. andrachne* in Aegean and Western Black Sea (Bartın and Kastamonu) regions. In this study, its presence was observed in Istanbul (Silivri) [8].

***Aleyrodes proletella* (Linnaeus), 1801**

Synonym: *Phalaena (Tinea) proletella* Linnaeus; *Aleyrodes chelidonii* Latreille [23]; *Aleyrodes euphorbiae* Low [21]; *Aleyrodes youngi* Hempel [16].

Studied material: 3 pupae from *Lactuca sativa* L., Marmara Ereğlisi (Tekirdağ), September 14, 2019; 3 pupae from *L. serriola* , Eyüpsultan (Istanbul), August 23, 2021; 2 pupae from *L. serriola* and 2 pupae from *Euphorbia* sp., Odayeri (Eyüpsultan/Istanbul), August 23, 2021; 3 pupae from *L. serriola*, İhsaniye (Eyüpsultan/Istanbul), August 23, 2021; 2 pupae from *L. serriola*, Subaşı (Çatalca/Istanbul), August 23, 2021; 3 pupae from *L. serriola*, Çerkezköy (Tekirdağ), August 24, 2021; 2 pupae from *L. serriola*, Saray (Tekirdağ), August 24, 2021; 2 pupae from *Euphorbia* L. sp., Lüleburgaz (Tekirdağ), August 25, 2021; 2 pupae from *L. serriola* and 2 pupae from *Euphorbia* sp., Kırklareli, August 25, 2021; 2 pupae from *L. serriola*, Dereköy (Kırklareli), August 25, 2021; 2 pupae from *L. serriola*, Kapaklı (Kırklareli), August 25, 2021; 2 pupae from *L. serriola*, Babaeski (Kırklareli), August 25, 2021; 3 pupae from *L. serriola*, Kapıkule (Edirne), August 26, 2021; 2 pupae from *L. serriola*, Edirne, August 26, 2021; 2 pupae from

L. serriola, Lalapaşa (Edirne), August 26, 2021; 2 pupae from *L. serriola*, Havsa (Edirne), August 26, 2021; 2 pupae from *L. serriola*, Silivri (Istanbul), August 27, 2021; 2 pupae from *L. serriola*, Çatalca (Istanbul), August 27, 2021.

Host plants: *Lactuca* spp., *Mycelis muralis* (L.) Dumort, *Sonchus arvensis* L., *S. oleraceus* L., *Sonchus* sp., *Brassica oleracea* L., *Euphorbia esula* L., *Chelidonium majus var. majus* L., *C. majus var. laciniatum*, *Ranunculus ficaria L.* [24].

Global distribution: A cosmopolitan species, found primarily in the Palaearctic region, as well as in the Ethiopian, Madagascan, and Oriental regions [16].

Distribution in Türkiye: Mentioned in Central and Northern Anatolia regions by [15], [25], reported in Eastern Mediterranean region by [7]. Additionally, found in Eastern Mediterranean (Mersin, Adana, Hatay), Western Mediterranean (Antalya, Burdur, Isparta), Aegean (Muğla, Aydın), Marmara (Balıkesir, Bursa), Central Anatolia (Konya, Karaman, Aksaray, Niğde, Kayseri, Sivas), and Eastern Anatolia (Malatya) regions [8]. In this study, *A. proletella* was identified in all provinces of the Thrace region: Istanbul, Kırklareli, Edirne, and Tekirdağ. Additionally, this species was first recorded on the cultivated plant lettuce (*Lactuca sativa*) in this study.

***Bemisia afer* (Priesner & Hosny), 1970**

Synonym: *Bemisia hancocki* Corbett; *Bemisia citricola* Gomez-Menor; *Bemisia afer* (Priesner & Hosny) [16].

