KSÜ Tarım ve Doğa Derg 26 (1), 38-46, 2023
KSU J. Agric Nat 26 (1), 38-46, 2023
https://doi.org/10.18016/ksutarimdoga.vi. 938969

Diyarbakır, Elazığ ve Muş İlleri (Türkiye) Sebze Alanlarında Saptanan Predatör Akar (Acari: Phytoseiidae) Türleri

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ÖZET

Bu çalışma Diyarbakır, Elazığ ve Muş illerinde 2018-2019 yıllarında; biber, domates, fasulye, hıyar, kabak, karpuz, kavun ve patlıcan yapraklarından predatör akar türlerini tespit etmek amacı ile yapılmıştır. Sebzelerden alınan 1063 adet bitki örneğinin 676 adedi akarlar ile bulaşık olarak tespit edilmiştir. Bu bitki örneklerinin %10,65' nde ise Phytoseiidae familyasına ait predatör akar türleri tespit edilmiştir. Tespit edilen faydalı akarlar; *Neoseiulus barkeri* Hughes, *Neoseiulus bicaudus* Wainstein, *Neoseiulus marginatus* (Wainstein), *Neoseiulus zwoelferi* (Dosse), *Neoseiulus* sp., *Phytoseius finitimus* Ribaga, *Proprioseiopsis messor* (Wainstein), *Typhlodromus* (*Anthoseius*) *rhenanus* (Oudemans) ve *Typhlodromus* (*Anthoseius*) *recki* (Wainstein) türleridir. *Neoseiulus barkeri* ise bu türler içerisinde %57.44 oranı ile tespit edilen en yaygın tür olmuştur. Araştırmada Phytoseiidae akarlarının en çok saptandığı kültür bitkileri ise %60,59 ve %15.94 ile sırasıyla *Cucumis sativus* ve ve *Solanum melongena* L.' dır. En az akar saptanan sebze ise % 1.06 ile *Capsicum annuum* L.' dur.

Bitki Koruma

Araştırma Makalesi

Makale Tarihçesi
Geliş Tarihi : 18.05.2021
Kabul Tarihi : 16.02.2022

Anahtar Kelimeler
Predatör akar
Neoseiulus
Typhlodromus
Diyarbakır
Cucumis sativus

Predatory mites (Acari: Phytoseiidae) on Vegetable Fields in Diyarbakır, Elazığ and Muş Provinces, Turkey

ABSTRACT

This study was conducted to identify predatory mite species on pepper, tomato, bean, cucumber, pumpkin, watermelon, melon, and eggplant plant leaves between 2018 and 2019 Diyarbakır, Elazığ, and Muş provinces. 1063 plant samples were collected and 676 of these samples which were observed with mite species. Predatory mite species were identified belonging to the Phytoseiidae family, which constitues 10.65% of 676 plant samples. The identified predatory mites were listed as *Neoseiulus barkeri* Hughes, *Neoseiulus bicaudus* Wainstein, *Neoseiulus marginatus* (Wainstein), *Neoseiulus zwoelferi* (Dosse), *Neoseiulus* sp., *Phytoseius finitimus* Ribaga, *Proprioseiopsis messor* (Wainstein), *Typhlodromus (Anthoseius) bagdasarjani* Wainstein and Arutunjan, *Typhlodromus (Anthoseius) rhenanus* (Oudemans) and *Typhlodromus (Anthoseius) recki* (Wainstein) in this study. *Neoseiulus barkeri* wasdetected as the most common species with 57.44% total number of individuals in the three provinces. The most detected host plants were *Cucumis sativus* L. at 60.59%; *Solanum melongena* L. (Family name) at 15.94% while the least detected vegetable was *Capsicum annuum* L. at 1.06% percentages.

Plant Protection

Research Article

Article History
Received : 18.05.2021
Accepted : 16.02.2022

Keywords
Predatory mite
Neoseiulus
Typhlodromus
Diyarbakir
Cucumis sativus

Atıf Şekli: Kaymak Kara, B., Çobanoğlu, S. & Ölmez Bayhan, S. (2023). Diyarbakır, Elazığ ve Muş İlleri (Türkiye) Sebze Alanlarında Saptanan Predatör Akar (Acari: Phytoseiidae) Türleri. KSÜ Tarım ve Doğa Derg *26* (1), 38-46. https://doi.org/10.18016/ksutarim doga.vi.938969

To Cite : Kaymak Kara, B., Çobanoğlu, S. & Ölmez Bayhan, S. (2023). Predatory mites (Acari: Phytoseiidae) on Vegetable Fields in Diyarbakır, Elazığ and Muş Provinces, Turkey. *KSU J. Agric Nat 26* (1), 38-46. https://doi.org/10.18016/ksutarimdoga.vi.938969

INTRODUCTION

The vegetable yield in Turkey was 25,041,025 tonnes in the 592.937 hectares based on the Turkish Statistical Institute (TUIK) in 2019. Specifically,

Diyarbakır, Elazığ, and Muş provinces sustained 21.409 hectares of production areas and 667,755 tons' yield (TUIK 2019). These locations meet 2.66% of the country's overall demand. The production of vegetable is ordinarily carried out the in backyard of houses as a small business. Also, Diyarbakir is one of the most popular cities in Turkey concerning watermelon production (TUIK 2019).

