The Nucleus **47**, No. 1 (2010) 61-66

The Nucleus
A Quarterly Scientific Journal of Pakistan
Atomic Energy Commission
NCLEAM, ISSN 0029-5698

DESCRIPTION OF A NEW *CALOGLYPHUS* BERLESE MITE (ACARI: ACARIDAE) INFESTING PULSES IN PAKISTAN

*M. SARWAR and M. ASHFAQ[1]

Nuclear Institute of Agriculture, Tando Jam-70060, Pakistan

[1]University of Agriculture, Faisalabad-38040, Pakistan

(Received January 08, 2010 and accepted in revised form February 24, 2010)

Of the 13 mite species in genus *Caloglyphus* Berlese (family Acaridae) found in Pakistan, *Caloglyphus arbelos* was identified as a new species. The characters of apodeme 3 (*ap3*) which is reduced and broken medially enable the taxonomic separation of this new species from the other described taxa of genus *Caloglyphus* recorded from different geographical areas. A concise key on hypopus traits usable in taxonomy to discern this species from local and global specimens is made available. These studies on accurate diagnosis and identification of pest species are helpful in their successful management.

Keywords: Mite, Taxonomy, *Caloglyphus arbelos,* Pakistan.

1. Introduction

Mites are microscopic organisms belonging to the subclass Acari and class Arachnida in the Phylum Arthropoda. Acaroid mites in the family Acaridae (Tyroglyphidae) including *Caloglyphus* can survive in diverse environments such as storehouses, and human and animal bodies. Their infestation in humans can cause acariasis in several organs including lung, intestine and urinary tract [1]. Infestation of Acaroid mites is a well-known problem for stored grain, often influencing quality and hygienic condition of the grains [2].

A little work has been undertaken on the taxonomy of the *Caloglyphus* mites. Berlese [3] initially proposed and described the genus *Caloglyphus.* Zakhvatkin [4] prepared a comprehensive review of this genus and portrayed 4 new species and redescribed 6 species with improved descriptions. Nesbitt [5, 6] and Samsinak [7] supplemented 1, 3 and 1 new species to this genus, respectively. Mahunka [8-11] described 2, 1, 2 and 1 new species, respectively. Hughes [12] prepared an excellent compilation of this genus. Tseng and Hsieh [13] redescribed 1 species with improved depiction. Samsinak [14] amended the tribe *Caloglyphini*, re-established the genus *Caloglyphus* and illustrated 1 new species. Channabasavanna et al. [15], Rao et al. [16] and Ashfaq and Chaudhri [17] incorporated 1, 1 and 4 new species, respectively in this genus. Samsinak [18] pointed out 1 new species of the tribe *Caloglyphini*. Zou and Wang [19], Sevastyanov and Radi [20], Sher et al. [21], Klimov [22] and Eraky [23] supplemented 1, 3, 2, 1 and 1 new species, respectively to this genus. Klimov [24] reviewed acarid mites of the tribe *Caloglyphini* with description of a new species. Klimov and Oconnor [25] published phylogeny, historical ecology and systematics of some mites including full descriptions of each taxon, keys and biological information. Oconnor [26] listed two species of genus *Caloglyphus* (=*Sancassania*) phoretic on other species of arthropods. Sarwar and Ashfaq [27, 28] and Sarwar et al. [29, 30] documented 7 new species in genus *Caloglyphus*. Due to the economic importance of *Caloglyphus* mites, the present project was undertaken to study the systematics and biodiversity of this genus from various climatic regions of Pakistan.

2. Materials and Methods

The present study was carried out in Acarology Research Laboratory, Department of Agricultural Entomology, University of Agriculture, Faisalabad,

* Corresponding author : drmsarwar64@yahoo.com

Pakistan. Samples for mites were collected from Sargodha district (32-05 N, 72-40 E, 218 m) having the mean annual rainfall 360 mm and temperature 24°C. The mites were isolated by Berlese- Tullgren funnel apparatus. An electric light bulb (60 W) was lit, 10 cm above the samples for 24 hours. The collected mites were placed into small glass vials containing 70% alcohol and stored. Mites were slide mounted in Hoyer's medium for identification. Using a phase contrast microscope, taxonomical illustrations of specimens were made with a drawing mirror. Measurements of whole body parts of the species are given in micrometer (µm). The terms of body parts and idiosomal chaetotaxy follow Griffiths et al. [31] and terms for leg chaetotaxy and solenidiotaxy follow Griffiths [32].

