THREE NEW MITES OF THE GENUS LEDERMUELLERIA (STIGMAEIDAE)

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Three new species of the genus *Ledermuelleria* are described.

Ledermuelleria lyallpuriensis n. sp. belongs to 'segnis' group. Smoothness of web margins of setae, four setae on genu II, two pairs of paragenital setae separate it from *Ledermuelleria microsegnis* Chaudhri to which it is closely related.

Ledermuelleria hashmii n.sp. belongs to the 'pectinata' group and is closely related to *Ledermuelleria pectinata* (Ewing). The characters like shape of dimples, distances between alveoli of setae *ae*—*be*, *c*—*c* and *lm*—*lm* separate the two species.

Ledermuelleria yusufi n.sp. also belongs to 'pectinata' group. The taxonomic characters like number of setae on genu II, tarsus I, shape of setae 1A, 3A, 4A, length of seta *ll* separate it from *Ledermuelleria lirella* Summers and Price.

INTRODUCTION

The genus *Ledermuelleria* (originally *Ledermulleria*) was erected by Oudemans (1923). He transferred seven species from the genera *Callgonus*, *Raphignathus* and *Stigmaeus* to this genus. Summers (1957) and Summers and Price (1961) redescribed seven of the older species, added four new species and made a key to females of eleven species. Chaudhri (1965) described eleven new species of this genus. Recently, Wood (1966) described another nine new species of this genus from Australia, thus raising the number of species to thirtyone in this genus.

This paper reports another three species of this genus from Pakistan. Summers (1961) stated that mites in the 'Segnis' group of this genus have only one pair of genital setae but this paper reports a new species in which there are two pairs of paragenital setae. A new comprehensive key is given in this paper to accommodate the three new species.

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KEY TO FEMALES OF THE GENUS LEDERMUELLERIA

1. Dorsal setae acicular, clavate or flattened and blade-like; smooth or sparsely barbed 2
   Dorsal setae short; densely barbed, bushy (Pectinata group) 27
2. One or two pairs of paragenital setae; dorsal setae arcuate, flattened; with thin lateral vanes (Segnis group) 3
   Two or three pairs of paragenital setae; dorsal setae acicular or clavate (Maculata group) 12
3. Dorsal plating with dimples, lining of each dimple finely alveolate with granular periphery; basins of dimples with sieve-like pattern of small alveoli 4

   Dorsal plating with dimples; their rims smooth or evenly crinkled; basins of dimples without a sieve-like pattern of small alveoli 8
4. Dorsal setae sharply pointed; setae with spinules 5
   Dorsal setae bluntly pointed; vanes broad, membranous 6
5. Femur I with five setae ..... *segnis* (Koch)
   Femur II with four setae 7
6. Each dimple with 7-15 vacuoles; dorsal setae slender, slightly spinulate, those on hysterosoma less than 45μ long ..... *corticola* Wood
   Each dimple with 20-40 vacuoles; dorsal setae more robust, distinctly spinulate or pectinate, those on hysterosoma 60-65μ long .... *mixta* Wood
7. Dorsal setae bluntly pointed, vane broad, membranous, with shallow marginal serrations and additional rows of blunt barbs on their upper surface; one pair of paragenital setae; genu II with three setae ..... *microsegnis* Chaudhri

   Dorsal setae bluntly pointed, membranous, with smooth margins, but without additional rows of blunt barbs on their upper surface; two pairs of paragenital setae; genu II with four setae ..... *lyallpuriensis* n. sp.
8. Lateral vanes of dorsal setae smooth ..... *chilensis* Chaudhri
   Lateral vanes of dorsal setae barbed 9
9. Femur II with five setae 10
   Femur II with four setae 11
10. Seta *be* twice as long as *ce*; *li* shorter than distance *li-li*; seta *c* 41μ long ..... *modiola* S. & P.
    Seta *be* longer than *ce* only by 8 μ; *li-* or greater than distance *li-li*; seta *c* 59μ long ..... *arcuata* Chaudhri

11. Tarsus II with nine setae; ornamentation does not fade mid-dorsally; genu III with one seta.....*simplex* Wood
Tarsus II with ten setae; ornamentation fades mid-dorsally; genu III with two setae.....*smithi* Chaudhri