The growers generally prefer the application of the chemicals because of getting higher yields in a short time. As known, the side effects of the chemical applications are harmful on non-target organisms, such as humans, animals, other beneficial pests and the environment. Therefore, the growers should be guided about management strategies in order to not disrupt the natural balance. Biological control is one of management strategies that is susceptible to environmental, human, and animal health. Besides, it is a suitable method for sustainable agriculture techniques. The main biocontrol agents for pest control are entomopathogens, predators, and parasitoids (Kılınçer et al. 2010). For this purpose, the Phytoseiidae predatory mites should be revealed and studied to increase their efficiency.

There are 2,692 identified species (including synonyms) belonging to the Phytoseiidae family so far (Demite et al. 2014). These species are included in the integrated pest management programs as a promising alternative source for pesticides. Phytoseiidae species are the largest group in commercially possible mite biocontrol agents, about 20 species offered globally.

Amblyseius swirskii Athias-Henriot *(Acari: Phytoseiidae), Phytoseiulus persimilis* Athias-Henriot *(Acari: Phytoseiidae), Neoseiulus cucumeris* (Oudemans) *(Acari: Phytoseiidae),* and *N. californicus* (McGregor) *(Acari: Phytoseiidae)* are the most recognized species, comprising the more significant part of the whole arthropod biocontrol agent market (Knapp et al. 2018).

Biocontrol-based studies show that *Phytoseiidae* sustains excellent potential for being used against *Tetranychus urticae* Koch (Acari: Tetranychidae), (Sarwar et al. 2011). *Neoseiulus* species are also promising predators as a part of such programs (Döker 2019). One of the most notable factors for suppressing phytophagous mites is Phytoseiidae species which was detailed by many researchers (Düzgüneş 1963; Çobanoğlu 1989; Çobanoğlu 2002; Zhang 2003; Kasap 2020; Yeşilayer & Çobanoğlu, 2011). In Turkey, 19 genera belonging to Amblyseiinae, Phytoseiinae, and Typhlodrominae subfamilies, and three sub-genera belonging to 85 phytoseiid mite species were determined (Döker et al. 2014; 2015). The number of species has exceeded 90 up until now (Döker 2019).

Objective of this study was to determine the phytoseiid species feeding on phytophagous mites in vegetable fields of Diyarbakır, Elazığ, and Muş territories. The samples collected sites and coordinates are shown in Table (1). The use of pesticides was rare, except some commercial production areas of Muş province. In general, farming wascarried out in the backyard of the houses. Which were considered valuable place for a comprehensive study on predatory mites for the first time in Elazığ, and Muş provinces.

There has been no study directly targeting predator mites in vegetable areas in related region. Yaman et al. (2018) identified *Phytoseius finitimus* (Ribaga) (Mesostigmata: Phytoseiidae) in the vegetable areas of Diyarbakır and Mardin provinces.

Table 1. The Coordinates of the studied locations of the Diyarbakır, Elazığ, and Muş provinces.
Çizelge 1. *Çalışmanın yapıldığı* Diyarbakır*, Elazığ ve Muş illeri' nin koordinatları.*

Province	Location	Geographic coordinates (N and E)	Altitude (m)
Diyarbakır	Bismil	37° 50′ 58′′ 40° 40′ 07′′	546
	Çermik	38° 08′ 06′′ 39° 27′ 21′′	688
	Çınar	37° 40′ 06′′ 40° 16′ 19′′	806
	Eğil	38° 15′ 26′′ 40° 04′ 51′′	848
	Ergani	38° 16′ 04′′ 39° 45′ 42′′	932
	Central district	37° 55′ 29′′ 40° 12′ 39′′	688
Elazığ	Baskil	38° 32′ 06′′ 38° 39′ 12′′	1.276
	Maden	38° 26′ 39′′ 39° 37′ 37′′	1.155
	Sivrice	38° 26′ 49′′ 39° 18′ 33′′	1.274
	Central district	38° 40′ 28′′ 39° 13′ 21′′	1.060
Muş	Hasköy	38° 41′ 00′′ 41° 41′ 26′′	1.278
	Korkut	38° 44′ 18′′ 41° 47′ 08′′	1.312
	Central district	38° 44′ 04′′ 41° 29′ 28′′	1.396

