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Article

Stilt–legged mites (Acari: Prostigmata: Camerobiidae) in Iran

Mohammad Ahmad Hoseini & Mohammad Khanjani

Deprtment of Plant Protection, College of Agriculture, Bu–Ali Sina University, Hamedan, Iran; E-mails: mahmadhoseini@yahoo.com, mkhanjani@gmail.com

Abstract

This study was carried out to determine the stilt–legged in mite species of some parts of Iran. In this survey, soil and litter under cultivated and uncultivated plants were collected and transferred into the laboratory for processing. A total of 11 species, belonging to the genera *Tycherobius* & *Neophyllobius* were collected and identified. A list of camerobiid mites of Iran and a key to the Iranian species of the genera *Tycherobius* & *Neophyllobius* are provided.

Key words: *Tycherobius*, *Neophyllobius*, pradatory mite, key, Iran

Introduction

The family Camerobiidae was created by Southcott (1957). Currently this family comprises seven genera (Fan & Walter 2011) and the genus *Neophyllobius* is the largest one in the family (Bolland 1991; Fan & Zhang 2005). Most members of this family feed on eriophyid mites, false spider mites, tarsonemid mites and tydeid mites and crawlers of scale insects (Bolland 1986; Khanjani & Ueckermann 2002, 2006; Gerson *et al*. 2003; Khanjani *et al.* 2010; Fan & Walter 2011). They are often found on tree stems, tree bark, grass, and straw and in leaf litter and have a worldwide distribution (Fan & Zhang 2005). This paper deals with species of the genera *Tycherobius* & *Neophyllobius* in Iran.

Material and methods

This study was executed to collect and identify stilt–legged mites in some regions of Iran by the senior author as a part of his M. Sc. thesis. Most of the known species of the Iranian camerobiid were re–collected from soil and litter samples under cultivated and uncultivated plants. The mites were extracted by using a Berlese funnel and mounted on microscopic slides in Hoyer's medium (Walter & Krantz 2009). The species then were determined by using an Olympus BX_{51} microscope equipped with differential interference contrast. The key of Khanjani *et al.* (2012) was used to identify the species. The localities of the species are presented in Table 1 and Fig. 1.

Results

In this study some (11) of the 19 known Iranian species were re-collected but all of them are listed below:

Superfamily Raphignathoidea Kramer, 1877
Family Camerobiidae, Southcott, 1957
Genus *Neophyllobius* Berlese, 1886
Type species: *Neophyllobius elegans* Berlese, 1886: 19.

***Neophyllobius asalii* Khanjani & Ueckermann, 2006**

Type locality and habitat: Khorramabad, Lorestan Province, from Grass litter (Poaceae), col. Mohammad Khanjani, 2005.

New material examined: Chaghlvandy, Lorestan Province, 10 Oct. 2011, 4 (♀♀) from soil under gum, *Astragalus* sp. (Fabaceae) and hawthorn, *Crataegus oxycantha* (Rosaceae); Hamedan vicinity, Hamedan Province, 10 Oct. 2011, 5 (♀♀) from gum, *Astragalus* sp. (Fabaceae); Heydareh village, Hamedan vicinity, Hamedan Province, 26 Aug. 2011, 4 (♀♀), from gum, *Astragalus* sp. (Fabaceae); Sarcheshmaeh village, Mahallat vicinity, Markazi Province, 16 April 2012, 1 (♀), from plum, *Prunus domestica* L. (Rosaceae); Sarcheshmaeh village, Mahallat vicinity, Markazi Province, 10 May 2012, 2 (♀♀), from walnut, *Juglans regia* L. (Juglandaceae); Shalan village, Kermanshah vicinity, Kermanshah Province, 2012, 2 (♀♀), from alfalfa, *Medicago sativa* L. (Fabaceae).

***Neophyllobius astragalusi* Khanjani & Ueckermann, 2002**
Type locality and habitat: Asad–Abad, Hamedan Province, from gum, *Astragalus* sp. (Fabaceae), col. Mohammad Khanjani, 1997.

New material examined: Chaghlvandy, Lorestan province, 12 Oct. 2011, 2 (♀♀), from hawthorn, *Crataegus oxycantha* (Rosaceae); Khorramabad, Lorestan province, 14 Nov. 2011, 1 (♀), from hawthorn, *Crataegus oxycantha* (Rosaceae); Hydareh village of Hamedan vicinity, Hamedan Province, 6 June 2012, 1 (♀), from gum, *Astragalus* sp. (Fabaceae); Tarik Dareh region of Hamedan vicinity, Hamedan Province, 6 June 2012, 2 (♀♀), from gum, *Astragalus* sp. (Fabaceae); Ghorveh, Kordestan Province, 4 Nov. 2011, 4 (♀♀), from gum, *Astragalus* sp. (Fabaceae).