12. Major callosity present.....13
Major callosity absent.....18

13. Three pairs of paragenital setae.....14
Two pairs of paragenital setae.....16

14. Tarsus IV without proximodorsal solenidion.....*lacuna* Summers
Tarsus IV with proximodorsal solenidion.....15

15. Approximate ratio of lengths *be/ae*=1.1; *be/he*=2.0; dorsal plates with small widely spaced dimples clearly defined.....*rhodomela* (Koch)
Approximate ratio *be/ae*=1.5; *be/he*=4.0; dorsal plates without evident dimples.....*ottavii* (Berlese)

16. Dorsal setae acicular, with minute spinules on distal half; tarsus III with eight setae.....*granulose* Wood
Dorsal setae spindle to club-shaped; with few incipient spinules, and a transparent sheath; tarsus III with eight or nine setae.....17

17 Idiosoma 468μ; tarsus III with nine setae; intercoxal seta 4*A* absent.....*parviseta* Chaudhri
Idiosoma 338μ; tarsus III with eight setae; intercoxal seta 4*A* present.....*schusteri* S. & P.

18. Three pairs of genital setae.....19
Two pairs of genital setae.....24

19. Eyes present.....20
Eyes absent.....22

20. Intercoxal seta 4*A* absent.....*capella* Chaudhri
Intercoxal seta 4*A* present.....21

21. Tarsus IV with proximodorsal solenidion.....*ovata* Chaudhri
Tarsus IV without proximodorsal solenidion.....*clavata* C. & F.

22. Femur IV with three setae.....*parasitica* Chaudhri
Femur IV with two setae.....23

23. Dorsal setae long, barbulate with blunt tips; propodosoma rounded anteriorly; sternal plating between coxae I-II and III-IV with reticulation.....*gorgasi* Chaudhri

Dorsal setae plumose, relatively short, not long enough to reach base of seta next behind; propodosoma noticeably conical; sternal plates without reticulation.....*gamma* Chaudhri,

24. Seta *ce* noticeably reduced; less than 1/3 the length of seta *be*..... ..... *brevisetosa* Wood
Seta *ce* more than half the length of *be*.....25

25. Dorsal sculpturing a regular polygonal reticulum; *c-c* slightly shorter than or equal to *li-li*.....26
Dorsal sculpturing an irregular pattern of small circular dimples; *c-c* distinctly greater than *li-li*.....*manapouriensis* Wood

26. Dorsal setae long, rod-like, with hyaline sheath; *ce* about 3/5 as long as *be*.....*distincta* Wood
All dorsal setae approximately equal in length; stick-like, slightly capitate and tufted distally.....*clavigera* Wood

27. Femur II with four setae; eyes present.....28
Femur II with five setae; eyes present or absent.....30

28. Femur I with six setae.....29
Femur I with five setae.....*dumose* Wood

29. Dimples without sieve-like appearance; distance between sockets of *ae-be* not less than 48μ; *c-c* more than 54μ; *lm-lm* not more than 136μ..... .....*pectinata* (Ewing)
Dimples with sieve-like appearance; distance between sockets of *ae-be* not more than 28μ; *c-c* not less than 87μ; *lm-lm* not less than 121μ..... .....*hashmii* n. sp.

30. Eyes not present.....31
Eyes present 32

31. Genu II with four setae; setae 1A, 3A and 4A smooth; tarsi I with 14 setae; dorsal setae burrlike.....*lirella* S. & P.
Genu II with three setae; setae 1A, 3A and 4A barbed, like dorsal setae; tarsi I with 13 setae; dorsal setae with long marginal spinules..... .....*yussufi* n. sp.

32. Propodosoma tapered to a pointed apex; seta *c* about 17μ long; setae *a-a* about 48μ apart.....*carticula* S. & P.
Propodosoma not tapered to a pointed apex; seta *c* at least 32μ long; setae *a-a* approximately 55μ apart.....33

33. Dorsal plates with relatively uniform pattern of ornamentation; setae *a-a* approximately 68μ apart.....*myrtea* Chaudhri.
Dorsal plates with regional variations in pattern of dimples with large variations in size and shape; a few elongate transversely and a few with

greatest diameters in longitudinal plane; setae *a-a* approximately 54μ apart.....*plumifer* (Halbert).