MATERIALS and METHODS

The materials of this study were *Capsicum annuum* L. (Solanales: Solanaceae), *Cucumis sativus* L. (Cucurbitales: Cucurbitaceae), *Cucumis melo* L. (Cucurbitales: Cucurbitaceae), *Cucurbita pepo* L. (Cucurbitales: Cucurbitaceae), *Citrullus lanatus*

(Thunb.) Matsum. & Nakai (Cucurbitales: Cucurbitaceae), *Solanum melongena* L. (Solanales: Solanaceae), *Solanum lycopersicum* L. (Solanales: Solanaceae) and *Phaseolus vulgaris* (Fabales: Fabaceae) fields in Diyarbakır, Elazığ and Muş provinces (Figure 1).

Samples were taken randomly from related areas. The primary material in this study was Phytoseiidae family predators collected from the vegetable leaves.

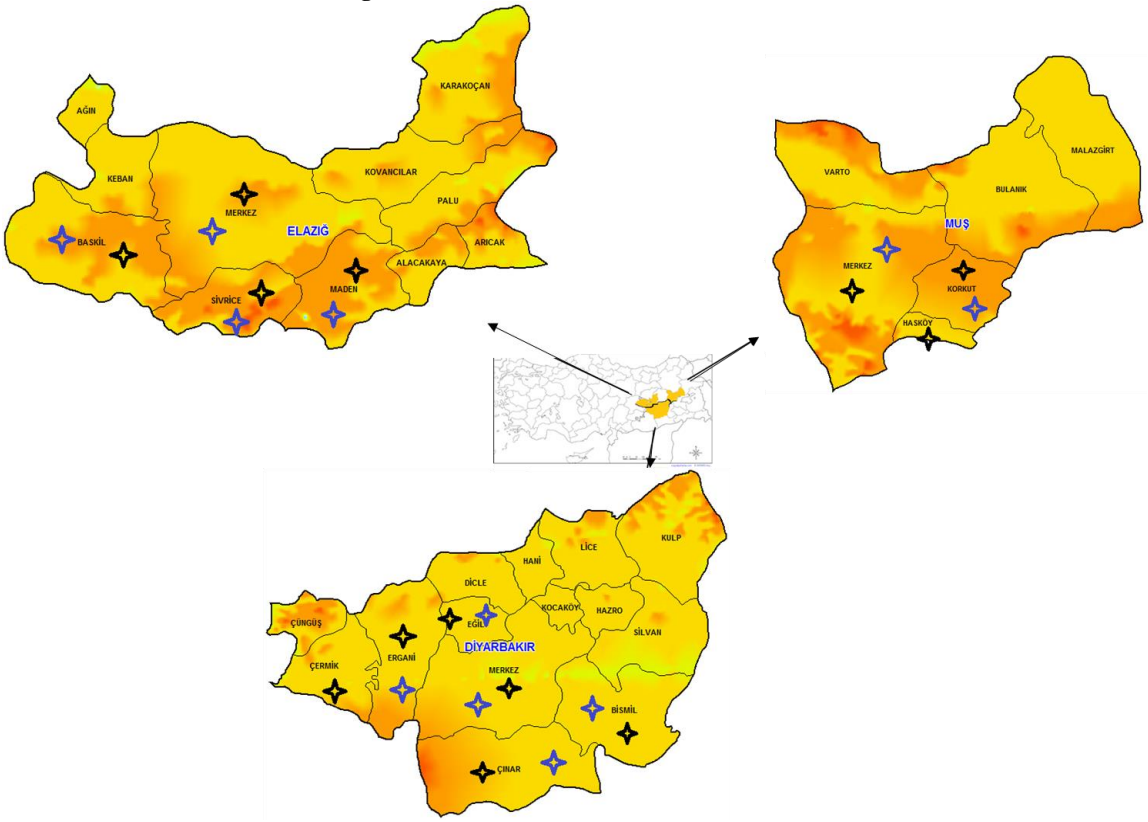

Figure 1. Sampling areas in Diyarbakır, Elazığ and Muş provinces (✦ Sampling districts✦, Phytoseiidae found districts).

Şekil 1: *Diyarbakır, Elazığ ve Muş illerindeki örnekleme alanları (✦ Örneklenen ilçeler,✦ Phytoseiidae bulunan ilçeler).*

The samples were collected during a 14 day vegetation period between April and October of 2018-2019.

