

**PROSTIGMATID SOIL MITES OF ALFALFA FIELDS IN  
NORTHWEST OF IRAN (EAST AZERBAIJAN PROVINCE)  
WITH ONE GENUS, SUBGENUS AND FOUR SPECIES  
AS NEW RECORDS**

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ABSTRACT: Prostigmatic soil mite fauna of alfalfa fields of six regions in Northwest of Iran (East Azerbaijan) including Soofian, Payam, Zenooz, Marand, Shabestar and Jolfa was studied at three different times of the year 2006 (mid-May, mid-July and mid-September), based on Nested design. In this study 24 species, 26 genera and 17 families belonging to 8 superfamilies were identified in which 1 genus and 1 species were new records for mite fauna of Iran and 4 genera and 4 species were new records for mite fauna of east Azerbaijan province. Results showed that the maximum mean number was obtained in Shabestar at mid-September. This study confirms that at the case of high temperature and low humidity, the diversity and frequency of mites are increased.

KEY WORDS: Alfalfa, soil, East Azerbaijan, Fauna, Prostigmata.

Prostigmatid mites are found in various habitats which have a lot of morphological and biological diversity. Members of some families such as Bdellidae, Cunaxidae, Tydeidae, Stigmaeidae, Trombidiidae have Predatory behavior, some like Tetranychidae, Tenuipalpidae are herbivorous and families such as Terpnacaridae are rusty feeder. Therefore the terrestrial, aquatic, predator, herbivorous, rusty feeder mites and parasite of birds, small mammals and arthropods are found between prostigmatid mites (Bedano, 2004). Obligative herbivores such as members of Superfamilies Eriophyoidea and Tetranychoida, and even predatory ones like Anystidae and Bdellidae might be found randomly in soil samples. Obligative parasite of Invertebrates (Pyemotidae and Carboacaridae) and also some species that live in air microhabitats due to migration could be transferred to the soil habitat being found in the samples. Such disorders causes problems in mites faunistic studies and role of them in soil (Kethley, 1990). Reviewing literature revealed that in Iran, some faunistic studies have been done by Khanjani & Euckermann (2002), Khalil-Manesh (1972), Sepasgozarian (1976), Daneshvar (1977), Nozari (1992), Soroush (1994), Nourbakhsh & Kamali (1995), Mosaddegh (1996), Taghavi Amshi (1996), Barymani Varandi (1996), Haddad Irani-Nejad (1996), Jamali Zavvare (2000), rastegar (2002), Haji Qanbar (2001), Bagheri (2007), and many other internal specialist (Kamali et al., 2001). Totally, more than 1040 species of mites reported from Iran (Kamali et al., 2001; Khanjani & Haddad Irani-Nejad, 2005). This study aimed to investigate the occurrence and species diversity of soil prostigmatid mite fauna of alfalfa fields of six regions in Northwest of Iran (East Azerbaijan Province).

## MATERIALS AND METHODS

Prostigmatic soil mite fauna of alfalfa fields in Northwest of East Azerbaijan province (six regions including Soofian, Payam, Zenooz, Marand, Shabestar and Jolfa) was studied at three different times of the year 2006 (mid-May, mid-July and mid-September), based on Nested design (Snedecor and Cochran, 1967). Three fields in each of the six regions with three samples in each field were selected and sampling of them was conducted at three different times. Soil samples were taken of maximum depth of 25 cm. Specimens were transferred to the acarological laboratory of Plant Protection Department, Faculty of Agriculture, University of Tabriz. Mites were extracted by using the Berlese funnel. Mites were cleared by using Lactoglyserin and nesbit solutions (Krantz, 1978). Cleared specimens were slide mounted in Hoyer's medium. Type specimens are held in the Acarological Collection, Department of Plant Protection, Faculty of Agriculture, University of Tabriz, Tabriz, Iran.