DESCRIPTION OF NEW SPECIES

1. Ledermuelleria lyallpuriensis n. sp. (Fig. 1).

Female. The mite of this species belongs to '*segnis*' group. Dorsal plates with variable pattern of dimples; lining of each dimple finely vacuolated which imparts granular texture to its periphery in optical section (1*b*), basins of dimples contain numerous tiny alveoli which are sieve-like. Eyes present. Dorsal setae recurved, arcuate, feather-like, midrib of each seta supports on outspreading membrane or web; web with smooth margins and without

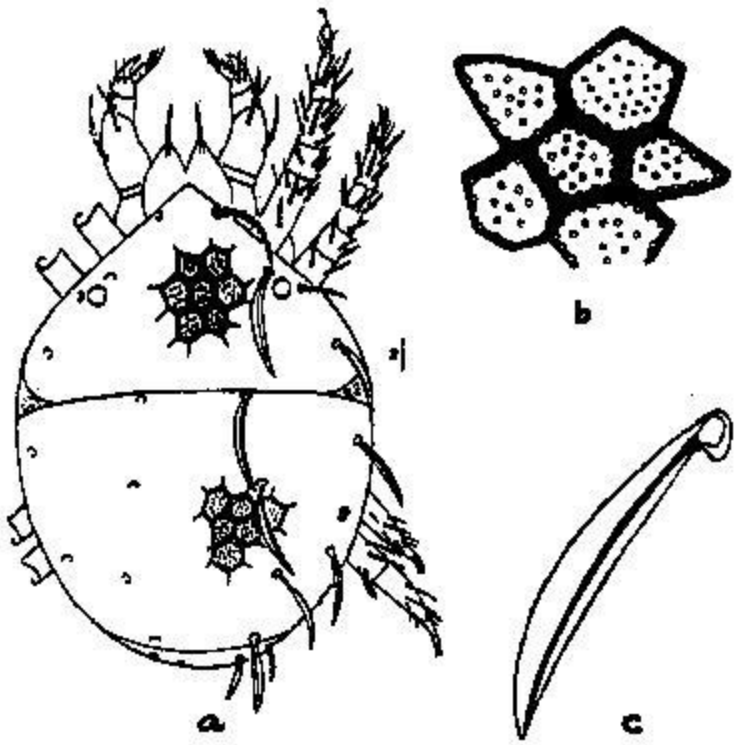

Fig. 1. *Ledermuelleria lyallpuriensis* n.sp. (*a*) female dorsum; (*b*) dorsal plate ornamentation; (*c*) seta.

additional barbs (1*c*). Seta *be* longest (67μ). Setae *b* and *la* almost equal in length (62μ). Tubercles of setae *ae*, *ce*, *de* marginal in location. Seta *ce* more than 2/3rd length of *be*. Seta *li* 46μ long, 56μ apart. Reticulation on sternal plates not clearly visible. Genital plate almost surrounded by ventral extensions of suranal plate; two pairs of paragenital setae; three pairs of anogenital setae. Setae on legs: trochanters 1-1-2-1, femora 6-5-3-2, genua

4-4-1-1, tibiae 7-6-6-6, tarsi 14-10-8-7.

Measurements (average 6 specimens): body length 349μ, width 197μ (1 a); setae *ae* 48μ, *be* 67u, *ce* 36μ, *de* 57μ, *a* 57μ, *b* 62μ, *c* 52μ, *la* 62μ, *li* 46μ, *lm* 33μ *le* 27μ, *he* 55μ.

Type. Holotype female, W.P.A.U., Lyallpur, Campus, February 1, 1965 from wheat-straw (*Triticum aestivum* L.), deposited in the Department of Entomology, W.P.A.U., Lyallpur, Pakistan; eight females same collection; one female, Insectary, February 25, 1965 on mango bark (*Mangifera indica* L.). One specimen each deposited in United States National Museum, U.S.A. and British Museum (Natural History), U.K.

This species is closely related to *Ledermuelleria microsegnis* Chaudhri but the following points separate it:

1. The web margins of setae smooth, without additional rows of barbs in this species. There are shallow marginal serrations and additional rows of blunt barbs on the upper surfaces of the setae in *microsegnis*.
2. Genu II with four setae in this species, three setae in *microsegnis*.
3. Two pairs of paragenital setae in this species but only one pair of paragenital setae in *microsegnis*.

