



Five new records of eriophyid mites (Acari: Eriophyoidea) from herbaceous plants and fruit trees in Van province, Turkey

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ABSTRACT

Five species of eriophyid mites were detected as new records for the mite fauna of Turkey. The samples were collected on herbaceous plants and fruit trees in Bahçesaray, Edremit, İskele and Akdamar island of Van province, Turkey between 2014 and 2016. The identified eriophyid species are *Aceria camdeboo* (Meyer, 1981) on *Celtis* sp. (Cannabaceae); *A. trifolii* (Nalepa, 1892) on *Vicia biennis* L. (Fabaceae), *Aculus*

parakarensis (Bagdasarian, 1972) on *Amygdalus communis* L. (Rosaceae), *Leipothrix moraceus* (Castagnoli, 1980) on *Morus alba* L. (Moraceae) and *Phyllocoptes obtusus* (Nalepa, 1891) on *Salvia* sp. (Lamiaceae). The species are depicted, measured and information on their hosts, damage symptoms and geographical distribution are given.

Keywords: Eriophyoidea, New record, *Aceria*, Van, Turkey

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1. Introduction

Eriophyid mites are very small, obligatory phytophagous invertebrates and the majority of these mites are host specific (Lindquist et al. 1996). Weed-associated eriophyids are considered to have high potential as biological control agents because of their host specificity (Smith et al. 2010). Turkey has a rich eriophyid biodiversity because of the geographical position and botanical history of the country (Ekim & Güner 2000; Karagöz 2003). Many studies were carried out to determine the eriophyid fauna of Turkey (Denizhan et al. 2006, 2008; Denizhan & Çobanoğlu 2010). Denizhan et al. (2015) listed eriophyid mites in a catalogue along with remarks and information on their current distribution in Turkey and they reported that a total of 130 eriophyid species for the Turkish fauna up to March 2013. Then, eight eriophyid species were determined as new records for Turkey: *Aceria tenuis* (Nalepa 1891), *Epitrimerus gibbosus* (Nalepa 1892) and *Quadracus urticae* (Keifer 1944) on weed plants in Samsun (Diler & Ozman-Sullivan 2011), *Aceria sobhiani* Sukhareva, 2001 on *Acroptilon repens* L., *Aceria carduui* Petanovic, Boczek and Shi 2002 on *Carduus pycnocephalus* L. in Ankara (Diler & Ozman-Sullivan 2016), *Aceria stefanii* (Nalepa 1898) on pistachio trees in the South-Eastern Anatolia (Usanmaz et al. 2018), *Aceria diospyri* (Keifer 1944) on *Diospyros kaki* L. in Yalova (Denizhan 2018) and *Rhyncaphytoptus castaneae* (Farkas 1960) on *Castanea sativa* Mill. in Aydın (Gokce et al. 2020).

Although only 138 eriophyid mite species have been recorded in Turkey to date, there is still many more to be discovered. Therefore, the aim of this study is to add five new species from Van region in Turkey. These new records, increased the total number of eriophyid species to 143 in Turkey.

2. Material and Methods

The plant samples were collected from herbaceous plants and fruit trees in Bahçesaray, Edremit, İskele and Akdamar island of Van province, located in the Eastern part of Turkey, between 2014 and 2016. Eriophyid mites collected from the plants were directly examined under a dissecting stereo-microscope (Leica ES2) and mounted on microscope slides in F-medium according to Keifer (1975). The identifications were made with the help of a phase-contrast microscope (Leica DM 1000). The morphological nomenclature follows Lindquist et al. (1996), all the measurements were made according to Amrine & Manson (1996) and De Lillo et al. (2010). The systematic classification follows Amrine et al. (2003). Information on the hosts and damage symptoms, geographical distribution of these species and GPS coordinates of the location of each sample are provided. The Prodorsal shield, empodium and genital area are figured. The voucher specimens of the species are kept in the mite collection of the Faculty of Science, University of Trakya, Edirne, Turkey.

3. Results and Discussion

Five eriophyoid mites were identified as new records for the mite fauna of Turkey from herbaceous plants and fruit trees in Van province: *Aceria camdeboo* (Meyer, 1981), *A. trifolii* (Nalepa, 1892), *Aculus parakarensis* (Bagdasarian, 1972), *Leipothrix moraceus* (Castagnoli, 1980) and *Phyllocoptes obtusus* (Nalepa, 1891). Information on the measurements, drawings, hosts, damage symptoms and geographical distribution of these species are given below.

