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Two New Species of the Genus *Cunaxa* (Acari: Cunaxidae) from District Nankana

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Abstract.- Among the predatory mites Cunaxidae is an important family which is reported to predate upon other harmful mites and soft bodied insects. As a result of survey of taxonomic exploration, two new species of the genus *Cunaxa* viz., *leuros* and *rafiqi*, were collected from rice husk from District Nankana. These two new species raised the total number of known species from Pakistan to 9. A key to all the known species of the genus *Cunaxa* is prepared to incorporate these new species. Types are deposited in the Acarology Research Laboratory, Department of Agri. Entomology, University of Agriculture, Faisalabad, Pakistan.

Key words: *Cunaxa*, Acari, Cunaxidae, rice husk, Nankana.

INTRODUCTION

The family Cunaxidae was erected by Thor in 1902. It is a group of very important predators of harmful mites and small insects of agricultural importance. The mites belonging to Family Cunaxidae are reported from world over. Few species like *Cunaxa capreolus* (Berlese) is cosmopolitan while others have restricted distribution. Many species of this family have been reported from Pakistan (Muhammad *et al.*, 1989; Muhammad and Chaudhri, 1993; Bashir and Afzal 2006a,b, 2007). The genus *Cunaxa* is the most abundant and largest genus of this family which comprises of over 50 known species. The genus *Cunaxa* was erected by Von Heyden in 1826. He designated *Scirus setirostris* Hermann as the type species. A lot of taxonomic work has been done all over the world on this genus, as summarized by Smiley (1992). Significant additions to the fauna of this family after Smiley (1992) are by Chinniah and Mohanasundaram (2001), Corpuz-Raros and Garcia (1995), Gupta (1991, 1992), Gupta and Paul (1985), Khaustov and Kuznetsov (1998), Muhammad *et al.* (1989), Sergeyenko (2004), Sionti and Papadoulis (2003) and Bashir and Afzal (2006a). Den Heyer (1979) created a new genus *Rubroscirus* on the basis of having a single seta (instead of two) on coxa IV and reticulated dorsal shields, among other character states. Smiley (1992), however, did not follow this creation, considering these characters of specific level. Thus, he synonymised *Rubroscirus* with *Cunaxa*. From Pakistan, Muhammad *et al*. (1989) reported *Rubroscirus valentis* and Muhammad and Chaudhri (1993) reported *Rubroscirus rasile* and *Rubroscirus otiosus*. Bashir and Afzal (2006a), having the same opinion as of Smiley (1992), shifted these species of genus *Rubroscirus* to genus *Cunaxa*. The present authors agree with these workers and treat these species under genus *Cunaxa*. In the present manuscript the authors have described two new species of this genus which has raised the number of total species of this genus to 9 from Pakistan

MATERIALS AND METHODS

A thorough survey was conducted from different climatic regions of Punjab, Pakistan to explore the fauna of family Cunaxidae, which resulted in identification of two new species of genus *Cunaxa* from rice husk. For extraction of mites, the samples of leaf debris, soil, rice husk and other materials were processed through Berlese's funnels for at least 24 hours. The mites, thus collected in a beaker containing 50% alcohol, were then sorted under a binocular microscope and

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cunaxid mites were preserved in small vials of 70% alcohol and a few drops of glycerin. Permanent slides were prepared using Hoyer's medium. The mounted specimens were identified using a phase contrast microscope and the illustrations were prepared by using an ocular grid. The new species was distinguished as different with the help of existing keys and literature of Chaudhri (1977), Smiley (1992), Muhammad and Chaudhri (1993) and Bashir and Afzal (2006b). The setal nomenclature of Smiley (1992) has been followed. All measurements are given in µm, with the measurement of the holotype first followed by range, standard deviations and number of specimens in brackets. The following abbreviations are used: Asl, attenuate solenidion; bsl, blunt ended solenidion; sts, simple tactile setae; T, trichobothrium.