2. Ledermuelleria hashmii n. sp. (Fig. 2).

Female. This species belongs to the 'pectinata' group. Propodosoma does not taper to a point. Dimples in dorsal plates large, irregular in shape and size, mostly polygonal; each dimple circumscribed with 18-22 shallow, crescentric indentations to produce appearance of sinuous periphery (2b), basins of depressions contain numerous tiny alveoli which appear sieve-like. Eyes present between setae *be* and *ce*, nearer to *be* than *ce*. Dorsal setae subequal, all very short, bushlike (2c), spinules coarse, overlapping and clustered. Seta *li* longest (35μ). Humeral plate triangular with dimples. Genital plate wedge-shaped with three pairs of small, smooth paragenital setae. Dorsal plate continues on to the ventral side along wedge-shaped genital plate. Intercoxal plates weakly reticulate, fused in midline forming sternal plates between coxal groups. Setae *1A*, *3A* and *4A* small and smooth. Setae and sensilla on legs: trochanters 1-1-1-1, femora 6-4-3-2, genua 4-4-1-1, tibiae 7-6-6-6, tarsi 14-10-8-7.

Measurements (average 10 specimens), length idiosoma 346μ, width 175μ (2a); setae: *ae* 19μ, *be* 19μ, *ce* 15μ, *de* 17μ, *a* 19μ, *b* 20μ, *c* 23μ, *la* 16μ, *li* 35μ, *lm* 21μ, *e* 24μ, *le* 16μ, *he* 23μ.

Type. Holotype female, W.P.A.U., Campus, January 31, 1965 from

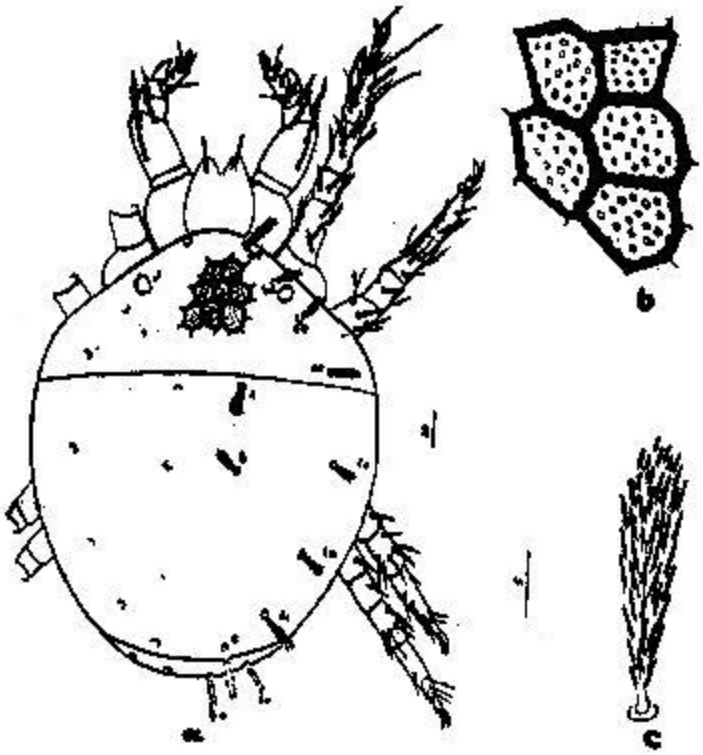

Fig. 2. *Ledermuelleria hashmii* n.sp. (*a*) female dorsum; (*b*) dorsal plate ornamentation; (*c*) seta.

wheat straw (*Triticum aestivum* L.) deposited in the Department of Entomology, W.P.A.U., Lyallpur; nine females same collection; one female 4 mi. North Sheikhupura, April 7, 1965 on rice straw (*Oryza sativa* L.), examples deposited in United States National Museum, U.S.A.; British Museum (Natural History), U.K. and Department of Entomology, University of California, Davis, California.

This species is closely related to *Ledermuelleria pectinata* (Ewing) but the following characters separate it:

1. The dimples are with sieve-like appearance in this species, and not sieve-like as in *pectinata*.
2. The distance between the alveoli of setae *ae-be* does not exceed 28μ in this species but it is 48μ or more in *pectinata*.
3. The distance between the alveoli of setae *c—c* is 87μ in this species but it is 54μ in *pectinata*.
4. The distance between the alveoli of setae *im-im* is not less than 121μ in this species but it is not more than 136μ in *pectinata*.