## RESULTS

In this study 24 species, 26 genera and 17 families belonging to 8 superfamilies were identified in which 1 genus and 1 species were new records for mite fauna of Iran and 4 genera and 4 species were new records for mite fauna of east Azerbaijan province. Results indicated that the maximum number of prostigmatid mites was obtained in Shabestar which obtained in mid-September.

### Key to the prostigmatid families collected from soil of alfalfa fields in Northwest of Iran, East Azarbaijan province:

- 1-Females (rarely males) with a pair of anterolateral prodorsal stigmata and associated trachea; setae *e* and *f*, *im* and *ip* are in the same sclerite ..... 17
- Females and males with stigmata between cheliceral bases or on posterodorsal margin of gnathosoma, or stigmata absent; setae *e* and *f*, *im* and *ip* are not in the same sclerite or they are absent ..... 2
- 2- With prodorsal trichobothria ..... 3
- Without prodorsal trichobothria ..... 13
- 3- Palpal tibia with one claw-like seta which inserted on distal portion (Superfamily Trombidoidea) ..... Trombidiidae
- Palpal tibia without one claw-like seta ..... 4
- 4-With trichobothria on tibia IV (Superfamily Bdelloidea) ..... 5
- Without trichobothria on tibia IV ..... 6
- 5-Palpi long, antenniform, often elbowed, typically with long distal setae ..... Bdellidae
- Palpi extending beyond gnathosoma or barely equal to chelae in length, terminating in a tarsal claw ..... Cunaxidae
- 6-With two pairs of prodorsal trichobothria (Superfamily Pachygnathoidea) ..... 7
- With one pairs of prodorsal trichobothria ..... 8
- 7-Pretarsus of legs I-IV with three claws ..... Bimichaelidae
- Pretarsus of legs I-IV with one claw ..... Nanorchestidae
- 8- Pretarsus of legs II-IV without claws and only with one empodium; oesophagus sclerotinized and like a blade like structure extending within prodorsum ..... Alicorhagididae

- Pretarsus of legs II-IV with one pair of claws and one empodium; sclerotization of oesophagus not extended to prodorsum ..... 9

9- Palpa with five segments ..... Terpnacaridae  
 - Palpa with four segments ..... 10

10- Tarsus I with Famulus and at least with one curved solonidia (Superfamily Eupodoidea) ..... 11  
 - Tarsus I without Famulus and curved solonidia (Superfamily Tydeoidea) ..... 12

11-Subcapitulum with two pairs of setae ..... Eupodidae  
 - Subcapitulum with four pairs of setae ..... Rhagidiidae

12-With an *ereinetal organ* opening in the distal portion of tibia I, consisting of an inverted sac-like structure in a narrow duct which opens at or near the insertion of a simple or highly modified seta ..... Ereynetidae  
 - Without *ereinetal organ* ..... Tydeidae

13-Female genital operature transverse, rarely appearing triangular; pretarsal claws with tenent hairs (Superfamily Tetranychoida) ..... 14  
 - Female genital operature longitudinal; pretarsal claws without tenent hairs (Superfamily Raphignathoidea) ..... 16

14-Palpa simple and without tibial claw ..... Tenuipalpidae  
 - Palpa with tibial claw ..... 15

15-Tarsus I with two bulbous solonidia ..... Linotetranyidae  
 - Tarsus I without two bulbous solonidia ..... Tetranychidae

16-Cheliceral bases fused to form a stylophore into which a pair of sinous peritremes extend ..... Caligonellidae  
 -Peritremes and stigmata absent ..... Stigmaeidae

17- Femora and genu IV fused in females; in males leg IV with four segments (Superfamily Tarsonemoidea) ..... Tarsonemidae  
 - Femora and genu IV not fused in females; in males leg IV with five segments (Superfamily Pyemotoidea) ..... Caraboacaridae

**Superfamily Bdelloidea Dugès, 1834**

**Family Bdellidae Duges, 1834**

***Spinabdella cronini* (Baker & Balock, 1962)**

**Materials examined and associations:** 1 specimens, Soofian, mid-May 2006; 2 specimens, Payam, mid-May and mid-September 2006; 3 specimens, Marand, mid-July 2006; 1 specimens, Jolfa, mid-May 2006; 4 specimens, Shabestar, mid-September 2006.