The leaves were taken different level and direction of the plants including, lower, middle, and top of the host plants. If the plant morphology was consisted of the small plates, 50 or 60 samples were taken for each 0.1-hectare area. On the other hand, if plants have big leaves such as eggplant and cucumber, 20 or 30 leaves were taken for a 0.1-hectare area (Bora & Karaca 1970; Can & Çobanoğlu 2010; Çobanoğlu & Kumral 2014). Collected samples were first placed paper and then polyethylene bags and delivered to the Diyarbakır Plant Protection Research Institute laboratory (Diyarbakır) in the iceboxes. The plant materials were examined under the stereoscopic microscope to collect phytoseiid mite species. After first examination with stereoscopic microscope, overlooked leaf samples were transferred into Berlese system for extraction. The Acari class species were kept 70% ethyl alcohol until microscopic slides. Then, the individuals were transferred into Lactophenol solution for cleaning (Çobanoğlu & Kumral 2014; Kasap & Çobanoğlu 2009). After cleaning they were prepared with in Hoyer's medium and placed on the slides and incubated at 50-60 ºC' for 48 hours. The slides were sealed by nail polish to prevent possible air escape (Düzgüneş 1980).

Regardless of whether they were infected with *T. urticae* during the sampling. Mite species were identified with help of Prof. Dr. Sultan ÇOBANOĞLU at the Department of Plant Protection, Ankara University. Literatures were used in diagnoses: Kolodochka (1978); Çobanoğlu (1993 a,b,c); Moraes et al. (2004); Chant & McMurtry (2007); Papadoulis et al. (2009); Faraji et al. (2011).

RESULT and DISCUSSION

In this study ten predatory mites including *Neoseiulus barkeri* Hughes (Acari: Phytoseiidae), *N. bicaudus* Wainstein (Acari: Phytoseiidae), *N. marginatus* (Wainstein) (Acari: Phytoseiidae), *N.*

zwoelferi (Dosse) (Acari: Phytoseiidae), *Neoseiulus* sp. (Acari: Phytoseiidae), *P. finitimus*, *Proprioseiopsis messor* (Wainstein) (Acari: Phytoseiidae), *T. (A.) bagdasarjani* Wainstein and Arutunjan (Acari: Phytoseiidae), *T. (A.) rhenanus* (Oudemans) (Acari: Phytoseiidae) and *T. (A.) recki* (Wainstein) (Acari: Phytoseiidae) were identified (Table 2). The presence rate of the Phytoseiidae mites were calculated on randomly collected samples and formulated as bellow;

The presence rate= the individual numbers of Phytoseiidae species X 100 / Total number of individuals.

Also, five species relate to *Neoseiulus*, and three species relating to *T. (Anthoseius)* genera were identified as the most beneficial predatory mites (Table 2)., *N. barkeri* was detected as the most common species with 57.44% total number of individuals in the three provinces. *Neoseiulus bicaudus* was the second most common species with an 11.17%. The following percentages of species are *N. marginatus* 10.10%, *T. (A.) recki* 5.31%, *Phytoseius finitimus* 4.78%, *Neoseiulus sp.* 4.78%, *N. zwoelferi* 3.72%, *T. (A.) rhenanus* 1.59%, *P. messor* 0.53%, and *T. (A.) bagdasarjani 0.*53% in table 2. The table 2 shows that the most common host plant is *C. sativus* with 114 specimens, while the least preferred host is *C. annuum* with two samples. Also, the most common phytoseiid species is *N. barkeri*, with a 57.44 % ratio. Conversely, the rarest seen species are *T. (A.) bagdasarjani*, and *P. messor* 0.53% ratio.

Table 2. Phytoseiid mite species and range of the host plants.
Çizelge 2. *Phytoseiidae akar türleri ve kültür bitkilerinde bulunma oranları.*

Genera In	Mite Species	Host Plants*								Total	Ratio (%)
		1	2	3	4	5	6	7	8		
Phytoseiidae	*Neoseiulus barkeri*	76	14	1	-	1	11	-	5	108	57.44
	Neoseiulus bicaudus	-	13	-	-	6	-	2	-	21	11.17
	Neoseiulus marginatus	17	-	-	-	-	-	2	-	19	10.10
	Neoseiulus zwoelferi	7	-	-	-	-	-	-	-	7	3.72
	Neoseiulus sp.	4	2	-	-	-	1	2	-	9	4.78
	Typhlodromus (A.) bagdasarjani	1	-	-	-	-	-	-	-	1	0.53
	Typhlodromus (A.) recki	7	-	-	-	3	-	-	-	10	5.31
	Typhlodromus (A.) rhenanus	-	-	-	-	2	1	-	-	3	1.59
	Phytoseius finitimus	2	1	1	-	5	-	-	-	9	4.78
	Proprioseiopsis messor	-	-	-	-	1	-	-	-	1	0.53
In Total		114	30	2	0	18	13	6	5	188	100

*1. *C. sativus* 2. *S. melongena* 3. *C. annuum* 4. *S. lycopersicum* 5. *C. pepo* 6. *P. vulgaris* 7. *C. lanatus* 8. *C. melo*

