

Article

Tenuipalpus Sensu Lato Donnadieu (Acari: Prostigmata: Tenuipalpidae); New Species Groups, a New Species, and Keys to the World Species [†]

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Simple Summary: Castro et al. divided the genus *Tenuipalpus* into two groups, i.e., *Tenuipalpus sensu stricto* and *Tenuipalpus sensu lato*. Four new species groups of the *Tenuipalpus sensu lato* group are proposed in this study, considering the total number of dorsal opisthosomal setae. Additionally, diagnostic keys to new species groups and the world species of *Tenuipalpus sensu lato* are developed.

Abstract: Four new species groups of the *Tenuipalpus sensu lato* group are proposed in the present study based on the total number of dorsal opisthosomal setae, namely, *carolinensis* with ten pairs of setae (214 species), *dubinini* with nine pairs of setae (33 species), *granati* with eight pairs of setae (29 species), and *barticanus* with seven pairs of setae (7 species). Additionally, diagnostic keys to species groups and 273 species of the *Tenuipalpus sensu lato* are provided. Three species, *T. lustrabilis* Chaudhri, *T. guptai* Sadana and Gupta, and *T. solanensis* Sadana and Gupta, are synonymized with *T. punicae* Pritchard and Baker. One species, *T. rodionovi* Chalilova, is suggested as a junior synonym of *T. granati* Sayed, and eight species, *T. chiococcae* De Leon, *T. costarricensis* Salas and Ochoa, *T. ephedrae* Livschitz and Mitrofanov, *T. molinae* Evans, *T. santae* Manson, *T. simplychus* Cromroy, *T. tetrazygiae* De Leon, and *T. oxalis* (Flechtmann), belonging to the *carolinensis* species group, are not included in the key. Furthermore, a new species of *Tenuipalpus sensu lato*, *T. jazanensis* sp. nov., is described and illustrated based on females collected from the *Chamaerops* spp. (Arecaceae).

Keywords: opisthosomal setae; tropical regions; divisions; *Chamaerops* spp.; related species; geographical distribution



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1. Introduction

Tenuipalpus Donnadieu is the largest genus in the family Tenuipalpidae Berlese (Acari: Prostigmata: Tetranychoidae) and consists of more than 320 species, distributed worldwide, especially in the tropical and subtropical regions [1–3]. The members of this genus are mostly oligophagous in their feeding habits [2]. The three species, i.e., *T. granati* Sayed, *T. punicae* Pritchard and Baker, and *T. eriophyoides* Baker, are serious pests of fruit trees worldwide [4].

The genus *Tenuipalpus* was erected by Donnadieu in 1875 [5]. Based on the number of dorsal setae and palp segmentation, Reck [6] and Mitrofanov [7] erected six genera by transferring some of *Tenuipalpus* species, *Extenuipalpus* Reck [6], *Aegyptopalpus* Mitrofanov [7], *Deleonipalpus* Mitrofanov [7], *Gnathopalpus* Mitrofanov [6], *Tuttlepalpus* Mitrofanov [7], and *Ultratenuipalpus* Mitrofanov [7]. Meyer [8] synonymized five of those genera with the genus *Tenuipalpus* by using the same morphological characters and proposed six species groups, namely, *albae*, *caudatus*, *elegans*, *granati*, *quadrisetosus*, and *trisetosus*. Later, Baker and Tuttle [9] recognized only two species groups, *caudatus* and *proteae*, based on the presence

and absence of setae *f*₂ (seven and six pairs of dorsolateral setae), respectively. Further, they divided the *caudatus* group into three species subgroups based on the number of intercoxal setae (3*a* and 4*a*). Meyer [10] followed the concept of Baker and Tuttle [9] and divided the *proteae* into three species subgroups and added two more species subgroups to the *caudatus* group.

Collyer [11] made the world key of 102 *Tenuipalpus* species. Additionally, some local keys were developed over time by Meyer [10], which included around 90 species from Africa; Baker and Tuttle [9] included 20 species from Mexico; Al-Gboory [12] included seven species from Iraq; Khanjani et al. [13] included nine species from Iran; Castro and Feres [14] included 12 species from Brazil; and Xu et al. [15] included 25 species from China.

For more than three decades, *Tenuipalpus* species groups, as proposed by Baker and Tuttle [9] and Meyer [10], were consistent. However, recently, Castro et al. [1] divided the genus into two groups by using a combination of characters: *Tenuipalpus sensu stricto* (36 species), with a pair of lateral projections associated with setae *c*₃ and only one pair of setae 4*a*, and *Tenuipalpus sensu lato* (287 species), without a lateral projection associated with setae *c*₃ and one to four pairs of setae 4*a*. Also, a world key to the species of *Tenuipalpus sensu stricto* was provided [1,16]. However, no diagnostic key to the world species of *Tenuipalpus sensu lato* has been developed yet.

The aims of the present study were to (i) classify all species of *Tenuipalpus sensu lato* into new species groups based on distinct morphological characters; (ii) develop diagnostic keys to species groups and 273 species of the *Tenuipalpus sensu lato*; and (iii) examine specimens of *Tenuipalpus* species collected from different regions of Saudi Arabia.

2. Materials and Methods

The published taxonomic literature of all known 287 species belonging to the *Tenuipalpus sensu lato* group was collected using different resources: the Acarology Laboratory King Saud University, Google Scholar, ResearchGate, and different acarological journals, and through personal communication (Dr. Qing Hai Fan, Fujian Agriculture and Forestry University, China; and Dr. Elizeu B. Castro, São Paulo State University, São José do Rio Preto campus, São Paulo, Brazil). Diagnostic keys to species groups and 273 species are provided. All specimens of the genus that were collected by the Acarology lab have been examined. The mounted specimens of *Tenuipalpus* species were examined and identified under a phase contrast microscope (DM2500, Leica, Wetzlar, Germany). Different mite body parts were pictured using an Auto-Montage software system v4.0.1.1 (Syncroscopy, Cambridge, UK) and drawn with Adobe Illustrator v27.7 (Adobe System Inc., San Jose, CA, USA). All measurements are in micrometers. The terminology used in the research follows that of Mesa et al. [2]. The specimens were deposited at the King Saud University Museum of Arthropods (KSMA, Acarology Section), Department of Plant Protection, College of Food and Agriculture Sciences, King Saud University, Riyadh, Saudi Arabia.

3. Results

The *Tenuipalpus sensu lato* group was divided into four species groups based on the total number of dorsal opisthosomal setae, namely, the *carolinensis* group—with ten pairs of setae (214 species), the *dubinini* group—with nine pairs of setae (33 species), the *granati* group—with eight pairs of setae (29 species), and the *barticanus* group—with seven pairs of setae (seven species). This proposed division did not consider whether a specific setae was absent or not (i.e., any setae among the opisthosomal setae can be absent). The diagnostic keys to those four new species groups and 273 species of *Tenuipalpus sensu lato* were also developed.

Among the *carolinensis* group, eight species were not included in the key: *T. chiococcae* De Leon, *T. costarricensis* Salas and Ochoa, *T. ephedrae* Livschitz and Mitrofanov, *T. molinai* Evans, *T. santae* Manson, *T. simplychus* Cromroy, *T. tetrazygiae* De Leon, and *T. oxalis* (Flechtmann) (Table 1). Three species; *T. guptai* Sadana and Gupta, *T. solanensis* Sadana and Gupta, and *T. lustrabilis* Chaudhri, were synonymized with *T. punicae* Pritchard and Baker.

Two species, *T. simplex* Vitzthum and *T. jasmini* Khan were poorly described; they were tentatively placed in the new groups of *carolinensis* and *granati*, respectively. The species *T. rodionovi* Chalilova was suggested as a junior synonymy of *T. granati* Sayed.

Table 1. List of species not included in the diagnostic key of the new species group *carolinensis*.

Species (Geographic Distribution)	Host Plant	Related Species (Geographical Distribution)	Host Plant
<i>T. chiococcae</i> [17] (USA)	<i>Chiococca pinetorum</i>	<i>T. pigrus</i> Pritchard and Baker (USA)	<i>Umbellularia californica</i>
<i>T. costarricensis</i> [18] (Costa Rica)	<i>Cedrela</i> sp.	<i>T. granati</i> Sayed (Worldwide)	Polyphagous
<i>T. ephedrae</i> [19] (Ukraine)	<i>Ephedra distachya</i>	-	-
<i>T. molinai</i> [20] (Honduras)	Asteraceae: Unidentified plant	-	-
<i>T. oxalis</i> [21] (Brazil)	<i>Oxalis</i> sp.	-	-
<i>T. santae</i> [22] (Costa Rica)	Unidentified (fence tree)	<i>T. celtidis</i> Pritchard and Baker (USA)	<i>Celtis</i> sp.
<i>T. simplychus</i> [23] (Puerto Rico)	<i>Cordia sulcata</i>	<i>T. knorri</i> Baker and Pritchard (Argentina)	-
<i>T. tetrazygiae</i> [17,24] (India and USA)	<i>Anacardium occidentale</i> and <i>Etrazygia bicolor</i>	-	-

Among the examined Tenuipalpus specimens collected from different regions of Saudi Arabia, a new species, *Tenuipalpus jazanensis* sp. nov., belonging to the Tenuipalpus sensu lato group, resulted. The new species is hereby fully described and illustrated based on females collected from the European fan palm, *Chamaerops* spp. (Arecaceae) from the Jazan region (Figures 1–4).

3.1. Family Tenuipalpidae Berlese, 1913 [25]

Genus *Tenuipalpus* Donnadieu, 1875 [5].

Type species: *Tenuipalpus palmatus* Donnadieu, 1875 [5] (= *Tenuipalpus caudatus* Dugès, 1834) [26].

Diagnosis: (modified after Castro et al. [16]): Prodorsum have three pairs of setae (*v2*, *sc1*, *sc2*) except the species *T. elegans* (Collyer) with two pairs of prodorsum setae (*sc1*, *sc2*), setae *v2* absent, opisthosoma with 7–10 pairs of setae; (*c3*, *d3*, *e3*, *f3*, *h1*, *h2* present; *c2*, *d2*, *e2* absent; *c1*, *d1*, *e1*, *f2* present or absent (*d1*, *e1* rarely absent), setae *h2* elongate, flagellate; palp one- to three-segmented; venter with one to two pairs of setae *3a* (*3a1* always present; *3a2* present or absent) and one to five pairs of setae *4a* (*4a1* always present; *4a2*, *4a3*, *4a4*, *4a5* present or absent); two pairs of pseudanal setae *ps1-2* (three pairs, *ps1-3*, rarely present).

3.2. Divisions of the Tenuipalpus Sensu Lato Group

Tenuipalpus sensu lato Castro et al. [1]

Diagnosis: (modified after Castro et al. [1]). Opisthosoma without one pair of lateral body projections associated with setae *c3*, venter with one to five pairs of intercoxal setae *4a*.

3.2.1. *T. carolinensis* Species Group

Diagnosis: (based on female). Opisthosoma with ten pairs of dorsal setae. This group consists of 214 species.

3.2.2. *T. dubinini* Species Group

Diagnosis: (based on female). Opisthosoma with nine pairs of dorsal setae. This group consists of 33 species.

3.2.3. *T. granati* Species Group

Diagnosis: (based on female). Opisthosoma with eight pairs of dorsal setae. This group consists of 29 species.

3.2.4. *T. barticanus* Species Group

Diagnosis: (based on female). Opisthosoma with seven pairs of dorsal setae. This group consists of seven species.

3.3. New Species

Tenuipalpus (sensu lato Castro et al. [1])

T. carolinensis group

Tenuipalpus jazanensis sp. nov.

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Diagnosis: (based on Female). Propodosoma without lateral lobes anterior marginally; propodosoma with transverse striate medially and laterally, reticulated sublaterally. Hysterosoma medially with few reticulations in the area between setae *c1-c1* and sublaterally; one pair of seta *3a* and five pairs of setae *4a* (*4a1*–5) present; rostrum reaching to the middle of femur I; palp three-segmented; legs setal counts on coxae, 2–2–1–1 trochanters, 1–1–2–1; femora 4–4–2–0; genua 3–2–1–1; tibiae 5–5–3–3 and tarsus 8 (1)–8 (1)–5–5.

