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Orijinal araştırma (Original article)

The distribution of predatory mite species (Acari : Phytoseiidae) on ornamental plants and parks of Istanbul, Turkey[1]

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Summary

This study was conducted to determine the natural enemies of phytophagous mites on deciduous trees, conifers, and shrubs in recreational areas of Istanbul, Turkey between 2006 and 2008. A total of 1200 plant samples were collected from 51 plant species. As a result, 11 predatory mites (Acari : Phytoseiidae) namely *Amblyseius andersoni* (Chant, 1957), *Euseius finlandicus* (Oudemans, 1915), *Kampimodromus aberrans* (Oudemans, 1930), *Neoseiulus insularis* (Athias-Henriot, 1978), *Typhlodromus* (*Typhlodromus*) *tiliae* Oudemans, 1929, *Typhlodromus* (*Typhlodromus*) *athiasae* Porath and Swirski, 1965, *Typhlodromus* (*Typhlodromus*) *cotoneastri* Wainstein, 1961, *Typhlodromus* (*Anthoseius*) *bagdasarjani* Wainstein and Arutunjan, 1967, *Typhlodromus* (*Anthoseius*) *recki* Wainstein, 1958, *Phytoseius finitimus* Ribaga, 1904 and *Paraseiulus triporus* (Chant and Yoshida-Shaul, 1982) were identified. *P. triporus* and *A. andersoni* was found associated with *Tydeus californicus* (Acari: Tydeidae) on *Carpinus betulus* L. (Betulaceae). *T.* (*T.*) *athiasae* was the most abundant phytoseiid species.

Key words: Mite, Phytoseiidae, predator, ornamental plants, Istanbul, Turkey

Anahtar sözcükler: Akar**,** Phytoseiidae, predatör, süs bitkileri, Istanbul, Türkiye

Introduction

Istanbul is one of Turkey's premier cities and contains a number of parks and recreational areas. These parks and recreational areas are significant in the city and comprise approximately 9,965,000 m^2 (Aksoy, 2001). Many groups of phytophagous and predatory mites are distributed in these parks. It is important to identify these pests and their predators at the species level.

Phytoseiid mites have a considerable economic impact because they are predators of several phytophagous mites, including spider mites (Tetranychidae). They include approximately 2300 species, found throughout the world (Moraes et al., 2004). Phtoseiids have received a great deal of attention because of their potential use in the biological control of plant-parasitic mites (Swirski & Amitai, 1982; Sekeroğlu, 1984; Çobanoğlu, 1992; Yıldız, 1998). There have been many studies of predatory mites in

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different locations. In Hungary, a survey on different sources in different localities was recorded; it is included 28 phytoseiid, two stigmaeid, and four cheyletid species (Ripka, 1997, 1998). In Tunisia twelve species of phytoseiid mites were found, including a new genus and a new species on date palm production areas (Kreiter & Tixier, 2006) and nineteen phytoseiid species were reported in Iran (Rahmani *et al* 2010). Çobanoğlu (1989a, 1989b, 1992, 2004) and Sekeroğlu (1984) conducted several taxonomic studies on phytoseiid mites (Mesostigmata: Phytoseiidae) in the regions of Anatolia and the Thrace (Trakya) region of Turkey. Kasap et al. (2007) and Kasap & Çobanoğlu (2007) provided an inventory of the phytoseiid mites in apple and walnut orchards in the Van and Bitlis provinces of Turkey.

However, before this study, there were no available data on the phytoseiid mites of the Istanbul province, located in the western part of Turkey on the Marmara coast. The main objective of this study is to present observations and a quantitative assessment of phytoseiid mite species on ornamental plants in Istanbul during 2006-2008. Determining which mites are beneficial a key factor in the natural control of phytophagous mites is the other objective of this study.

