Phytoseiid mites (Acari: Phytoseiidae) associated with conifers in northern Iran, with a new species record and an identification key to coniferous phytoseiid mites of Iran

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Abstract

The phytoseiid mite fauna of coniferous trees and shrubs were surveyed in northern Iran. Sixteen phytoseiid species belonging to six genera were identified on 11 plant species. Among them, *Typhlodromus (Anthoseius) foenilis* Oudemans, 1930 is considered as new record for mite fauna of Iran. Detailed morphological characteristics based on adult of both sexes of *T. (A.) foenilis* are given. An identification key to phytoseiid mites associated with conifers in Iran is also provided.

Key words: Conifers; fauna; predatory mites, morphological data, *Typhlodromus (Anthoseius) foenilis*.

Introduction

Almost all conifers world-wide occur in natural habitats, and they are generally used as ornamental trees in gardens and urban areas. Species of the coniferous families, Pinaceae and Cupressaceae (pine, yew, juniper, spruce), are cone-bearing trees, shrubs, or ground cover plants, mostly evergreen, with a wide scope of applications, that can live usually over 100 years in suitable environments (Arslan and Çelem 2000; Xue et al. 2007). In recent years, the nursery production of ornamental conifers in Iran, especially in northern zones (Guilan, Mazandaran, and Golestan Provinces) has increased.

Fauna on the coniferous plants includes many groups of harmful and beneficial organisms (Kropczynska et al. 1985). Coniferous plants are attacked by several pests. Owing to their perennial nature, coniferous trees can create stable microhabitats for small arthropods (Boczek and Shevchenko 1996). Spider mites and eriophyoids are harmful pests of coniferous plants; they are small, with a short life cycle and high fecundity (Puchalska 2014). Phytoseiid mites (Acari: Phytoseiidae) are important predators of spider and eriophyoid mites (Sabelis 1996; Gerson et al. 2003).

Compared to the other mite families of Iran, the fauna of the Phytoseiidae is the best known. According to the literature, about 86 phytoseiid species are known from...
Iran (Faraji et al. 2007; Hajizadeh et al. 2009; Hajizadeh and Mortazavi 2015a, b). Although many reports of phytoseiid mites on coniferous trees exist throughout the world (i.e. Lehman 1982; Moraes et al. 1986; Yesilayer and Çobanoğlu 2006; Kazmierczak and Lewandowski 2006; Bayram and Çobanoğlu 2007; Mangini and Hain 2007), very little is known on coniferous mites in Iran. From 1996 to date, only eight species of phytoseiid mites were recorded on coniferous plants in Iran (Brimani Varandi 1996; Barimani Varandi and Kamali 1998; Kamali et al. 2001; Amirazodi and Ostovan 2012; Hajizadeh et al. 2015b). Hence, the purpose of this survey was to identify phytoseiid mites of coniferous plants in northern Iran.

Materials and Methods
This study was carried out in northern Iran during 2013–2014. Plant foliage and litter samples were collected from forests, nurseries and parks. Mites were extracted using Berlese funnels or by direct examinations of plant materials under a stereomicroscope. Specimens were preserved in 75% ethanol and then cleared in Nesbitt’s solution. Cleared mites were mounted in Hoyer’s medium on microscopic slides. The mites were examined under an Olympus BX51 phase-contrast microscope (Olympus Optical Co., LTD., Tokyo, Japan) at 1000× magnification. All drawings were prepared with the help of a 1.25X Olympus camera Lucida (Olympus Optical Co., LTD., Japan). All the measurements are given in micrometer (μm); the average followed (in parentheses) by the respective ranges. The dorsal chaetotaxy is widely used as a taxonomic criterion in the Mesostigmata, and the system and notations followed in the present work is that of Lindquist and Evans (1965) and Rowell et al. (1978), and Chant and Yoshida-Shaul (1991) and Lindquist (1994) for dorsal and ventral setae, respectively. Nomenclature used for dorsal solenostomes and poroids is that proposed by Athias-Henriot (1975). The classification systems for phytoseiid mites follow those of Chant and McMurtry (1994, 2003a, b, 2004, 2005a, b, c, 2006, 2007). World distribution of each species is based on Demite et al. (2014). The voucher specimens of each species was preserved as slide-mounted specimens are deposited in the Mite Collection of the Acarology Laboratory, Department of Plant Protection, Faculty of Agricultural Sciences at University of Guilan, Rasht, Iran. Specimens were identified by the relevant taxonomic keys (Chant and Yoshida-Shaul 1987; Faraji et al. 2007; Ferragut and Ueckermann 2012; Hernandes et al. 2012; Hajizadeh and Mortazavi 2015a).