Description Female (n = 5)

Dorsum (Figure 1): Anterior margin of prodorsum deeply incised, depth of notch 25 (24–27), propodosoma without lateral lobes anterior marginally; propodosoma with transverse striate medially and laterally, reticulated sublaterally. Hysterosoma medially with few reticulations in the area between setae *c1* and sublaterally; dorsal body setae lanceolate serrate, almost equal in length, except setae *h2*; opisthosomal pores present; distance between setae *v2-h1* 339 (335–355), *sc2-sc2* 180 (160–240). Prodorsum slightly wider than proximal section of opisthosoma; anterior central of prodorsum with transverse striations; lateral regions with reticulations. All dorsal setae short (except *h2*), not more than 23 µm long; setae *v2*, *sc1*, and *sc2* serrate, *sc2* longer than *v2* and subequal in length with *sc1*; opisthonotum with reticulations; opisthosomal setae serrate; setae *e3* shorter than *f2* and *f3*, *h2* flagelliform and elongate serrate. Setal lengths: *v2* 16 (13–16), *sc1* 23 (20–23), *sc2* 23 (19–23), *c1* 13 (13–16), *c3* 13 (12–15), *d1* 12 (12–13), *d3* 14 (12–16), *e1* 13 (10–15), *e3* 12 (12–15), *f2* 14 (14–16), *f3* 14 (14–16), *h1* 14 (14–20), *h2* 233 (230–239). Distance between dorsal setae: *v2-v2* 43 (41–43), *sc1-sc1* 107 (95–107), *c1-c1* 57 (52–59), *c3-c3* 195 (192–197), *d1-d1* 32 (30–39), *d3-d3* 156 (160–169), *e1-e1* 25 (12–25), *e3-e3* 82 (82–90), *f2-f2* 71 (66–72), *f3-f3* 56 (52–57), *h2-h2* 41 (36–43), *h1-h1* 20 (20–23), *c1-d1* 45 (40–45), *d1-e1* 60 (60–62), *c1-c3* 66 (66–69), *d1-d3* 64 (59–65), *e1-e3* 41 (40–44), *c3-d3* 38 (30–38), *d3-e3* 121 (120–127), *e3-f3* 30 (28–36), *f3-f2* 10 (12–15), *h1-h2* 7 (7–10).

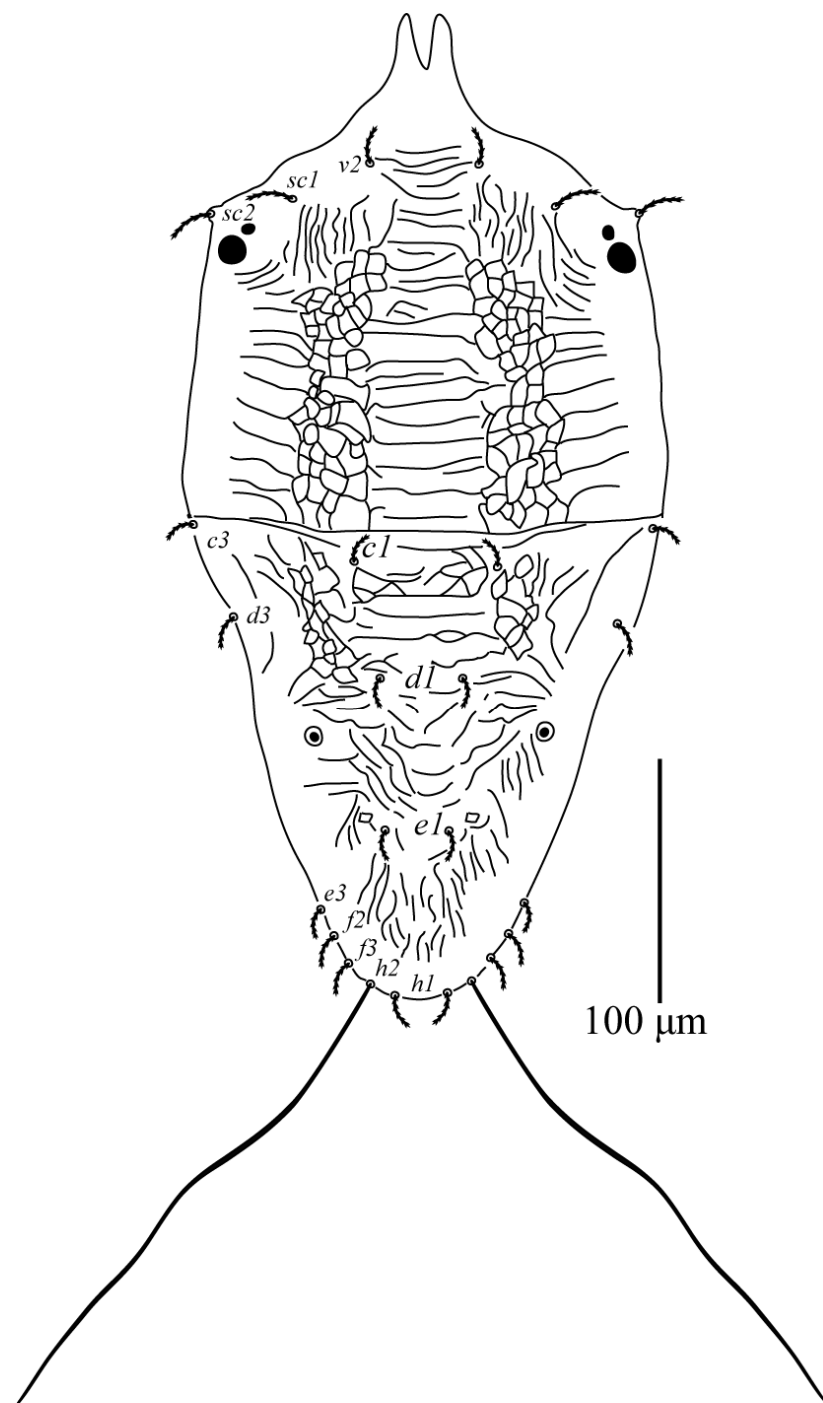


Figure 1. *Tenuipalpus jazanensis* sp. nov. Female. Dorsum. Scale bar: 100 μm.

Venter (Figure 2): Ventral cuticle with broken longitudinal striations. Area posterior setae 4a with broken transverse striate. All ventral setae smooth, setae 1a, 4a flagelliform, and elongate. Setal lengths: 1a 82 (82–92), 1b 30 (22–31), 1c 30 (26–30), 2b 33 (23–33), 2c 33 (23–33), 3a 25 (25–31), 3b 30 (21–31), 4a1 90 (90–100), 4a2 83 (82–91), 4a3 83 (80–86), 4a4 76 (76–84), 4a5 73 (73–102), 4b 33 (30–33), ag 36 (26–36), g1 33 (26–34), g2 33 (25–33), ps1 23 (18–25), ps2 23 (18–23). Distance between ventral setae: 1a–1a 23 (19–24), 3a–3a 30 (30–32), 4a1–4a1 7 (5–7), 4a2–4a2 21 (19–22), 4a3–4a3 35 (31–36), 4a4–4a4 49 (42–49), 4a5–4a5 60 (57–62), 1a–3a 108 (102–110), 3a–4a1 57 (57–60), 1b–1c 14 (13–19), 2b–2c 20 (19–25).

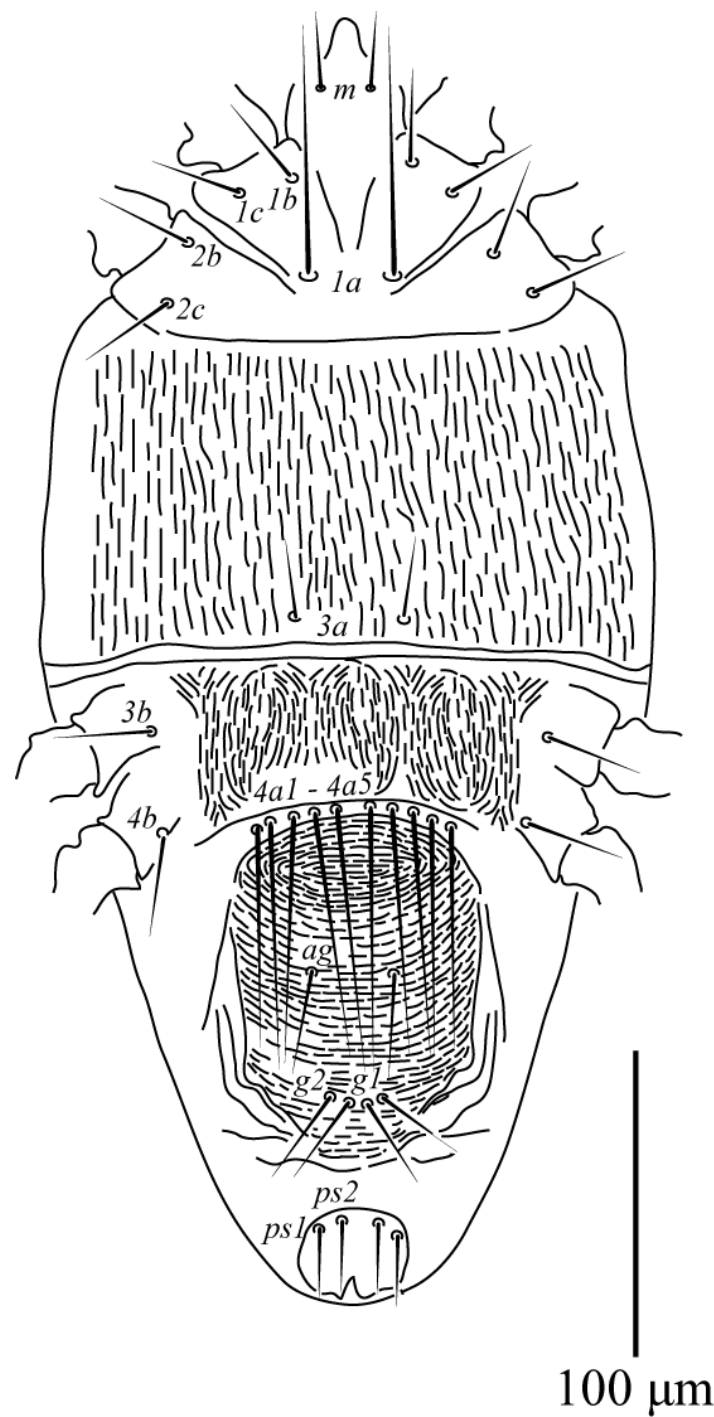


Figure 2. *Tenuipalpus jazanensis* sp. nov. Female. Venter. Scale bar: 100 μ m.

Gnathosoma (Figure 3): Ventral setae *m* 25 (14–25); distance between setae *m*–*m* 15 (10–15) Palps 3-segmented (Figure 3), median segment elongates, bearing one barbed seta *d* 15 (12–20); distal segment short, with eupathidium *ul'* 4 (4–7) *ul''* 15 (12–15).

Legs (Figure 4): Setae on legs as follows: coxa 2–2–1–1; trochanters 1–1–2–1; femora 4–4–2–0; genu 3–2–1–1; tibiae 5–5–3–3; tarsus 8 (1 ω)–8 (1 ω)–5–5; femur IV without seta. Leg I–IV setal count as follows (solenidia in parenthesis).