KEY TO KNOWN SPECIES OF *CUNAXA* FROM PAKISTAN

1. Hysterosomal shield present..... 2
- Hysterosomal shield absent..... 6
2. Setae D_1-D_3 simple 3
- Setae D_1-D_3 spiculate ..... *-doxa* Chaudhri
3. Venter with 4 pairs simple setae between coxae II and distal part of the body in addition to setae of anal and genital region; setae D_4 and D_5 spiculate..... 4
- Venter with more than 4 pairs simple setae between coxae II and distal part of the body in addition to setae of anal and genital region; setae D_4 and D_5 simple 5
4. Seta D_4 extending beyond the base of seta D_5; tibia III with 5 setae .....*leuros*, n. sp.
- Seta D_4 not extending beyond the base of seta D_5; tibia III with 6 setae.....*rafiqi*, n sp.
5 Seta D_1 2.5 times longer than setae D_2 and D_3; venter with 5 pairs of simple setae between coxae II and distal part of the body in addition to seta of anal and genital region .....*jatoiensis*,Bashir & Afzal
- Seta D_1 of almost same length as of setae D_2 and D_3; venter with 6 pairs of simple setae between coxae II and distal part of the body in addition to setae of anal and genital region .....*capreolus* (Berlese)
6. Setae D_1-D_5 simple.....*reticulatus* Bashir & Afzal
- Setae D_1-D_5 spiculate 7
7. Leg tibia II-IV with 5-5-5 setae.....*valentis* (Muhammad, Chaudhari & Akbar)
- Leg tibia II-IV not with 5-5-5 setae..... 8
8. Genu II and tibia I each with 7 setae ..... *resile* (Muhammad & Chaudhri)
- Genu II and tibia I each with 9 setae .....*otiosus* (Muhammad & Chaudhri)

1. *Cunaxa leuros*, new species
(Fig. 1 A – F)

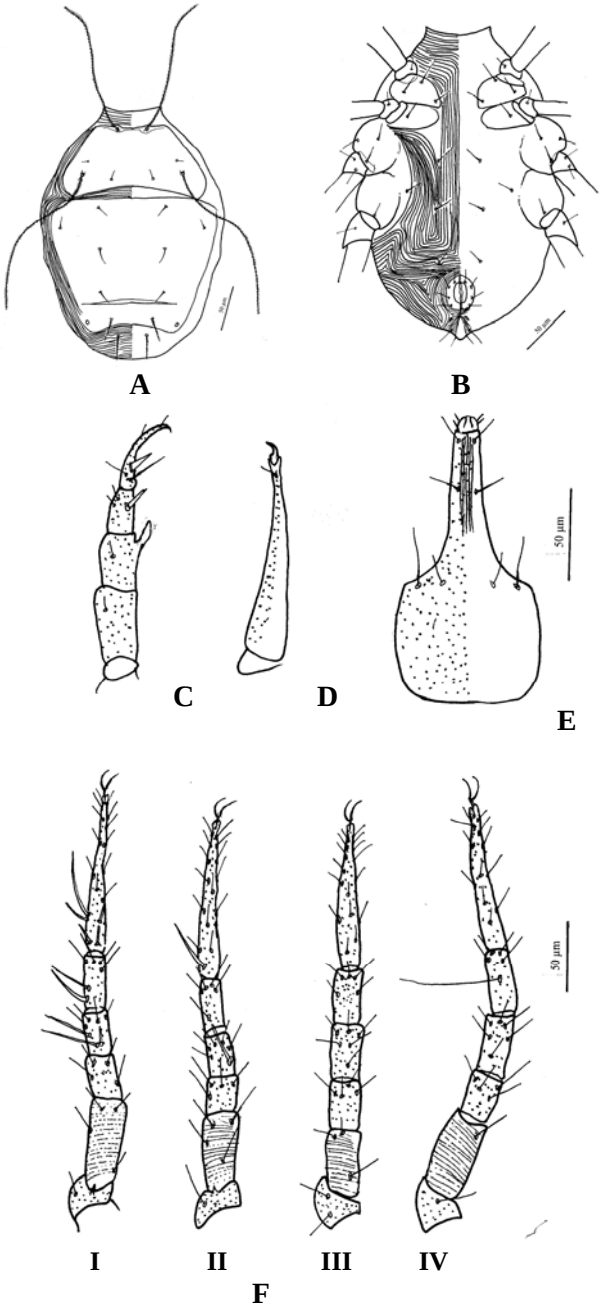

Fig.1 *Cunaxa leuros*, new species; A, dorsal side; B, ventral side; C, palp; D, chelicera; E, hypostome; F, legs I-IV.

Female

Gnathosoma

Gnathosoma 200 long and 80 wide. Hypostome subrectangular in shape and cone shaped distally; with 4 pairs simple hypognathal setae (hg_1-hg_4) and 2 pairs adoral setae; with dot like lobes (Fig. 1E).