Studied material: 1 pupa from *Clematis vitalba* L., Gümüşpınar (Çatalca/Istanbul), September 12, 2019; 2 pupae from *Morus alba* L., 1 pupa from *Cydonia oblonga* L., 2 pupae from *Fraxinus excelsior* L., 2 pupae from *Prunus domestica* L., 1 pupa from *P. persica* (L.), Edirne, September 13, 2019; 1 pupa from *Morus* sp., 1 pupa from *Ziziphus spina-christi* (L.), Eyüpsultan (Istanbul), August 23, 2021; 1 pupa from *P. domestica*, 1 pupa from *Morus* sp., Odayeri (Eyüpsultan/Istanbul), August 23, 2021; 1 pupa from *Z. spina-christi*, Işıklar (Eyüpsultan/Istanbul), August 23, 2021; 1 pupa from *Morus* sp., 1 pupa from *Z. spina-christi*, İhsaniye (Eyüpsultan/Istanbul), August 23, 2021; 1 pupa from *Morus* sp., Subaşı (Çatalca/Istanbul), August 23, 2021; 1 pupa from *Morus* sp., 1 pupa from *Z. spina-christi*, Çerkezköy (Tekirdağ), August 24, 2021; 1 pupa from *Morus* sp., Saray (Tekirdağ), August 24, 2021; 1 pupa from *Morus* sp., Lüleburgaz (Tekirdağ), August 25, 2021; 1 pupa from *Morus* sp., Kırklareli, August 25, 2021; 1 pupa from *Morus* sp., Üsküp (Kırklareli), August 25, 2021; 2 pupae from *Morus* sp., Dereköy (Kırklareli), August 25, 2021; 1 pupa from *Morus* sp., 1 pupa from *Z. spina-christi*, Kapaklı (Kırklareli), August 25, 2021; 2 pupae from *Morus* sp., Babaeski (Kırklareli), August 25, 2021; 2 pupae from *Morus* sp., Edirne, August 26, 2021; 1 pupa from *Morus* sp., Lalapaşa (Edirne), August 26, 2021; 1 pupa from *Morus* sp., 1 pupa from *Z. spina-christi*, Havsa (Edirne), August 26, 2021; 1 pupa from *Morus* sp., Silivri (Istanbul), August 27, 2021; 1 pupa from *Morus* sp., 1 pupa from *Z. spina-christi*, Çatalca (Istanbul), August 27, 2021.

Host plants: Recorded on over 50 plant species from 20 families [16], [26], [27].

Global distribution: A cosmopolitan species, found primarily in the Palaearctic region, as well as in the Ethiopian, Madagascan, and Oriental regions [16].

Distribution in Türkiye: Found in the Akdeniz, Ege, Central Anatolia, Southeast Anatolia, and Western Black Sea regions [8], [10]. In this study, this species was identified in all provinces of the Thrace region: Istanbul, Kırklareli, Edirne, and Tekirdağ.

***Bemisia tabaci* (Gennadius), 1936**

Synonym: *Aleurodes tabaci* Gennadius; *Bemisia argentifolii* Bellows and Perring; *Bemisia achyranthes* Singh; *Bemisia bahiana* Bondar; *Bemisia costa-limai* Bondar; *Bemisia goldingi* Corbett; *Bemisia hibisci* Takahashi; *Aleurodes inconspicua* Quaintance; *Bemisia manihotis* Frappa; *Bemisia minima* Danzig; *Bemisia miniscula* Danzig; *Bemisia nigeriensis* Corbett; *Bemisia vayssierei* Frappa; *Cortesiana restonicae* Goux [16].

Studied material: 2 pupae of *Hedera helix* L., 3 pupae of *Helianthus tuberosus* L., Subaşı (Çatalca/Istanbul), 12.09.2019; 3 pupae of *Cucurbita maxima* L., İğneada (Demirköy/Kırklareli), 13.09.2019.

Hosts: This species has been recorded as a host on over 350 plant species from 60 families [16].

Global distribution: A cosmopolitan species, primarily found in the Palearctic region, as well as in the Ethiopian, Madagascan, Oriental, Australian, Nearctic, and Neotropical regions [16].