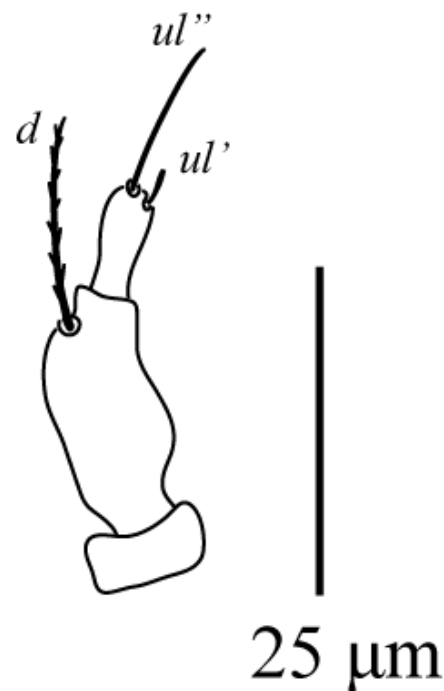


Figure 3. *Tenuipalpus jazanensis* sp. nov. Female. Palp. Scale bar: 25 μ m.

Males and immature. Unknown

Type Materials. Holotype female, four paratype females, from *Chamaerops* sp. (Arecaceae) Wadi Baydh, Jazan, 17°37.559' N, 42°22.196' E, 10 October 2020, coll. J. H. Mirza, H.M.S. Mushtaq and E.M. Khan.

Etymology: The specific epithet (*jazanensis*) is derived from the type region, Jazan.

Remarks: The new species, *Tenuipalpus jazanensis* sp. nov., belongs to the *carolinensis* species group. This species group is distinguished from other species groups of *Tenuipalpus* sensu lato by having ten pairs of opisthosomal setae. *Tenuipalpus jazanensis* sp. nov. resembles *T. pareriophyoides* Meyer and Gerson and *T. eriophyoides* Baker by having more than three pairs of intercoxal setae 4a, one pair of setae 3a, dorsal setae lanceolate serrate and dorsum with irregular striate laterally. The new species differs from *T. pareriophyoides* and *T. eriophyoides* by the following characters; prodorsum medially with transverse striations; area in between setae c1, d1 and d3 with few reticulations (prodorsum medial area mostly smooth or punctate; area in between setae c1, d1 and d3 with rugose pattern or striate); genu I with three setae (genu I with two setae); setae g and ag smooth (setae g and ag serrate in *T. pareriophyoides*; setae g and ag serrate in *T. eriophyoides*).

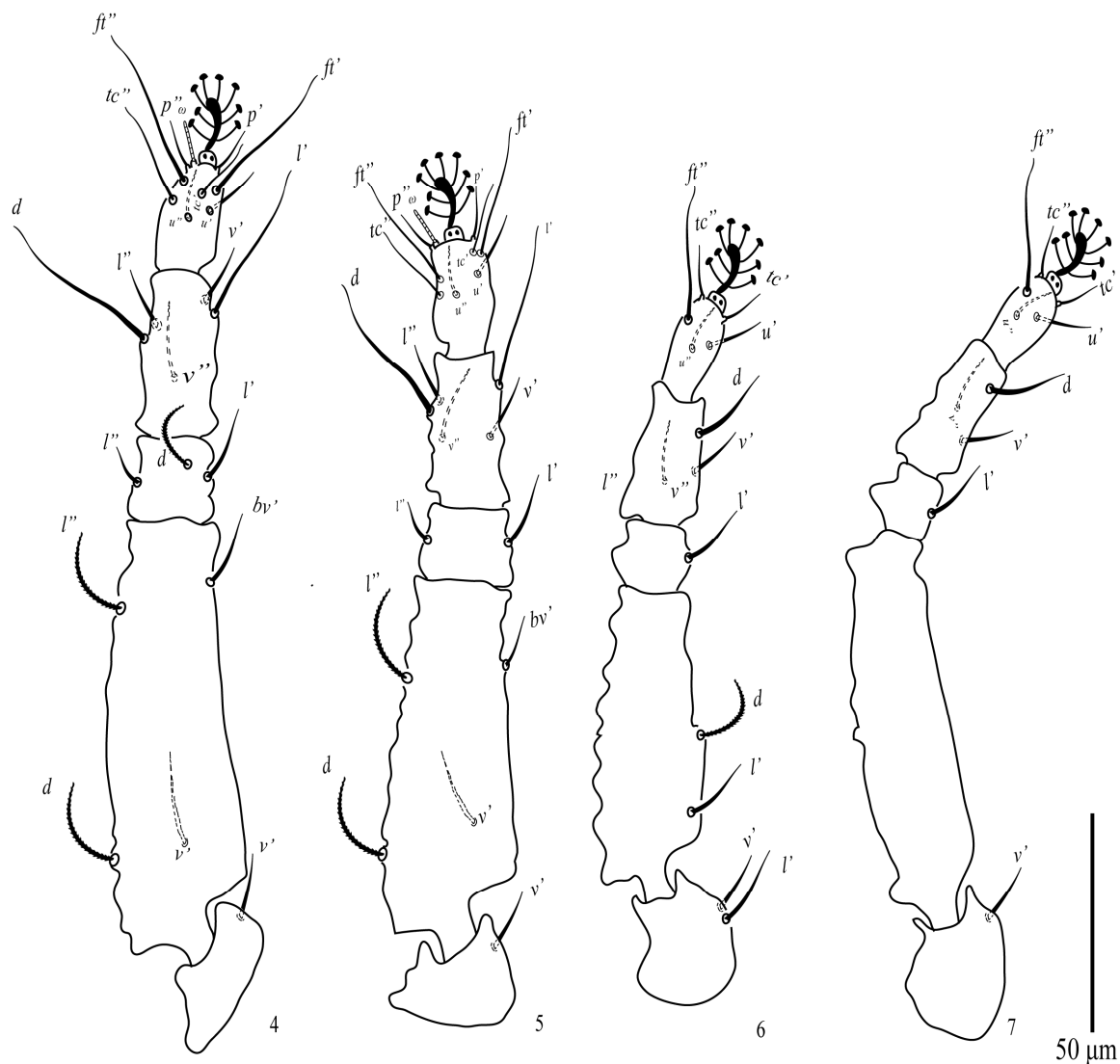


Figure 4. *Tenuipalpus jazanensis* sp. nov. Female. 4, Leg I; 5, leg II; 6, leg III; 7, leg IV. Scale bar: 50 µm.

3.4. Key to the Groups and Species Groups of *Tenuipalpus* (Based on Females)

1. Dorsum with one pair of lateral projections associated with setae *c3* and another pair of lateral projections anterior to setae *sc2*; lateral setae *sc2*, *c3*, *e3*, *f2*, *f3*, and *h1* variable in shape from lanceolate, obovate to ovate; femora I and II with setae *d* inserted in lateral position on tubercles *Tenuipalpus* sensu stricto (sensu Castro et al. [1])
- 1' Dorsum always without a pair of lateral projections associated with setae *c3* and usually without the lateral projection anterior to setae *sc2*; lateral setae not as mentioned above and usually setiform or minute; femora I and II with setae *d* usually inserted in dorsal position *Tenuipalpus* sensu lato (sensu Castro et al. [1]) 2
2. Dorsum with ten pairs of opisthosomal setae *carolinensis* species group
- 2' Dorsum with less than ten pairs of opisthosomal setae 3
3. Dorsum with nine pairs of opisthosomal setae *dubinini* species group
- 3' Dorsum with less than nine pairs of opisthosomal setae 4
4. Dorsum with eight pairs of opisthosomal setae *granati* species group
- 4' Dorsum with seven pairs of opisthosomal setae *barticanus* species group

3.5. Key to the World Species of the *T. carolinensis* Species Group (Based on Females)

- 1 Venter with one pair of *4a* 2

1'	Venter with more than one pair of 4a	3
2	Venter with one pair of 3a	6
2'	Venter with two pairs of 3a	141
3	Venter with two pairs of 4a	4
3'	Venter with four or five pairs of 4a	5
4	Venter with one pair of 3a	169
4'	Venter with two pairs of 3a	197
5	Venter with four pairs of 4a and one pair of 3a	201
5'	Venter with five pairs of 4a and one pair of 3a	<i>T. jazanensis</i> sp. nov.
6	Opisthosoma with lateral bulges	7
6'	Opisthosoma without lateral bulges	17
7	Venter with three pairs of anal setae <i>ps1</i> , <i>ps2</i> , and <i>ps3</i>	<i>T. venustus</i> Collyer
7'	Venter with two pairs of anal setae <i>ps1</i> and <i>ps2</i>	8
8	Propodosoma with transverse striae medially	9
8'	Propodosoma without transverse striae medially	10
9	Palp with one seta on terminal segment; propodosoma striated sublaterally.....	<i>T. orilloi</i> Rimando
9'	Palp with two seta on terminal segment; lateral sublateral area of propodosoma smooth	<i>T. frondosus</i> Cromroy
10	Palp two segmented	<i>T. dominguensis</i> De Leon
10'	Palp three segmented	11
11	Genua I and II each with one seta	<i>T. tabebuiae</i> De Leon
11'	Genua I and II each with more than one seta	12
12	Median area of propodosoma with longitudinal striae; femur II with three setae	<i>T. crescentiae</i> De Leon
12'	Median area of propodosoma not as mentioned above	13
13	Venter of propodosoma with transverse striae medially	14
13'	Venter of propodosoma without transverse striae medially	15
14	Setae <i>g1-2</i> crossing the bases of setae <i>ps1-2</i>	<i>T. placitus</i> Chaudhri
14'	Setae <i>g1-2</i> not crossing the bases of setae <i>ps1-2</i>	<i>T. couroapiupita</i> De Leon
15	Palp with one seta on terminal segment; rostral with two lateral lobes well developed	<i>T. apichai</i> Castro and Feres
15'	Palp with two setae on terminal segment	16
16	Trochanter I with one seta; femora I and II each with four setae	<i>T. haripuriensis</i> Akbar and Chaudhri
16'	Trochanter I without setae; femora I and II each with two setae	<i>T. zizyphae</i> Mohanasundaram
17	Second pair of propodosomal setae <i>sc1</i> longer than first and third pairs <i>v2</i> and <i>sc2</i>	18
17'	Second pair of propodosomal setae <i>sc1</i> equal or shorter than first and third pairs <i>v2</i> and <i>sc2</i>	32
18	Dorsocentral setae <i>d1</i> elongate crossing the bases of setae <i>e1</i>	19
18'	Dorsocentral setae <i>d1</i> not crossing the bases of setae <i>e1</i>	22
19	Dorsocentral setae <i>c1</i> elongate crossing the bases of setae <i>d1</i>	20
19'	Dorsocentral setae <i>c1</i> not crossing the bases of setae <i>d1</i>	21
20	Dorsolateral setae <i>d3</i> longer than the distance between setae <i>c3-d3</i> , setae <i>e3</i> reaching or crossing the bases of setae <i>f3</i>	<i>T. bagdadensis</i> Al-Gboory
20'	Dorsolateral setae <i>d3</i> shorter than the distance between setae <i>c3-d3</i> , setae <i>e3</i> not reaching the bases of setae <i>f3</i>	<i>T. gatoomensis</i> Meyer
21	Dorsocentral setae <i>e1</i> crossing the bases of setae <i>h2</i>	<i>T. galpiniae</i> Meyer
21'	Dorsocentral setae <i>e1</i> not reaching to the bases of setae <i>h2</i>	<i>T. ovalis</i> Meyer and Ryke
22	Dorsocentral setae <i>c1</i> , <i>d1</i> and <i>e1</i> spatulate	<i>T. magalismontani</i> Meyer
22'	Dorsocentral setae <i>c1</i> , <i>d1</i> and <i>e1</i> setiform or lanceolate	23