**Previous provincial records for Iran:** Hamedan (Khanjani, 1996; East Azerbaijan (Fathipur, 1994; Bagheri et al., 2007).

**Comments:** This is the third record for the province.

**Family Cunaxidae Thor, 1902**

**Key to the cunaxid species collected from soil of alfalfa fields in Northwest of Iran, East Azarbaijan province:**

- With three segmented palpa ..... *Pulaeus martini* den Heyer, 1981
- With five segmented palpa ..... *Pseudobonzia saaymani* Den Heyer, 1977

***Pulaeus martini* den Heyer, 1981**

**Materials examined and associations:** 3 specimens, Soofian, mid-May, mid-July and mid-September 2006; 3 specimens, Jolfa, mid-May and mid-September 2006; 1 specimen, Shabestar, mid-September 2006.

**Previous provincial records for Iran:** East Azerbaijan (Bagheri et al., 2007).

**Comments:** This is the second record for the province.

***Pseudobonzia saaymani* Den Heyer, 1977**

**Materials examined and associations:** 2 specimens, Jolfa, mid- September 2006.

**Previous provincial records for Iran:** There is no provincial record of this species in Iran.

**Comments:** This is the first record in Iran.

**Superfamily Pachygnathoidea (Lindquist 1998)****Family Bimichaelidae Womersley, 1944*****Alycus* sp.**

**Materials examined and associations:** 3 specimens, Payam, mid- July 2006; 1 specimen, Marand, mid-July 2006; 2 specimens, Jolfa, mid- July 2006; 1 specimen, Shabestar, mid-September 2006.

**Previous provincial records for Iran:** There is no provincial record of this genus in Iran.

**Comments:** This is the first record in Iran. Identification at species level is on going.

**Family Nanorchestidae Grandjean, 1937*****Spleorchestes pratensis* Willmann, 1936**

**Materials examined and associations:** 7 specimens, Payam, mid- September 2006; 3 specimens, Shabestar, mid- July 2006.

**Previous provincial records for Iran:** East Azerbaijan (Bagheri et al., 2007).

**Comments:** This is the second record for the province.

**Family Alicorhagiidae Grandjean, 1939*****Alicorhagidia ustiata* Theron, Meyer & Ryke, 1970**

**Materials examined and associations:** 3 specimens, Soofian, mid- September 2006.

**Previous provincial records for Iran:** East Azerbaijan (Bagheri et al., 2007).

**Comments:** This is the second record for the province.

**Family Terpnacaridae Grandjean, 1939*****Terpnacarus gibbosus* (Womersley, 1944)**

**Materials examined and associations:** 1 specimen, Marand, mid- July 2006.

**Previous provincial records for Iran:** West Azerbaijan (Hajiqanbar & Momen, 2006).

**Comments:** This is the second record of *T. gibbosus* in Iran and new for the province.

**Superfamily Eupodoidea Koch, 1842****Family Eupodidae Koch, 1882****Key to the Eupodid species collected from soil of alfalfa fields in Northwest of Iran, East Azarbaijan province:**

- 1-*vi* club shaped ..... *Cocceupodes* sp.  
 - *vi* not club shaped ..... 2
- 2- With recognizable sejugal furrow in females ..... *Claveupodes* sp.  
 - Without recognizable sejugal furrow in females ..... *Eupodes sigmoidensis*

***Cocceupodes* sp.**

**Materials examined and associations:** 2 specimens, Shabestar, mid- July 2006.

**Previous provincial records for Iran:** East Azerbaijan (Bagheri et al., 2007).

**Comments:** This is the second record of for the province. Identification at species level is on going.

***Claveupodes* sp.**

**Materials examined and associations:** 2 specimens, Soofian, mid- July and mid-September 2006; 1 specimens, Payam, mid- July 2006; 1 specimens, Zenooz, mid- September 2006; 5 specimens, Shabestar, mid-May, mid- July and mid- September 2006.