Family: PHYTOSEIIDAE

Subfamily: AMBLYSEIINAE MUMA

Genus: *Neoseiulus* Hughes

Species: *Neoseiulus barkeri* Hughes

Examined Materials: Diyarbakır: Bismil, 5.07.2018, *P. vulgaris* (1♀); Diyarbakır: Bismil, 5.07.2018, *S. melongena* (1♀); Diyarbakır: Bismil, *C. sativus* (5♀♀ 2♂♂); Diyarbakır: Bismil, 19.07.2018, *S. melongena* (4♀♀ 1♂); Diyarbakır: Bismil, 19.07.2018, *C. melo* (1♀); Diyarbakır: Bismil, 19.07.2018, *C. sativus* (5♀♀); Diyarbakır: Bismil, 9.10.2018, *C. annuum* (1♀); Diyarbakır: Bismil, 2.08.2019, *C. sativus* (11♀♀ 3♂♂); Diyarbakır: Central District, 04.10.2018, *S. melongena* (2♀♀); Diyarbakır: Çınar, 5.07.2018, *C. sativus* (15♀♀ 2♂); Diyarbakır: Çınar, 5.07.2018, *C. melo* (4♀); Diyarbakır: Çınar, 5.07.2018, *S. melongena* (6♀♀); Diyarbakır: Çınar, 01.08.2018, *C. sativus* (3♀♀ 1♂); Diyarbakır: Çınar, 15.10.2018, *C. sativus* (26♀♀ 3♂♂); Diyarbakır: Ergani, 21.06.2018, *P. vulgaris* (6 ♀♀); Diyarbakır: Ergani, 12.09.2018, *P. vulgaris* (1♀); Elazığ: Baskil, 07.08.2018, *C. pepo* (1♀); Muş: Central District, 10.09.2019, *P. vulgaris* (2♀♀ 1♂).

Distribution of Turkey: Adapazarı, Ankara, Antalya, Aydın, Bursa, Çanakkale, Diyarbakır, Edirne, Istanbul, Izmir, Ordu, Samsun, Şanlıurfa (Çıkman 1995; İnal 2005; Faraji et al. 2011; Kılıç et al. 2012; Kasap et al. 2013; Çobanoğlu & Kumral 2014; Ölmez et al. 2015; Kutlu 2016; Soysal & Akyazı 2018).

Distribution the World: Algeria, Argentina, Australia, Benin, Brazil, Burundi, Cape Verde, Chile, Canary Islands, China, Cyprus, Egypt, Finland, France, former USSR (Georgia, Ukraine), England, London Dock, Germany, Ghana, Greece, Guinea, Hawaii, Iran , Israel, Italy, Japan, Jordan, Madagascar, Netherlands, Latvia, Malawi, Mayotte Island, Morocco, Mozambique, Oman, Portugal, Kenya, Japan, Norway, Nigeria, South Korea, South Africa, Spain, Sweden, Turkey, Yemen, Tunisia, Thailand, North Africa, New Jersey, Senegal, Rodriguez Island, Syria and the United States (California) (Athias-Henriot 1966; Hughes 1976; Papadoulis et al. 2009; Demite et al. 2020).

Species: *Neoseiulus bicaudus* Wainstein

Examined Materials: Diyarbakır: Çınar, 3.06.2018, *S. melongena* (11♀♀ 2♂♂); Elazığ: Baskil, 17.08.2018, *C. pepo* (5♀♀ 1♂); Elazığ: Maden, 30.07.2019, *C. lanatus*

(2♀♀).

Distribution of Turkey: Ankara, Aydın, Bursa, Izmir, Ordu, Samsun, Yalova (İnal 2005; Faraji et al. 2011; Çobanoğlu & Kumral 2014; Soysal & Akyazı 2018).

Distribution the World: France, former USSR (Armenia, Azerbaijan, Georgia, Caucasus Region, Kazakhstan, Moldova, Krasnodar region), Greece, Hungary, Iran, Latvia, Mexico, Portugal, Israel, Italy, Norway, Chile, Egypt, Saudi Arabia, Serbia, Slovakia, Spain, Switzerland, Syria, Tajikistan, Tunisia, Turkey and the United States (Papadoulis et al. 2009; Demite et al. 2020).

Species: *Neoseiulus marginatus* (Wainstein)

Examined Materials: Diyarbakır: Bismil, 19.07.2018, *C. sativus* (2♀); Diyarbakır: Bismil, 19.07.2018, *C. sativus* (1♀); Diyarbakır: Central District, 18.07.2019, *C. sativus* (1♀); Diyarbakır: Çınar, 15.10.2018, *C. lanatus* (1♀); Elazığ: Baskil, 17.08.2018, *C. lanatus* (1♀); Elazığ: Central District, 16.07.2018, *C. sativus* (7♀♀ 3♂♂); Elazığ: Central District, 11.10.2018, *C. sativus* (2♀♀); Elazığ: Maden, 23.07.2018, *C. sativus* (1♀).