23	Palpus two segmented	<i>T. acritus</i> Meyer
23'	Palpus three segmented	24
24	Dorsum covered with longitudinal striae	25
24'	Dorsum not covered with longitudinal striae	26
25	Dorsolateral setae <i>e3</i> , <i>f2</i> , <i>f3</i> , and <i>h1</i> subspatulate	<i>T. africanus</i> Meyer
25'	Dorsolateral setae <i>e3</i> , <i>f2</i> , <i>f3</i> , and <i>h1</i> lanceolate	<i>T. striolatus</i> Meyer
26	Genua I and II each with two setae	27
26'	Genua I and II each with three setae	28
27	Setae <i>4a</i> crossing the bases of setae <i>g1-2</i> ; rostral shield with well-developed lateral lobes; tarsi I and II each with eight tactile setae	<i>T. protectus</i> Meyer
27'	Setae <i>4a</i> not crossing the bases of setae <i>g1-2</i> ; rostral shield with small lateral lobes; tarsi I and II each with seven tactile setae	<i>T. pieteri</i> Meyer
28	Femur II with three setae; tarsi I and II each with six setae	<i>T. trifoliatae</i> Mohanasundaram
28'	Femur II with four setae	29
29	Genua III and IV each with one seta	<i>T. combreti</i> Meyer
29'	Genua III and IV each without setae	30
30	Dorsolateral setae <i>e3</i> , <i>f2</i> , and <i>f3</i> short not reaching the bases of next setae; femur IV with one setae	<i>T. ariauae</i> Feres and Hernandez
30'	Dorsolateral setae <i>e3</i> , <i>f2</i> , and <i>f3</i> reaching or crossing the bases of next setae	31
31	Dorsum pitted medially, with few transverse striae posterior setae <i>e1</i> ; setae <i>ag</i> not reaching the bases of setae <i>g1-2</i>	<i>T. ueckermanni</i> Meyer
31'	Dorsum with transverse to irregular striae medially; setae <i>ag</i> reaching the bases of setae <i>g1-2</i>	<i>T. prunioides</i> Meyer
32	First pair of propodosomal setae <i>v2</i> reaching or crossing to the bases of second pair <i>sc1</i>	33
32'	First pair of propodosomal setae <i>v2</i> not reaching the bases of second pair <i>sc1</i>	39
33	Palp one or two segmented	34
33'	Palp three segmented	35
34	Palp one segmented	<i>T. senecionis</i> Collyer
34'	Palp two segmented	<i>T. rangiorae</i> Collyer
35	Dorsocentral setae <i>c1</i> crossing the bases of setae <i>d1</i> ; femora I and II each with three setae	<i>T. laminasetae</i> Mohanasundaram
35'	Dorsocentral setae <i>c1</i> not reaching the bases of setae <i>d1</i>	36
36	Genua I and II each with two setae	<i>T. portulacae</i> Parsi, Khosrowshahi and Farid
36'	Genua I and II each with three setae	37
37	Tibiae I and II each with five setae	<i>T. morianus</i> Meyer
37'	Tibiae I and II each with four setae	38
38	Setae in trochanters I–IV 2-2-1-1; femora I and II each with four setae	<i>T. acacii</i> Maninder and Ghai
38'	Setae in trochanters I–IV 1-1-2-2; femora I and II each with five setae	<i>T. fici</i> Maninder and Ghai
39	Dorsolateral setae <i>e3</i> reaching or crossing to the bases of setae <i>f2</i>	40
39'	Dorsolateral setae <i>e3</i> not reaching to the bases of setae <i>f2</i>	77
40	Dorsocentral setae <i>c1</i> reaching or crossing bases of setae <i>d1</i>	41
40'	Dorsocentral setae <i>c1</i> not reaching bases of setae <i>d1</i>	45
41	Femora I and II each with six setae	<i>T. faresianus</i> Maninder and Ghai
41'	Femora I and II each with less than six setae	42
42	Femora I and II each with five setae	<i>T. ixorae</i> Maninder and Ghai
42'	Femora I and II each with less than five setae	43
43	Dorsal setae oblanceolate smooth, setae <i>e1</i> short; femora II and IV with four and one setae respectively	<i>T. szarvasensis</i> Bozai
43'	Dorsal setae laminate or lanceolate	44

44	Dorsal setae laminate serrate; femur II with three setae	<i>T. erythrinae</i> Mohanasundaram
44'	Dorsal setae lanceolate; femur II with four setae	<i>T. baeri</i> Reck
45	Dorsum almost smooth or with few striations	46
45'	Dorsum not as mentioned above	53
46	Setae <i>sc2</i> associated with projection or sit on tubercles	47
46'	Setae <i>sc2</i> not associated with projection or sit on tubercles; dorsolateral setae <i>c3</i> and <i>d3</i> setiform	<i>T. trichiliae</i> De Leon
47	Palp one segmented	48
47'	Palp more than one segmented	49
48	Dorsolateral setae <i>e3</i> , <i>f2</i> , <i>f3</i> , and <i>h1</i> spatulate or ovate; venter pitted laterally	<i>T. terminaliae</i> De Leon
48'	Dorsolateral setae <i>e3</i> , <i>f2</i> , <i>f3</i> , and <i>h1</i> lanceolate; venter completely smooth	<i>T. bucidae</i> De Leon
49	Dorsolateral setae <i>c3</i> broadly spatulate or leaf-like	50
49'	Dorsolateral setae <i>c3</i> not as mentioned above	51
50	Propodosoma with longitudinal striae medially; dorsolateral setae <i>c3</i> broadly spatulate	<i>T. austrocedri</i> Gonzalez
50'	Propodosoma smooth; dorsolateral setae <i>c3</i> leaf-like	<i>T. kapoki</i> De Leon
51	Dorsolateral setae <i>d3</i> spatulate, serrate	<i>T. lawrencei</i> Baker and Pritchard
51'	Dorsolateral setae <i>d3</i> setiform minute	52
52	Setae <i>sc2</i> crossing bases of setae <i>sc1</i> ; area posterior setae <i>4a</i> with broken striae	<i>T. tapirirae</i> De Leon
52'	Setae <i>sc2</i> not reaching bases of setae <i>sc1</i> ; area posterior setae <i>4a</i> smooth, few striae posterior setae <i>g1-2</i>	<i>T. zanthus</i> De Leon
53	Palp with two eupathidium setae on terminal segment	54
53'	Palp with one eupathidium setae on terminal segment	58
54	Genua I and II each with one seta; tarsi III and IV each with six setae	<i>T. malligai</i> Mohanasundaram
54'	Genua I and II each with more than one seta	55
55	Genua I and II each with two setae	56
55'	Genua I and II each with three setae	57
56	Tibiae I and II each with four setae	<i>T. metis</i> Hasan, Akbar, and Bashir
56'	Tibiae I and II each with five setae	<i>T. velitor</i> Hasan, Akbar, and Bashir
57	Setae <i>4a</i> crossing bases of setae <i>ps1-2</i> ; setae <i>ag</i> not crossing bases of setae <i>g1-2</i>	<i>T. insularis</i> Meyer
57'	Setae <i>4a</i> not crossing bases of setae <i>ps1-2</i> ; setae <i>ag</i> crossing bases of setae <i>g1-2</i> and reaching to the bases of <i>ps2</i>	<i>T. zuluensis</i> Meyer
58	Opisthosoma reticulated medially	59
58'	Opisthosoma without reticulation	61
59	Genua I and II each with one setae	<i>T. gharii</i> Mohanasundaram
59'	Genua I and II each with two setae	60
60	Opisthosoma with two pairs of pores; genua III and IV each with one seta	<i>T. boninensis</i> Ehara
60'	Opisthosoma with one pair of pores; Genua III and IV each without setae	<i>T. decus</i> Chaudhri
61	Palp one segmented	62
61'	Palp more than one segmented	63
62	Dorsum with irregular ridges, caudolateral setae <i>e3</i> , <i>f2</i> , <i>f3</i> , and <i>h1</i> narrowly lanceolate	<i>T. metopii</i> De Leon
62'	Dorsum pitted, caudolateral setae <i>e3</i> , <i>f2</i> , <i>f3</i> , and <i>h1</i> subspatulate ...	<i>T. unimerus</i> De Leon
63	Genu I with one seta	64
63'	Genu I with more than one seta	67
64	Genu II with one seta	65

64'	Genu II without setae; dorsum striated with smooth patches	<i>T. celtidis</i> Pritchard and Baker
65	Palp three segmented	66
65'	Palp two segmented	<i>T. pagesae</i> Rimando
66	Dorsum covered with wavy lines; tibiae I and II each with three setae	<i>T. vriddagiriensis</i> Mohanasundaram
66'	Dorsum ornamented; tibiae I and II each with five setae	<i>T. heveae</i> Baker
67	Genu II with two setae	68
67'	Genu II with three setae	72
68	Genu III with one seta	6
68'	Genu III without seta	71
69	Genu IV with one seta; dorsum smooth laterally	<i>T. antipodus</i> Collyer
69'	Genu IV without setae; dorsum with broken striae laterally	<i>T. knorri</i> Baker and Pritchard
70	Dorsum with short wavy lines, dorsocentral setae not minute	<i>T. leguminae</i> Mohanasundaram
70'	Dorsum with transverse striations, dorsocentral setae minute	<i>T. knorri</i> Baker and Pritchard
71	Tibia I with four setae; setae <i>ag</i> not reaching bases of setae <i>g1</i>	<i>T. bacuri</i> Flechtmann and Noronha
71'	Tibia I with five setae; setae <i>ag</i> reaching bases of setae <i>g1</i>	<i>T. platycaryae</i> Wang
72	Opisthosoma with irregular transverse elevation between setae <i>c3–c3</i>	<i>T. attiahi</i> Baker and Pritchard
72'	Opisthosoma without irregular transverse elevation between setae <i>c3–c3</i>	73
73	Dorsum with transverse ridges; setae <i>v2</i> and <i>sc1</i> leaf-like, spatulate, serrate	<i>T. tepicanus</i> De Leon
73'	Dorsum without transverse ridges	74
74	Setae <i>sc2</i> about three times or more longer than the length of setae <i>v2</i> and <i>sc1</i>	75
74'	Setae <i>sc2</i> twice or smaller than the length of setae <i>v2</i> and <i>sc1</i>	<i>T. jamaicensis</i> De Leon
75	Dorsal setae <i>c1</i> , <i>d1</i> , <i>e1</i> , <i>c3</i> , and <i>d3</i> very small, setiform, minute serrate	76
75'	Dorsal setae <i>c1</i> , <i>d1</i> , <i>e1</i> , <i>c3</i> , and <i>d3</i> lanceolate serrate	<i>T. namaensis</i> Meyer
76	Coxae III and IV each with one setae; tibia IV with three setae	<i>T. oliveirai</i> Flechtmann
76'	Coxae III and IV each with two setae; tibia IV with two setae	<i>T. odoratus</i> Souza, Castro, and Oliveira
77	Palp one segmented	<i>T. rhizophorae</i> De Leon
77'	Palp more than one segmented	78
78	First of dorsocentral setae <i>c1</i> reaching have or more than have distance between setae <i>c1–d1</i>	79
78'	First of dorsocentral setae <i>c1</i> less than have distance between setae <i>c1–d1</i>	81
79	Trochanters I–IV, 2-2-2-2; femur I with five setae	<i>T. indicus</i> Maninder and Ghai
79'	Trochanters I–IV, 1-1-2-1; femur I with four setae	80
80	Tarsi I and II each with four setae; setae <i>4a</i> short not reaching to the bases of setae <i>ag</i>	<i>T. garciniae</i> Meyer and Bolland
80'	Tarsi I and II each with four setae; setae <i>4a</i> crossing the bases of setae <i>ps1–2</i>	<i>T. eucleae</i> Meyer
81	Dorsum almost smooth except few striations.	82
81'	Dorsum not as mentioned above	86
82	Genua I and II each with one seta	<i>T. vieirae</i> Castro, Ramos, and Feres
82'	Genua I and II each with more than one seta	83
83	Setae <i>4a</i> extend behind to the bases of setae <i>ag</i>	84
83'	Setae <i>4a</i> not extend behind to the bases of setae <i>ag</i>	85
84	Dorsolateral setae <i>c3</i> lanceolate to spatulate; area between setae <i>3a</i> and <i>4a</i> smooth	<i>T. simarubae</i> De Leon