***Neophyllobius bamiensis* Khanjani, Asadabadi, Izadi & Doğan, 2012**

Type locality and habitat: Bam vicinity, Kerman Province, 3 May 2010, 2 (♀♀) from bark of palm, *Phoenix dactylifera* L. (Arecaceae), Khanjani *et al.* 2012.

***Neophyllobius camelli* Khanjani & Ueckermann, 2002**

Type locality and habitat: Lahijan vicinity, Guilan Province, from tea, *Camellia sinensis* L. (Malvaceae), col. Mohammad Khanjani 2000.

***Neophyllobius dogani* Khanjani & Ahmad Hoseini, 2013**

Type locality and habitat: Chaghlvandy, Khorramabad, Lorestan Province, 10 Oct 2011, 2 (♀♀), from gum, *Astragalus* sp. (Fabaceae).

***Neophyllobius edwardi* Khanjani & Ahmad Hoseini, 2013**

Type locality and habitat: Sorkhi region, Fars province, 14 July 2011, 4 (♀♀), from

soil & rotten leaves under oak trees, *Quercus brantii* Lindl (Fagaceae).

***Neophyllobius kamalii* Khanjani, Asali Fayaz, & Ghanbalani, 2010**

Type locality and habitat: Dalahoo, Rijab, Kermanshah Province, 12 Dec. 2005, from pomegranate, *Punica granatum* L. (Punicaceae), col. Khanjani *et al*., 2010.

***Neophyllobius lorestanicus* Khanjani & Ahmad Hoseini, 2013**

Type locality and habitat: Sarcheshmahe village, Mahallat, Markazi Province, 8 Nov. 2012, 1 (♀), from soil under of plum, *Prunus domestica* L. (Rosaceae); Sarcheshmahe village, Mahallat, Markazi Province, 8 Nov. 2012, 3 (♀♀), from soil under of walnut, *Juglans regia* L. (Juglandaceae).

***Neophyllobius mitrae* Khanjani, Molavi & Ueckermann, 2011**

Type locality and habitat: Ahwaz vicinity, Khuzestan province, 18 Oct. 2003, from soil under date palm, *Phoenix datylofera* L. (Arecaceae), Khanjani, *et al.*, 2011

***Neophyllobius ostovani* Khanjani & Ahmad Hoseini, 2013**

Type locality and habitat: Koohmare region, Fars Province, 9 Aug. 2011, 1 (♀), from soil & rotten leaves of oak trees, *Quercus brantii* Lindl. (Fagaceae); Koohmare region, Fars Province, 14 Sept. 2011, 2(♂♂), from soil & rotten leaves of oak trees, *Quercus brantii* Lindl. (Fagaceae).

***Neophyllobius persiensis* Khanjani & Ueckermann, 2002**

Type locality and habitat: Asad–Abad region, Hamedan Province, gum, *Astragalus* sp. (Fabaceae); alfalfa, *Medicago sativa* L. (Fabaceae), col. Mohammad Khanjani, 1998.

New material examined: Sorkhabad village, Hamedan vicinity, Hamedan Province, 8 Nov. 2011, 5 (♀♀), from gum, *Astragalus* sp. (Fabaceae); Heydareh village, Hamedan vicinity, Hamedan Province, 13 Aug. 2012, 3 (♀♀), from gum, *Astragalus* sp. (Fabaceae); Sarcheshmaeh village, Mahallat vicinity, Markazi Province, 26 Nov. 2012, 2 (♀♀), from gladiolus, *Gladiolus boehmii* L. (Iridaceae).

***Neophyllobius pistaciae* Bolland & Mehrnejad, 2001**

Type locality and habitat: Sirjan, Kerman Province, from wild pistachio, *Pistachio mutica* L. (Anacardiaceae), col. Mohammad Reza Mehrnejad, 1993.

***Neophyllobius seemani* Khanjani & Ahmad Hoseini, 2013**

Type locality and habitat: Nahavad vicinity, Hamedan province, 18 March 2011, 3 (♀♀), from litter under oak trees, *Quercus brantii* Lindl. (Fagaceae).