3. Ledermuelleria yussufi n.sp. (Fig. 3).

Female. This species belongs to the 'pectinata group. Propodosoma conical, tapers to a bluntly rounded protuberance on which are borne setae *ae*. Dimples in dorsal plates variable in size, polygonal, devoid of alveoli, margins thick (3b); basins of each dimple encircled completely by 5-7 dimples. Eyes absent. Dorsal setae small, shafts have long marginal spinules. (3c). Seta *li* longest (27μ). Humeral plate semi-circular. Genital plate with three pairs of small paragenital setae. These resemble dorsal setae. Dorsal plate

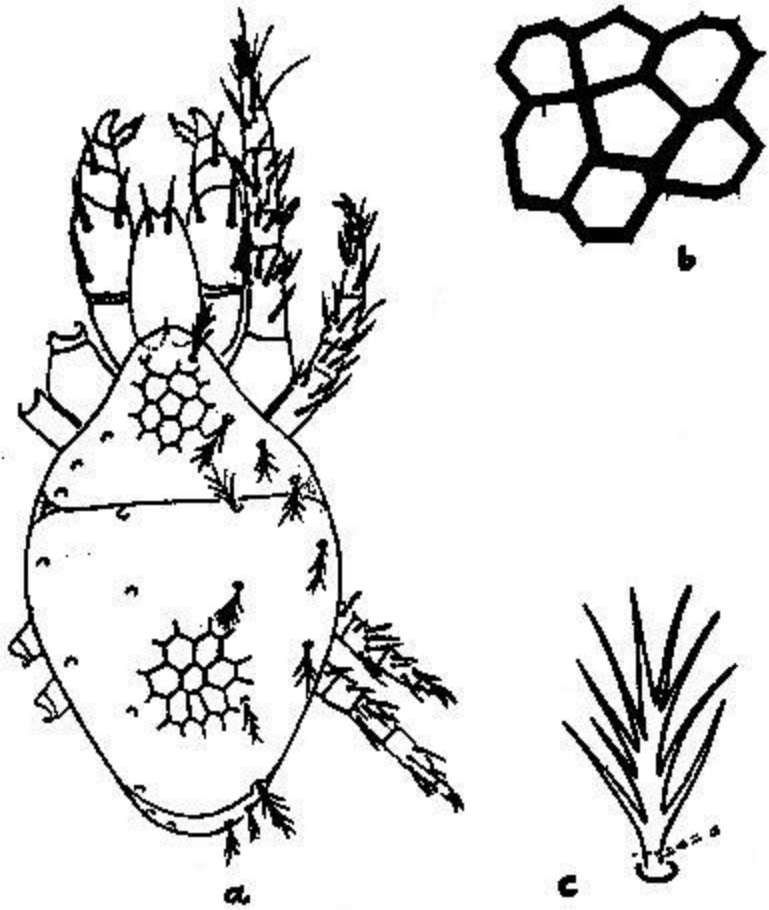

Fig. 3. *Ledermuelleria yussufi* n.sp. (*a*) female dorsum; (*b*) dorsal plate ornamentation; (*c*) seta.

continues on the ventral side along the genital plate. Sternal plate between coxae with dimples. Setae 1A, 3A and 4A similar to dorsal setae but small in size. Setae and sensillae on legs: trochanters 1-1-1-1, femora 6-5-3-2, genua 4-3-1-1, tibiae 7-6-6-6, tarsi 13-9-8-7. All coxae with setae having spinules except setae on coxae I where one seta is simple and smooth.

Measurements (average 15 specimens): length idiosoma 305μ, width 142μ (3a). Setae *ae* 21μ, *be* 22μ, *ce* 18μ, *de* 19μ, *a* 20μ, *b* 19μ, *c* 21μ, *la* 22μ, *lm* 20μ, *li* 27μ, *e* 21μ, *le* 16μ, *he* 21μ.

Type. Holotype female, collected from W.P.A.U., Lyallpur, Campus, January 31, 1965 from wheat straw (*Triticum aestivum* L.) deposited in the Department of Entomology, W.P.A.U., Lyallpur; fourteen females, same collection; two females, W.P.A.U., Campus, February 3, 1965 from maize straw (*Zea mays* L.) deposited in the United States National Museum, U.S.A.; British Museum (Natural History), U.K. and Department of Entomology, University of California, Davis, California.

This species is closely related to *Ledermuellerla lirella* Summers and Price. It can be separated from *lirella* on the basis of the following characters:

1. Genu II and tarsus I with three and thirteen setae in this species as against four and fourteen in *lirella* respectively.
2. Setae 1A, 3A, 4A with spinules in this species. They are smooth in *lirella*.
3. Seta *li* 27μ long in this species as against 41μ in *lirella*.

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