84'	Dorsolateral setae <i>c3</i> setiform; area between setae <i>3a</i> and <i>4a</i> striated	<i>T. mourerae</i> De Leon
85	Venter striated; dorsolateral setae <i>f2</i> , <i>f3</i> , and <i>h1</i> narrowly lanceolate	<i>T. hurae</i> De Leon
85'	Venter almost smooth; dorsolateral setae <i>f2</i> , <i>f3</i> , and <i>h1</i> broadly lanceolate	<i>T. guamensis</i> Baker
86	Genua I and II each with one seta	87
86'	Genua I and II each with more than one seta	96
87	Genua III and IV each with one seta	<i>T. amygdalusae</i> Maninder and Ghai
87'	Genua III and IV each without setae	88
88	Propodosoma with reticulation pattern	89
88'	Propodosoma without reticulation pattern	91
89	Trochanters I and II each without setae; tibiae I and II each with four setae	<i>T. zhengzhouensis</i> Xu and Yin
89'	Trochanters I and II each with one seta; tibiae I and II each with five setae	90
90	Area between <i>c1</i> and <i>d1</i> and area posterior setae <i>e1</i> with reticulation pattern	<i>T. taonicus</i> Ma and Yuan
90'	Area between <i>c1</i> and <i>d1</i> and area posterior setae <i>e1</i> without reticulation pattern	<i>T. muguanicus</i> Ma and Yuan
91	Opisthosoma with reticulation pattern	92
91'	Opisthosoma without reticulation pattern	93
92	Propodosoma bordered by longitudinal striae; area between setae <i>c1</i> and <i>d1</i> with complete or incomplete reticulation	<i>T. japonicas</i> Nishio
92'	Propodosoma not bordered by longitudinal striae; area between setae <i>c1</i> and <i>d1</i> with transverse irregular	<i>T. zhizhilashvilae</i> Reck
93	Propodosoma strongly ridged medially; area between setae <i>c1</i> , <i>d1</i> and <i>d1</i> almost smooth	<i>T. guettardae</i> De Leon
93'	Propodosoma without ridge	94
94	Tibiae III and IV each with two setae	<i>T. anoplus</i> Baker and Pritchard
94'	Tibiae III and IV each with three setae	95
95	Tarsi I and II each with one solenidion setae	<i>T. cedrelae</i> De Leon
95'	Tarsi I and II each without solenidion setae	<i>T. anoplomexus</i> Baker and Tuttle
96	Genua III with one seta	97
96'	Genua III without setae	109
97	Genu IV with one seta	98
97'	Genu IV without setae	101
98	Femur IV with one seta	99
98'	Femur IV without setae	<i>T. toowongi</i> Smiley and Gerson
99	Femur I with three setae	<i>T. danxianensis</i> Yin, Cui, and Lin
99'	Femur I with four setae	100
100	Hysterosoma having strong transversal wrinkle posterior to setae <i>d1</i> and a "U-shaped" pattern posterior to setae <i>e1</i>	<i>T. gneti</i> Xu, Fan, Huang, and Zhang
100'	Dorsum covered with irregular striae	<i>T. qingchengensis</i> Wang
101	Palp with one seta on terminal segment	102
101'	Palp with two setae on terminal segment	106
102	First and second pairs of propodosomal setae <i>v2</i> and <i>sc1</i> short, subequal in length; third pair <i>sc2</i> elongate	103
102'	First pair of propodosomal seta <i>v2</i> short, second and third pairs <i>sc1</i> and <i>sc2</i> subequal in length and longer than first pair <i>v2</i>	<i>T. uvae</i> De Leon
103	Dorsocentral setae <i>c1</i> , <i>d1</i> , and <i>e1</i> spatulate; propodosoma provided with a definite horseshoe ridge medially	<i>T. comptus</i> Meyer
103'	Dorsocentral setae <i>c1</i> , <i>d1</i> , and <i>e1</i> lanceolate; propodosoma with a definite horseshoe ridge	104
104	Trochanter IV with two setae	<i>T. disparilis</i> Wang and Cui

104'	Trochanter IV with one seta	105
105	Tarsi I and II each with eight tactile setae	<i>T. toropi</i> Castro, Ramos, and Feres
105'	Tarsi I and II with five and four tactile setae	<i>T. sharmai</i> Sadana and Gupta
106	Dorsocentral setae <i>c1</i> spatulate; area between setae <i>c1</i> , <i>d1</i> and <i>e1</i> with longitudinal striae	<i>T. falcatus</i> Meyer
106'	Dorsocentral setae <i>c1</i> lanceolate or setiform; area between setae <i>c1</i> , <i>d1</i> and <i>e1</i> without longitudinal striae	107
107	Genua I and II each with two setae	<i>T. ferosus</i> Akbar and Chaudhri
107'	Genua I and II each with three setae	108
108	Tarsi I and II each with six tactile setae	<i>T. lunatus</i> Meyer
108'	Tarsi I and II each with seven tactile setae	<i>T. elongatus</i> Meyer
109	Genua I and II each with two setae	110
109'	Genua I and II each with three setae	127
110	Trochanter III with one seta; tibia IV with two setae	111
110'	Trochanter III with two setae; tibia IV with two or three setae	112
111	Tarsi III and IV each with five setae	<i>T. flacourtiae</i> Meyer
111'	Tarsi III and IV each with four setae	<i>T. emeticae</i> Meyer
112	Tibia IV with two setae; all dorsal setae short	<i>T. moraesii</i> Feres and Hernandez
112'	Tibia IV with three setae	113
113	Femur II with three setae	<i>T. mopaneae</i> Meyer
113'	Femur II with four setae	114
114	Propodosoma with reticulation pattern sublaterally and striated medially	115
114'	Propodosoma not as mentioned above	116
115	Opisthosoma reticulated between setae <i>d1</i> and <i>e1</i>	<i>T. jianfengensis</i> Ma and Yuan
115'	Opisthosoma without reticulation	<i>T. sanyaensis</i> Yin, Cui, and Lin
116	Propodosoma framed by longitudinal striae or ridge	117
116'	Propodosoma as mentioned above	120
117	Dorsal setae <i>v2</i> , <i>sc1</i> , <i>sc2</i> , <i>c1</i> , <i>d1</i> , and <i>e1</i> subspatulate to spatulate	<i>T. dumus</i> Meyer
117'	Dorsal setae <i>v2</i> , <i>sc1</i> , <i>sc2</i> , <i>c1</i> , <i>d1</i> , and <i>e1</i> lanceolate or setiform	118
118	Setae <i>4a</i> crossing the basis of setae <i>g1-2</i>	119
118'	Setae <i>4a</i> not crossing the basis of setae <i>g1-2</i> ; venter of propodosoma with longitudinal, broken striae laterally	<i>T. smithi</i> Meyer
119	Setae <i>ag</i> crossing the bases of setae <i>g1-2</i> ; area between setae <i>3a</i> and <i>4a</i> with transverse striae	<i>T. zeyheri</i> Meyer
119'	Setae <i>ag</i> not crossing the bases of setae <i>g1-2</i> ; area between setae <i>3a</i> and <i>4a</i> with longitudinal striae	<i>T. dombeyae</i> Meyer
120	Palp with one seta on terminal segment	121
120'	Palp with two setae on terminal segment	125
121	Opisthosoma with transverse folds between dorsocentral setae <i>d1</i> and <i>e1</i>	<i>T. burserae</i> De Leon
121'	Opisthosoma without transverse folds between dorsocentral setae <i>d1</i> and <i>e1</i>	122
122	Genital plate with complete to incomplete reticulated; genital setae <i>g1-2</i> strongly serrate	<i>T. melhaniae</i> Meyer
122'	Genital plate without reticulation pattern	123
123	Venter smooth	<i>T. aboharensis</i> Sadana and Chhabra
123'	Venter not smooth	124
124	Dorsum irregularly striate-rugose with smooth patches, complete and incomplete reticulations sublaterally; venter strongly rugose	<i>T. budensis</i> Ueckermann and Ripka
124'	Dorsum irregularly, broken striate without smooth patches; venter with smooth areas	<i>T. hornotinus</i> Chaudhri
125	Tarsi III and IV each with four setae; dorsum with irregular broken longitudinal striae	<i>T. umarii</i> Hasan, Wakil, and Bashir

125'	Tarsi III and IV each with five setae; dorsum with reticulation pattern	126
126	Third pair of propodosomal setae <i>sc2</i> as long as the distance between setae <i>sc1</i> and <i>sc2</i> ; ventral cuticle with smooth regions anterior to setae <i>3a</i> and <i>4a</i> <i>T. punicae</i> Pritchard and Baker	
126'	Third pair of propodosomal setae <i>sc2</i> less than the distance between setae <i>sc1</i> and <i>sc2</i> ; ventral cuticle without smooth regions anterior to setae <i>3a</i> and <i>4a</i> <i>T. shishehboursi</i> Khanjani, Khanjani, and Seeman	
127	Median area of propodosoma smooth except few traverse striae posterior and anterior medially <i>T. jussiaeae</i> De Leon	
127'	Median area of propodosoma not as mentioned above	128
128	Tibiae I and II each with four setae; dorsum covered with polygonal reticulate pattern <i>T. vitexi</i> Meyer	
128'	Tibiae I and II each with five setae	129
129	Dorsum with reticulation sublaterally, medially with irregular striae <i>T. menglunensis</i> Yin and Cui	
129'	Dorsum without reticulation	130
130	Propodosoma with longitudinal furrow medially, rest of dorsum covered with innumerable ridge <i>T. sanblasensis</i> De Leon	
130'	Propodosoma without longitudinal furrow medially	131
131	Setae <i>4a</i> extend behind to the bases of setae <i>g1-2</i>	132
131'	Setae <i>4a</i> not extend behind to the bases of setae <i>g1-2</i>	136
132	Coxa IV and femur IV each with two setae <i>T. panici</i> De Leon	
132'	Coxa IV and femur IV each with one seta	133
133	Median area of propodosoma framed by longitudinal striae	134
133'	Median area of propodosoma not framed by longitudinal striae	135
134	Area between setae <i>3a</i> and <i>4a</i> with longitudinal striae <i>T. crocopontensis</i> Meyer	
134'	Area between setae <i>3a</i> and <i>4a</i> smooth <i>T. sclerocaryae</i> Meyer	
135	Palp with one seta on terminal segment; rostral shield with two lateral lobes strongly angulate <i>T. bauchani</i> Castro, Feres, Mesa, and Moraes	
135'	Palp with two setae on terminal segment; rostral shield with two lateral lobes not strongly angulate <i>T. bellulus</i> Meyer	
136	Tarsi I and II each with seven tactile setae	137
136'	Tarsi I and II each with eight tactile setae	138
137	Dorsum with few transverse, irregular striae medially <i>T. sophiae</i> Meyer	
137'	Dorsum with incomplete reticulation or areolae medially <i>T. leonorae</i> Meyer	
138	Tarsi III and IV each with four setae	139
138'	Tarsi III and IV each with five setae	140
139	Setae <i>g1-2</i> reaching or crossing to the bases of setae <i>ps1-2</i> ; median area of propodosoma not framed by longitudinal striae <i>T. lycioides</i> Meyer	
139'	Setae <i>g1-2</i> not reaching to the bases of setae <i>ps1-2</i> ; median area of propodosoma framed by longitudinal striae <i>T. auriculatae</i> Meyer	
140	Median area of propodosoma framed by longitudinal striae <i>T. rusapensis</i> Meyer	
140'	Median area of propodosoma not framed by longitudinal striae <i>T. lanceae</i> Meyer	
141	Dorsocentral setae <i>c1</i> reaching or crossing have distance between setae <i>c1</i> and <i>d1</i>	142
141'	Dorsocentral setae <i>c1</i> short not reaching have distance between setae <i>c1</i> and <i>d1</i>	145
142	Propodosoma setae <i>v2</i> and <i>sc1</i> short not reaching have distance between their basis, setae <i>sc2</i> longer than <i>v2</i> and <i>sc1</i> ; propodosoma smooth medially and with transverse striae laterally <i>T. hondurensis</i> Evans	
142'	Propodosoma setae <i>v2</i> and <i>sc1</i> long reaching or crossing have distance between their bases	143
143	Genua I and II with two setae, genu IV with two setae; opisthosoma with a few broken longitudinal mediolaterally. <i>T. jawadii</i> Hasan, Wakil, and Bashir	
143'	Genua I and II with three setae	144