Materials and Methods

Phytoseiid mites were collected from various ornamental plants and parks in Istanbul, Turkey between 2006 and 2008 at the following sampling sites: Avcılar, Beykoz, Büyükçekmece, Eyüp, Çatalca, Gaziosmanpaşa, Kartal, Kadıköy, Küçükçekmece, Maltepe, Sarıyer, Silivri, Sultanbeyli, Pendik, Tuzla and Ümraniye. Specimens were collected at weekly intervals from various areas and plants, including deciduous trees, conifers, parks, ornamental trees, home gardens, and shrubs in recreational areas of Istanbul province (Fig. 1). The samples were taken mainly from unsprayed areas during the growing seasons. In total, 1200 samples were taken from branches and leaves. Samples were transferred to the Entomology Laboratory of the Central Research Institute, Istanbul, in an icebox. Mites were removed from the leaf samples under a stereomicroscope and extracted using Berlese funnels. The predatory mites were preserved in 70% ethyl alcohol. After clearing the mite samples in lactophenol solutions, they were mounted in Hoyer's medium. The slides were dried (for 2–4 weeks) at 35°C. The identifications were based on Rowell et al. (1978), Kolodochka (1978), Arutunjan (1977), Beglyarov (1981) and Chant & Yoshida-Shaul (1987).

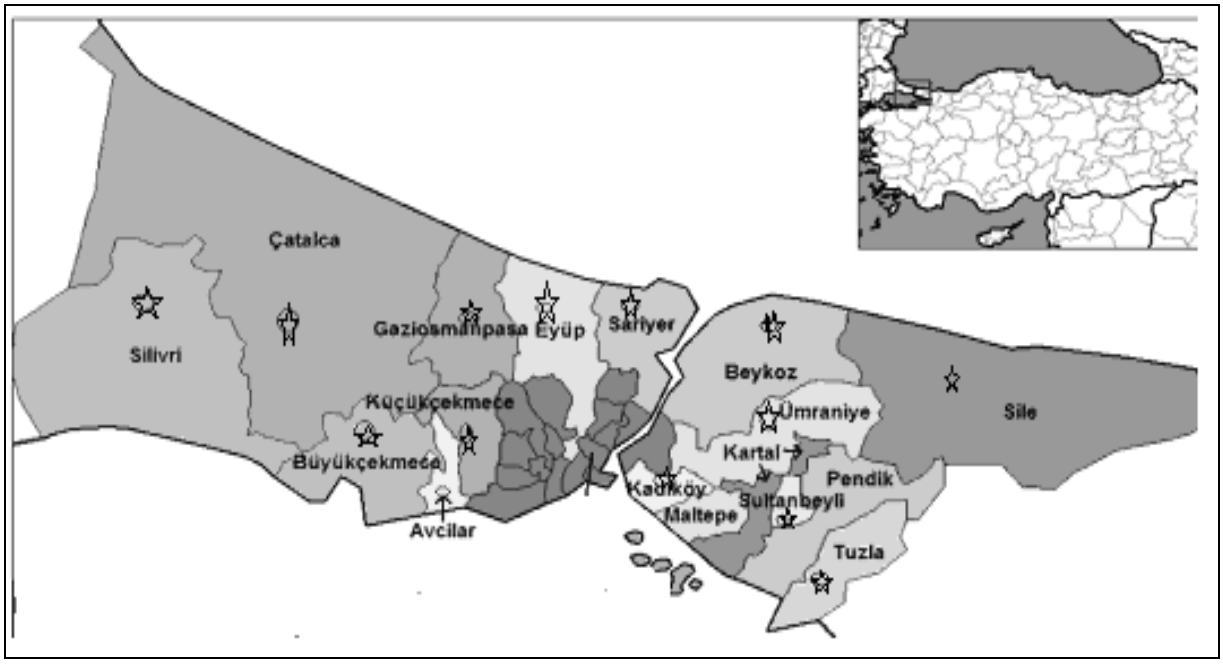

Figure 1. Surveyed areas in İstanbul during 2006 2008 (☆ Sampling localities) (Anonymous, 2007).

The slides of the mounted specimens were deposited in the collection of both authors at the University of Ankara, Department of Plant Protection, Ankara and Soil and Aqua Research Institute, Tokat. All the plant samples were collected by the senior author.