3. Results and Discussion

3.1 Caloglyphus arbelos, new species (Hypopus)

3.1.1 Material examined

Holotype, hypopus, 1 paratype were collected from Sargodha from lentil (*Lens culinaris* M.) on 4.9.1994 and deposited in Acarology Research Laboratory, Department of Agricultural Entomology, University of Agriculture, Faisalabad.

3.1.2 Description

The description of mite specimen based on the hypopial stage is summarized in ensuing lines: -

3.1.3 Dorsal idiosoma

Body 350 µm long, 290 µm wide, divided into propodosomal and hysterosomal shields. Propodosomal shield 111 µm long, 270 µm wide, dotted antero-medially, 1 pair visible pores, broken striations antero-laterally, remaining shield smooth; setae *vi, ve, sci, sce* and *scs* each 1 pair, simple, 15 µm, 5 µm, 7 µm, 13 µm and 26 µm long, respectively; all setae spaced from each other, *sci-sci* 40 µm, *sce-sce* 88 µm and *sci-sce* 15 µm apart; setae *sci* and *sce* forming a semi-circular line, middle in position. Hysterosomal shield 243 µm long, 290 µm wide, smooth, lateral margins turning towards venter, dotted and striated anteriorly, longitudinal broken striations latero-posteriorly, 11 pairs setae, 9 pairs visible pores. Setae *d1* = *d2* = *d3* = *d4* = 10 µm; *hi* 19 µm, *he* 12 µm; *la* 11 µm, *lp1* = *lp2* = 13 µm; *sae* 55 µm, *sai* 15 µm, long; *d1* - *d1* 84 µm, *d2* - *d2* 59 µm, *d3* - *d3* 74 µm, *d4* - *d4* 84 µm; *d1* - *d2* 48 µm, *d2* - *d3* 73 µm, *d3* - *d4* 68 µm and *la* - *la* 175 µm apart. Hysterosomal shield anterior margin overlaping propodosomal shield posterior margin upto 33 µm, overlaping area with transverse, broken striations and dots (Fig. 1).

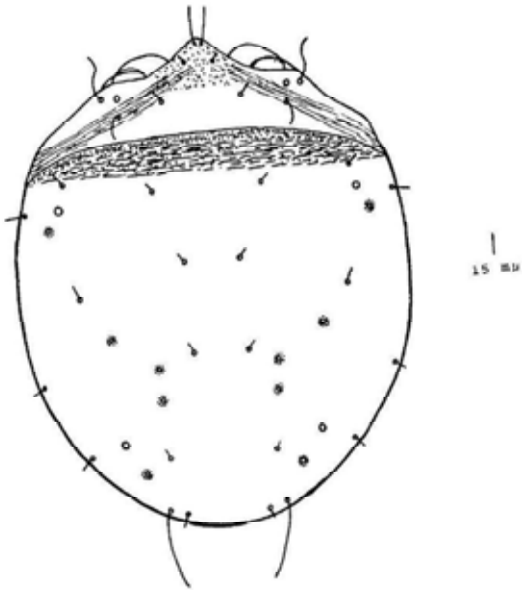

Figure 1. Showing Dorsal view of *C. arbelos* n. sp.

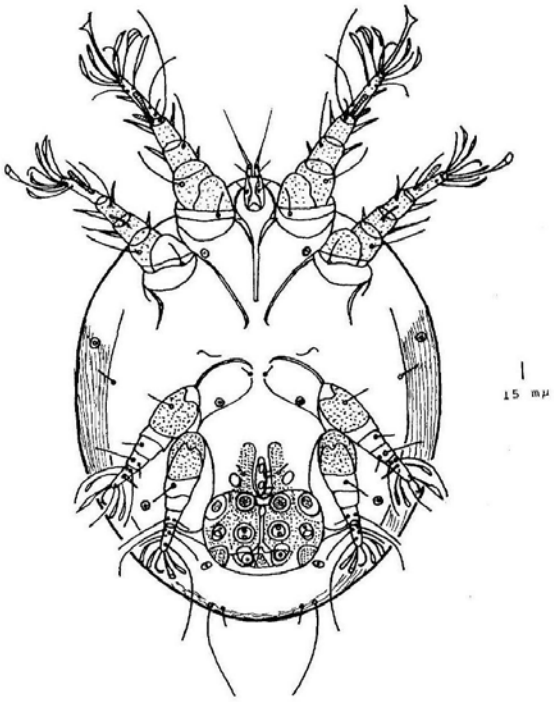

Figure 2. Showing Ventral view of *C. arbelos* n. sp.

