Description of Two New Species of Genus *Caloglyphus* Berlese (Acari: Acaridae) From Pakistan

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Abstract.- Mites are microscopic organisms which comprise a large group of Arthropoda belonging to the subclass Acari of class Arachnida. Acarid mites are more important including genus *Caloglyphus* Berlese. The genus *Caloglyphus* is found commonly in different areas of Punjab, Pakistan. A comprehensive survey of stored commodities resulted in two new species e.g., *Caloglyphus pejowaliensis* and *C. aurangensis* from district Narowal. The illustrations of main body characters, traditional description, host and comparison remarks are also given. A concise key of all the known species of this genus from Pakistan is also prepared.

**Key words**: Acaridae, hypopus, stored wheat, mung.

INTRODUCTION

Mites of the family Acaridae have been reported from stored foods and grains all over the world causing different levels of damage to stored products. Many studies demonstrated that species of the stored grain mites attack the germ and consume very little portion of the remaining grain, thus causing up to only 3% of weight reduction (Solomon, 1946). These mites feed on embryo resulting in germination loss of the grains (Zachvatkin, 1941; Mahmood et al., 2012) along with deterioration in seed quality which also make it unsuitable for milling and unpalatable for livestock (Wilkin and Stables, 1985).

The species of *Caloglyphus* have been reported from potato tubers, onion bulbs, barley, rice, wheat, flour and chicken feeds (Ostovan and Kamali, 1995). These mites can survive in diverse environments such as store-houses, human and animal bodies. The genus *Caloglyphus* was erected by Berlese (1923) by designating *Caloglyphus berlesei* Michael, 1903 as its type species. Zachvatkin (1937) revised all the species known at that time in genus *Caloglyphus*. Zachvatkin (1941) described 4 new species and re-described 6 new species. Nesbitt (1944, 1949) added 1 and 3 new species, respectively. Samsinak (1966) added 1 new species, Mahunka (1973, 1974, 1978 and 1979) described 2, 1, 2 and 1 new species, respectively of genus *Caloglyphus*. Hughes (1976) made an excellent contribution to the mite fauna of stored grains and stored houses. Tseng and Hsieh (1976) re-described 1 species of the genus *Caloglyphus*. Samsinak (1980) revised the tribe Caloglyphini and elevated the status of *Caloglyphus* to the genus. Channabasavanna et al. (1981), Rao et al. (1982), Ashfaq and Chaudhri (1983), Samsinak (1988), Zou and Wang (1989), Sevastyanov and Radi (1991), Sher et al. (1991), Klimov (1996) and Eraky (1999) added 1, 1, 4, 1, 3, 2, 1 and 1 species respectively. Klimov (2000) revised acarid mites of tribe Caloglyphini and synonymized *Caloglyphus* with *Sancassania* and described a new species. The present authors agree with Samsinak (1980) and consider *Caloglyphus* as a valid genus. Sarwar and Ashfaq (2004, 2006, 2010a,b) and Sarwar et al. (2005, 2009) reported 9 species from different localities of Pakistan. Previously, 15 species have been reported from Pakistan. In the present paper two new species of genus *Caloglyphus* have been described and illustrated thus making a total of 17 species of this genus from this part of the world. A key to all the known species of this genus is also prepared.

MATERIALS AND METHODS

The District Narowal in Punjab province was surveyed to explore new taxa and distribution range...
of acarid mites. Samples of different stored grains and commodities were collected and transferred to Acarology Research Laboratory, University of Agriculture, Faisalabad. Mites were isolated by Berlesè’s funnel in small beakers having ethanol and a few drops of glycerin. Hypopi were mounted on the microscopic slides permanently in Hoyer’s medium. The mounted specimens were examined under high power phase contrast microscope (Meiji). All illustrations of body parts were made with the help of the ocular grid. Measurement of different body parts were made with the help of an ocular micrometer. All the measurements are given in micro meters. The specimens were identified up to the species level with the help of available literature and keys.