Distribution of Turkey: Ankara (Faraji et al. 2011).

Distribution the World: Algeria, The Former Soviet Union (Armenia, Turkmenistan, Azerbaijan, Georgia, Kazakhstan, Moldova, Russia, Yaroslavl province, Ukraine), France, Greece, Hungary, Iran, Israel, Moldova, Moscow, Serbia, Turkey, Latvia and Kenya (Papadoulis et al. 2009).

Species: *Neoseiulus zwoelferi* (Dosse)

Examined Materials: Muş: Central District, 18.06.2019, *C. sativus* (6♀♀ 1♂).

Distribution of Turkey: Ankara, Erzurum, Hakkâri, Samsun (İnal, 2005; Faraji et al., 2011).

Distribution the World: Finland, the former USSR (Azerbaijan, Kazakhstan, Ukraine, Yaroslavl province, Russia, Moscow), the former Yugoslavia, Germany, Slovakia, Greece, Hungary, Latvia, Montenegro, Iran, Israel, Norway, Sweden, Switzerland, Turkey and the United States (Arizona, California, Ohio, Oregon, Pennsylvania and Wiskonsin) (Papadoulis et al. 2009; Demite et al. 2020).

Species: *Neoseiulus* sp.

Examined Materials: Diyarbakır: Bismil, 5.07.2018, *S. melongena* (2♀♀); Diyarbakır: Bismil, 19.07.2018, *C. sativus* (3♀♀1♂); Diyarbakır: Eğil, 4.09.2018, *C. lanatus* (2♀♀); Elazığ: Central District, 19.06.2018, *P. vulgaris* (1♀).

Genus: *Proprioseiopsis* Muma

Species: *Proprioseiopsis messor* (Wainstein, 1960)

Examined Materials: Elazığ: Sivrice, 10.09.2018, *C. pepo* (1♀).

Distribution of Turkey: Adapazarı, Aydin, Bursa, Çanakkale, Izmir (Faraji et al. 2011; Kasap et al. 2013; Çobanoğlu & Kumral 2014).

Distribution the World: Algeria, Argentina, Australia, former USSR (Armenia, Azerbaijan, Georgia, Turkmenistan, Ukraine), France, Egypt, New South Wales, Gaza Strip, Germany, Canary Islands, Greece, Hungary, Iran, Israel, Italy, Latvia, Morocco, Portugal, Saudi Arabia, Slovakia, Morocco, New Zealand, South Africa, Spain, Syria, Turkey and the United States. (Papadoulis et al. 2009; Demite et al. 2020).

Subfamily: PHYTOSEIINAE

Genus: *Phytoseius*

Species: *Phytoseius finitimus* Ribaga, 1904

Examined Materials: Diyarbakır: Bismil, 9.10.2018, *S. melongena* (1♀); Diyarbakır: Bismil, 9.10.2018, *C. annuum* (1♀); Diyarbakır: Eğil, 24.07.2019, *C. pepo* (2♀♀); Elazığ: Baskil, 17.09.2019, *C. pepo* (2♀♀ 1♂); Muş: Central District, 10.08.2018, *C. sativus* (2♀♀).

Distribution of Turkey: Adana, Adapazarı, Amasya, Ankara, Antalya, Amasya, Aydın, Balıkesir, Bolu, Burdur, Bursa, Çanakkale, Diyarbakır, Edirne, Erzincan, Giresun, Gümüşhane, Hakkâri, Icel, Isparta, Istanbul, Izmir, Kahramanmaraş, Kastamonu, Konya, Muğla, Niğde, Ordu, Rize, Samsun, Tekirdağ, Tokat (İnal 2005; Faraji et al. 2011; Özşişli & Çobanoğlu 2011; Kasap et al. 2013; Çobanoğlu & Kumral 2014; Soysal & Akyazı 2018; Yaman et al. 2018).

Distribution the World: Algeria, the Azores, Egypt, France, Greece, Iran, Israel, Italy, Montenegro, Morocco, Portugal, Slovenia, Spain, Syria, Tunisia, Turkey and the United States - California (Demite et al. 2020).

Subfamily: TYPHLODROMINAE

Genus: *Typhlodromus* (*Anthoseius*)

Species:
Typhlodromus (*Anthoseius*) *bagdasarjani* Wainstein and Arutunjan

Examined Materials: Diyarbakır: Ergani,15.08.2018, *C. sativus* (1♀).

Distribution of Turkey: Ankara, Hakkâri, Istanbul, Muğla, Van Lake (around). (Bayram & Çobanoğlu 2007; Inak & Çobanoğlu 2018; Kasap & Çobanoğlu 2009; Faraji et al. 2011; Özsisli & Çobanoğlu 2011; Yesilayer & Çobanoğlu 2011)

Distribution the World: Armenia, Azerbaijan, Iran, Turkey, Turkmenistan (Demite et al. 2020).