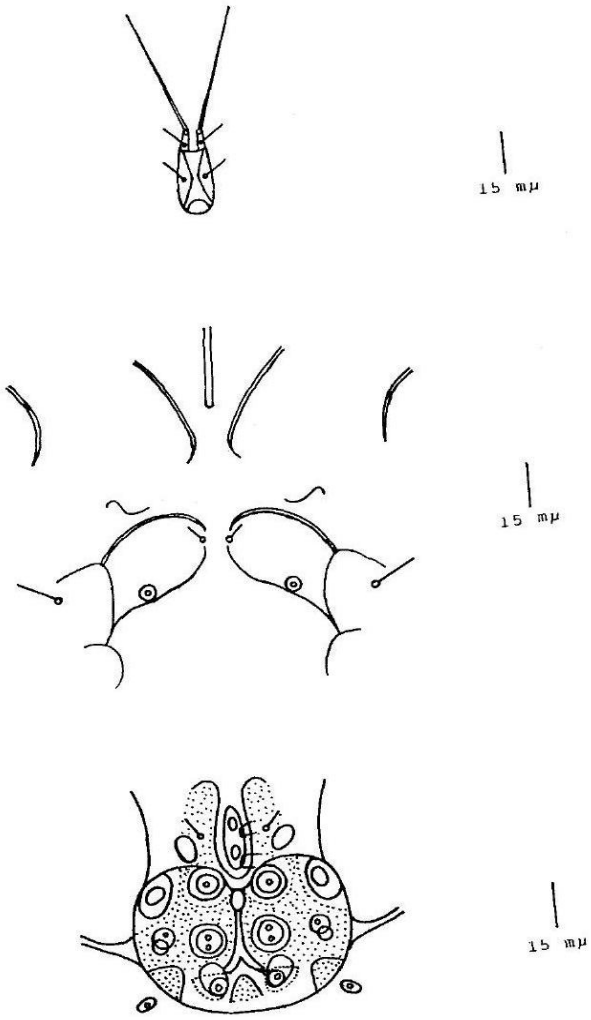

Figure 3. Gnathosoma (upper), Coxal apodemes (middle), Suctorial shield (lower) of *C. arbelos* n. sp.

3.1.4 Gnathosoma

Gnathosoma fused pedipalpi, 2 segmented, broad at base, slightly tapering anteriorly, 29 µm long (basal segment 18 µm, distal segment 11 µm, bifurcated anteriorly, 1 pair arista, 43 µm long, 2 pairs small setae (Fig. 3 upper).

3.1.5 Ventral idiosoma

Apodeme 1 (*ap1*) largely Y-shaped, sclerotized, continuing with sternum 1 (*st1*). Sternum 1 (*st1*) 55 µm long, free. Apodeme 2 (*ap2*) free, curved at tip. Apodeme 3 (*ap3*) not meeting apodeme 4 (*ap4*), broken medially. Sternum 2 (*st2*) absent. Apodeme 5 (*ap5*) originating from trochanter IV, making broad, rounded tip anteriorly, not meeting apodeme 4 (*ap4*). Metasternal seta (*mts*) 1 pair, small, each seta inbetween the tips of apodeme 4 (*ap4*) and apodeme 5 (*ap5*) (Fig. 2). Coxal fields I and II, III and IV open, smooth (Fig. 3 middle). Seta *hv* 13 µm long. Genital shield not separated from ventral shield as shown in Fig. 2, smooth, dotted along genital slit. Genital slit elongated, 2 pairs genital suckers and 1 pair paragenital seta (*pr*) mesiad to genital disc (*gdi3*). Genital disc (*gdi3*) oval-shaped without radial striations. Coxal discs *di1* and *di2* present (Fig. 2). Suctorial shield 76 µm long, 97 µm wide, slightly concave antero-medially, broadly rounded posteriorly, dotted, 1 pair anterior suckers, 1 pair anal suckers, both equal in size having dots in between, 1 pair lateral and 1 pair posterior conoids, 2 pairs vestigial suckers towards periphery (Fig. 3 lower), 1 pair suckers below the shield, posteriorly and laterally with sclerotized piece, with pointed ends. Suctorial shield separated from posterior body end by 34 µm, a distance smaller than suctorial shield length (Fig. 2).