Palp 5 segmented, measuring 158, dotted. Chaetotaxy of palp as follows: trochanter none; basifemur with one simple seta; telofemur with one uncinated apophysis and one simple seta; genu with one spine like seta and two simple setae; tibiotarsus with 4 simple and one thick spine like setae and terminating in a small claw (Fig. 1C).

Chelicera 150 long; terminating in a claw; dorsal and ventral sides with lobes; with one dorsolateral simple seta (Fig. 1D).

Dorsum

Body 280 long (without gnathosoma) and 230 wide. Propodosoma with subrectangular shield, originating behind the base of gnathosoma and extending to the anterior region of hysterosoma. Propodosomal shield smooth, with anterior and posterior sensillae PS_1, PS_2 measuring 200, 270 respectively and propodosomal setae P_1, P_2 10, 12.5 long, respectively, both simple.

Hysterosoma separated from propodosoma by smooth striae, hysterosoma with a subrectangular median shield complemented with setae D_1-D_4 and L_1 measuring 12.5, 15, 15, 25, 12.5 respectively. Setae D_5 measuring 25 not present on the hysterosomal shield. Setae D_1, D_2, D_3 and L_1 simple while seta D_4 and D_5 spiculate. Hysterosoma with 1 pair pores lateral to setae D_4. Setae D_4 extending beyond the base of setae D_5 (Fig. 1A).

Venter

Venter with smooth striations. Coxae I-II and coxae III-IV contiguous. Hysterosoma with 4 pairs of simple setae between coxae II and distal part of the body in addition to setae of genital and anal region. Genital shield with two smooth valves, each valve with 4 simple genital setae (g_1-g_4) in a row. Anal (a) and para-anal (Pa) setae one pair each. One pair minute pores near anal shield (Fig. 1B).

Legs

Legs I-IV measuring (from trochanter base to the tip of tarsus) 330, 300, 330 and 350 respectively. All legs with dot like lobes, tarsi I-IV long, slender and attenuate, terminating with small lateral bilobed flanges. Chaetotaxy of legs I-IV as follows: Coxae 3-1-3-1; trochanters 1-1-2-1; basifemora 4-4-3-1; telofemora 4-4-4-4; genua 7(3 asl + 4 sts)-6(1 asl + 5 sts)-6-6; tibiae 6(2 asl + 4 sts)-5-5-5(1 T + 4 sts) and tarsi 17(5 asl + 12 sts)-15(1 asl + 14 sts)-16-12 (Fig. 1F).

Male

Not known.

Type

Holotype female, collected Nankana (Sheikhupura) from rice husk on 27-07-2004 (Hamid). The specimen has been deposited in Acarology Research Laboratory, Department of Agri. Entomology, University of Agriculture Faisalabad - Pakistan.

Etymology

This species epithet is derived for the character of dorsal shields (*i.e.* smooth).

Remarks

This species can be distinguished from *Cunaxa terrula* Den Heyer on the basis of following characters.

1. Palp telofemur with elongate finger like apophysis in *C. terrula* but in this new species palp telofemur with uncinated apophysis.
2. Venter with five pairs of simple setae between coxae II and distal part of the body in addition to setae of anal and genital region in *C. terrula* as against 4 pairs of simple setae in this new species.
3. Hysterosomal shield with setae D_1-D_3 in *C. terrula* but in this new species hysterosomal shield with setae L_1 and D_4 in addition to setae D_1-D_3.
4. In *C. terrula* genua (I-IV) with 9-7-6-6; tibiae (I-IV) with 7-6-6-5 and tarsi (I-IV) with 33-29-27-21 setae as against 7-6-6-6; 6-5-5-5 and 17-15-16-12 respectively on these segments in this new species.

This new species *C. leuros* can be separated from *C. lehmanae* Smiley due to following characters:

1. Palp telofemur with finger like apophysis in *C. lehmanae* while with uncinate apophysis in this new species.
2. Hysterosomal shield present in this new species while absent in *C. lehmanae*.
3. Ventral hysterosoma with 6 pairs simple setae between coxae II and distal apart of the body in addition to setae of anal and genital region in *C. lehmanae* as against 4 pair in this new species.
4. Both species differ in setal counts of legs I-IV segments.