Results and Discussion

Eleven predatory mites (Acari: Phytoseiidae) namely *Amblyseius andersoni* (Chant), *Euseius finlandicus* (Oudemans), *Kampimodromus aberrans* (Oudemans), *Neoseiulus insularis* (Athias-Henriot), *Typhlodromus* (*Typhlodromus*) *tiliae* Oudemans, *Typhlodromus* (*Typhlodromus*) *athiasae* Porath and Swirski, *Typhlodromus* (*Typhlodromus*) *cotoneastri* Wainstein, *Typhlodromus* (*Anthoseius*) *bagdasarjani* Wainstein and Arutunjan, *Typhlodromus* (*Anthoseius*) *recki* Wainstein, *Phytoseius finitimus* Ribaga, and *Paraseiulus triporus* (Chant and Yoshida-Shaul) were identified (Table 1, Fig. 2).

Table 1. Predatory mite species (Phytoseiidae) collected from ornamental plants and parks of Istanbul, Turkey

Phytoseiid Species	Host Plant	Number of Specimen	Abundance (%)
Amblyseius andersoni (Chant),	*Viburnum tinus* L.	5♀♀	5.95
	Carpinus betulus L.	3♀♀	3.57
Neoseiulus insularis(Athias-Henriot)	*Picea pungens* Engelm.	1♀	1.19
	Salix babylonica L.	3♀♀	3.57
*Euseius finlandicus (*Oudemans)	*Acer negundo* L.	1♀	1.19
Kampimodromus aberrans (Oudemans)	*Eriobotrya japonica* (Thunb.)	1♀	1.19
Typhlodromus(*T.*) *tiliae* Oudemans	*Acer negundo* L.	2♀♀	2.38
Typhlodromus (*T.*) *athiasae* Porath and Swirski	*Pinus pinea* L	8♀♀, 3♂♂	13.10
	Cupressus arizonica Greene	28♀♀, 2♂♂	35.73
	Cedrus atlantica (Endl.)	2♀♀	2.38
	Platanus orientalis Brot (L.)	1♀	1.19
	Quercus robur L.	1♀, 1♂	2.38
	Laurus nobilis L.	2♀♀	2.38
	Acer negundo L.	3♀♀	3.57
	Eriobotrya japonica (Thunb.)	4♀♀, 1♂	5.95
	Nerium oleander L.	1♀	1.19
	Malus communis L.	1♀	1.19
Typhlodromus (*T.*) *cotoneastri* Wainstein	*Pinus pinea* L.	1♀	1.19
	Cedrus atlantica (Endl.)	1♀	1.19
	Cupressus arizonica Greene	1♀	1.19
Typhlodromus (*A.*) *recki* Wainstein	*Cedrus atlantica* (Endl.)	1♀	1.19
Typhlodromus (*A.*) *bagdasarjani* Wainstein and Arutunjan	*Picea pungens* Engelm.	1♀	1.19
	Pinus pinea L.	1♀	1.19
Paraseiulus triporus Chant and Yoshida-Shaul)	*Laurus nobilis* L.	2♀♀	2.38
Phytoseius finitimus Ribaga	*Carpinus betulus* L.	1♀	1.19
	Cupressocyparis leylandii L.	1♀	1.19