Results
In the current survey, a total of 16 phytoseiid mite species, belonging to six genera and three subfamilies were collected and identified from northern Iran (Guilan, Mazandaran and Golestan Provinces) associated with coniferous plants. Among them Typhlodromus (Anthoseius) foenilis Oudemans, 1930 is newly record for the mite fauna of Iran. The male of T. (A.) foenilis is described and illustrated for the first time. An identification key to the adult females of the 16 recorded species associated with coniferous plants in Iran is also provided.

Taxonomy

Family Phytoseiidae Berlese
Subfamily Amblyseiinae Muma
Amblyseius azerbaijanicus Abbasova, 1970*1

Material examined
Guilan Province, Rezvanshahr County (37° 33′ 4″ N, 49° 8′ 22″ E), 11 September 2014, 
Platycladus orientalis (L.) Franco (Cupressaceae) foliage, 1 female, 2 males, collected by M. R. Yazdanpanah.

This species was originally described from Khachmas, Azerbaijan, in nest of the rodent Micromys minutus (Pallas) and recorded from Azerbaijan and Iran (Abbasova 1970; Demite et al. 2014).

Amblyseius herbicola (Chant, 1959)

Material examined
Mazandaran Province, Sari County (36° 33′ 48″ N, 53° 3′ 36″ E), 23 September 1995, Thuja orientalis (L.) (Cupressaceae) foliage, 1 female, collected by H. Barimani Varandi; Guilan Province, Soumahe Sara County, Bahambar Village (37° 26′ 56″ N, 49° 14′ 50″ E), 11 September 2014, Pinus roxburghii Sarg. (Pinaceae) foliage, 2 females and 3 males, collected by M. R. Yazdanpanah.

This species was originally described from Portugal, intercepted at Boston, Massachusetts, USA, on Bromeliaceae, and recorded from Argentina, Australia, Benin, Brazil, Burundi, Canary Islands, China, Colombia, Costa Rica, Dominican Republic, DR Congo, EL Salvador, Ghana, Guadeloupe, Guatemala, Hawaii, Honduras, India, Iran, Kenya, Les Saintes, Malawi, Malaysia, Martinique, New Caledonia, Papua New Guinea, Peru, Philippines, Portugal, Puerto Rico, Reunion Islands, Rwanda, Senegal, Singapore, South Africa, Spain, Taiwan, Thailand, USA, Venezuela and West Indies (Chant 1959; Demite et al. 2014).

Amblyseius rademacheri Dosse, 1958*

Material examined
Guilan Province, Rasht County (37° 16′ 51″ N, 49° 34′ 59″ E), 7 July 2014, Chamaecyparis lawsoniana (A. Murray) Parl. (Cupressaceae) foliage, 2 females and 1 male, collected by M. R. Yazdanpanah.

This species was originally described from Stuttgart/Hohenheim, Baden Wurttemberg, Germany, on apple, and recorded from Armenia, Austria, Azerbaijan, China, Czechoslovakia, Denmark, Georgia, Germany, Hungary, Iran, Italy, Japan, Latvia, Moldova, The Netherlands, Russia, Slovakia, Slovenia, South Korea, Spain, Switzerland and Ukraine (Dosse 1958; Demite et al. 2014).