Family: Eriophyidae Nalepa, 1898

Subfamily: Eriophyinae Nalepa, 1898

Genus: *Aceria* Keifer, 1944

***Aceria camdeboo* (Meyer, 1981)**

Female: 188–217 μm long, 43–54 μm wide; gnathosoma 9–12 μm long; gnathosomal setae 3–4; chelicerae 10–11 μm ; Prodorsal shield 20–22 μm long, 30–31 μm wide; dorsal setae 11–13 μm long (Figure 1a).

Leg: Foreleg 18 μm long; tibia 4 μm ; tarsus 5 μm ; tarsal solenidion 7 μm ; empodium 5 μm long; empodium 3 rayed (Figure 1c). Hindleg 19 μm long; tibia 4 μm ; tarsus 5 μm ; tarsal solenidion 7 μm ; empodium 5 μm long; empodium 3 rayed.

Genitalia 10 μm long; 13 μm wide; female genital cover flap smooth; genital setae 10 μm (Figure 1b).

Material examined: Bahçesaray, Van (38° 19' 49 N; 42° 10' 22 E; 1557m); 15.08.2015 (3♀♀), 27.07.2016 (5♀♀, 1♂)

Host Plant: *Celtis* sp. (Cannabaceae)

Geographical distribution: South Africa (Amrine & Stasny, 1994) and Turkey (present study)

Remarks: We observed that the mite produces bead-like galls. Twelve species of eriophyoid were found on the *Celtis*. Since *Aceria* species are not detected on *Celtis* spp. in the Palearctic region (Amrine & Stasny, 1994), *A. camdeboo* is also a new record for the Palearctic region.

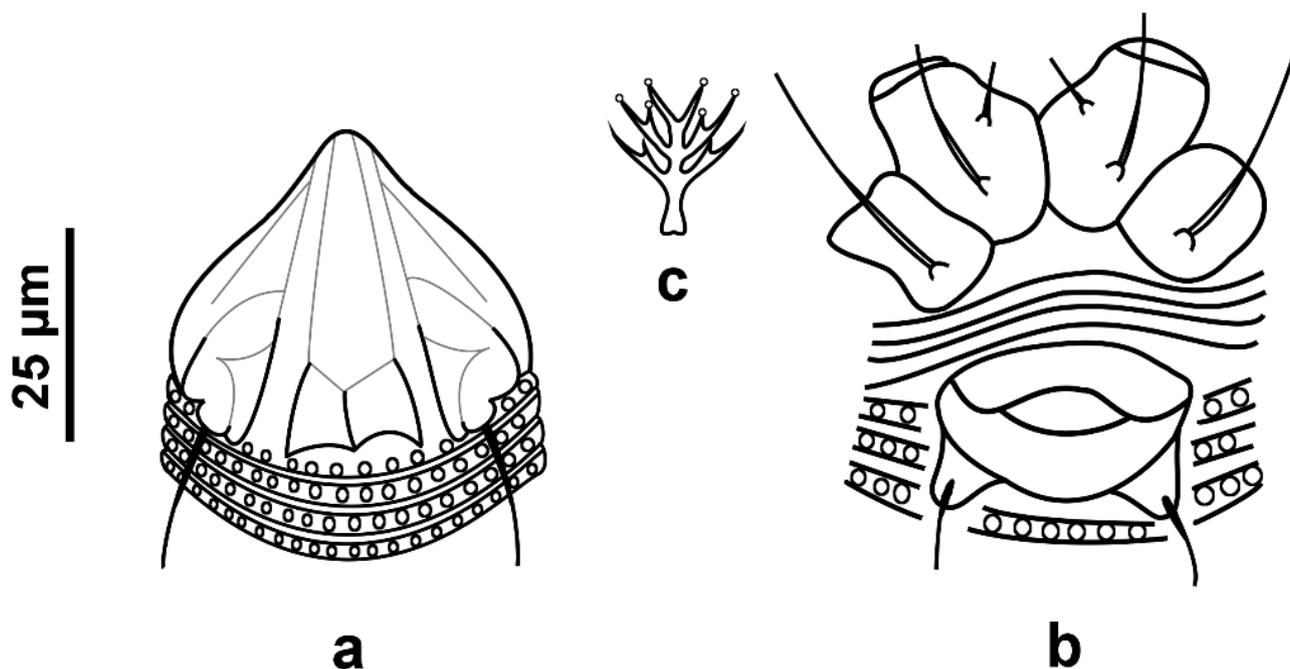


Figure 1- *Aceria camdeboo* a- Prodorsal shield, b- Genitalia, c- Empodium

***Aceria trifolii* (Nalepa, 1892)**

Synonym: *Eriophyes plicator* var. *trifolii* (Nalepa, 1892)