Distribution in Türkiye: [10] and [8] Noted that this species is present in the Mediterranean, Aegean, Southeast Anatolia, Central Anatolia, Southeast Anatolia, and Marmara regions. However, previous studies have indicated that this species is widespread throughout Türkiye [27], [28]. In this study, it was only found in Istanbul (Subaşı-Çatalca) and Kırklareli (İğneada-Demirköy).

***Dialeurodes citri* (Ashmead), 1916**

Synonym: *Aleyrodes citri* Ashmead; *Aleurodes citrifolii* (Foster) Riley & Howard; *Aleyrodes (Dialeurodes) citri* (Riley & Howard) Cockerell; *Aleyrodes (Dialeurodes) aurantii* (Maskell) Cockerell; *Dialeurodes citri* (Ashmead), Quaintance & Baker; *Dialeurodes citri* (Riley & Howard), Quaintance & Baker; *Dialeurodes citri* (Ashmead) *var. kinyana* Takahashi; *Dialeurodes citri* (Ashmead) *var. hederae* Takahashi [16].

Studied material: 4 pupae of *Lygustrum vulgare* L., 4 pupae of *Viburnum odoratissimum* Ker Gawl., 3 pupae of *Diospyors lotus* L. in Odayeri (Eyüpsultan/Istanbul), 23.08.2021; 2 pupae of *V. odoratissimum* in Kırklareli, 25.08.2021; 2 pupae of *V. odoratissimum* in Kapaklı (Kırklareli), 25.08.2021; 2 pupae of *V. odoratissimum* in Dereköy (Kırklareli), 25.08.2021; 2 pupae of *V. odoratissimum* in Silivri (İstanbul), 27.08.2021.

Hosts: This species has been recorded as a host on over 80 plant species from 29 families [16], [29].

Global distribution: Reported in the USA, Brazil, China, India, Italy, Japan, Pakistan, Sri Lanka, USSR, Chile, Taiwan, Thailand, Türkiye [16].

Distribution in Türkiye: This species has been reported in the Mediterranean, Southeast Anatolia, Aegean, and Black Sea regions by various researchers [10], [30], [28], [30], [8]. In this study, *D. citri* was found on *L. vulgare* and *V. odoratissimum* plants cultivated as hedges in Istanbul.

***Siphoninus finitimus* Silvestri, 1915**

Synonym: *Siphoninus phillyreae mulititubulatus* Goux [16].

Studied material: 2 pupae of *C. vitalba* in Gümüşpınar (Çatalca/Istanbul), 12.09.2019; 3 pupae of *Fraxinus excelsior* L. in Şarköy (Tekirdağ), 12.09.2019; 3 pupae of *F. excelsior*, 2 pupae of *Crataegus tanacetifolia* (Lam.) in Demirköy (Kırklareli), 13.09.2019; 2 pupae of *P. latifolia* in Haliçköy (Malkara/Tekirdağ), 14.09.2019; 2 pupae of *F. excelsior*, 2 pupae of *Prunus spinosa* L., Eyüpsultan (İstanbul), 23.08.2021; 2 pupae of *Malus communis* L., 2 pupae of *Pyrus communis* L., 2 pupae of *P. spinosa* in Odayeri (Eyüpsultan/Istanbul), 23.08.2021; 2 pupae of *P. spinosa* in İhsaniye (Eyüpsultan/Istanbul), 23.08.2021; 1 pupa of *P. spinosa* L. in Işıklar (Eyüpsultan/Istanbul), 23.08.2021; 1 pupa of *P. spinosa* in Subaşı (Çatalca/Istanbul), 23.08.2021; 1 pupa of *P. spinosa* in Çerkezköy (Tekirdağ), 24.08.2021; 1 pupa of *P. spinosa* in Saray (Tekirdağ), 24.08.2021; 1 pupa of *P. spinosa* L. in Lüleburgaz (Tekirdağ), 25.08.2021; 2 pupae of *P. spinosa* in Kırklareli, 25.08.2021; 2 pupae of *P. spinosa* in Üsküp (Kırklareli), 25.08.2021; 2 pupae of *P. spinosa* in Dereköy (Kırklareli), 25.08.2021; 2 pupae of *P. spinosa* in Kapaklı (Kırklareli), 25.08.2021; 2 pupae of *P. spinosa*, 2 pupae of *Pyrus elaeagnifolia* Pall in Babeski (Kırklareli), 25.08.2021; 2 pupae of *P. spinosa*, 2 pupae of *Crateagus* sp. in Lalapaşa (Edirne), 26.08.2021; 2 pupae of *P. spinosa* L., 2 pupae of Crateagus sp. in Havsa (Edirne), 26.08.2021; 2 pupae of *P. spinosa* in Silivri (İstanbul), 27.08.2021; 2 pupae of *P. spinosa* in Çatalca (İstanbul), 27.08.2021.