Neoseiulus barkeri Hughes, 1948*

Material examined
Guilan Province, Rasht County (37° 16′ 51″ N, 49° 34′ 59″ E), 6 July 2014, Chamaecyparis lawsoniana (A. Murray) Parl. (Cupressaceae) foliage, 2 females; 7 July 2014, Pinus eldarica Medw. (Pinaceae) debrises, 2 females; Guilan Province, Soumahe Sara County, Bahambar Village (37° 26′ 56″ N, 49° 14′ 50″ E), 11 September 2014, Pinus roxburghii Sarg. (Pinaceae) foliage, 4 females and 1 male, collected by M. R. Yazdanpanah.

1 New records for Iranian coniferous mite fauna are marked with an asterisk (*).
This species was originally described from London Docks, England, on germinating barley, and recorded from Algeria, Argentina, Australia, Benin, Brazil, Burundi, Canary Islands, Cape Verde, China, Cyprus, Egypt, England, Finland, France, Georgia, Germany, Ghana, Greece, Guinea, Hawaii, Iran, Israel, Italy, Japan, Jordan, Kenya, Latvia, Malawi, Morocco, Mozambique, The Netherlands, Nigeria, Norway, Oman, Portugal, Reunion Islands, Russia, Saudi Arabia, Senegal, South Africa, South Korea, Spain, Sweden, Syria, Thailand, Tunisia, Turkey, Ukraine, USA, West Bank and Yemen (Hughes 1948; Demite et al. 2014).

Neoseiulus brevispinus (Kennett, 1958)*

Material examined
Guilan Province, Rasht County (37° 16′ 51″ N, 49° 34′ 59″ E), 6 July 2014, Chamaecyparis lawsoniana (A. Murray) Parl. (Cupressaceae) foliage, 1 female; Guilan Province, Soumahe Sara County, Bahambar Village (37° 26′ 56″ N, 49° 14′ 50″ E), 11 September 2014, Pinus roxburghii Sarg. (Pinaceae) foliage, 1 female and 1 male, collected by M. R. Yazdanpanah.

This species was originally described from Watsonville, California, USA, on strawberry, and recorded from Caucasus region, Hungary, Iran, Russia and USA (Kennett 1958; Demite et al. 2014).

Neoseiulus marginatus (Wainstein, 1961)*

Material examined
Guilan Province, Rasht County (37° 16′ 51″ N, 49° 34′ 59″ E), 7 July 2014, Platycladus orientalis (L.) Franco (Cupressaceae) foliage, 1 female, collected by M. R. Yazdanpanah.

This species was originally described from Kazakhstan, on herb, and recorded from Algeria, Armenia, Azerbaijan, France, Georgia, Greece, Hungary, Iran, Israel, Kazakhstan, Kenya, Latvia, Moldova, Russia, Serbia, Turkey, Turkmenistan and Ukraine (Wainstein 1961; Demite et al. 2014).

Neoseiulus sugonjaevi (Wainstein and Abbasova, 1974)*

Material examined
Guilan Province, Soumahe Sara County, Bahambar Village (37° 26′ 56″ N, 49° 14′ 50″ E), 11 September 2014, Pinus roxburghii Sarg. (Pinaceae) foliage, 1 female and 1 male; Guilan Province, Rasht County (37° 16′ 51″ N, 49° 34′ 59″ E), 7 July 2014, Pinus sylvestris L. (Pinaceae) debries, 1 female and 1 male; Guilan Province, Rezvanshahr County, Punel Village (37° 32′ 16″ N 49° 06′ 16″ E), 11 September 2014, Pinus roxburghii Sarg. (Pinaceae) foliage, 1 females and 3 males, collected by M. R. Yazdanpanah.