Species: *Typhlodromus* (*Anthoseius*) *recki* Wainstein, 1958

Examined Materials: Diyarbakır: Bismil, 19.07.2018, *C. pepo* (3♀♀); Diyarbakır: Bismil, 19.07.2018, *C. sativus* (2♀♀), Elazığ: Maden, 28.08.2018, *C. sativus* (1♀); Elazığ: Sivrice, 10.09.2018, *C. sativus* (3♀♀ 1♂).

Distribution of Turkey: Adapazarı, Amasya, Ankara, Amasya, Balıkesir, Burdur, Bursa, Çanakkale, Edirne, Gümüşhane, Içel, Isparta, Istanbul, Izmir, Kars, Kastamonu, Konya, Muğla, Nevşehir, Niğde, Samsun, Tekirdağ, Tokat, Yalova, Zonguldak (İnal 2005; Faraji et al. 2011; Kasap et al. 2013; Çobanoğlu & Kumral 2014; Kumral & Çobanoğlu 2015).

Distribution the World: Algeria, Cyprus, former USSR (Armenia, Azerbaijan, Caucasus Region, Georgia, Kazakhstan, Moldova, Russia, Ukraine), Austria, Slovenia, Cyprus, France, Greece, Hungary, Iran, Morocco, Portugal, Israel, Italy, Lebanon, Tunisia, Syria and Turkey. (Papadoulis et al. 2009; Demite et al. 2020).

Species: *Typhlodromus* (*Anthoseius*) *rhenanus* (Oudemans)

Examined Materials: Elazığ: Sivrice, 10.09.2018, *P. vulgaris* (1♀); Elazığ: Sivrice, 10.09.2018, *C. pepo* (2♀♀).

Distribution of Turkey: Antalya, Adapazarı, Erzurum (Faraji et al. 2011).

Distribution the World: Algeria, Belgium, Brazil, Canada, Cyprus, Denmark, England, Finland, France, former USSR (Azerbaijan, Belarus, Kazakhstan, Moldova, Russia, Ukraine), former Yugoslavia, Hungary, Germany, Greece, India, Iran, Ireland, Italy, Israel, Latvia, the Netherlands, Norway, Northern Ireland, Madeira Island, Portugal, Poland, Sweden, Switzerland, Slovakia, Slovenia, Spain, Syria, Turkey, and the USA (California, Illinois, Oregon, Virginia, Washington, Wisconsin) (Papadoulis et al. 2009; Demite et al. 2020).

CONCLUSION

As a result, 1063 plant samples were collected, and 676 of which were observed with mite species. On seventy-two plant samples predatory mite species were identified belonging to the Phytoseiidae family, which constitutes 10.65% of 676 plants. This ratio differs in each of the three provinces. When examined in terms of the total number of individuals; the distribution ratios of Phytoseiidae were 74.46%; 19.14%, and 6.38 % for Diyarbakır, Elazığ and Muş provinces, respectively (Table 3).

Table 3. Number of individuals of phytoseiid mite species in different Provinces in 2018 and 2019.
Çizelge 3. Phytoseiidae akar türlerinin 2018 ve 2019 yıllarında illerdeki birey sayıları.

Provinces	Years	1*	2	3	4	5	6	7	8	9	10	Total number of individuals	Ratio(%)
Diyarbakır	2018	90	13	4	-	8	1	5	-	2	-	123	74.46
	2019	14	-	1	-	-	-	-	-	2	-	17	
Elazığ	2018	1	6	14	-	1	-	5	3	-	1	31	19.14
	2019	-	2	-	-	-	-	-	-	3	-	5	
Muş	2018	-	-	-	-	-	-	-	-	2	-	2	6.38
	2019	3	-	-	7	-	-	-	-	-	-	10	
In Total		108	21	19	7	9	1	10	3	9	1	188	100

*1. *N. barkeri* 2. *N. bicaudus* 3. *N. marginatus* 4. *N. zwoelferi* 5. *Neoseiulus sp.* 6. *T. (A.) bagdasarjani* 7. *T. (A.) recki* 8. *T. (A.) rhenanus* 9. *P. finitimus* 10. *P. messor*

Overall, the host plants have a critical place in the study meaning that. Phytoseiidae species prefer different cultivated plants. At the same time, the rate of host plant preference reveals different numbers. For instance, *C. sativus*, with a 60.59% ratio, is the most preferred host plant. It is followed by; *S. melongena* 15.94%; *C. pepo* 8.96%; *P. vulgaris* 6.90%; *C. melo* 3.18%; *C. lanatus* 2.65% and *C. annuum* is 1.06 %(Figure 2). Interestingly, Phytoseiidae was not observed on the *Solanum lycopersicum* plants.