Female: 149–200 μm long, 56–60 μm wide; gnathosoma 9–11 μm long; gnathosomal setae 3–5; chelicerae 6–10 μm ; Prodorsal shield 33–35 μm long, 32–37 μm wide; dorsal setae 10–17 μm long (Figure 2a).

Leg I. 26–35 μm long; tibia 5–6 μm ; Tarsus 5–7 μm ; tarsal solenidion 7–8 μm ; empodium 5–6 μm long; empodium 5 rayed. Leg II. 27–32 μm long; tibia 5–7 μm ; tarsus 5–7 μm ; tarsal solenidion 7–8 μm ; empodium 5–6 μm long; empodium 5 rayed.

Genitalia 10–13 μm long; 17–28 μm wide; female genital cover flap (8 ridges); genital setae 12–19 μm (Figure 2b).

Material examined: Bahçesaray, Van (38° 19' 49 N: 42° 10' 22 E; 1557m); 14.08.2014 (10♀♀).

Host Plant: *Vicia biennis* L. (Fabaceae)

Geographical distribution: Bosnia, France, Germany, Hungary, Italy and Turkey (present study).

Remarks: We observed that the mite caused leaf curling and bleaching. The mite was originally reported on *Trifolium arvense* L. and then *Medicago falcata* L., *M. lupulina* L., *Ononis minutissima* L., *Trifolium dubium* Sibth., *T. pratense* Sibth., *P. repens* L., *Vicia hirsuta* L. in the Palearctic region, and caused proliferation of flowers and deformation of leaves. *Vicia biennis* is recorded as a new host plant for *A. trifolii* in this study. The lengths of opisthosoma, gnathosoma and prodorsal shield, which are important features for species identification, of the Turkish specimens of *Aceria trifolii* differs slightly in the Turkish specimens from that of the type specimens. The lengths of opisthosoma and gnathosoma are longer in the Turkish specimens, 200 μm and 11 μm but 190 μm and 9 μm in the type specimens. The length of prodorsal shield in the Turkish specimens (35 μm) is narrower than in the type specimens (38 μm).