Hosts: *Pocconia excelsa* Aiton, *Olea chrysophylla* Lam., *O. europaea* L., *O. europaea* L. *subsp. africana* L., *Olea* sp. ([27]). This study identified new hosts for this species, including *Clematis vitalba* L., *Crateagus* sp., *C. tanacetifolia, F. excelsior, M. communis, P. latifolia, P. spinosa, P. communis*, and *Pyrus elaeagnifolia* Pall.

Global distribution: Reported in Eritrea, Ethiopia, Spain, Canary Islands, Corsica, Peru, Chile, and Jordan [27].

Distribution in Türkiye: Initially reported in Adana, this species has been found in Central, Southern Anatolia, Marmara [28], [8], Western Mediterranean [30], [8], Eastern Mediterranean [7], [8], and Aegean [8] regions. This study found this species throughout the Thrace region, specifically in Kırklareli and Tekirdağ.

***Siphoninus phillyreae* (Haliday), 1915**

Synonym: *Aleurodes phylliceae* Bouche; *Siphoninus phillyreae* (Haliday) Silvestri; *Siphoninus finitimus* Silvestri; *Siphoninus phillyreae inequalis* (Gautier) Goux; *Siphoninus phillyreae mulititubulatus* Goux [16].

Studied material: 2 pupae of *P. latifolia* in Haliçköy (Malkara/Tekirdağ), 14.09.2019; 2 pupae of *Punica granatum* L. in Tekirdağ, 14.09.2019; 3 pupae of *F. excelsior* in Odayeri (Eyüpsultan/Istanbul), 23.08.2021; 2 pupae of *F. excelsior* in İhsaniye (Eyüpsultan/Istanbul), 23.08.2021; 2 pupae of *F. excelsior* in Çerkezköy (Tekirdağ), 24.08.2021; 2 pupae of *F. excelsior* in Kırklareli, 25.08.2021; 2 pupae of *F. excelsior* in Üsküp (Kırklareli), 25.08.2021; 2 pupae of *F. excelsior* in Kapaklı (Kırklareli), 25.08.2021; 2 pupae of *F. excelsior* in Babaeski (Kırklareli), 25.08.2021; 2 pupae of *F. excelsior* in Edirne, 26.08.2021; 2 pupae of *F. excelsior* in Lalapaşa (Edirne), 26.08.2021; 2 pupae of *F. excelsior* in Havsa (Edirne), 26.08.2021; 2 pupae of *F. excelsior* in Silivri (İstanbul), 27.08.2021; 2 pupae of *F. excelsior* in Çatalca (İstanbul), 27.08.2021.

Hosts: Various hosts including *Catalpa X chilopsis* T.S. Elias & Wisura, *Cercis occidentalis* Torr., *C. siliquastrum* L., *Lagerstroemia indica* (L.) Pers., *Liriodendron tulipifera* L., *Magnolia stellate* (Siebold ve Zucc.) Maksim., *Afzelia* sp., and more [16], [31], [32], [33], [34].

Global distribution: Reported in various countries including the United States, Germany, Australia, Bulgaria, Cyprus, Lebanon, Switzerland, India, Italy, Spain, Iran, and more [16].