3.1.6. Legs

Strong and stout, I-IV measuring 125 µm, 115 µm, 98 µm and 105 µm long, respectively (trochanter base to tarsus tip). Setae and solenidia on legs I-IV segments: coxae 0-0-0-0, trochanters 1-1-1-0, femora 1-1-0-1, genua 3-3-1-0, tibiae 3-3-2-2, tarsi 13-9-8-8. Tarsi I and II 41 µm and 38 µm long, respectively. Seta *vF* on femora I, II and IV 42 µm, 40 µm and 29 µm long, respectively, absent on femur III. Seta *e* on tarsi I-IV 35 µm, 26 µm, 28 µm and 30 µm in length, respectively. Seta *mG* on genua I and II each lancet-like; *hT* on tibiae I and II each lancet-like, 15 µm, 18 µm, 20 µm and 20 µm long, respectively. Seta ó on genua I and II, a simple seta 36 µm and a solenidion 11 µm long, respectively. Tarsi I and II each with a solenidion *w1* 25 µm long. Tarsi III and IV short and stout. Seta ö on tibiae I and II 70 µm and 53 µm long, respectively. Seta *ba* on tarsus I, 22 µm long. Tarsi I-IV provided with 1 spoon-shaped + 5 leaf-like; 1 spoon-shaped + 4 leaf-like; 1 lancet-like + 3 leaf-like; 1 spoon-shaped + 3 leaf-like setae, respectively (Fig. 2).

Remarks: Much morpholgical variations have been found in *Caloglyphus arbelos* and other species of genus *Caloglyphus* recorded so far in the world. The new species seems close to *Caloglyphus agrios* Sarwar et al. [29] with the following differing characters: -

1. Propodosomal shield without visible pores and hysterosomal shield with 3 pairs visible pores in *C. agrios* but propodosomal shield with 1 pair and hysterosomal shield with 9 pairs visible pores in this species.
2. Sternum 2 (*st2*) presents in *C. agrios* but absent in this species.
3. Ventral shield separated from genital shield in *C. agrios* but not separated in this species.
4. Coxal discs (*di1, di2*) conoids in *C. agrios* but not so in this species.
5. Genital disc (*gdi3*) kidney-shaped in *C. agrios* but oval-shaped in this species.
6. Coxal field III closed in *C. agrios* but open in this species.

Key to species of genus *caloglyphus* (Hypopus)

1	Sternum 2 (*st2*) present	2
-	Sternum 2 (*st2*) absent	26
2	Sternum 2 (*st2*) meeting genital shield posteriorly	3
-	Sternum 2 (*st2*) not meeting genital shield posteriorly	19
3	Apodeme 2 (*ap2*) meeting apodeme 3 (*ap3*)	4
-	Apodeme 2 (*ap2*) not meeting apodeme 3 (*ap3*)	7
4	Dorsum dotted; sternum 1 (*st1*) bifid posteriorly	*C. captus* Sarwar and Ashfaq
-	Dorsum not dotted; sternum 1 (*st1*) not bifid posteriorly	5
5	Propodosomal setae (*sci, sce*) forming a straight line	*C. austerus* Sarwar *et al.*
-	Propodosomal setae (*sci, sce*) not forming a straight line	6
6	Apodeme 2 (*ap2*) meeting apodeme 4 (*ap4*); metasternal seta (*mts*) present	*C. spinipes* Mahunka
-	Apodeme 2 (*ap2*) not meeting apodeme 4 (*ap4*); metasternal seta (*mts*) absent	*C. rodionovi* A. Z.
7	Apodeme 3 (*ap3*) meeting apodeme 4 (*ap4*)	12
-	Apodeme 3 (*ap3*) not meeting apodeme 4 (*ap4*)	8
8	Gnathosomal lateral margins parallel	9
-	Gnathosomal lateral margins not parallel	11
9	Sternum 1 (*st1*) bifid posteriorly; paragenital seta (*pr*) bifid	*C. multaniensis* Ashfaq and Chaudhri
-	Sternum 1 (*st1*) not bifid posteriorly; paragenital seta (*pr*) not bifid	10
10	Tarsus I with 4 leaf-like setae; external ventral seta of genu II simple	*C. tshernyshevi* Zakhvatkin
-	Tarsus I with 5 leaf-like setae; external ventral seta of genu II spine-like	*C. agrios* Sarwar *et al.*
11	Setae *sci* and *sce* forming straight line; apodemes 4 (*ap4*) not meeting medially	*C. opacatus* Ashfaq and Chaudhri
-	Setae *sci* and *sce* not forming straight line; apodemes 4 (*ap4*) meeting medially	*C. trigonellum* Sher *et al.*
12	Gnathosoma notched posteriorly	13
-	Gnathosoma not notched posteriorly	14
13	Setae *sci* and *sce* of equal size; apodemes 4 (*ap4*) meeting medially	*C. merisma* Ashfaq and Chaudhri
-	Setae *sci* and *sce* not of equal size; apodemes 4 (*ap4*) not meeting medially	*C. hadros* Sarwar *et al.*
14	Dorsal body setae simple	15
-	Dorsal body setae serrated	*C. oviformis* Mahunka
15	Gnathosoma much below the anterior margin of propodosoma; coxal field III open	*C. moniezi* A.Z.
-	Gnathosoma not much below the anterior margin of propodosoma; coxal field III not open	16
16	Gnathosoma parallel laterally; distal fork separated from basal oint	18
-	Gnathosoma not parallel laterally; distal fork not separated from basal joint	17