**Previous provincial records for Iran:** East Azerbaijan (Bagheri et al., 2007).

**Comments:** This is the second record for the province. Identification at species level is on going.

***Eupodes sigmoidensis* Stradtman & Golf, 1947**

**Materials examined and associations:** 3 specimens, Soofian, mid- July 2006; 2 specimens, Marand, mid- September 2006.

**Previous provincial records for Iran:** Hamedan (Khanjani, 1996); East Azerbaijan (Bagheri et al., 2007).

**Comments:** This is the second record of *E. sigmoidensis* for the province.

**Family Rhagidiidae Oudemans, 1922**

***Coccorhagidia clavifrons* (Canestrini, 1886)**

**Materials examined and associations:** 2 specimens, Zenooz, mid- September 2006.

**Previous provincial records for Iran:** Hamedan (Khanjani, 1996); East Azerbaijan (Bagheri et al., 2007).

**Comments:** This is the second record for the province.

***Robustocheles mucronata* (Willmann, 1936)**

**Materials examined and associations:** 2 specimens, Marand, mid-May 2006.

**Previous provincial records for Iran:** Fars (Ostovan, 1993); East Azerbaijan (Bagheri et al., 2007).

**Comments:** This is the second record for the province.

**Superfamily Tydeoidea Kramer, 1877**

**Family Tydeidae Kramer, 1877**

**Key to the tydeid species collected from soil of alfalfa fields in Northwest of Iran, East Azarbaijan province:**

- With three setae in femora II ..... *Lorrya* sp.
- With two setae in femora II ..... *Tydeus* sp.

***Lorrya* sp.**

**Materials examined and associations:** 3 specimens, Soofian, mid- September 2006; 2 specimens, Payam, mid- September 2006; 3 specimens, Marand, mid-May, mid-July and mid-September 2006; 1 specimens, shabestar, mid- July 2006.

**Previous provincial records for Iran:** East Azerbaijan (Bagheri et al., 2007).

**Comments:** This is the second record for the province.

***Tydeus* sp.**

**Materials examined and associations:** 3 specimens, Soofian, mid- July and mid-September 2006; 1 specimen, Payam, mid-September 2006; 2 specimens, Marand, mid-September 2006; 2 specimens, Shabestar, mid- July 2006.

**Previous provincial records for Iran:** Khoozestan, Mazandaran, Chaharmahal and Bakhtiari and west Azerbaijan (Kamali et al., 2001); East Azerbaijan (Bagheri et al, 2007).

**Comments:** This is the second record for the province.

**Family Ereynetidae Oudemans, 1931**

***Ereynetes sabinensis* Baker 1945**

**Materials examined and associations:** 5 specimens, Soofian, mid- September 2006; 2 specimens, Marand, mid-May 2006; 2 specimens, Zenooz, mid-May 2006.

**Previous provincial records for Iran:** East Azerbaijan (Bagheri et al., 2007).

**Comments:** This is the second record in Iran.

**Superfamily Tetranychoida Donnadieu, 1876**  
**Family Linotetraniidae Baker & Pritchard, 1953**  
***Linotetranus niknami* Bagheri et al., 2008**

**Materials examined and associations:** 2 specimens, Shabestar, mid- September 2006.

**Previous provincial records for Iran:** East Azerbaijan (Bagheri et al., 2008).

**Comments:** This species was described by Bagheri, Haddad Irani-Nejad, Kamali, Khanjani, Saboori and Lotfollahi (2008).