***Neophyllobius zolfigolii* Khanjani Asali Fayaz, & Ghanbalani, 2010**

Type locality and habitat: Nahavand vicinity, Hamedan Province, from soil under of

wild rose bushes, *Rosa* sp. (Rosaceae), col. Khanjani *et al.*2010.

Table 1. Localities of collected specimens in some parts of Iran.

Locality	Province	Geographical status	a.s.l. (m)
Chaghlvandy	Lorrestan	33° 56' N, 48° 39' E	1703
Khorramabad	//	33° 48' N, 48° 35' E	1147
Heydareh village	Hamedan	34° 48' N, 48° 27' E	1920
Hamedan	//	34° 45' N, 48° 31' E	1990
Tarik Dareh region	//	34° 45' N, 48° 26' E	2147
Sorkhabad village	//	34° 49' N, 48° 38' E	1797
Lowshan	Guilan	36° 37' N, 49° 30' E	491
Lahijan vicinity	//	37° 11' N, 50° 00' E	19
Saravan forest, (Rasht vicinity)	//	37° 1' N, 49° 38' E	250
Parashkoh village, Langarud	//	37° 32' N, 50° 10' E	21
Rostamabad village, (Rudbar countryside)	//	36° 53' N, 49° 29' E	750
Qasimabad vilage, (Chaboksar vicinity)	Mazandaran	36° 58' N, 52° 12' E	216
Sorkhi region	Fars	29° 31' N, 52° 12' E	1824
Koohmare region	//	29° 29' N, 52° 11' E	1636
Sarcheshmahe village, (Mahallat vicinity)	Markazi	33° 54' N, 50° 27' E	1754
Shalan village	Kermanshah	33° 28' N, 45° 59' E	1070
Dalahoo, Rijab	//	35° 17' N, 46° 59' E	1648
Ghorveh	kurdistan	35° 9' N, 47° 47' E	1472
Bam vicinity	Kerman	29° 07' N, 58° 16' E	1148
Sirjan	//	29° 25' N, 55° 32' E	1710
Ahwaz vicinity	Khuzestan	31° 20' N, 48° 41' E	18

New material examined: Khorramabad vicinity, Lorestan province, 12 Oct. 2011, 2 (♀♀), from Licorice, *Glycyrrhiza glabra* L. (Fabaceae).

Genus *Tycherobius* Bolland, 1986
Type species: *Neophyllobius lombardinii* Summers & Schlinger, 1955

***Tycherobius emadi* Khanjani, Hajizadeh, Ahmad Hoseini & Jalili, 2013**

Type locality and habitat: Saravan forest, Rasht vicinity, Guilan province, 6 Oct. 2011, 1 (♀), from soil under white mulberry trees, *Morus alba* L. (Moraceae); Lowshan vicenty, Guilan province, 2 June 2011, 2 (♂♂), from soil under white mulberry trees, *Morus alba* L. (Moraceae), col. Khanjani *et al*., 2013.

***Tycherobius farsiensis* Khanjani, Yazdanpenah, Ostovan & Asali Fayaz, 2012**

Type locality and habitat: Koohmare Sorkhi region, Fars Province, from soil and rotten leaves under oak tree, *Quercus brantii* Lindl. (Fagaceae), col. Khanjani *et al*., 2012.

***Tycherobius iranensis* Khanjani, Yazdanpenah, Ostovan & Asali Fayaz, 2012**

Type locality and habitat: Koohmare Sorkhi region, Fars Province, from soil and rotten leaves under oak tree, *Quercus brantii* Lindl (Fagaceae), col. Khanjani *et al*., 2012.

***Tycherobius sahragardi* Khanjani, Hajizadeh, Ahmad Hoseini & Jalili, 2013**

Type locality and habitat: Parashkoh village, Langarud vicinity, Guilan province, 6 Oct. 2011, 1 (♀), from soil under citrus trees, *Citrus* sp. (Rutaceae); Qasimabad vilage, Chaboksar vicinity, Mazandaran province, 14 Oct. 2011, 1 (♀), from soil under citrus trees, *Citrus* sp. (Rutaceae); Rostamabad village, Rudbar countryside, Guilan Province, 31 May 2011, 1 (♂), from soil under unknown host plant, col. Khanjani *et al*., 2013.