There is no other research for the identification of Phytoseiidae mite species in the region. However, some general fauna studies were completed prevously, such as Yaman et al. (2018); *P. finitimus* in Diyarbakır province, Ölmez-Bayhan et al. (2015); *N. barkeri* and *P. persimilis* in Diyarbakır province. Moreover, Kutlu (2016) was identified a related Phytoseiidae family since *P. finitimus*, *N. barkeri*, *Euseius finlandicus* Oudemans (Acari: Phytoseiidae) ve *N. californicus* in vegetable fields in Edirne, Turkey. Based on this study, the most common predatory mite species were described as *N. californicus* with a 42.15% appearance rate. Soysal & Akyazı (2018) identified 15 phytoseiid species and three predatory mite species including *N. barkeri*, *N. bicaudus*, *P. finitimus* in the vegetable fields in Ordu province. They indicated that predatory mites they found were comprise 21.8% of the general mite fauna.

Çobanoğlu (1989) reported *Amblyseius umbraticus* (Chant) (Acari: Phytoseiidae) in vegetable fields for the first time in Antalya. *Neoseiulus barkeri* and *T. (Anthoseius) rhenanus* species were also reported for the first-time in Turkey in the same study. Özşişli & Çobanoğlu (2011) were performed a Fauna study in vegetable and fruit fields in Kahramanmaras to extend their study. *Amblyseius andersoni* (Chant) (Acari: Phytoseiidae), *E. finlandicus*, *Paraseiulus triporus* (Chant and Yoshida-Shaul) (Acari: Phytoseiidae), *P. soleiger* (Ribaga) (Acari: Phytoseiidae), *Kampimodromus aberrans* (Oudemans) (Acari: Phytoseiidae), *P. subsoleiger*

Wainstein (Acari: Phytoseiidae), *T. (A.) bagdasarjani*, *P. finitimus,* and *T. (A.) intercalaris* (Livshitz-Kuznetsov) (Acari: Phytoseiidae) predatory species were reported. Based on this study, *E. finlandicus* was observed as the most common species in orchards. The same research has also shown that the phytoseiid mite fauna in Kahramanmaraş will contribute to future integrated management activities.

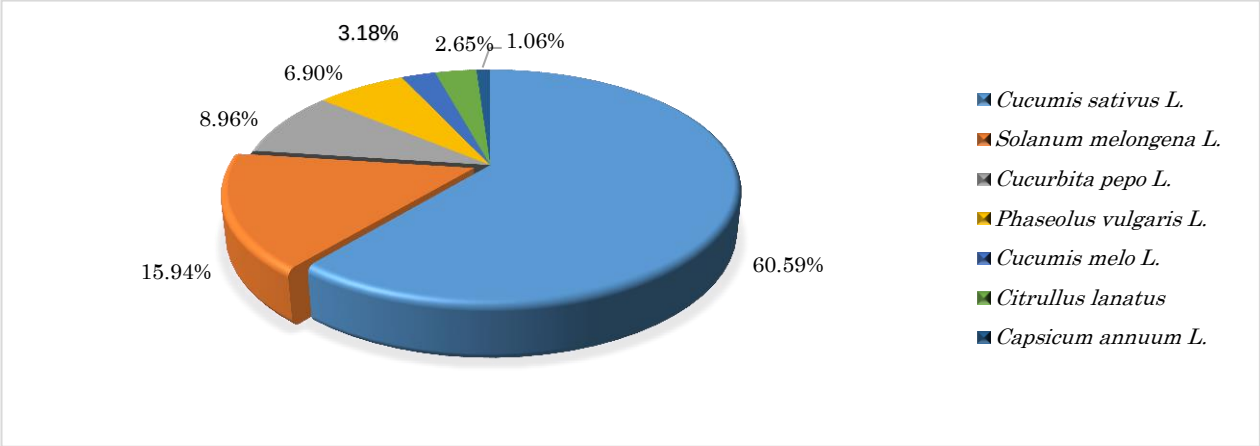

Figure 2. The host plants detected of Phytoseiidae species.
Şekil 2. *Phytoseiidae türlerinin saptandığı kültür bitkileri.*

This research proved that the predatory mite species are very promising for future biological management strategies, and these locations have significant predatory mite potential.

ACKNOWLEDGEMENT

This study was financed by the General Directorate of Agricultural Research and Policies (TAGEM) as a Doctoral Project with TAGEM/BSAD/A/19/A2/P5/1361 project number.

Authors Contributions

The authors declare that they have contributed equally to the article.

Statement of Conflict of Interest

None of the authors had any financial or personal relationships with other individuals or organizations that might inappropriately influence their work during the submission process.

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