This species was originally described from Dzhalilabad, Azerbaijan, in rodent nest, and recorded from Azerbaijan, Iran and Uzbekistan (Wainstein and Abbasova, 1974; Demite et al. 2014).

Neoseiulus umbraticus (Chant, 1956)

Material examined
Mazandaran Province, Behshahr County (36° 41′ 32″ N, 53° 33′ 9″ E), 3 November

This species was originally described from Newgate Shaw, East Malling Research Station, Kent, England, on *Rubus fruticosus* L. (Neotype designated by Chant and Yoshida-Shaul (1982): Oaken Wood, East Malling, Kent, England, on *Rubus* sp.) and recorded from Armenia, Azerbaijan, Belarus, Caucasus region, Denmark, England, France, Georgia, Germany, Hungary, Iran, Italy, Jamaica, Latvia, Mexico, Moldova, Montenegro, Norway, Poland, Russia, Slovakia, Spain, Switzerland, Turkey, Ukraine and USA (Chant 1956; Demite et al. 2014).

*Transeius wainsteini* (Gomelauri, 1968)

**Material examined**


This species was originally described from Manglisi, Georgia, on *Corylus* sp. and recorded from Denmark, Georgia, Germany, Iran, Slovakia and Turkey (Gomelauri 1968; Demite et al. 2014). *Transeius wainsteini* is senior synonym of *T. caspiansis* (Denmark and Daneshvar), *T. patellae* (Karg) and *T. similis* (Koch) according to Rhamani et al. (2010).

Subfamily *Phytoseiinae* Berlese

**Phytoseius finitimus** Ribaga, 1904*

**Material examined**

Guilan Province, Soumahe Sara County, Larsar Village (37° 28’ 20” N, 49° 10’ 19” E), *Pinus eldarica* Medw. (Pinaceae) foliage, 4 females, collected by M. R. Yazdanpanah.

This species was originally described from Portici, Campania, Italy, on *Buddleja madagascariensis*. Lam., and recorded from Algeria, Egypt, France, Greece, Iran, Israel, Italy, Montenegro, Portugal, Spain, Syria, Tunisia, Turkey and USA (Ribaga, 1904; Demite et al. 2014).

Subfamily *Typhlodrominae* Chant and McMurtry
Paraseiulus triporus (Chant and Yoshida-Shaul, 1982)*

Material examined
Guilan Province, Rasht County (37° 16’ 51” N, 49° 34’ 59” E), 26 July 2014, Cupressus spp. foliage, 1 female, collected by J. Hajizadeh.

This species was originally described from Ala, Italy, on unknown plant, and recorded from Czech Republic, Czechoslovakia, Denmark, Finland, France, Georgia, Germany, Greece, Hungary, Iran, Italy, Kazakhstan, Moldova, Morocco, The Netherlands, Poland, Portugal, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Syria, Turkey, Ukraine and USA (Chant and Yoshida-Shaul 1982; Demite et al. 2014).

Typhlodromus (Anthoseius) bakeri (Garman, 1948)

Material examined
Mazandaran Province, Sari County, Sang Deh Village (36° 4’ 5” N, 53° 13’ 0” E), 18 July 1995, Picea abies (L.) H. Karst. (Pinaceae) foliage, 2 females, collected by H. Barimani Varandi;

Guilan Province, Shaft County, Chubar Village (38° 10’ 49” N, 48° 53’ 36” E), 13 August 2014, Pinus roxburghii Sarg. (Pinaceae) foliage, 1 female, collected by M. R. Yazdanpanah.

This species was originally described from Westwoods, Hamden, Connecticut, USA, on apple, and recorded from Alaska, Armenia, Australia, Austria, Azerbaijan, Canada, Caucasus region, Czech Republic, Czechoslovakia, Denmark, England, Finland, France, Germany, Greece, Hawaii, Hungary, India, Iran, Italy, Latvia, Montenegro, The Netherlands, New Zealand, Norway, Poland, Portugal, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and USA (Garman 1948; Demite et al. 2014).