17	Hysterosomal shield smooth; trochanter I without seta; ó on genu II spine-like	*C. muscarius* Sevastyanov and Radi
-	Hysterosomal shield dotted; trochanter I with 1 seta; ó on genu II a solenidion	*C. kenos* Sarwar and Ashfaq.
18	Hysterosomal shield smooth; sternum 1 (*st1*) not bifid posteriorly; coxal discs (*di1, di2*) conoids	*C. bradys* Sarwar *et al.*
-	Hysterosomal shield dotted; sternum 1 (*st1*) bifid posteriorly; coxal discs (*di1, di2*) not conoids	*C. faisalabadiensis* Sher, Asfaq and Parvez
19	Ventral shield separated from genital shield	22
-	Ventral shield not separated from genital shield	20
20	Apodemes 4 (*ap4*) meeting medially	*C. polyphyllae* Zakhvatkin
-	Apodemes 4 (*ap4*) not meeting medially	21
21	Suctorial shield rounded	*C. mandzhur* Zakhvatkin
-	Suctorial shield longer than wide	*C. rhizoglyphoides* Zakhvatkin
22	Gnathosoma with 1 pair small setae	23
-	Gnathosoma not with 1 pair small setae	25
23	Coxal disc (*di1*) replaced by a seta	*C. mycophagus* Megnin
-	Coxal disc (*di1*) not replaced by a seta	24
24	Sternum 2 (*st2*) free from either sides; coxal field III open	*C. baloghi* Mahunka
-	Sternum 2 (*st2*) free posteriorly; coxal field III closed	*C. conus* Mahunka
25	Apodeme 2 (*ap2*) meeting apodeme 3 (*ap3*); suctorial shield with radial striations posteriorly	*C. bifurcatus* Mahunka
-	Apodeme 2 (*ap2*) not meeting apodeme 3 (*ap3*); suctorial shield without radial striations posteriorly	*C. forficularis* Sevastyanov and Radi
26	Gnathosoma extended beyond the body	27
-	Gnathosoma not extended beyond the body	29
27	Apodemes 4 (*ap4*) meeting medially	*C. morosus* Ashfaq and Chaudhri
-	Apodemes 4 (*ap4*) not meeting medially	28
28	Coxal field III open; metasternal seta (*mts*), paragenital seta (*pr*) and seta *hv* present	*C. arbelos*, n. sp.
-	Coxal field III closed; metasternal seta (*mts*), paragenital seta (*pr*) and seta *hv* not present	*C. berlesei* Michael
29	Apodeme 3 (*ap3*) meeting apodeme 4 (*ap4*)	32
-	Apodeme 3 (*ap3*) not meeting apodeme 4 (*ap4*)	30
30	Gnathosoma reduced; coxal field III opened	*C. caroli* Channabasavanna *et al.*
-	Gnathosoma well developed; coxal field III closed	31
31	Coxal field II open; legs strong and stout	*C. geotruporum* Zakhvatkin
-	Coxal field II closed; legs fat and small	*C. spinitarsus* Hermann
32	Coxal field III open; genital disc (*gdi3*) and suctorial shield with radial striation	*C. clemens* Sarwar and Ashfaq
-	Coxal field III closed; genital disc (*gdi3*) and suctorial shield without radial striation	*C. cingentis* Sarwar and Ashfaq

4. Conclusions

Our results have helped to clarify the taxonomic status of one new *Caloglyphus* mite detected infesting the lentil. It seems distinct from already existing taxa of the genus. The characters of apodeme 3 (*ap3*) which is reduced and broken medially, enable the taxonomic separation of this new species from the other described taxa of genus *Caloglyphus* recorded in different geographical areas of Pakistan.