**Family Tetranychidae Donnadieu, 1875**  
***Tetranychus urticae* Koch, 1836**

**Materials examined and associations:** 2 specimens, Jolfa, mid-May 2006.

**Previous provincial records for Iran:** Several provinces of Iran (Kamali et al., 2001).

**Comments:** This species is phytophagous.

**Family Tenuipalpidae Berlese, 1913**  
***Cenopalpus spinosus* (Donnadieu, 1875)**

**Materials examined and associations:** 3 specimens, Soofian, mid- July 2006.

**Previous provincial records for Iran:** Mazandaran (Kamali et al., 2001); East Azerbaijan (Bagheri et al., 2007).

**Comments:** This species is phytophagous.

**Superfamily Raphignatoidea Kramer, 1877**  
**Family Caligonellidae Grandjean, 1944**

***Molotrognathus bahariensis* Ueckermann & Khanjani, 2002**

**Materials examined and associations:** 3 specimens, Shabestar, mid-May 2006.

**Previous provincial records for Iran:** Hamedan (Ueckermann & Khanjani, 2003); East Azerbaijan (Bagheri et al., 2007).

**Comments:** This is the second record for the province.

**Family Stigmaeidae Oudemans, 1931**

**Key to the *Stigmaeid* species collected from soil of alfalfa fields in Northwest of Iran, East Azerbaijan province:**

- 1-Chelicera partly fused ..... *Cheyllostigmaeus iranensis*  
 - Chelicera not fused ..... 2
- 2-With 9-16 dorsal shields ..... 3  
 - With 3-4 dorsal shields ..... 4
- 3-With 12 tactile setae in Tarsus I ..... *Stigmaeus malekii*  
 - With 13 tactile setae in Tarsus I ..... *Stigmaeus elongates*
- 4- With 3 dorsal shields ..... 5  
 - With 4 dorsal shields ..... 6
- 5- Central part of the section between the third and fourth leg without reticulation and is only pointed ..... *Eustigmaeus sculptus*  
 -not as above ..... *Eustigmaeus nasrinae*
- 6- With 6 tactile setae in femora I ..... *Ledermuelleriopsis plumose*  
 - With 5 tactile setae in femora I ..... *Ledermuelleriopsis zahiri*

***Cheyllostigmaeus iranensis* Khanjani & Ueckermann, 2002**

**Materials examined and associations:** 2 specimens, Soofian, mid- July 2006; 5 specimens, Marand, mid-May, mid-July and mid-September 2006; 1 specimen, Zenooz, mid-May 2006.

**Previous provincial records for Iran:** Hamedan (Khanjani & Ueckermann, 2002); East Azerbaijan (Bagheri et al., 2007).

**Comments:** This is the second record for the province.

***Stigmaeus malekii* Haddad, Bagheri & Khanjani, 2006**

**Materials examined and associations:** 1 specimen, Marand, mid-July 2006.

**Previous provincial records for Iran:** East Azerbaijan (Haddad Irani-Nejad, 2006).

**Comments:** This is the second record for Iran.

***Stigmaeus elongatus* Berlese, 1886**

**Materials examined and associations:** 1 specimen, Soofian, mid- July 2006; 1 specimen, Marand, mid-July 2006.

**Previous provincial records for Iran:** Hamedan (Khanjani & Ueckermann, 2002); East Azerbaijan (Bagheri et al., 2006).

**Comments:** This is the second record for the province.

***Eustigmaeus sculptus* Dogan, Ayyildiz & Fan, 2003**

**Materials examined and associations:** 2 specimens, Shabestar, mid-May and mid-September 2006.

**Previous provincial records for Iran:** East Azerbaijan (Bagheri et al., 2006).

**Comments:** This is the second record for Iran.

***Eustigmaeus nasrinae* Khanjani & Ueckermann, 2002**

**Materials examined and associations:** 1 specimen, Soofian, mid- September 2006; 2 specimens, Shabestar, mid-September 2006; 1 specimen, Marand, mid- September 2006.