***Tycherobius ueckermanii* Khanjani, Yazdanpenah, Ostovan & Asali Fayaz, 2012**

Type locality and habitat: Koohmare Sorkhi region, Fars Province from soil and rotten leaves under oak tree, *Quercus brantii* Lindl (Fagaceae), col. Khanjani *et al*., 2012.

Key to known Iranian species of Camerobiidae (Adult female & male)

1. Two medio-ventral setae on tarsi I and II in a longitudinal line.... ***Neophyllobius***…...2
– Two medio-ventral setae on tarsi I and II not in a longitudinal line....***Tycherobius***…15
2. Propodosoma with one pair of *pdx* seta ……..……... 3
– Propodosoma with a single *pdx* seta ……..……...… ***N. ostovani***
3. Tarsi formula 10(ω)–10(ω)–8–8……..……..…….….. 4
– Tarsi formula 10(ω)–9(ω)–8–8 or 9(ω)–9/8(ω)–8–8.....7
4. Setae c_1, d_1 and e_1 equal to sub equal in length.....5
– Setae c_1 62 less than half length of d_1 143 and e_1 116…….....…… ***N. persiaensis***
5. Setae c_1, d_1 and e_1 sub equal in length; genual setae I–II equal or half-length of tibiae ……..…….6
– Setae (c_1, d_1 and e_1) equal in length (125); genual setae I–II longer than tibiae ……...…….…..... ***N. pistaciae***
6. Femora I–IV 4–3–2–1, idiosomal setae *pdx* ≥ 48, $c_1 \geq 52$, $d_1 \geq 58$, $e_2 \geq 55$, $h_2 \geq 48$; genual setae I–IV ≥ 230, ≥243, ≥300, ≥310 respectively……..……....***N. bamiensis***
– Femora I–IV 4–3–2–2; *pdx* = 54, $c_1 = 74$, $d_1 = 69$, $e_2 = 46$, $h_2 \geq 34$; genual setae I–IV = 112, 85, 177, 231 respectively…….……..…..…..…….…..... ***N. camelli***
7. Tarsi 9(ω)–8 (ω)–8–8……...…. ***N. seemanni***
–Tarsi 10(ω)–9(ω)–8–8 ……..…...…...…….…….…… 8
8. Seta *vi* > *ve*, h_1 1/3 h_2……..……..... ***N. kamalii***
– Seta *vi* < *ve*, h_1 as long as h_2……..……..……9
9. Genual setae Ge II 101, Ge IV 224 and h_1=h_2 25…...…….. ***N. zolfigoli***
– Genual setae Ge II 156–223, Ge IV 302–338, h_1 and h_2 more than 35…….....……..10
10. Seta c_1 86–133, c_2 80–94, d_1 130–143, e_1 114–131 and Ge II 156–280…..…...….. 11
– Seta c_1 159–208, c_2 95–162, $d_1$154–223, e_1 145–223 and Ge II 285–302……..……..13
11. Seta *vi* 67–77, *sce* 65–72, d_2 63–77, f_1 100–106…….. ……..…….……..12
– Seta *vi* 57–60, *sce* 50–52, d_2 54, f_1 90–92……... ***N. dogani***
12. Genu I–II 81–156 c_1 (108–109), f_2 (55–52)…….....…….....… ***N. mitrae***
– Genu I–II (210–223)–(275–280), c_1 (83–86), f_2 (40–44) ……..…. ***N. lorestanicus***
13. Prodorsal setae *vi* 83–93, *sci* 75–83, *sce* 76–85 and opisthosomal seta f_1 128–178..14

– Prodorsal setae *vi* 70–75, *sci* 58–61, *sce* 61–64 and opisthosomal seta f_1 102–106……..……..***N. edwardi***

14. Seta *d* on femur I as long as or slightly shorter than distance to articulation facet with genu; setae c_1 208, d_1 and e_1 223 long; c_1 extends past posterior margin of body…….…….....***N. astragalusi***

– Seta *d* clearly shorter than distance to articulation facet; setae c_1 195, d_1 163 and e_1 173 long, c_1 extends beyond f_1.....***N. asalii***

15. Dorsal seta *pdx* present……..……16

– Dorsal seta *pdx* absent ……...……...……...……...…… 17

16. Prodorsum with a single *pdx* seta ……..…..……..... ***T. emadi***

– Prodorsum with one pair of *pdx* setae ……...…….... ***T. sahragardi***

17. Femur III with 3 or 4 setae ……..……..……18

– Femur III with 2 setae……..……...……...…… ***T. ueckermanni***

18. Tarsi I–II 9(*ω*)–8(*ω*), seta *c1*longest, *sce* shortest dorsal seta…...……... ***T. iranensis***

– Tarsi I–II 10(*ω*)–9(*ω*), seta *d1*longest, *c1*shortest dorsal seta…….…… ***T. farsiensis***