Typhlodromus (Typhlodromus) leptodactylus Wainstein, 1961

Material examined
Golestan Province, Chaman Saver Village (36° 36’ 43” N, 54° 12’ 3” E), 9 November 1995, Picea abies (L.) H. Karst. (Pinaceae) foliage, 1 female, collected by H. Barimani Varandi.

This species was originally described from Pantishar Canyon, Georgia, on Juniperus sp., and recorded from Armenia, Azerbaijan, Cyprus, Georgia, Greece, Iran, Israel and Ukraine (Wainstein 1961; Demite et al. 2014).

Typhlodromus (Typhlodromus) perbibus Wainstein and Arutunjan, 1968

Material examined
Mazandaran Province, Behshahr County (36° 41’ 32” N, 53° 33’ 9” E), 27 May 1995, Thuja occidentalis L. (Cupressaceae) foliage; Taxus sp. (Taxaceae) foliage, 6 females and 2 males, collected by H. Barimani Varandi.

This species was originally described from Rehovot, Central District, Israel, on Citrus sp., and recorded from Azerbaijan, Cyprus, Egypt, France, Greece, Iran, Israel, Jordan, Syria and Turkey (Porath and Swirski, 1965; Demite et al. 2014).

Typhlodromus (Typhlodromus) tubifer Wainstein, 1961

Material examined
Mazandaran Province, Behshahr County (36° 41’ 32” N, 53° 33’ 9” E), 27 May
Chaetotactic formula of genu II: 2 long; genua and tibiae I shaped atrium teeth.

13) (Fig. 13), level of paranal setae 72 (70–72), primary platelet 21 (20–21), integument paragenital poroides located on integument between setae 18 (16–18), S 55 (53–55), setae 26 (25–26), j5 16 (15–16), j6 19 (18–20), j7 18 (16–19), j8 17 (15–18), z3 23 (22–23), z4 22 (20–21), z5 17 (15–18), Z4 39 (38–40), Z5 48 (45–50), s4 26 (25–28), s6 26 (25–28), ZV 23 (22–23), and two pairs of lyrifissures, setae 18 (16–18), and a pair of poroides on metasternal shields.

This species was originally described from Manglisi, Georgia, on unspecified substrate, and recorded from Armenia, Azerbaijan, Belgium, Caucasus region, Georgia, Iran, Moldova, and Turkey (Wainstein 1961; Demite et al. 2014).

**Typhlodromus (Anthoseius) foenilis Oudemans, 1930**

Adult female - Five specimens measured.

**Dorsal idiosoma** (Fig. 1) - Dorsal shield 367 (362–375) long and 223 (190–240) wide at j6 level, completely reticulated; with 5 pairs of large solenostomes (gd2, gd4, gd6, gd8, gd9) and 13 pairs of poroides, 18 pairs of dorsal setae: j1 22 (20–25), j3 26 (25–28), j4 16 (15–18), j5 18 (16–19), j6 19 (18–20), j7 23 (20–25), j8 6 (5–8), z2 17 (15–18), z3 23 (22–23), z4 22 (20–23), z5 17 (15–18), Z4 39 (38–40), Z5 48 (45–50), s4 26 (25–28), s6 26 (25–28), ZV 23 (22–23), and R1 25 on lateral integument; all dorsal setae smooth except pectinate Z5.