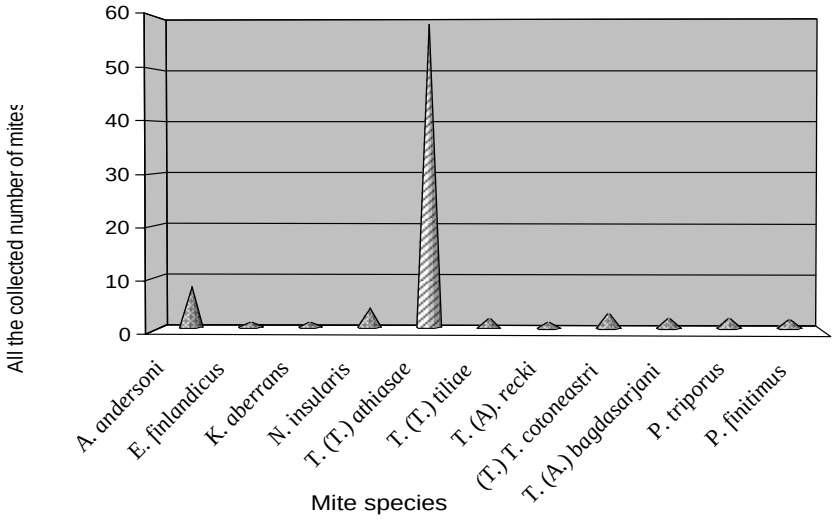

Figure 2. The number of identified Phytoseiidae species and their different stages in parks and urban areas of İstanbul.

Amblyseius andersoni Chant, 1957

Material examined: Şile: *Viburnum tinus* L. 1 December 2006, (5♀♀); Belgrad forest: *Carpinus betulus* L. 23 October 2007 (3♀♀).

Comments: This species was previously recorded in The Black Sea coast, The Marmara and Mediterranean regions of Turkey (Sekeroğlu, 1984; Çobanoğlu, 1989a, 1991, 2004). During this study, it was found associated with the colonies of *Agistemus terminalis* (Quayle, 1912) (Stigmaeidae).

Euseius finlandicus (Oudemans, 1915)

Material examined: The Yıldız Wood; *Acer negundo* 1 November 2006 (1♀).

Comments: *Euseius finlandicus* was collected in almost every region of Turkey. It is a common and widespread species in all regions of Turkey, on various plants including apple, hazelnut, pear, citrus, and grape (Swirski & Amitai, 1982; Düzgüneş & Kılıç, 1983; Sekeroğlu, 1984; Çobanoğlu, 1989a, 2004; İncekulak & Ecevit, 2002; Yanar & Ecevit, 2005). *Euseius finlandicus* was determined in the colonies of Tetranychidae, Eriophyidae, Tarsonemidae, Tydeidae, and some specimens were also observed on thrips (Çobanoğlu, 2004). It was observed in all the apple orchards in Van Lake Basin (Kasap & Çobanoğlu 2007).

Neoseiulus insularis (Athias-Henriot, 1978)

Material examined: Özgürlük Park: *Picea pungens* (Engelm.) 06 June 2006 (1♀); Yeniçiftlik; *Salix babylonica* L., 13 October 2007 (3♀♀).

Comments: *Neoseilus insularis* was previously reported from Thrace, the European part of Turkey (Çobanoğlu, 2004). In this study, *N. insularis* was found associated with *Agistemus terminalis* and *Tydeus californicus* on *Picea pungens*; it was also collected with *Typhlodromus* (*A.*) *bagdasarjani* and *Oligonychus ununguis* (Jacobi) (Tetranychidae) species on *Salix babylonica* L.

Typhlodromus* (*Typhlodromus*) *tiliae Oudemans, 1929

Material examined: Özgürlük Park: *Acer negundo* L. 1 November 2006 (2♀♀).

Comments: *Typhlodromus* (*T.*) *tiliae* was previously reported on eggplant in Antalya (Çobanoğlu, 1989b and from apple trees in Turkey (Çobanoğlu, 1993). This species was also reported in a vineyard in France (Kreiter, 1991). In this study *Typhlodromus* (*T.*) *tiliae* was found with a *Cenopalpus lineola* Canestrini & Fanzago community on *Acer negundo*.