Acknowledgements

We thank the numerous friends and colleagues who helped us in mite collections.

References

[1] M. Boquete, F. Carballada, M. Armisen, A. Nieto, S. Martin, F. Polo and J. Carreira. J. Investig. Allergol. Clin. Immunol **10** (2000) 229.

[2] C.P. Li, Y.B. Cui, J. Wang, Q.G. Yang and Y. Tian, World Journal of Gastroenterology **9**, No. 4 (2003) 874.

[3] A. Berlese Centuria sesta di Acari Nuovi. Redia **15** (1923) 237.

[4] A. A. Zakhvatking,. Fauna of USSR Arachnoidea VI (1) Tyroglyphoidea (Acari). Zoological Institute of the USSR Academy of Sciences, New Series, No. 28 (1941) English Translation (1959), A. Rateliffe, and Hughes, A. M., American Institute of Biological Sciences, 573 pp.

[5] H. H. J. Nesbitt, Canadian Entomologist **76**, No. 2 (1944) 21.

[6] H. H. J. Nesbitt, Pan Pacific Entomologist **25**, No. 2 (1949) 57.

[7] K. Samsinak, Zoologischer Anzeiger **176**, No. 1 (1966) 27.

[8] S. Mahunka, Zoologica Hungrica **19**, No. 3-4 (1973) 289.

[9] S. Mahunka, Zoologica Hungrica **20**, Nos. 1-2 (1974) 137.

[10] S. Mahunka, Acta Zoologica Hungrica **24**, Nos. 1-2 (1978) 107**.**

[11] S. Mahunka, Acta Zoologica Hungrica **25** (1979) 311.

[12] A. M. Hughes. Technical Bulletin, Ministry of Agriculture Food and Fisheries, London, U.K, No. 9 (1976) p.400.

[13] Y. H. Tseng and S. A. Hsieh, Taiwan Sugar Research Institute, No. 74 (1976) p. 47-52.

[14] K. Samsinak, Mitteilungen aus dem Zoologischen Museum Berlin **56**, No. 2 (1980) 201.

[15] G. P. Channabasavanna, N. S. Krishna Rao and H. R. Ranganath, Indian Journal of Acarology **6**, No. 1/2 (1981) 57.

[16] N.S.K. Rao, H. R. Ranganath, G. P. Channa-basavanna, N. S. Rao Krishna and N. S. K. Rao, Indian Journal of Acarology, **7**, No. 1 (1982) 37.

[17] M. Ashfaq and W. M. Chaudhri, Pakistan Entomologist **5** No. 1-2 (1983) 61.

[18] K. Samsinak, Entomologie Mitteilungen aus dem Zoologischen Museum Hamburg **9**, No. 133 (1988) 159.

[19] P. Zou and X.Z. Wang, Acta Agriculturae, Shanghai **5**, No. 3 (1989) 21.

[20] V.D. Sevastyanov and G. K. K. K. Radi, Entomology Review **8** (1991) 139.

[21] F. Sher, M. Ashfaq and A. Parvez, Pakistan Entomologist **13**, Nos. 1-2 (1991) 27.

[22] P. B. Klimov, Vestink Zoologii Ukraine **34**, Nos.4-5 (2000) 27.

[23] S.A. Eraky, Folia Entomologica Hungrica **60** (1999) 45.

[24] P.B. Klimov and B. M. Oconnor, Invertebrate Systematics **17** (2003) 469.

[25] P. V. Klimov, Zoologischeskii Zhurnal **75**, No. 4 (1996) 613.

[26] B.M. Oconnor, Ann Arbor Michigan, USA (2003) 1079.

[27] M. Sarwar and M. Ashfaq, Pakistan Journal of Scientific and Industrial Research **47**, No. 6 (2004) 455.

[28] M. Sarwar and M. Ashfaq, Acarologia, **XLVI**, Nos. 1-2 (2006) 115.

[29] M. Sarwar, M. Ashfaq and S. Akbar, Pakistan Journal of Scientific and Industrial Research **48**, No. 5 (2005) 345.

[30] M. Sarwar, M. Ashfaq and S. Nadeem, Journal of Agriculture and Biological Sciences **1**, No. 1 (2009) 38.

[31] D.A. Griffiths, W.T. Atyeo, R.A. Norton and C.A. Lynch, Journal of Zoology **220** (1990) 1.

[32] D.A. Griffiths, Bulletin of British Museum (Natural History), Zoology Series **19** (1970) 85.