**Peritreme** (Fig. 1) - Extending to level of setae j1.

**Ventral idiosoma** (Fig. 2) - Sternal shield smooth, 80 (78–82) long and 69 (65–73) wide at level setae ST2, posterior margin slightly waved, with two pairs of setae (ST1 and ST2); and two pairs of lyrifissures, setae ST3 located off shield on small platelets, setae ST4 and a pair of poroides on metasternal shields. Distances between ST1–ST1 56 (55–58), ST2–ST2 60 (58–62), ST3–ST3 66 (65–68), ST1–ST3 71, ST4–ST4 72 (70–75), ST5–ST5 64 (63–67). Lengths ST1 24 (23–25), ST2 22 (20–25), ST3 19 (18–20), ST4 19 (18–20); genital shield smooth, width 67 (65–70) at widest level; setae ST5 19 (18–20); paragenital poroides located on integument between setae ST5 and ZV1; a narrow integumental platelet located between genital and ventrianal shield; 2 pairs of metapodal shields, primary plateate 21 (20–23) and accessory plateate 8 long; ventrianal shield pentagonal, with a few striae, and with inconspicuous ornamentation; anterior margin convex, length 119 (118–120), width at level of setae ZV2 94 (90–100) and width at level of paranal setae 72 (70–75); 4 pairs of preanal setae and without pore: JV1 12 (10–13), JV2 14 (13–15), JV3 16 (15–17), and ZV2 14 (13–15); 4 pairs of setae surrounding ventrianal shield on integument, JV4 13 (12–15), JV5 50, ZV1 12 (10–15), ZV3 12 (10–13) (Fig. 2).

**Chelicera** (Fig. 5) - Fixed digit 33 long with 3 teeth; movable digit 32 long with 2 teeth.

**Spermatheca** (Fig. 4) - Calyx cup-shaped and saccular 16 (15–17) long with a c-shaped atrium incorporated in the calyx.

**Legs** (Fig. 3) - Macroseta on basitarsus IV with a small apical knob, 49 (48–50) long; genua and tibiae I-II-III-IV with 10-7-7-7 and 10-7-6-6 setae, respectively. Chaetotatctic formula of genu II: 2-2/0-2/0-1; genu III: 1-2/1-2/0-1.

**Adult male** - Two specimens measured.
Dorsal idiosoma (Fig. 6) - Dorsal shield 277 (275–280) long and 205 (200–208) wide at j6 level, dorsum completely reticulated, with 5 pairs of large solenostomes (gd2, gd4, gd6, gd8, gd9) and 13 pairs of poroides, 20 pairs of dorsal setae: j1 19 (18–20), j3 25, j4 13, j5 13, j6 14 (13–15), J2 19 (18–20), J5 6 (5–7), z2 14 (13–15), z3 17 (15–18), z4 18, z5 14 (13–15), Z4 35 (33–38), Z5 40, s4 21 (20–22), s6 21 (20–22), S2 25, S4 21 (20–22), S5 14 (13–15), r3 21 (20–22), R1 18; setae r3 and R1 on the shield, all dorsal setae simple and smooth.

Figures 1–5. Typhlodromus (Anthoseius) foenilis Oudemans (female) - 1. Dorsal view of idiosoma; 2. Ventral view of idiosoma; 3. Tibia and tarsus IV; 4. Spermatheca; 5. Chelicera. Scale bar = 130 µm for Figs. 1 and 2; 90 µm for Fig. 3; 40 µm for Fig. 4; 80 µm for Fig. 5.

Peritreme (Fig. 6) - Extending to level of setae z2 or slightly pass bases of setae z2.

Ventral idiosoma (Fig. 7) - All shields smooth. Sternogenital shield 129 (125–132) long and 62 (60–63) wide at ST2 level, with 3 pairs of poroides and 5 pairs of
sternogenital setae, ST1 19 (18–20), ST2 19 (18–20), ST3 18, ST4 18, ST5 16 (15–18) long; distance between ST1 - ST3 64 (63–65), and ST2-ST2 55, and ST5-ST5 41 (40–43). Ventrianal shield 102 (100–103) long and 128 (125–130) wide at ZV2 level, and 55 (53–58) wide at level of anus, with 4 pairs of setae, JV1 14 (13–15), JV2 13, JV3 14 (13–15); ZV2 15 long; setae JV5 23 (20–25) located off shield.