KEY TO SPECIES OF GENUS CALOGlyphus BERLESE FROM PAKISTAN (HYPOPI)

1. Sternum 2 (st2) present .......................................................... 2
   - Sternum 2 (st2) absent .................................................. 12
2. Apodeme 2 (ap2) meeting apodeme 3 (ap3) ...................... ................. usterus Sarwar, Ashfaq and Nadeem
   - Apodeme 2 (ap2) not meeting apodeme 3 (ap3) ........ 3
3. Apodeme 3 (ap3) meeting apodeme 4 (ap4) ........................ 8
   - Apodeme 3 (ap3) not meeting apodeme 4 (ap4) .......... 4
4. Gnathosomal lateral margins parallel ...................................... 5
   - Gnathosomal lateral margins not parallel ..................... 6
5. Sternum 1 (st1) bifid posteriorly; paragenital seta (pr) bifid ........................................ multaniensis Ashfaq and Chaudhri
   - Sternum 1 (st1) not bifid posteriorly; paragenital seta (pr) not bifid ........................................ agrius Sarwar, Ashfaq and Akbar
6. Setae sci and sce forming straight line; coxal discs (di1, di2) not conoids .......... opacatus Ashfaq and Chaudhri
   - Setae sci and sce not forming straight line; coxal discs (di1, di2) conoids ............................................... 7
7. Apodeme 4 (ap4) not meeting medially; paragenital seta (pr) antero-medial to genital disc (gdi3); gnathosomal distal fork not separated from basal joint......................................................... verto Sarwar and Ashfaq
   - Apodeme 4 (ap4) meeting medially; paragenital seta (pr) messed to genital disc (gdi3); gnathosomal distal fork separated from basal joint......................................................... trigonellum Sher, Ashfaq and Parvez
8. Gnathosoma notched posteriorly ........................................ 9
   - Gnathosoma not notched posteriorly ..................... 10
9. Setae sci and sce of equal size; apodemes 4 (ap4) meeting medially .......... merisma Ashfaq and Chaudhri
   - Setae sci and sce not of equal size; apodemes 4 (ap4) not meeting medially.............................................. hadros Sarwar, Ashfaq and Akbar
10. Gnathosoma distal fork separated from basal joint; genital disc (gdi3) kidney-shaped ........................................ 11
    - Gnathosoma distal fork not separated from basal joint; genital disc (gdi3) not kidney-shape .............................. kenos Sarwar and Ashfaq
11. Hysterosomal shield smooth; sternum 1 (st1) not bifid posteriorly; coxal discs (di1, di2) conoids ............................ falsalabadiensis Sher, Ashfaq and Parvez
    - Hysterosomal shield dotted; sternum 1 (st1) bifid posteriorly; coxal discs (di1, di2) not conoids ................. fasalabadiensis Sher, Ashfaq and Parvez
12. Gnathosoma extended beyond body ........................................ 13
    - Gnathosoma not extended beyond body ........................... 15
13. Apodeme 4 (ap4) meeting medially ........................................ morosus Ashfaq and Chaudhri
    - Apodeme 4 (ap4) broken medially ................................ morosus Ashfaq and Chaudhri
14. Propodosomal shield dotted without striation ........................................ aurangensis n.sp
    - Propodosomal shield dotted antero-medially with striations ........................................ arbelos Sarwar and Ashfaq
15. Body dotted having 2 pair visible pores on dorsum ................. pejowaliensis n.sp
    - Body smooth having not 2 pair visible pores on dorsum ........................................ 16
16. Coxl field III open; genital disc (gdi3) and suctorial shield with radial striations ........................................ cingentis Sarwar and Ashfaq
    - Coxl field III closed; genital disc (gdi3) and suctorial shield without radial striation ........................................ cingentis Sarwar and Ashfaq

1. Caloglyphus aurangensis, new species

(Fig. 1)

Hypopus

Gnathosoma

Gnathosoma fused pedipalpi, 2 segmented, broad at base, slightly tapering anteriorly, 32 long (basal segment 18, distal segment 11), bifurcated anteriorly, 1 pair arista, 34 long, 2 pairs small setae (Fig. 1B).