Distribution in Türkiye: This species has been reported in most regions of Türkiye, including Central Anatolia, Southern Anatolia, Marmara [28], [8], Western Mediterranean [30], [8], Southeast Anatolia [10] Eastern Mediterranean [7], [8], and Aegean [8]. This study confirms its presence throughout the Thrace region.

***Trialeurodes lauri* (Signoret), 1963**

Synonym: *Aleurodes lauri* Signoret; *Trialeurodes lauri* (Signoret); *Trialeurodes lauri* (Signoret) [21]; *Trialeurodes klemmi* [16].

Studied material: 5 pupae of *Laurus nobilis* L. in Odayeri (Eyüpsultan/Istanbul), 23.08.2021.

Hosts: *Arbutus* sp., *A. andrachne*, *L. nobilis*, and *Quercus* sp. [16], [8].

Global distribution: Reported in various countries including Türkiye, Eritrea, Ethiopia, Spain, Canary Islands, Corsica, Peru, Chile, and Jordan [16].

Distribution in Türkiye: Found in Adana, Central Anatolia, and the Aegean region, including provinces like Antalya, Balıkesir, Çanakkale, Hatay, Mersin, Izmir, and Osmaniye [8]. This study confirms its presence in Istanbul on laurel plants.

***Trialeurodes vaporariorum* Westwood, 1856**

Synonym: *Aleurodes vaporariorum* Westwood, *Trialeurodes vaporariorum* (Westwood); *Trialeurodes mossopi* Corbett [15]; *Trialeurodes sesbania* Corbett [15]; *Asterochiton sonchi* (Kotinsky), *Trialeurodes sonchi* (Kotinsky).

Studied material: 2 pupae of *C. maxima*, 2 pupae of *Datura stramonium* L., 2 pupae of *Phaseolus vulgaris* L. in Vize (Kırklareli), 12.09.2019; 2 pupae of *Lycopersicon esculentum* Mill. in Şarköy (Tekirdağ), 12.09.2019.

Hosts: This species is associated with 82 families and around 279 plant species [16].

Global distribution: A cosmopolitan species found worldwide [16].

Distribution in Türkiye: This species is widespread in Türkiye, reported in regions like Central Anatolia, Southern Anatolia, Southeast Anatolia [10], Marmara [28], [8], Western Mediterranean [30], [8], Eastern Mediterranean [7], [8], and Aegean [8]. This study found it in the Thrace region, specifically Kırklareli and Tekirdağ.

4. CONCLUSION

The findings of this study emphasize the significant impact of agricultural expansion on insect biodiversity, particularly whiteflies, in the Thrace region of the Marmara Region, Türkiye. The near disappearance of natural vegetation due to the dominance of field agriculture has led to a reduction in habitat diversity, which in turn affects insect populations. The limited sampling conducted in the remaining forested areas, parks, and gardens suggests that the uniformity in plant diversity may contribute to a decline in whitefly species richness.

The study identified 12 whitefly species from 9 different genera. Among these species, Aleurochiton aceris (Modeer), this study presents the first record of in Türkiye's insect fauna. This study contributed to Türkiye's whitefly fauna and insect biodiversity.

However, the loss of natural habitats and changes in plant composition could lead to long-term ecological imbalances. To mitigate these effects, conservation efforts should focus on preserving the remaining forested areas and promoting more diverse agricultural and landscaping practices. Further research with broader sampling and long-term monitoring is necessary to assess the full extent of biodiversity loss and its ecological consequences.

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CONFLICTS OF INTEREST

No conflict of interest was declared by the authors.

DECLARATION OF ETHICAL CODE

In this study, the authors undertake that they comply with all the rules within the scope of the "Higher Education Institutions Scientific Research and Publication Ethics Directive" and that they do not take any of the actions under the heading "Actions Contrary to Scientific Research and Publication Ethics" of the relevant directive.

AUTHORS' CONTRIBUTIONS

The authors have contributed equally to this study.

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