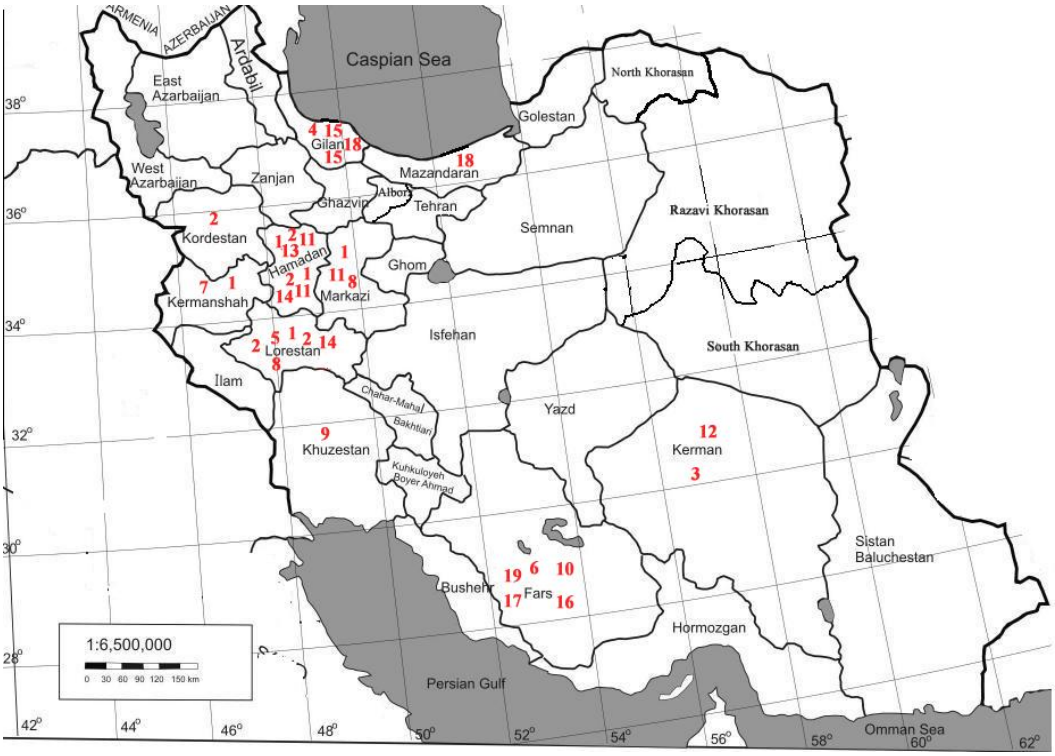

Figure 1. Geographic distribution of camerobiid species in some regions of Iran (See Table 2 for species names).

Table 2. List of species mentioned in Fig. 1.

No.	Species	No.	Species	No.	Species
1	*N. asalii*	8	*N. lorestanicus*	14	*N. zolfigolii*
2	*N. astragalusi*	9	*N. mitrae*	15	*T. emadi*
3	*N. bamiensis*	10	*N. ostovani*	16	*T. farsiensis*
4	*N. camelli*	11	*N. persiaensis*	17	*T. iranensis*
5	*N. dogani*	12	*N. pistaciae*	18	*T. sahragardi*
6	*N. edwardi*	13	*N. seemani*	19	*T. ueckermanii*
7	*N. kamalii*				

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کنه‌های پابلند (Acari: Prostigmata: Camerobiidae) ایران

محمد احمدحسینی و محمد خانجانی

چکیده

این مطالعه برای شناسایی کنه‌های پابلند برخی از مناطق ایران انجام شد. در این بررسی، خاک و بقایای گیاهی زیر گیاهان زراعی و غیر زراعی جمع‌آوری و برای انجام مطالعات بعدی به آزمایشگاه منتقل شد. ۱۱ گونه در قالب جنس‌های *Tycherobius* & *Neophyllobius* جمع‌آوری و مورد شناسایی قرار گرفت. همچنین فهرست و کلید شناسایی گونه‌های متعلق به کنه‌های خانواده Camerobiidae ایران تهیه شد.

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