Typhlodromus* (*Typhlodromus*) *athiasae Porath and Swirski, 1965

Material examined: Ozgürlük Park; *Pinus pinea* L. 3 July 2006 (3♀♀), 7 July 2006 (1♀); *Cupressus arizonica* Green 10 July 2006 (5♀♀), 2 October 2007 (1♀), 22 July 2008 (2♀♀); *Cedrus atlantica* (Endl.) (Pinaceae) 31 August 2006 (1♀); *Platanus orientalis* L. 22 September 2006 (1♀); Dostlar Park; *Cupressus arizonica* 29 September 2006 (1♀), 16 October 2006 (1♀), 3 July 2007 (1♀), 19 September 2007 (3♀♀), *Nerium oleander* L. 11 December 2007 (1♀), Ziraat Okulu; *Cupressus arizonica* 6 September 2006 (1♀), 15 October 2007 (1♀), 20 December 2007 (2♀♀), Atatürk Park; *Pinus pinea* 19 October 2006 (3♀♀); Sultanahmet; *Cedrus atlantica* 1 November 2006 (1♀); Yıldız Wood; *Quercus robur* L. 1 November 2006 (1♀, 1♂), *Laurus nobilis* L. 1 November 2006 (2♀♀), *Acer negundo* 1 November 2006 (3♀♀); SSK Park; *Cupressus arizonica* 18 October 2007 (11♀♀, 2♂♂); SSK Park; *Pinus pinea* 18 October 2007 (1♀, 3♂♂), Haliç Hospital; *Eriobotrya japonica* (Thunb.) 21 October 2007 (4♀♀, 1♂); Halkalı; *Malus communis* L. 10 November 2008 (1♀).

Comments: *Typhlodromus* (*T.*) *athiasae* was previously recorded on citrus in Turkey (McMurtry, 1977; Çobanoğlu, 1989a; Kumral & Kovancı, 2004). *Typhlodromus* (*T.*) *athiasae* was the most common species on different host plants in Turkey. During this study, 59 specimens were collected from 10 different plant species.

Typhlodromus* (*Typhlodromus*) *cotoneastri Wainstein, 1961

Material examined: Özgürlük Park; *Pinus pinea* 3 July 2006 (1♀), Dostlar Park; *Cedrus atlantica* 29 September 2006 (1♀), SSK Park; *Cupressus arizonica* 18 October 2007 (1♀).

Comments: *Typhlodromus* (*T.*) *cotoneastri* was determined in the Thrace and Marmara regions of Turkey on apple, cherry, and pear trees (Düzgüneş & Kılıç, 1983; Çobanoğlu, 2004). In addition, it was found with colonies of *Bryobia rubrioculus* and *Cenopalpus pulcher* Canestrini & Fanzago (Tenuipalpidae) in Tatvan (Kasap & Çobanoğlu, 2007).

Typhlodromus* (*Anthoseius*) *bagdasarjani Wainstein and Arutunjan, 1967

Material examined: Özgürlük Park; *Picea pungens* 31 August 2006 (1♀), Kurtköy nursery; *Pinus pinea* 12 December 2007 (1♀).

Comments: *Typhlodromus* (*A.*) *bagdasarjani* was mentioned in association with *Tetranychus urticae* Koch, *Eriophyes tristriatus* (Nalepa) (Eriophyidae), and *Aceria hippophaenus* (Nalepa) (Eriophyidae) (Arutunjan, 1977). This species was reported on olive and tamarisk trees in Turkmenistan (Kolodochka, 1978). It was also reported from woody ornamental plants in Ankara (Çobanoğlu et al., 2003) and from *Pinus brutia* Ten. (Pinaceae) and *Pinus nigra* L. (Pinaceae) in Turkey (Bayram & Çobanoğlu, 2007). This species was found among colonies of *T. urticae* and stigmaeid mites from *Urtica urens* L. (Urticaceae) in Hakkari (Kasap & Çobanoğlu, 2009). During this study, this species was found with *Oligonychus ununguis* and *Pentamerismus oregonensis* McGregor (Tenuipalpidae) on *Picea pungens*.

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

Material examined: Dostlar Park; *Cedrus atlantica* 16 October 2006 (1♀).

Comments: This species is common and widespread; these mites are found throughout Turkey (Swirski & Amitai, 1982; Sekeroğlu, 1984; Çobanoğlu, 1989a, 1991, 2004; Madanlar, 1992; Kumral, 2005; Bayram & Çobanoğlu, 2007).