Chelicera (Fig. 8) - Spermatodactyl L-shaped, shaft with 29 (28–30) long. Movable digit of chelicera unidentate, 19 (18–20) long; fixed digit bidentate, 24 (23–25) long.

Legs - Chaetotactic formula of genua II and III are identical to the female. Macroseta of basitarsus IV, 35 long.


Material examined

This species was originally described from Franeker, Friesland, The Netherlands, on hay stack, and recorded from Belgium, Cyprus, England, Greece, Ireland, The Netherlands, Norway, Spain, Syria, Tunisia, Turkey (Oudemans 1930; Andre 1986; Evans and Momen 1988; Evans and Edland 1998; Çobanoğlu 2004; Faraji et al. 2008;
Papadoulis *et al.* 2009; Kreiter *et al.* 2010; Tsagkarakis *et al.* 2011; Sahraoui *et al.* 2012; Barbar 2013, 2014; Tsagkarakis *et al.* 2014), and Iran (this study). *Typhlodromus foenilis*, was found in the France by Kreiter *et al.* (2000) and Tixier *et al.* (2000) under the name of *Typhlodromus (Anthoseius) cryptus* Athias-Henriot. Evans and Momen (1988) made *T. cryptus* a junior synonym of *T. foenilis*.

### Key to species of phytoseiid mites associated with coniferous plants in Iran (female)

1. Either or both setae z3 and s6 present ................................................................. 2  
   - Seta z3 and s6 absent ................................ (Amblyseinae Muma) ............................ 3
2. Setae Z1, S2, S4 and S5 absent .... (Phytoseiinae Berlese, *Phytoseius* Ribaga) ....  
   .......................................................... (*P. finitimus* Ribaga)  
   - At least one of setae Z1, S2, S4 and S5 present .................................................... 12
3. Macrosetae present only on leg IV or absent ............ (*Neoseiulus* Hughes) .... 4  
   - Macrosetae at least on genu III, as well as on leg IV ............................................... 8
4. Spermatheca with atrium not forked at junction with major duct, nor appearing thick walled, vacuolated; movable digit of chelicerae with 2 teeth... *N. umbraticus* (Chant)  
   - Spermatheca with atrium forked at junction with major duct, or atrium appearing thick walled, vacuolated; movable digit of chelicerae with 1 tooth............................. 5
5. Spermatheca with a stalk between atrium and calyx; dorsal shield with 7 pairs of solenostomes .......................................................... (*N. marginatus* (Wainstein)  
   - Spermatheca without a stalk between atrium and calyx; dorsal shield with 3–4 pairs of solenostomes  ........................................................................  6
6. Calyx of spermatheca constricted at juncture with atrium; fixed digit of chelicerae with 5 teeth .......................................................... *N. sugonjaevi* (Wainstein and Abbasova)  
   - Calyx not constricted at juncture with atrium, calyx, atrium and major duct of approximately same width; fixed digit of chelicerae with 3–4 teeth .............. 7
7. Calyx of spermatheca long, slender, flaring towards vesicle; Z4 30, Z5 48 µm; fixed digit of chelicerae with 3 teeth .................................................. *N. brevispinus* (Kennett)  
   - Calyx of spermatheca cone shaped; Z4 38, Z5 55 µm; fixed digit of chelicerae with 4 teeth ......................................................................... *N. barkeri* Hughes
8. Seta J2 absent ................. (*Proprioseiopsis* Muma) ........... *P. messor* (Wainstein)  
   - Seta J2 present ........................................................................................................... 9
9. Ratio of setae s4:S2 < 2.7:1.0 ............... (*Transeius* Chant and McMurtry) ......  
   .......................................................... *T. wainsteini* (Gomelauri)  
   - Ratio of setae s4:S2 > 3.0:1.0 .............. (*Amblyseius* Berlese) .......................... 10
10. Seta z4 about 2/3 distance between insertions of setae z4 and s4  
    .......................................................... *A. azerbaijanicus* Abbasova  
    - Seta z4 shorter than half distance between insertions of setae z4 and s4 .......... 11
11. Ventrianal shield vase-shaped ................................................................. *A. herbicola* (Chant)  
    - Ventrianal shield not vase-shaped .................................... *A. rademacheri* Dosse
12. Seta z6 present (Paraseiulinia Wainstein) ...... *P. triporus* (Chant and Yoshida-Shaul)  
13. Seta S5 present ........... (*Typhlodromus* subgenus *Anthoseius* De Leon) .... 14  
    - Seta S5 absent ........... (*Typhlodromus* subgenus *Typhlodromus* Scheuten) .... 15
14. Dorsal shield heavily sclerotized; neck of spermatheca sclerotized .......................................................... \( T. (A.) \) bakeri (Garman)
- Dorsal shield not heavily sclerotized; spermatheca not sclerotized .......................................................... \( T. (A.) \) foenilis Oudemans
15. Ventrianal shield with three pairs of preanal setae ... \( T. (T.) \) leptodactylus Wainstein
- Ventrianal shield with four pairs of preanal setae .......................................................... 16
16. Dorsal shield with three pairs of solenostomes .... \( T. (T.) \) tubifer Wainstein
- Dorsal shield with four pairs of solenostomes .......................................................... \( T. (T.) \) perbibus Wainstein and Arutunjan