**Previous provincial records for Iran:** Hamedan (Khanjani & Ueckermann, 2002).

**Comments:** This is the first and second record for the province and Iran.

***Ledermulleriopsis plumosa* Willmann, 1951**

**Materials examined and associations:** 1 specimen, Soofian, mid-July 2006; 1 specimen, Marand, mid- September 2006.

**Previous provincial records for Iran:** Hamedan (Khanjani & Ueckermann, 2002); East Azerbaijan (Bagheri et al., 2006).

**Comments:** This is the second record for the province.

***Ledermulleriopsis zahiri* Khanjani & Ueckermann, 2002**

**Materials examined and associations:** 1 specimen, Payam, mid-July 2006; 2 specimens, Shabestar, mid-September 2006.

**Previous provincial records for Iran:** Hamedan (Khanjani & Ueckermann, 2002); East Azerbaijan (Bagheri et al., 2006).

**Comments:** This is the second record for the province.

**Superfamily Pyemotoidea Oudemans, 1937****Family Caraboacaridae Mahunka, 1970*****Carboacarus stammeri* Krczal, 1959**

**Materials examined and associations:** 2 specimens, Soofian, mid-September 2006; 1 specimen, Zenooz, mid-September 2006.

**Previous provincial records for Iran:** Tehran (Mirjamali et al., 2008).

**Comments:** This is the first and second record for the province and Iran respectively.

**Superfamily Tarsonemoidea Canestrini & Fanzago, 1877****Family Tarsonemidae (Lindquist, 1986)**

**Key to the Tarsonemid species collected from soil of alfalfa fields  
in Northwest of Iran, East Azarbaijan province:**

- $v_1$  and  $sc_2$  equal in length ..... *Tarsonemus (Tarsonemus) fusarii*  
 -  $v_1$  shorter than  $sc_2$  ..... *Steneotarsonemus (Steneotarsonemus) sp.*

***Tarsonemus (Tarsonemus) fusarii* Cooreman, 1941**

**Materials examined and associations:** 4 specimens, Soofian, mid-September 2006.

**Previous provincial records for Iran:** Hamedan (Khanjani, 1996); Mazandaran (Faraji & Kamali, 1993); Khorasan (Hagiqanbar, 2009).

**Comments:** This is the fourth record in Iran and new for the province.

***Steneotarsonemus (Steneotarsonemus) sp.***

**Materials examined and associations:** 2 specimens, Soofian, mid-September 2006; 1 specimen, Zenooz, mid-September 2006; 1 specimen, Shabestar, mid-September 2006.

**Previous provincial records for Iran:** There is no provincial record of this genus in Iranian literature.

**Comments:** This is the first record for the province. Identification of these specimens at the species level is on going.

**DISCUSSION**

Distribution of this order during three different sampling times showed increasing trend from mid-May to mid-September. But trend of families Eupodidae, Rhagidiidae, Bdellidae, Ereyetidae and Cunaxidae was different. For example, although all families had quite increasing trend, but Eupodidae showed highest mean number in mid-July; Bdellidae increasing trend was similar to Eupodidae but with low changes; Rhagidiidae had lowest number in mid-July which was similar to Cunaxidae and Ereyetidae although had low changes. This process may show that members of families Eupodidae and Bdellidae are thermophilic and families Rhagidiidae, Cunaxidae and Ereyetidae are psychrophilic.

Maximum number of this order was obtained in Shabestar at mid-September. In general, the number of mites from high to low was in Soofian, Marand, Shabestar, Zenooz, Jolfa and Payam respectively.

Dependance of mites diversity and frequency has been shown by many studies like Bedano et al. (2005), Toros & Emekci (1989), Fathi Poor (1994) and Ardashir (2004) which confirms the results of this study. In general, at the case of high temperature and low humidity, the diversity and frequency of mites are increased.

Of 30 species identified in this survey, some were phytophagous such as *Tetranychus urticae* (Tetranychidae) and *Chenopalpus spinosus* (Tenuipalpidae) and some like *Pulaeus martini*, *Pseudobonzia saaymani* (Cunaxidae), *Molotrogathus bahariensis* (Caligonellidae), *Cheylostigmaeus iranensis*, *Stigmaeus malekii*, *S. elongatus*, *Eustigmaeus sculptus*, *E. nasrinae*, *Ledermulleriopsis plumosa* and *L. zahiri* (Stigmaeidae) were predacious that their presence are important for maintenance of phytophagous and saprophagous mites equilibrium in soil.

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