Paraseiulus triporus (Chant and Yoshida-Shaul, 1982)

Material examined: The Yıldız Wood; *Laurus nobilis* 1 November 2006 (2♀♀).

Comments: *Paraseiulus triporus* was previously reported from *Malus communis* L. (Rosaceae) in Turkey (Çobanoğlu, 2004). It was found associated with the population of *Bryobia rubrioculus* (Scheuten) (Tetranychidae), *Amphitetranychus viennensis* (Zacher) (Tetranychidae), *Aculus schlechtendali* (Nalepa) (Eriophyidae) and *Zetzellia mali* (Ewing) (Acari: Stigmaeidae) from malus trees in Van (Kasap & Çobanoğlu, 2007).

Phytoseius finitimus Ribaga, 1904

Material examined: The Belgrad Forest; *Carpinus betulus* 23 October 2007 (1♀), Kurtköy Nursery; *Cupressocyparis leylandii* (Dall. & Jaks.) 12 December 2007 (1♀).

Comments: *P. finitimus* is a very common species and found throughout Turkey. It was collected from apple leaves in Ankara (Çobanoğlu, 1997, 2004). The dorsal shield is lightly sclerotized and some of the dorsal setae are thickened, massive, and crenated (Çobanoğlu, 1997). During this study *Phytoseius plumifer* (Canestrini & Fanzago) was found with Tydeidae colonies and *Amblyseius andersoni* from *Cedrus atlantica.*

Kampimodromus aberrans (Oudemans, 1930)

Material examined: Haliç Hospital; *Eriobotrya japonica* 21 October 2007 (1♀).

Comments: *Kampimodromus aberrans* is commonly found on various plants including apple, hazelnut, and pear, in all regions of Turkey (Swirski & Amitai, 1982; Düzgüneş & Kılıç, 1983; Çobanoğlu et al., 2003; Kasap & Çobanoğlu, 2007; Kasap et al., 2007). It had previously been collected among the colonies of Eriophyidae, Tarsonemidae, and Tenuipalpidae (Çobanoğlu, 2004) and was also associated with the colonies of Eriophyidae, Tarsonemidae, Tetranychidae, and Tydeidae in Hakkari (Kasap & Çobanoğlu, 2009). In this study this species was found with *Tetranychus urticae* Koch, *Arctoseius* sp. and *Typhlodromus* (*T.*) *athiasae* colonies in Istanbul province.

Conclusion

During this study, 51 plant species were sampled. Phytoseiid species were collected from 15 of these plant species, from which were collected 86 specimens. In the present study, 11 species of phytoseiid mites belonging to seven genera were recorded from Istanbul province;

Typhlodromus (*T.*) *athiasae* was the most common species. The number of genus and densities of 84 individuals were determined. *Typhlodromus* 80% (66), *Amblyseius* 10.6% (8), *Neoseiulus* 4.9% (4), two specimens (2. 3%), *Paraseiulus* and *Phytoseius* and one specimen *Euseius* and *Kampimodromus* (% 1.1), respectively (Fig. 3).*Typhlodromus* (*T.*) *athiasae* is commonly found on different plants including citrus, olive and the *Pinus* ecosystems in Turkey (Sekeroğlu, 1984; Çobanoğlu, 1989a).

The other phytoseiid species were: *Amblyseius andersoni*, *Typhlodromus* (*T.*) *tiliae*, *Euseius finlandicus*, *Kampimodromus aberrans*, *Neoseiulus insularis*, *Typhlodromus* (*T.*) *cotoneastri*, *Typhlodromus* (*Anthoseius*) *bagdasarjani*, *Typhlodromus* (*Anthoseius*) *recki*, *Paraseiulus triporus*, and *Phytoseius finitumus.*