144	Venter with transverse striations pattern broadly spaced medially; dorsocentral setae slender serrate	<i>T. etemadii</i> Mahdavi and Asadi
144'	Venter with transverse striations medially except area around setae 3a smooth; dorsocentral setae setiform serrate	<i>T. ortus</i> Chaudhri
145	Dorsum with few reticulations or incomplete reticulations medially	146
145'	Dorsum striated	150
146	Palp with two setae on terminal segment	147
146'	Palp with one seta on terminal segment	148
147	Area between coxae III and IV with longitudinal broken striation; ventral of propodosoma smooth medially	<i>T. aurantiacus</i> Wang
147'	Area between coxae III and IV with transverse striations medially and few longitudinal striations laterally	149
148	Prodorsal setae <i>sc2</i> nearly twice as long as prodorsal setae <i>v2</i> and <i>sc1</i> ; dorsal setae subspatulate	<i>T. angolensis</i> Meyer
148'	Prodorsal setae <i>sc2</i> about as long as prodorsal setae <i>v2</i> and <i>sc1</i> ; dorsal body setae spatulate	<i>T. nigerianus</i> Meyer
149	Venter with longitudinal striation laterally and smooth medially; propodosoma with incomplete reticulations sublaterally	<i>T. spatulatus</i> Wang
149'	Venter with incomplete reticulations laterally and smooth medially; propodosoma striated sublaterally	<i>T. obvelatus</i> Wang
150	Propodosoma smooth medially	151
150'	Propodosoma with different pattern of striations medially.	152
151	Opisthosoma covered with broken striations; area posterior setae <i>e1</i> with transverse broken striations	<i>T. leptadeniae</i> Mohanasundaram
151'	Opisthosoma smooth medially, sublateral area with few longitudinal broken striations; area posterior setae <i>e1</i> smooth	<i>T. kobachidzei</i> Reck
152	Propodosoma with a few wavy lines with smooth area medially; setae on femora I–IV 3-3-2-1	<i>T. coimbatorensis</i> Mohanasundaram
152'	Propodosoma with irregular or broken striations	153
153	Dorsolateral setae spatulate, broadly spatulate or broadly lanceolate	154
153'	Dorsolateral setae setiform, lanceolate or slender or ovate	157
154	Ventral of propodosoma smooth medially	155
154'	Ventral of propodosoma with transverse striations medially	156
155	Propodosomal setae <i>v2</i> and <i>sc1</i> spatulate; opisthosoma with longitudinal striations forming a thick ridge-like structure medially	<i>T. waqasii</i> Hasan, Wakil, and Bashir
155'	Propodosomal setae <i>v2</i> and <i>sc1</i> ovate; opisthosoma striae forming star-shaped pattern around setae <i>d1</i>	<i>T. bakerdeleonorum</i> Evans
156	Genua I and II with two setae; dorsolateral setae <i>e3</i> setiform; ventral propodosoma pitted laterally	<i>T. orchidofilo</i> Moraes and Freire
156'	Genua I and II with three setae; dorsolateral setae <i>e3</i> broadly lanceolate serrate; ventral propodosoma with longitudinal striations laterally	<i>T. erasus</i> Chaudhri
157	Propodosoma with transverse striations medially	158
157'	Propodosoma without transverse striations medially	161
158	Area between setae <i>1c</i> and <i>d1</i> smooth; propodosoma with few striations posteriorly	<i>T. lygodii</i> De Leon
158'	Area between setae <i>1c</i> and <i>d1</i> with transverse or irregular striations	159
159	Genua I and II with two setae; propodosoma anterior medially with few transverse striations	<i>T. chinariensis</i> Akbar and Chaudhri
159'	Genua I and II with three setae	160
160	Opisthosoma with transverse broken striations and few longitudinal striations posteriorly	<i>T. mustus</i> Chaudhri
160'	Opisthosoma with longitudinal broken striations laterally, sublaterally with incomplete reticulations pattern	<i>T. carolinensis</i> Baker

- 161 Tibiae I and II with four setae; propodosoma with irregular broken longitudinal and transverse striae *T. cissampelosa* Maninder and Ghai
- 161' Tibiae I and II with five setae 162
- 162 Propodosoma with distinct, longitudinal rugose pattern or with large central raised region of weakly colliculate cuticle flanked by series of fine longitudinal folds, becoming oblique laterally.....163
- 162' Propodosoma with irregular striation 164
- 163 Opisthosomal setae *f2* and *f3* ovate, other opisthosomal setae lanceolate; setae *sc2* oblanceolate; area between setae *c1-c1* mostly smooth ... *T. crassulus* Baker and Tuttle
- 163' All opisthosomal setae lanceolate; setae *sc2* oblanceolate; area between setae *c1-c1* weakly reticulated *T. sarcophilus* Welbourn and Beard
- 164 Venter completely smooth; opisthosoma with lateral bulge anterior coxa III *T. shanxiensis* Qian, Yuan, and Ma
- 164' Venter not as mentioned above 165
- 165 Ventral propodosoma smooth laterally; area between setae *c1* and *d1* with few longitudinal striations; dorsolateral setae slightly lanceolate; dorsocentral setae setiform *T. pernicis* Chaudhri, Akbar, and Rasool
- 165' Ventral propodosoma with longitudinal or broken striations or reticulated laterally 166
- 166 Anterolateral ventral cuticle with broken longitudinal striations laterally 167
- 166' Anterolateral ventral cuticle with longitudinal striations or reticulations168
- 167 Propodosomal setae *v2*, *sc1*, and *sc2* lanceolate, propodosoma outlined by longitudinal striae and provided with few irregular striae inside this area *T. geigeriae* Meyer
- 167' Propodosomal setae *v2*, *sc1*, and *sc2* setiform; propodosoma with irregular broken striations *T. eremitus* Chaudhri
- 168 Dorsolateral setae narrowly lanceolate; anterolateral ventral cuticle entirely striate, ventral cuticle between setae *1a-4a* with transverse striae *T. daneshvari* Khosrowshahi and Arbabi
- 168' Dorsolateral setae setiform; anterolateral ventral cuticle reticulate laterally; ventral cuticle with smooth regions anterior to setae *3a* *T. parsii* Khosrowshahi and Arbabi
- 169 Propodosoma smooth medially; area posterior setae *3a* with transverse, broken striae, genua I and II with each with one seta *T. ludhianaensis* Sadana and Chhabra
- 169' Propodosoma not smooth medially 170
- 170 Dorsum covered with reticulation, incomplete reticulations, or polygonal cells medially 171
- 170' Dorsum without reticulation, incomplete reticulations, or polygonal cells medially 181
- 171 Genua I and II each with one seta 172
- 171' Genua I and II each with more than one seta 180
- 172 Propodosoma ventrally with reticulations at the bases of coxa II, ventral shield reticulated *T. reticulus* Siddiqui and Chaudhri
- 172' Propodosoma ventrally without reticulations 173
- 173 Venter with transverse striae medially 174
- 173' Venter smooth or smooth medially 176
- 174 Area anterior setae *3a* smooth, few transverse striae at the bases of coxa II; dorsum with reticulations medially *T. kesari* Sadana, Gupta, and Goyal
- 174' Area anterior setae *3a* covered with transverse striae 175
- 175 Dorsum entirely covered with polygonal reticulation; opisthosoma with a distinct band of transverse striae level with setae *d1* *T. kamalii* Khosrowshahi and Arbabi
- 175' Dorsosublateral region of propodosoma with irregular, incomplete reticulation; dorsosublateral region of opisthosoma with polygonal reticulation; opisthosoma without distinct band of transverse striae *T. euonymi* Khosrowshahi

176	Ventral propodosoma with longitudinal, broken striae laterally; opisthosoma with transverse lines near second pair of dorsocentral setae <i>d1</i>	<i>T. raptor</i> Akbar and Chaudhri
176'	Ventral propodosoma smooth	177
177	Opisthosoma with a transverse non-reticulated band posterior central setae <i>d1</i>	178
177'	Opisthosoma without a transverse non-reticulated band	179
178	Femur IV with one seta; tibiae I and II each with five setae	<i>T. persicae</i> Sadana, Chhabra and Gupta
178'	Femur IV with two setae; tibiae I and II each with four setae	<i>T. pyrusae</i> Maninder and Ghai
179	Trochanter IV with one seta; tibiae I and II each with five setae	<i>T. dimensus</i> Chaudhri
179'	Trochanter IV with two setae; tibiae I and II each with four setae	<i>T. pruni</i> Maninder and Ghai
180	Setae in genua I-IV 2-2-0-0	181
180'	Setae in genua I-IV 3-3-1-1; tibia III with two setae; dorsum with wavy diagonal laterally	<i>T. tectonae</i> Mohanasundaram
181	Palp three-segmented; setae in tibiae I-IV with 5-5-3-3; dorsum with longitudinal laterally	<i>T. trisegmentus</i> Siddiqui and Chaudhri
181'	Palp two-segmented; setae in tibiae I-IV with 4-4-3-3; dorsum with few reticulations, and broken striae medially	<i>T. jandialensis</i> Kauser, Akbar, and Naz
182	Dorsum covered with sub-areolate rogues	183
182'	Dorsum without sub-areolate rogues	186
183	Genua I and II each with two setae	184
183'	Genua I and II each with three setae	185
184	Opisthosoma with sublateral grooves; dorsocentral setae <i>c1</i> , <i>d1</i> and <i>e1</i> setiform to lanceolate	<i>T. karrooi</i> Meyer
184'	Opisthosoma without sublateral grooves; dorsocentral setae <i>c1</i> , <i>d1</i> and <i>e1</i> subspatulate	<i>T. kraussiana</i> Meyer
185	Opisthosoma setae <i>d1</i> , <i>e1</i> , and <i>d3</i> subspatulate; setae <i>ag</i> crossing have distance between setae <i>ag-g</i>	<i>T. abutiloni</i> Meyer
185'	Opisthosoma setae <i>d1</i> , <i>e1</i> , and <i>d3</i> lanceolate; setae <i>ag</i> reaching have distance between setae <i>ag-g</i>	<i>T. ombrensis</i> Meyer
186	Dorsum covered with longitudinal thick striae; setae in genua I-IV 3-3-1-1; venter with longitudinal striae medially	<i>T. pagina</i> Chaudhri, Akbar, and Rasool
186'	Dorsum without longitudinal thick striae	187
187	Genua I and II each with one seta	188
187'	Genua I and II each with more than one seta	191
188	Propodosoma or opisthosoma with reticulations pattern medially	189
188'	Propodosoma or opisthosoma without reticulations pattern medially	190
189	Palp with two segments; propodosoma with reticulation elements anteriorly; dorsum with longitudinal striae laterally	<i>T. kenos</i> Hasan, Wakil, and Bashir
189'	Palp with three segments; opisthosoma with incomplete reticulation up to second pair of dorsocentral setae <i>d1</i>	<i>T. mandraensis</i> Hasan, Wakil, and Bashir
190	Third pair of propodosomal setae <i>sc2</i> subspatulate longer than second pair <i>sc1</i> ; dorsum rugose	<i>T. heteropyxis</i> Meyer
190'	Second and third pairs of propodosomal setae <i>sc1</i> and <i>sc2</i> lanceolate and subequal in length; dorsum wrinkled	<i>T. tapiae</i> Castro and Feres
191	Genua I and II each with two setae	192
191'	Genua I and II each with three setae	195
192	Femur IV with one seta	193
192'	Femur IV with two setae	194
193	Propodosoma medially with incomplete to complete areolate; second and third pairs of propodosomal setae <i>sc1</i> and <i>sc2</i> subequal in length	<i>T. mkuziensis</i> Meyer