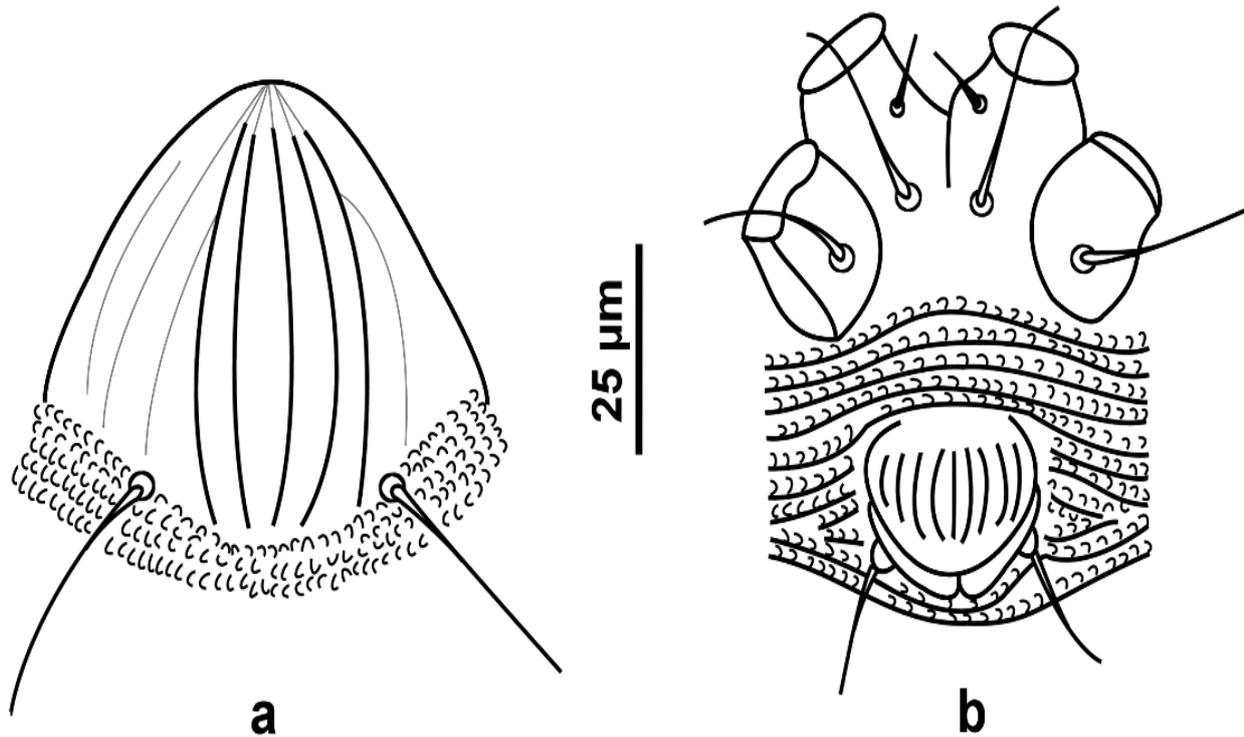


Figure 2- *Aceria trifolii* (Nalepa, 1892) a. Prodorsal shield, b. Genitalia

Subfamily: Phyllooptinae

Tribus: Anthocoptini

Genus: *Aculus* Keifer, 1959

Aculus parakarensis (Bagdasarian, 1972)

Female: 149–158 μm long, 45-51 μm wide; gnathosoma 17-21 μm long; gnathosomal setae 2-3; Prodorsal shield smooth, 23-26 μm long, 29-33 μm wide, dorsal setae 10-14 μm long (Figure 3a).

Leg I. 24 -26 μm long; tibia 5-6 μm ; tarsus 6-7 μm ; empodium 8-9 μm long; empodium 5 rayed. Leg II. 22-24 μm long; tibia 4-5 μm ; tarsus 5-7 μm ; empodium 8–9 μm long; empodium 5 rayed (Figure 3c). Genitalia 11–14 μm long; 18–20 μm wide; female genital flap smooth; genital setae 11–14 μm (Figure 3b).

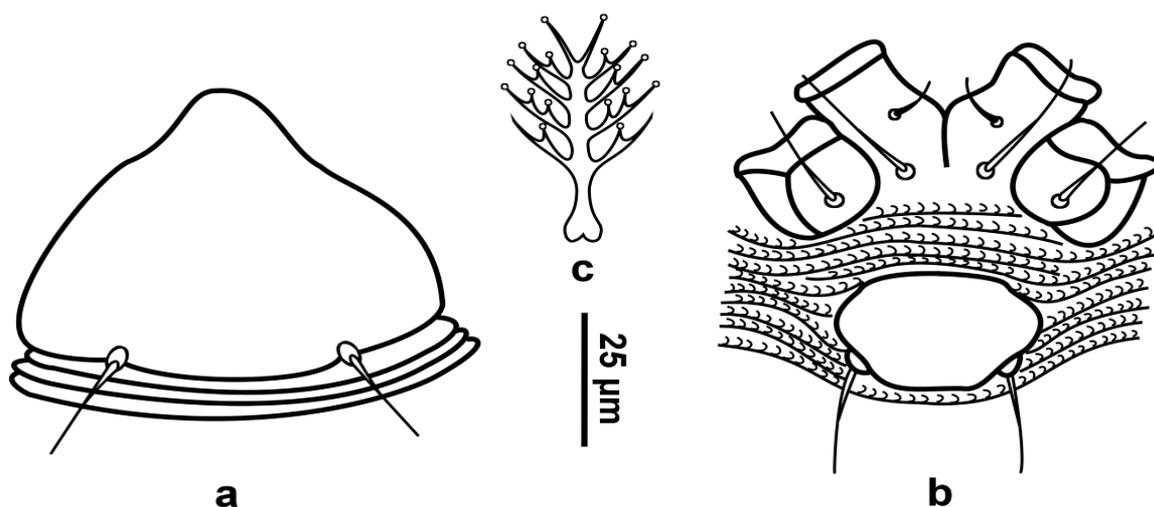


Figure 3- *Aculus parakarensis* (Bagdasarian, 1972) a- Prodorsal shield, b- Genitalia, c- Empodium

Material examined: Akdamar island, Van (38° 24' 04 N; 43° 14' 12 E; 1802m); 21.08.2014 (7 ♀♀).