Dorsum

Body 284 long, 216 wide, divided into propodosomal and hysterosomal shields. Propodosomal shield with rostral projection antero-medially, 53 long, 176 wide, dotted all around; setae vi, ve, sci, sce and scs, each 1 pair, simple,
TWO NEW SPECIES OF GENUS CALOGLYPHUS BERLESE

A

Fig. 1. Caloglyphus aurangensis n.sp.; dorsal (A) and ventral (B) views of hypopus.

B

d4 measuring 7, 15, 7, 12 long respectively. Setae d1 7, he 7; hi 17, lp1 12, lp2 15; sai 12, sae 34 long; d1 - d1 54, d2 - d2 137, d3 - d3 61, d4 - d4 61; d1 - d2 48, d1 - d3 61, d3 - d4 54 apart. Hysterosomal shield anterior margin overlapping propodosomal shield, overlapping area with transverse, broken striations (Fig. 1A).

Venter

Apodeme 1 (ap1) largely Y-shaped, sclerotized, continuing with sternum 1 (st1). Sternum 1 (st1) 42 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, not meeting apodeme 4 (ap4). Metasternal setae (mts) 1 pair, 10 long, each seta inbetween the tips of apodeme 4 (ap4) and apodeme 5 (ap5) (Fig. 1B). Coxal fields I and II, III and IV open, smooth. Seta hv 28 long. Genital shield not separated from ventral shield, smooth. Genital slit elongated having 1 pair paragenital seta (pR) 7 long adjacent to genital disc (gdis). Genital disc (gdis) oval-shaped with radial striations. Coxal discs di1 and di2 present. Suctorial shield 55 long, 76 wide, slightly concave anteromedially, 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 suckers. Suctorial shield separated from posterior body end by 34, a distance smaller than suctorial shield length (Fig. 1B).

Legs

Strong and stout, I-IV measuring 107, 101, 88 and 92 long, respectively (trochanter base to tarsus tip). Setae and solenidia on legs I-IV segments: coxae 0-0-0-0, trochanters 0-1-1-0, femora 1-1-0-1, genua 3-3-1-0, tibiae 3-3-1-2, tarsi 6-6-4-9. Tarsi I, II, III and IV 27, 27, 27 and 27 long, respectively. Seta vF on femora I, II and IV 29, 37 and 23 long, respectively, absent on femur III. Seta e on tarsi I, II and IV measuring 25, 36 and 25 in length, respectively. Seta mG on genua I and II each spine shape measuring 7; hT on tibiae I and II each spine shape measuring 17 and 15 long, respectively. Seta σ on genua I and II, a simple seta 36 and a solenidion 11 long, respectively. Tarsi I and II each with a solenidion wT 25 long. Tarsi III and IV short measuring 12, 7, 7, 10 and 17 in length, respectively; setae sci and sce forming circular line; sci-sci 32, sce-sce 69 and sci-sce 20 apart. Hysterosomal shield 218 long, 185 wide, smooth, anterior and lateral margins with dots and broken striations, lateral margins turn toward the leg II side, 11 pairs setae, 1 pairs visible pores. Setae d2, la, d3,
and stout. Tarsi I-IV provided with 1 spoon-shaped + 2 leaf-like; 1 spoon-shaped + 3 leaf-like; 1 lancet-like + 1 leaf like; 1 spoon-shaped +1 leaf-like setae, respectively (Fig. 1B).

**Type**

Holotype hypopus was collected from grain market of a town Aurangabad (Narowal) from wheat (*Triticum aestivum*) on 15-04-2012 and deposited in Department of Agri. Entomology, University of Agriculture, Faisalabad.

**Etymology**

This species name is described on the basis of locality of collection i.e., Aurangabad (Narowal).

**Remarks**

This new species is very close to already known species *Caloglyphus arbelos* Sarwar and Ashfaq but this new species differ from *C. arbelos* on basis of following characters.

*C. arbelos* with anterio-medially dotted propodosomal shield having 1 pair of visible pores while in this new species propodosomal shield dotted completely with no visible pore.