- 193' Propodosoma medially irregular to transverse striae; third pair of propodosomal setae *sc2* nearly twice as long as first and second pairs *v2* and *sc1* *T. microphylli* Meyer
- 194 Third pair of propodosomal setae *sc2* about twice as long as first and second pairs *v2* and *sc1* *T. acaciae* Ryke and Meyer
- 194' Third pair of propodosomal setae *sc2* about three times as long as first and second pairs *v2* and *sc1* *T. pyroides* Meyer
- 195 Femur IV with one seta; setae in genua I–IV 3-3-1-0; dorsum with transverse, irregular striae medially *T. carlosflechtmanni* Feres and Hernandez
- 195' Femur IV with two setae 196
- 196 Setae in genua I–IV 3-3-0-0; dorsal setae subspatulate; area posterior setae *4a* with longitudinal striae *T. aethiopicus* Meyer
- 196' Setae in genua I–IV 3-3-1-1; dorsal setae broadly lanceolate; area posterior setae *4a* with transverse striae *T. legatus* Chaudhri
- 197 Palp with two segments; propodosoma with a wide U-shape medially *T. Stefani* Meyer
- 197' Palp with three segments 198
- 198 Propodosoma with irregular transverse striae medially and with longitudinal striae mediolaterally; opisthosoma with dorsolateral reticulations *T. lulenicus* Ma and Yuan
- 198' Propodosoma with various patterns of striations or rugose 199
- 199 Trochanter IV without setae; ventral propodosoma smooth laterally *T. stativus* Chaudhri, Akbar, and Rasool
- 199' Trochanter IV with one seta 200
- 200 Dorsum with longitudinal, broken striae, and few transverse striae posterior setae *d1* *T. pisinnus* Chaudhri, Akbar, and Rasool
- 200' Dorsum without striation posterior setae *d1* *T. pacificus* Baker
- 201 Tibiae I and II each with 4 setae; genito-ventral plate smooth *T. yarensis* Hasan, Bashir, and Wakil
- 201' Tibiae I and II each with five setae; genito-ventral plate with transverse striation or with small rounded structures 202
- 202 Seta *v2* about as long as seta *sc1* and about half as long as seta *sc2* 203
- 202' Setae *v2*, *sc1*, and *sc2* subequal; aggenital and genital setae barbed 204
- 203 All dorsal setae lanceolate, serrate; femur IV with one seta; genu IV with one seta *T. eriophyoides* Baker
- 203' All dorsal setae subspatulate to spatulate serrate; femur IV with two setae; genu IV without setae *T. scitulus* Meyer
- 204 Ventral cuticle of idiosoma mostly with small rounded structures, except for the central region between setae *1a–3a*, where the rounded structures become elongate or fuse to each other to form wavy, broken longitudinal ridges, and for the regions laterad of ventrigenital plate and between genital and anal openings, smooth; genito-ventral plate also with small rounded structures; genua I–IV with 3-3-2-2 setae *T. omani* Moraes, Al-Shanfari, and Silva
- 204' Ventral cuticle of idiosoma mostly with wavy, broken longitudinal lines *T. pareriophyoides* Meyer and Gerson

3.6. Key to the World Species of the *T. dubinini* Species Group (Based on Females)

- 1 Venter with one pair of *4a* 7
- 1' Venter with more than one pair of *4a* 2
- 2 Venter with two pairs of *4a* 3
- 2' Venter with more than two pairs of *4a* 4
- 3 Venter with one pair of *3a* 19
- 3' Venter with two pairs of *3a* 32
- 4 Venter with three or four pairs of *4a* 5

4'	Venter with five or six pairs of 4a	<i>T. dubinini</i> Reck
5	Setae <i>d1</i> absent	<i>trisetosus</i> Baker and Tuttle
5'	Setae <i>d1</i> present	6
6	Venter with one pair of 3a	<i>T. rosae</i> Kadzhaja
6'	Venter with two pairs of 3a	<i>T. crassus</i> Andre
7	Setae <i>d3</i> present	9
7'	Setae <i>d3</i> absent	8
8	Dorsum with transverse striae medially	<i>T. yousefi</i> Nassar and Ghai
8'	Dorsum without transverse striae medially	<i>T. gumbolimbonis</i> De Leon
9	First pair of dorsocentral setae <i>c1</i> reaching or crossing bases of next setae <i>d1</i>	10
9'	First pair of dorsocentral setae <i>c1</i> short not reaching bases of next setae <i>d1</i>	13
10	Palp with one or two segments	11
10'	Palp with three segments	12
11	Palp with one segment; setae in genua I–IV 3-3-1-1; dorsocentral setae <i>d1</i> and <i>e1</i> short not reaching bases of setae <i>h1</i> and <i>h2</i>	<i>T. grevilleae</i> Gutierrez and Schicha
11'	Palp with two segments; setae in genua I–IV 2-2-0-0; dorsocentral setae <i>d1</i> and <i>e1</i> very long crossing bases of setae <i>h1</i> and <i>h2</i>	<i>T. banksiae</i> Gutierrez and Schicha
12	Tibiae I and II each with four setae; femur IV with one seta; dorsocentral setae <i>e1</i> crossing bases of setae <i>h1</i> and <i>h2</i>	<i>T. comatus</i> Meyer
12'	Tibiae I and II each with five setae; femur IV with two setae; dorsocentral setae <i>e1</i> not reaching bases of setae	<i>T. leucospermi</i> Meyer
13	Trochanters I and II without setae; tibiae I and II each with four setae; dorsum almost smooth, with few lines	<i>T. mallotae</i> Mohanasundaram
13'	Trochanters I and II with one seta	14
14	Tibia IV with two setae; dorsum coarsely reticulate to reticulate or rugose to areolate	15
14'	Tibia IV with three setae	17
15	Venter with broken striae medially	16
15'	Venter with transverse striae medially; dorsum strongly rugose to areolate; setae in tibiae I–IV 4-4-2-2	<i>T. leipoldti</i> Meyer
16	Setae in tibiae I–IV 4-4-2-2; tarsi III–IV each with four setae	<i>T. rhusi</i> Meyer
16'	Setae in tibiae I–IV 5-5-3-2; tarsi III–IV each with five setae	<i>T. oribiensis</i> Meyer
17	Palp with three segments	18
17'	Palp with one segments	<i>T. tortulus</i> Meyer
18	Setae in trochanters I–IV 1-1-1-1; genu I with two setae; dorsal setae <i>sc1</i> , <i>sc2</i> , <i>c3</i> , <i>f2</i> , <i>f3</i> , and <i>h1</i> leaf-like and spiculate	<i>T. flechtmanni</i> Mesa, Moraes, and Ochoa
18'	Setae in trochanters I–IV 1-1-2-1; genu I with three setae; dorsal setae minute lanceolate	<i>T. proteae</i> Meyer
19	Opisthosoma with two pairs of dorsocentral setae <i>c1</i> and <i>e1</i> ; dorsum rugose; setae in genua I–IV 2-2-0-0	<i>T. annonae</i> De Leon
19'	Opisthosoma with three pairs of dorsocentral setae <i>c1</i> , <i>d1</i> and <i>e1</i>	20
20	Propodosoma reticulated medially, and with longitudinal striae laterally; venter smooth; setae in genua I–IV 3-3-1-0	<i>T. tauricus</i> (Mitrofanov and Strunkova)
20'	Propodosoma without reticulation medially	21
21	Genua I and II each with one or two setae	22
21'	Genua I and II each with three setae	25
22	Genua I and II each with one seta; dorsum with longitudinal to irregular striae	<i>T. feliciae</i> Meyer
22'	Genua I and II each with two setae	23
23	Palp with one segment; setae in trochanters 1-1-1-1; dorsum with transverse ornamentation medially	<i>T. punjabensis</i> (Maninder and Ghai)
23'	Palp with three segments	24
24	Tibiae I and II each with four setae; dorsum covered with broken wavy striae; area posterior setae 4a with transverse, broken striae	<i>T. ilocanus</i> Corpuz-Raros

24'	Tibiae I and II each with five setae; dorsum covered with irregular, wrinkles medially	<i>T. maai</i> Xu, Fan, Huang, and Zhang
25	Genu III without setae, palp two segmented	<i>T. berkheyae</i> Meyer
25'	Genu III with one seta	26
26	Propodosoma almost smooth medially	27
26'	Propodosoma not as mentioned above	28
27	Opisthosoma almost smooth between dorsocentral setae <i>c1-e1</i> ; femur IV with two setae; dorsal setae narrowly lanceolate	<i>T. neokeiensis</i> Khan, Kamran, and Alatawi
27'	Opisthosoma covered with elongate cells; femur IV with one seta; dorsal setae lanceolate to oblanceolate	<i>T. kermanicus</i> Khadem, Asadi, and Seeman
28	Palp with one segment	29
28'	Palp with more than one segments	30
29	Coxa I with two setae; tibiae I and II each with four setae	<i>T. jagatkhanaens</i> Sadana and Gupta
29'	Coxa I with one seta; tibiae I and II each with three setae	<i>T. bassiae</i> Mohanasundaram
30	Femur IV with one seta	31
30'	Femur IV with two setae; dorsum with longitudinal striae and reticulate elements medially; dorsal setae broadly spatulate	<i>T. alhagus</i> Khan, Kamran, and Alatawi
31	Dorsum with transverse striae medially; ventral propodosoma with broken longitudinal striae laterally	<i>T. keiensis</i> Meyer
31'	Dorsum covered with longitudinal, irregular striae; venter of propodosoma with longitudinal striae laterally	<i>T. clematidos</i> Wang
32	Palp with two segments; genu III with one seta	<i>T. nenaxi</i> Meyer
32'	Palp with three segments; genu III without setae	<i>T. xerocolus</i> Meyer

3.7. Key to the World Species of the *T. granati* Species Group (Based on Females)

1	Venter with one pair of <i>4a</i>	3
1'	Venter with two pairs of <i>4a</i>	2
2	Venter with one pair of <i>3a</i>	22
2'	Venter with two pairs of <i>3a</i>	<i>T. iranicus</i> Khadem, Asadi, and Seeman
3	Propodosoma with two pairs of dorsal setae <i>sc1</i> and <i>sc2</i> present, setae <i>v2</i> absent	<i>T. elegans</i> (Collyer)
3'	Propodosoma with three pairs of dorsal setae <i>sc1</i> , <i>v2</i> and <i>sc2</i> present	4
4	Genua I–IV without setae	<i>T. philippinensis</i> (Corpuz-Raros)
4'	Genua I–IV not as mentioned above	5
5	Dorsocentral setae <i>c1</i> present	6
5'	Dorsocentral setae <i>c1</i> absent	10
6	Dorsocentral setae <i>d1</i> and <i>e1</i> absent	7
6'	Dorsocentral setae <i>e1</i> absent	8
7	Dorsum with polygonal reticulation; palp with three segments; genua I and II each with three setae	<i>T. cyatheae</i> Gerson and Collyer
7'	Dorsum with irregular striae; palp with two segments; genua I and II each with two setae	<i>T. pariae</i> Hasanvand, Jafari, Khanjani, and Khanjani
8	Second pair of dorsocentral seta <i>d1</i> lanceolate to elliptic lanceolate	<i>T. transvaalensis</i> Meyer
8'	Second pair of dorsocentral seta <i>d1</i> min, setiform	9
9	Opisthosoma with lateral projection anterior coxa III	<i>T. robustae</i> Meyer
9'	Opisthosoma without lateral projection anterior coxa III	<i>T. capparis</i> Meyer
10	Opisthosoma with lateral lobes; palp with one segment	11
10'	Opisthosoma without lateral lobes	14
11	Setae in trochanters I–IV 1-1-0-0	12
11'	Setae in trochanters I–IV 1-1-1-1	13