Host plants: *Amygalus communis* L. (Rosaceae)

Geographical distribution: Armenia, Bulgaria, Hungary (Amrine et al. 2003) and Turkey (present study).

Remarks: This species is a vagrant on the undersurface of leaves without causing apparent damage. *Aculus parakarensis* has only been found in the Palearctic region so far, and its widespread host is *Amygalus communis* (Ripka, 2007).

Genus: *Leipothrix* Keifer, 1966

Leipothrix moraceus (Castagnoli, 1980)

Female: 160–230 µm long, 59–63 µm wide; gnathosoma 7–8 µm long; gnathosomal setae 6–7; chelicerae 6–11 µm; Prodorsal shield 48–50 µm long; 53–55 µm wide; dorsal setae 11–18 µm long (Figure 4a).

Leg I. 33–36 µm long; tibia 5–6 µm; tarsus 4–5 µm; tarsal solenidion 4–5 µm; empodium 5–6 µm long; empodium 4 rayed.
Leg II. 41–43 µm long; tibia 5–6 µm; tarsus 4–5 µm; tarsal solenidion 5–6 µm; empodium 5–6 µm long; empodium 4 rayed.

Genitalia 11–12 µm long; 20–22 µm wide; female genital flap smooth; genital setae 14–16 µm (Figure 4b).

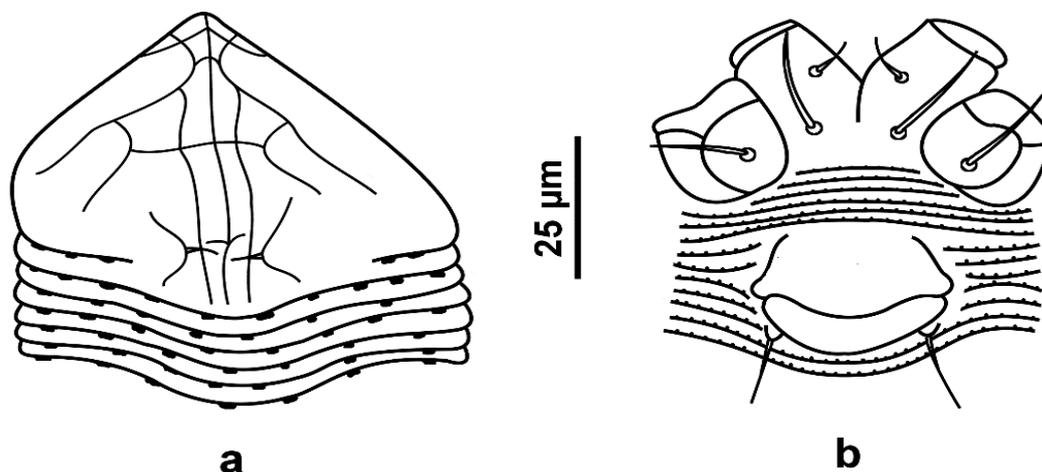


Figure 4- *Leipothrix moraceus* (Castagnoli, 1980) a- Prodorsal shield, b- Genitalia

Material examined: Edremit, Van (38° 20' 29 N; 43° 02' 09 E; 1669m); 07.07.2015 (11 ♀♀, 1 ♂).

Host Plant: *Morus alba* L. (Moraceae)

Geographical distribution: Italy (Castagnoli, 1980), China (Wang et al. 2017) and Turkey (present study).

Remarks: This species was previously found in Palearctic and Oriental regions (Amrine & Stasny, 1994). We observed that this species caused rust of leaves. The lengths of the body, prodorsal shield and tibia of the Turkish specimens of *Leipothrix moraceus* differs from that of the type specimens as follows: body length in the Turkish specimens (230 µm) is longer than in the Italian specimens (215 µm); length of prodorsal shield is also longer in the Turkish specimens (53 µm) than Italian specimens (50 µm) and the tibia in the Turkish specimens (6 µm) is slightly shorter than the that of the Italian specimens (8 µm).