*C. arbelos* having 9 pair visible pores on dorsum while in this new species dorsum with only 1 pair of visible pore. *C. arbelos* having medially broken *ap*3 while in this new species *ap*3 is absent. Genital slit dotted in *C. arbelos* while smooth in this new species.

**Caloglyphus pejowaliensis**, new species

(Fig. 2)

**Hypopus**

**Gnathosoma**

Gnathosoma fused pedipalpi, 2 segmented, broad at base, slightly tapering anteriorly, 32 long (basal segment 22, distal segment 10), bifurcated anteriorly, 1 pair arista, 32 long, 1 pairs small setae (Fig. 2B).

**Dorsum**

Body 284 long, 196 wide, divided into propodosomal and hysterosomal shields. Propodosomal shield 59 long, 127 wide, dotted all around; setae *vi, ve, sci, sce* and *sce*, each 1 pair, simple, measuring 17, 7, 6, 8 and 28 in length, respectively; setae *sci* and *sce* forming circular line;

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Fig. 2. *Caloglyphus pejowaliensis* n.sp.; dorsal (A) and ventral (B) views of hypopus.
two new species of genus Caloglyphus Berlese

Venter
Apodeme 1 (ap1) largely Y-shaped, 14, sclerotized, continuing with sternum 1 (st1). Sternum 1 (st1) 42 long, free. Apodeme 2 (ap2) free, rounded at tip. Apodeme 3 (ap3) meeting apodeme 4 (ap4). Sternum 2 (st2) absent. Apodeme 5 (ap5) originating from trochanter IV, making broad, meeting apodeme 4 (ap4). Metasternal seta (mts) 1 pair, minute, each seta in near base of apodeme 4 (ap4) and apodeme 5 (ap5), coxal fields I and II open, III and IV closed, dotted. Seta hv 14 long. Genital slit elongated having 1 pair paragenital seta (pR) minute adjacent to genital disc (gdi2). Genital disc (gdi3) oval-shaped with radial striations. Coxal discs di1 and di2 present. Suctorial shield 58 long, 74 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 suckers. Suctorial shield separated from posterior body end by 32, a distance smaller than suctorial shield length (Fig. 2B).

Legs
Legs Strong and stout, I-IV measuring 109, 101, 72 and 70 long, respectively (trochanter base to tarsus tip). Setae and solenidia on legs I-IV segments: coxae 0-0-0-0, trochanters 0-0-1-0, femora 1-1-0-0, genua 2-2-1-0, tibiae 3-3-1-1, tarsi 10-7-5-4. Tarsi I and II 40 each, Tarsi III and IV measuring 20 long each. Seta vF on femora I, II measuring 18 and 20 long, respectively, absent on femur III and IV. Seta e on tarsi I, II measuring 22, 24 in length, respectively. Seta mG on genua I and II each spine shape measuring 10 and 14 long respectively; hT on tibiae I and II each spine shape measuring 12 and 18 long respectively, Seta σ on genua I 18 and apophysis 36 long, respectively. Tarsi I and II each with a solenidion w 126 long each. Tarsi III and IV short and stout. Seta ba on tarsus I, 22 long. Tarsi I-IV provided with 1 spoon-shaped + 3 leaf-like; 1 spoon-shaped + 2 leaf-like + 1 lancet-like; 2 leaf like; 1 lancet-like respectively (Fig. 2B).

Type
Holotype hypopus was collected from grain market of a town Pejowali (Narowal) from Mung (Vignaradiata) on 04-07-2012 and deposited in Department of Agri. Entomology, University of Agriculture, Faisalabad.

Etymology
This species epithet if derived for the locality of collection.

Remarks
This new species is very close to already known species Caloglyphus bradys Sarwar, Ashfaq and Nadeem but this new species differ from C. bradys on basis of following characters. Hysterosomal shield in C. bradys smooth while in this new species hysterosomal shield dotted. C. bradys with 3 pairs visible pores on dorsum while in this species only 2 pairs of visible pores. C. bradys with gnathosoma having 1 pair of long arista with 2 small setae pairs while in this new species gnathosoma with only 1 pairs of small setae.

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REFERENCES


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