2. *Cunaxa rafiqi*, new species
(Fig. 2 A – F)

Female

Gnathosoma

Gnathosoma 210 (190-210; 207.27 ± 9.04; n = 11) long and 80 (80-80; 80 ± 0; n=11) wide. Hypostome subrectangular in shape and cone shaped distally, with 4 pairs simple hypognathal setae (hg_1-hg_4) and 2 pairs adoral setae, with dot like lobes (Fig. 2E).

Palp 5 segmented, measuring 143 (138-155; 147.63 ± 5.29; n=11), dotted. Chaetotaxy of palp as follows: trochanter none; basifemur with one simple seta; telofemur with one uncinated apophysis and one simple seta; genu with one spine like seta and two simple setae; tibiotarsus with 4 simple setae; one thick spine like seta and terminating in a small claw (Fig. 2C).

Chelicera 140 (133-140; 137.63 ± 2.01; n=11) long, terminating in a claw; dorsal and ventral sides with lobes, with one dorsolateral simple seta (Fig. 2D).

Dorsum

Body 310 (280-310; 303 ± 14.33; n=11) long (without gnathosoma) and 220 (200-220; 215.45±12.13; n=11) wide.

Propodosoma with subrectangular shield, originating behind the base of gnathosoma and extending to the anterior region of hysterosoma. Propodosomal shield smooth, with anterior and posterior sensillae PS_1, PS_2 measuring 170 (170-190; 182.72 ± 6.06; n=11), 250 (240-250; 246.81 ± 4.62; n=11) respectively and propodosomal setae P_1, P_2 both simple 8.75 (8.75-10; 9.20 ± 0.63; n=11) and 8.75 (8.75-12.5; 12.15 ± 1.13; n=11) long, respectively.

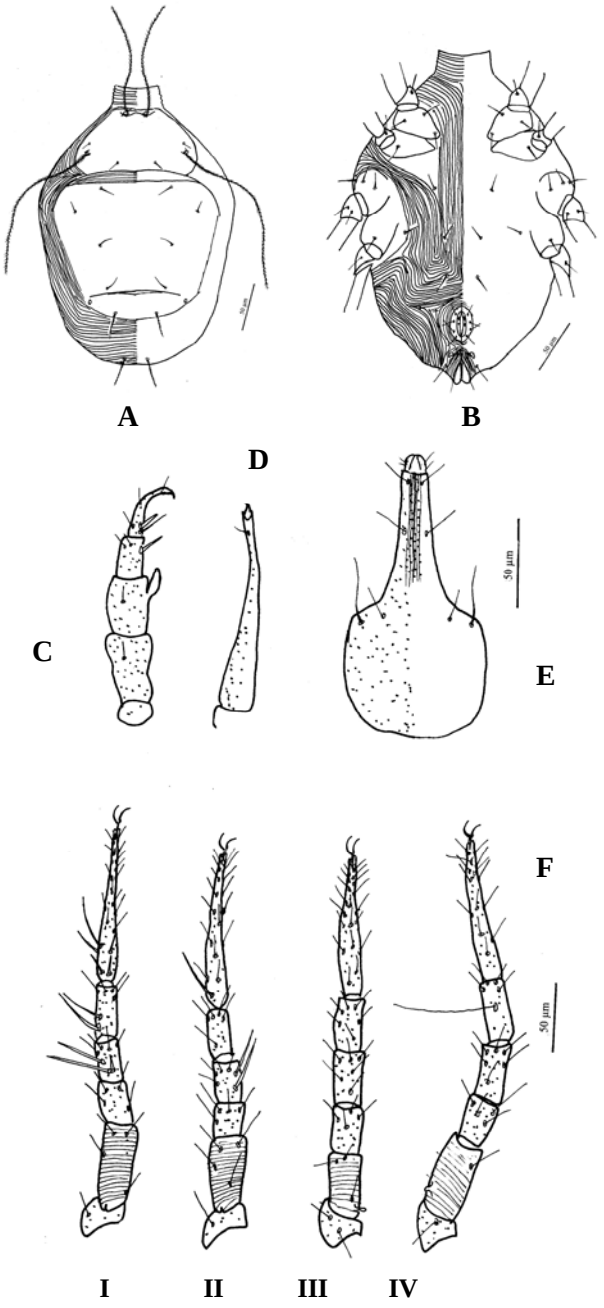

Fig. 2. *Cunaxa rafiqi*, n. sp. A, dorsal side; B, ventral side; C, palp; D, chelicera; E, hypostome; F, legs I-IV.