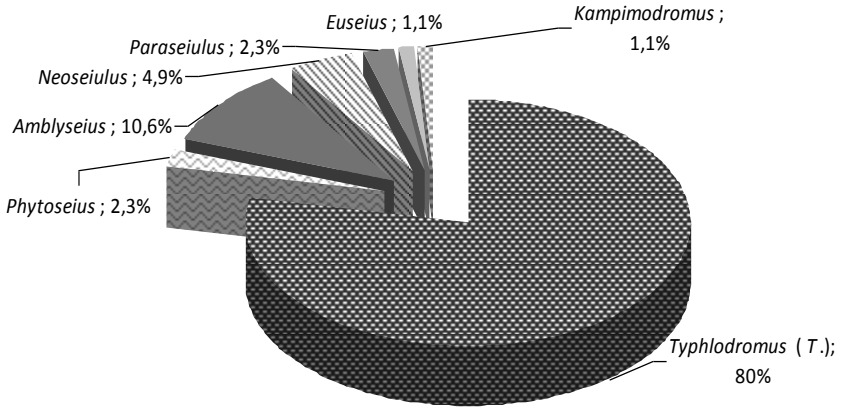

Figure 3. Number of individual as Phytoseiidae genus from parks and urban areas in İstanbul.

Acer negundo, *Cedrus atlantica*, and *Pinus pinea* were the most populated host plants whereas the other plants were rarely colonized by phytoseiid mites. *Amblyseius andersoni* was collected from two ornamental plants, *T.* (*T.*) *athiasae* was collected from 10 different plant species. *Pinus pinea* (L.) was preferred by *T. athiasae*, *Euseius finlandicus* was found on *Acer negundo* in Istanbul and on 19 deciduous trees and shrub trees in parks (Kabicek & Koubkova, 1998). This mite species has been recorded on numerous trees and bushes in Finland (Tuovinen, 1994), and occurs mostly in temperate zones on deciduous fruit trees (Tuovinen & Roxy, 1991).

It is also potentially significant to consider them in the context of a biological control system and preserving the natural balance. Mite fauna, and especially beneficial mite fauna, are rich in Istanbul province. The effectiveness of these species for the control of pest species should be a further step in these studies. Controlling the pest species, in the context of ecological balance, is important for the recreational areas and urban ecosystems in Istanbul province.

Özet

İstanbul (Türkiye)'daki park ve süs bitkilerinde predatör akar (Acari : Phytoseiidae) türlerinin dağılımı

2006-2008 yılları arasında İstanbul (Türkiye) parklarından toplanan ibreli, yaprağını döken park ve süs bitkileri üzerinden zararlı akar türlerinin doğal düşmanı olan predatör akar (Acari: Phytoseiidae) türleri belirlenmiştir. Toplam 51 farklı bitki türünden 1200 bitki örneği alınmıştır. Survey sonucunda 11 phytoseiid türü belirlenmiştir. Bu türler *Amblyseius andersoni* (Chant,1957), *Euseius finlandicus* (Oudemans, 1915), *Kampimodromus aberrans* (Oudemans, 1930), *Neoseiulus insularis* (Athias-Henriot, 1978), *Typhlodromus* (*Typhlodromus*) *tiliae* Oudemans, 1929, *Typhlodromus* (*Typhlodromus*) *athiasae* Porath and Swirski, 1965, *Typhlodromus* (*Typhlodromus*) *cotoneastri* Wainstein, 1961, *Typhlodromus* (*Anthoseius*) *bagdasarjani* Wainstein and Arutunjan, 1967, *Typhlodromus* (*Anthoseius*) *recki* Wainstein, 1958, *Phytoseius finitimus* Ribaga, 1904 ve *Paraseiulus triporus* (Chant and Yoshida-Shaul, 1982) (Acari: Phytoseiidae)'dur.

Çalışmada, bu türlerden *T.* (*T.*) *athiasae* en yaygın phytoseiid türü olarak bulunurken, *A*. *andersoni*, *Tydeus californicus* (Acari:Tydeidae) ile birlikte Gürgen [*Carpinus betilus* L. (Betulaceae)] üzerinde tespit edilmiştir.

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