Genus: *Phyllocoptes* Nalepa, 1887***Phyllocoptes obtusus* (Nalepa, 1891)**

Female: 150 μm long, 45 μm wide; gnathosoma 20-22 μm long; gnathosomal setae 2-3; chelicerae 12-18 μm ; Prodorsal shield 38-40 μm long; 11-13 μm wide; dorsal setae 14-17 μm long (Figure 5a);

Leg I. 28-33 μm long; tibia 5-6 μm ; Tarsus 5-6 μm ; empodium 7 μm long; empodium 4 rayed. Leg II. 35-36 μm long; tibia 5-7 μm ; tarsus 6-7 μm ; empodium 6-7 μm long; empodium 4 rayed.

Genitalia 11-15 μm long; 22-29 μm wide; genital seta 18-20 μm (Figure 5b); female genital cover flap (9 ridges).

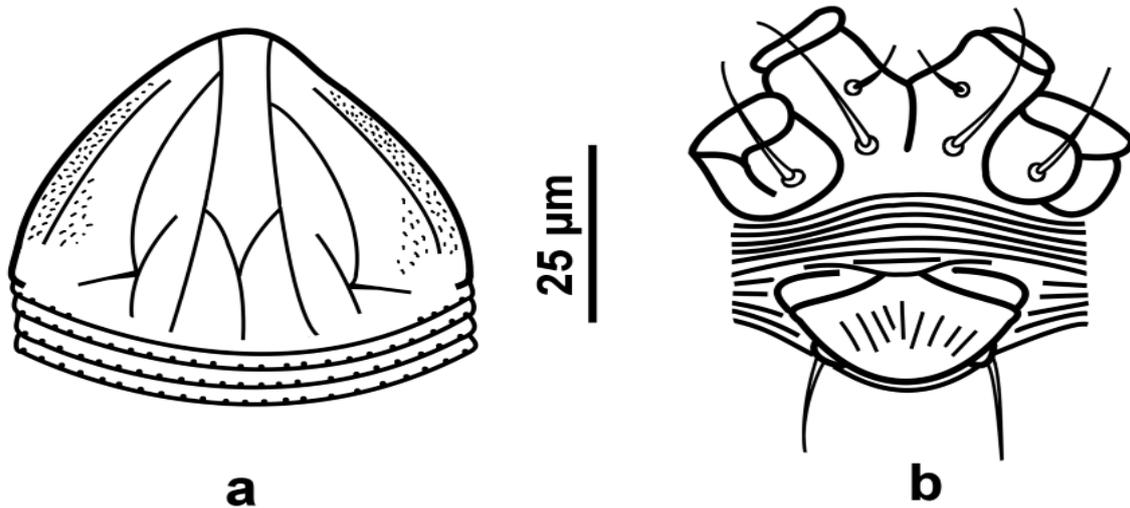


Figure 5- *Phyllocoptes obtusus* (Nalepa, 1891) a- Prodorsal shield, b- Genitalia

Material examined: İskele, Van (38° 31' 53 N; 43° 19' 40 E; 1658m); 28.06.2015 (5 ♀♀).

Host Plant: *Salvia* sp. (Lamiaceae)

Geographical distribution: Austria, Hungary, Russia, Yugoslavia (Amrine et al. 2003; Ripka, 2007) and Turkey (present study).

Remarks: This species is a vagrant on the undersurface of the leaves. There are approximately 900 species of *Salvia* genus in the world and 97 species exist in Turkey. Approximately 51 species of *Salvia* genus are endemic in Turkey (İpek & Gürbüz, 2010). It is known that eriophyoid mites are host specific and show different symptoms according to the host species (Lindquist et al. 1996).

4. Conclusions

Eriophyoids are very important phytophagous pests on crops, herbaceous plants, grasses and shrubs, and they are mostly host-specific or associated with a few hosts within a single genus or family. These mites have great potential for use as biological control agents of weeds because of their host specificity and their ability to significantly reduce the target weed's fitness (Smith et al. 2010). Knowledge of host plant specificity is necessary to develop effective control strategies and is fundamental in the application of the mites as biological control agents (Smith et al. 2010). To determine the host specificity of herbivores and to understand the role of each host species in the biology of the herbivore, information on the level of infestation of a pest on a particular host species is required (Skoracka & Dabert, 2010; Skoracka & Kuczyński, 2012).

In this study showed that, *Aceria camdeboo*, *A. trifolii*, *Phyllocoptes obtusus*, *Aculus parakarensis* and *Leipothrix moraceus* are recorded for the first time in Turkey. The influence these mites may have on the Turkish flora or their potential as weed control agents must still be determined. Future studies should continue focusing on eriophyoid mites as control agents of weeds, not ignoring their pest status.

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