Hysterosoma separated from propodosoma by smooth striae. Hysterosoma with a subrectangular smooth median shield complemented with setae D_1 measuring 13.75 (13.75-16.25; 14.88 ± 0.67; n=11), D_2 13.75 (13.75-16.25; 15 ± 0.55; n=11), D_3 13.75 (13.75-16.25; 15.11 ± 0.67; n=11), D_4 25 (22.5-27.5; 25.22 ± 1.45; n=11) and seta L_1 12.5 (11.25-15; 13.18 ± 1.02; n=11). Seta D_5 measuring 25 (22.5-27.5; 24.88 ± 1.62; n=11) not located on the hysterosomal shield. Hysterosoma with 1 pair pores lateral to setae D_4. Seta D_4 not extending beyond the base of seta D_5.

Setae D_4 and D_5 spiculate, almost double in length of setae D_1, D_2, D_3 and L_1 (Fig. 2A).

Venter

Venter with smooth striations. Coxae I-II and coxae III-IV contiguous. Hysterosoma with 4 pairs of simple setae between coxae II and distal part of the body in addition to setae of genital and anal region. Genital shield with two smooth valves, each valve with 4 simple genital setae (g_1-g_4) in a row and 2 genital suckers. Anal setae (a) and para-anal setae (pa) 1 pair each. One pair minute pores near anal shield (Fig. 2B).

Legs

Legs I-IV measuring (from trochanter base to the tip of tarsus) 300 (270-310; 290 ± 12.64; n=11); 270 (240-280; 259 ± 12.21; n=11); 260 (260-290; 273.63 ± 11.20; n=11) and 320 (300-320; 310 ± 7.74; n=11) respectively. All legs with dot like lobes, tarsi I-IV long, slender and attenuate, terminating with small lateral bilobed flanges. Chaetotaxy of legs I-IV as follows. Coxae 3-1-3-1; trochanters 1-1-2-1; basifemora 4-4-3-1; telofemora 4-4-4-4; genua 7 (3 asl + 4 sts)-6(2 asl + 4 sts)-6-6; tibiae 6(2 asl + 4 sts)-5-6-5(1 T + 4 sts) and tarsi 19(5 asl + 14 sts)- 17(1 asl + 16 sts)-19-14 (Fig. 2F).

Male

Not known.

Type

Holotype female, collected Nankana (Sheikhupura) from rice husk on 03-08-2004 (Hamid), other female paratypes were collected from the following localities (Table I).

Table I.- Localities and sources of collection of female paratypes of *C. rafiqi.*

Locality	No. of Paratypes	Date	Source
Nankana Sahib	6	03-08-2004	Rice husk
Gujranwala	3	09-05-2004	Tomato
Gujranwala	10	09-05-2004	Brinjal, Pumpkin, Cucumber
Pakpatan	2	04-06-2004	Leaf debris
Sahiwal	3	27-04-2004	Tomato, Brinjal
Sahiwal	3	07-08-2004	Tomato, Leaf Debris
Lahore	4	28-08-2004	Leaf debris
Faisalabad	2	16-05-2004	Cucumber, Leaf Debris
Faisalabad	3	25-07-2004	Pumpkin, Tomato, Brinjal

Type deposited in Acarology Research Laboratory, Department of Agri. Entomology, University of Agriculture, Faisalabad, Pakistan.

Etymology

This species is named in honour of Dr. Rafiq Khan, Professor Emeritus.

Remarks

This new species *C. rafiqi* can be separated from *C. lehmanae* Smiley on account of following character:

1. Palp telofemur with finger like apophysis in *C. lehmanae* while with uncinate apophysis in this new species.
2. Hysterosomal shield present in this new species while hysterosomal shield is absent in *C. lehmanae*.
3. Ventral hysterosoma with 6 pairs simple setae between coxae II and distal apart of the body in addition to setae of anal and genital region in *C. lehmanae* as against 4 pair in this new species.
4. Setal counts on legs I-IV differ in both the species.

This species can also be separated from *C. terrula* Den Heyer due to following characters.

1. Palp telofemur with uncinate apophysis in this new species while with a finger like apophysis in *C. terrula*.
2. Hysterosomal shield with setae $D_1 – D_3$ in *C. terrula*, while with L_1 and D_4 in addition to $D_1 – D_3$ in this new species.
3. Venter with 6 pairs of simple setae between coxae II and distal part of the body in addition to setae of anal and genital region in *C. terrula* as against 4 pairs in this new species.
4. Both species differ in having setal counts on legs I-IV.

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