- 12 Genua III and IV each with one seta; pregenital area finely areolate, setae *ag* crossing bases of setae *g1-2* *T. calcarius* Meyer
- 12' Genua III and IV each without setae; pregenital and genital areas partly punctate and striate, setae *ag* not reaching bases of setae *g1-2* *T. protumidus* Meyer
- 13 Genua I and II each with two setae; tibiae I and II each with four setae; dorsal setae lanceolate serrate *T. jonkeri* Meyer
- 13' Genua I and II each with three setae; tibiae I and II each with five setae; dorsal setae linear lanceolate to setiform *T. athrixiae* Meyer
- 14 Genua I and II each with two setae 15
- 14' Genua I and II each with three setae 18
- 15 Palp with three segments; setae in trochanters I–IV 1-0-1-0; tibiae I and II each with four setae opisthosoma with cross lines *T. acuminatae* Mohanasundaram
- 15' Palp with one segment 16
- 16 Femur IV with one seta; tibia II with four setae; propodosoma with three or more conspicuous sclerotic rings *T. palosapis* Corpuz-Raros
- 16' Femur IV with two setae; tibia II with five setae 17
- 17 Dorsal integument coarsely areolate; dorsal setae coarsely barbed; area anterior setae *4a* with longitudinal striae *T. engelbrechti* Meyer
- 17' Dorsal integument finely areolate; dorsal setae finely barbed; area anterior setae *4a* with broken striae *T. faveolus* Meyer
- 18 Dorsum with three oblong propodosomal plates and three rounded opisthosomal plates like structures medially with punctate inside pattern these plates; dorsum with longitudinal striae laterally *T. jordaani* Meyer
- 18' Dorsum without three oblong propodosomal plates 19
- 19 Tibia IV with two setae 20
- 19' Tibia IV with three setae 21
- 20 Second pair of propodosomal *sc1* setae setiform minute; tibiae I and II each with five setae *T. vernoniae* Meyer
- 20' Second pair of propodosomal *sc1* setae sub spatulate; tibiae I and II with four and three setae respectively *T. amatikulensis* Meyer
- 21 Dorsum areolate; opisthosoma with sublateral grooves *T. albae* Meyer
- 21' Propodosoma with transvers, broken striae medially; opisthosoma without sublateral grooves *T. caledonicus* Meyer
- 22 Dorsum with one pair of dorsocentral setae *c1* present, setae *d1* and *e1* absent 23
- 22' Dorsum with two pairs of dorsocentral setae *c1* and *e1* present, setae *d1* absent *T. tamarixi* Mahdavi and Asadi
- 23 Dorsum smooth or almost smooth medially, propodosoma with few striae laterally 24
- 23' Dorsum with irregular striae 26
- 24 Trochanter III with one setae; dorsum almost smooth medially; opisthosoma with few faint, transverse striae; propodosoma with few striae laterally *T. citus* Chaudhri, Akbar, and Rasool
- 24' Trochanter III with two setae 25
- 25 Genu III with one seta; femur IV with two setae; area between setae *3a* and *4a* with transverse striae *T. myrtus* Al-Gboory
- 25' Genu III without setae; femur IV with one seta; area between setae *3a* and *4a* smooth *T. viticola* Al-Gboory
- 26 Venter with transverse striae medially; setae *ag* reaching or crossing bases of setae *g1-2* 27
- 26' Venter without transverse striae medially; setae *ag* not reaching bases of setae *g1-2* *T. lineosetosus* Wang
- 27 Setae *4a* reaching to the bases of setae *g1-2* *T. granati* Sayed

27' Setae 4a reaching to the bases of setae g1-2 *T. populi* Al-Gboory

3.8. Key to the World Species of the *T. barticanus* Species Group (Based on Females)

- 1 Venter with one pair of 4a 3
- 1' Venter with two pairs of 4a 2
- 2 Venter with one pair of 3a 5
- 2' Venter with two pairs of 3a *T. sparsus* Chaudhri, Akbar, and Rasool
- 3 Palp with three segments *T. capassae* Meyer
- 3' Palp with two segments 4
- 4 First and second pairs of propodosomal setae *v2* and *sc1* subequal in length; opisthosoma with lateral lobes *T. chelinus* Meyer
- 4' Second pair of propodosomal setae *sc1* longer than first pair *v2*; opisthosoma without lateral lobes *T. papiothalensis* Meyer
- 5 Dorsum smooth; venter with transverse striae medially, propodosoma completely smooth *T. salicis* Al-Gboory
- 5' Dorsum striated 6
- 6 Genu I with one seta; dorsum strongly ridged; third pair of propodosomal setae *sc2* short not reaching bases of second pair *sc1* *T. barticanus* De Leon
- 6' Genu I with two setae; propodosomal with transverse striae medially; third pair of propodosomal setae *sc2* elongate crossing bases of second pair *sc1* *T. isabelae* Mesa, Moraes, and Ochoa

4. Discussion

The number of setae (dorsocentral and dorsolateral setae) has been used by different authors to erect tenuipalpid genera by transferring species from the genus *Tenuipalpus*, e.g., *Aegyptopalpus* Mitrofanov [7], *Deleonipalpus* Mirofanov [7], *Gnathopalpus* Mitrofanov [7], and *Tuttlepalpus* Mitrofanov [7]. Later, some of those genera were synonymized with the genus *Tenuipalpus* [8].

Different species groups were proposed based on the number of dorsocentral setae or dorsolateral setae [8–10]. According to the number of dorsolateral setae, two species groups, *caudatus* and *proteae*, based on the presence and absence of setae *f2* (with seven and six pairs of dorsolateral setae), respectively. Later, these two species groups were divided into species subgroups based on the number intercoxal setae *3a* and *4a* were recognized [9,10]. Also, the character of dorsocentral and dorsolateral setae have been used as a first couplet in the different keys to classify the *Tenuipalpus* species (Al-Gboory [12]; Khanjani et al. [13]; Castro et al. [16]; Xu et al. [15]). The literature of 287 species of *Tenuipalpus* sensu lato signified the importance of dorsal opisthosomal setae as a prominent diagnostic morphological character. However, using the presence and absence of dorsolateral setae *f2* (seven and six pairs of setae, respectively) could not be helpful, because some species (i.e., *T. clematidos* Wang, *T. flechtmanni* Mesa, Moraes, and Ochoa, *T. isabelae* Mesa, Moraes, and Ochoa, and *T. salicis* Al-Gboory) have six of dorsolateral setae (*f2* present), but the dorsolateral setae (*d3*) is absent. Hence, those species can not be placed in any species groups that proposed Baker and Tuttle [9] and Meyer [10] because of these grouping *caudatus* and *proteae* is based on presence and absence of setae *f2*. However, some previous works are considering the number of dorsolateral setae to distinguish these two species groups, regardless of which dorsolateral seta is absent. For example, Mahdavi and Asadi [27] included two species (*T. clematidos* Wang and *T. salicis* Al-Gboory) in the *proteae* species group, which have setae *f2* present. Therefore, we found that using the total number of opisthosomal setae is proper for dividing species groups, while the absence or presence of certain opisthosomal setae may be used for species differentiation in diagnostic keys. Hence, in this study, the four new species groups were proposed based on the number of opisthosomal setae.

4.1. Further Notes on the Poorly Described and Illustrated Species of the Species Group *Carolinensis*

The following remarks and additional notes are about those eight species belonging to the species group *carolinensis*, which were not included in the key due to poor/incomplete descriptions and illustrations. Their related species and a possible place in the diagnostic key are provided as follows:

***Tenuipalpus chiococcae* De Leon**

The species *T. chiococcae* was originally described as close to *T. pigrus* Pritchard and Baker [17]. The recent classification by Castro et al. [1] placed *T. pigrus* in *Tenuipalpus* sensu stricto since this species bears a pair of lateral body projections associated with setae c3. The result of our study placed *T. chiococcae* among five species in the diagnostic key, i.e., *T. aurantiacus* Wang, *T. angolensis* Meyer, *T. nigerianus* Meyer, *T. spatulatus* Wang, and *T. obvelatus* Wan.

***Tenuipalpus costarricensis* Salas and Ochoa**

Previously, *T. costarricensis* was considered close to *T. granati* Sayed [18]. However, in our study *T. granati* is placed in the group *granati*, while *T. costarricensis* came closer to three species; *T. eucleae* Meyer, *T. garciniae* Meyer and Bolland, and *T. indicus* Maninder and Ghai in the species group *carolinensis*.

***Tenuipalpus ephedrae* Livschitz and Mitrofanov**

For the species *T. ephedrae*, the morphological characters were obtained from a poor redescription [19], and the original description was not found. The taxonomic information available in the redescription only helped to place this species in the group *carolinensis*.

***Tenuipalpus molinai* Evans**

The species *T. molinai* was originally described as close to *T. pedrus* Manson [20]. The closely related *T. pedrus* Manson had been transferred to the genus *Colopalpus* Pritchard and Baker, previously [28]. However, the available morphological characters indicate that the species *T. molinai* belongs only to the species group *carolinensis*, but could not be assigned in the key.

***Tenuipalpus oxalis* Flechtmann**

The species *T. oxalis* is poorly described and illustrated, and the related species was not provided [21]. The available morphological characters helped to designate the species only to the level of the species group *carolinensis*.

***Tenuipalpus santae* Manson**

The species *T. santae* is morphologically close to *T. celtidis* Pritchard and Baker in the original description [22]. *Tenuipalpus santae* could not be placed due to missing leg chaetotaxy and other diagnostic characters.

***Tenuipalpus simplychus* Cromroy**

The species *T. simplychus* was described as closely related to *T. knorri* Baker and Pritchard in the original description [23]. Due to missing leg chaetotaxy information, *T. simplychus* could not be assigned a certain place in the diagnostic key.

***Tenuipalpus tetrazygiae* De Leon**

The species *T. tetrazygiae*, it was distinguished by the author from other described species of that time by the shape of dorsocentral setae and dorsum covered with irregular ridges [17]. Although this species has been placed in the *caroliensis* group, no certain place could be identified in the diagnostic key.

4.2. Synonymy of Some Species of the *Carolinensis* Species Group

The species *T. lustrabilis* was previously reported as a suspected junior synonym of *T. punicae* Pritchard and Baker [2,13]. We reviewed the original description and illustration [29] as well as the characters of *T. lustrabilis* in the published key by Meyer [8]. *T. lustrabilis* is hereby synonymized with *T. punicae* based on the number of shared characteristics, i.e., leg chaetotaxy, palp segmentation, shape and number of dorsal setae, pattern of dorsal reticulations, as well as its geographic distribution (Pakistan) and host plant (*Punica granatum*).

Similarly, the species *T. guptai* Sadana and Gupta was also suggested as a junior synonym of *T. solanensis* Sadana and Gupta [2,13]. We found that both species share most of their morphological features except for the number of setae on tarsi I–II (5–5 in *T. guptai* vs 7–7 in *T. solanensis*). This character has been commented to be a miscalculation [13], especially that *T. guptai* was described based on a single holotype female while *T. solanensis* only from three females. Moreover, both species were described based on specimens collected from the same host plant (*P. granatum*), the same type locality (India), on the same collection date (22–VI-1981), and have been mounted on the same slide (slide#91) [30].

Interestingly, the related species of *T. solanensis* is *T. lustrabilis*, which is declared as junior synonym of *T. punicae*. A detailed comparison of available description for both of these species show they are very similar; sharing leg chaetotaxy, palp segmentation, shape and number dorsal setae, pattern of dorsal reticulations, and host plant. Hence, the two species (*T. guptai* and *T. solanensis*) are also synonymized with *T. punicae*.

Tenuipalpus rodionovi Chalilova was described poorly without illustrations [31]. Therefore, it is neither assigned to any of the four species groups and not placed in the diagnostic keys. However, it was mentioned in the original description that it resembles three species: *T. granati* Sayed, *T. zhizhilashvili* Reck, and *T. kobachidzei* Reck. The latter two species belong to the species group *carolinensis*, while the former one belongs to the *granati* new species group. Pritchard and Baker [32] and Wainstein [33] suspected this species as a junior synonym of *T. granati*. There is a need to check the type specimens of this species to validate its status. Hence, *T. rodionovi* is considered as a suggested synonym of *T. granati* until further studies are made.

5. Conclusions

The history of the genus *Tenuipalpus* is complicated due to taxonomic and classification-based modifications. This research indicates that the genus *Tenuipalpus* needs more taxonomical studies to raise the level of groups and species groups to higher taxonomical ranking, by using persistent and strong morphological characters. This may even direct future research in the family Tenuipalpidae to study the other closely related genera, in order to validate their status.

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