**Discussion**

Based on specimens collected, relative abundance of phytoseiid species associated with coniferous plants in Northern Iran was calculated. Results showed that Transeius wainsteini (Gomelauri, 1968) with 37% relative abundance was the most abundant species among the 16 collected species, followed by Typhlodromus (Anthoseius) foenilis Oudemans, 1930 and Neoseiulus sugonjaevi (Wainstein and Abbasova, 1974) with 19% and 8% relative abundance, respectively. Neoseiulus marginatus (Wainstein, 1961), Paraseiulus triporus (Chant and Yoshida-Shaul, 1982) and Typhlodromus (Typhlodromus) leptodactylus Wainstein, 1961, each with 1% relative abundance were the less abundant species (Fig. 9). In Iran, the predatory mite, Transeius wainsteini, is distributed on different plants along the coast of the Caspian Sea (Guilan, Mazandaran, and Golestan Provinces). Laboratory studies showed good potential of this predatory mite for control of tetranychid mites (Daneshvar 1990; Rafatifard et al. 2004). Because \( T. \) wainsteini is abundant on coniferous plants in the above-mentioned areas, conservation measures for protection of this useful species would be advantageous.

![Figure 9. Relative abundance of phytoseiid mites species associated with coniferous plants in Northern Iran, based on samples collected in 2013–2014.](image-url)
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کنهای فیتوئزید (Acari: Phytoseiidae) مرتبط با سوزنی برگان در شمال ایران، همراه با گزارش یک گونه جدید و کلید شناسایی کنهای فیتوئزید درختان سوزنی برگ ایران

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چکیده

فون کنهای فیتوئزید درختان و درختچه‌های سوزنی برگ در شمال ایران مورد بررسی قرار گرفت. شناسه‌گویی گونه متعلق به شش جنس از خانواده Phytoseiidae، برگان شناسایی شدند. از بین گونه‌های شناسایی شده، گونه Typhlodromus (Anthoseius) foenilis Oudemans، 1930 برای فون کنهای ایران جدید است. ویژگی‌های مفصل ریخت شناسایی گونه $(A.)$ foenilis بر اساس مرحله بالغ هر دو جنس نر و ماده ارائه شده است. همچنین کلید شناسایی کنهای فیتوئزید مرتبط با سوزنی برگان در ایران، تهیه شده است. Typhlodromus (Anthoseius) foenilis

واژگان کلیدی: سوزنی برگان، فون، کنهای شکارگر، داده‌های ریخت شناسایی

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