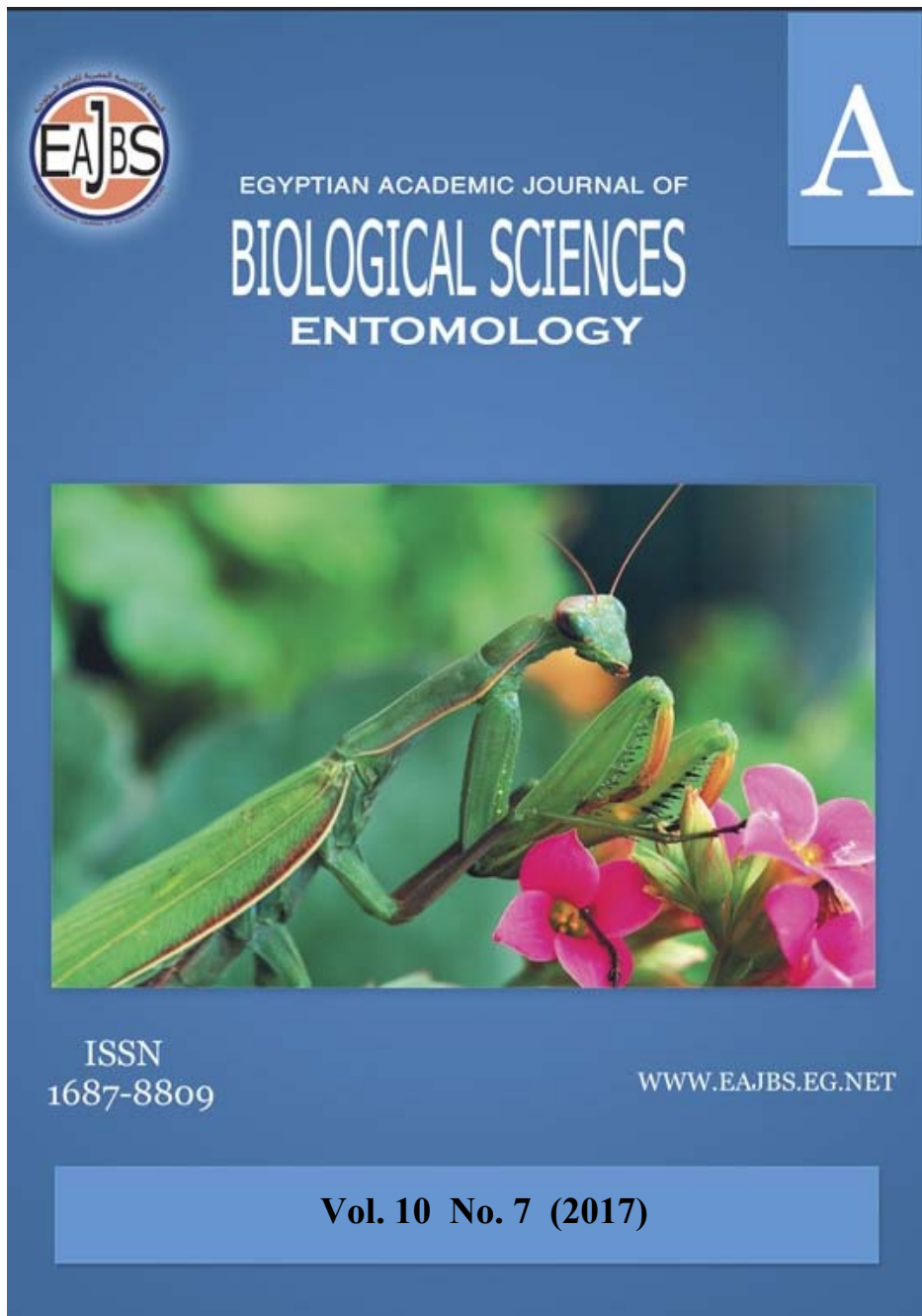


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A new Species in the Genus *Epitrimerus* Nalepa (Acari: Eriophyidae) from *Lantana camara* L. in Egypt

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ABSTRACT

A new species belonging to genus *Epitrimerus* Nalepa from Egypt is described and illustrated, namely *Epitrimerus lantanae* sp. nov. from *Lantana camara* L. (Verbenaceae). The new species is vagrant on the lower and upper leaf surfaces of their host plant. No damage to the host was observed. A key to the species of *Epitrimerus* in Egypt is provided. In addition, a list of all known species of eriophyoid mites found on *Lantana* sp. is also provided.

INTRODUCTION

Lantana camara is one of the ten worst weeds of the world, which is a native of tropical and subtropical America (Day *et al.* 2003). *L. camara* is regarded both as a notorious weed and a popular ornamental garden plant (Mishra, 2015). The genus *Lantana* is a member of the family Verbenaceae and is a pantropical weed affecting pastures and native forests which there are some 650 varieties in more than 60 countries worldwide (Parsons & Cuthbertson 2001). *L. camara* has multiple uses, mainly treated as an herbal medicine to cure cancers, chicken pox, measles, asthma, ulcers, swellings, eczema, tumors, high blood pressure, bilious fevers, catarrhal infections, tetanus, rheumatism, malaria and a toxic of abdominal viscera (Mandal *et al.* 2011). *L. camara* was also used as firewood and mulch. Also, it is planted as a hedge to contain or keep out livestock in some countries (Saraf *et al.* 2001). Leaf extracts of *Lantana* exhibit antimicrobial, fungicidal, insecticidal and nematocidal properties (Begum *et al.* 2000).

Eight eriophyoid species have been described from *L. camara* worldwide namely- *Aceria lantanae* (Cook, 1909) from Cuba; *Rhynacus kraussii* Keifer, 1962 from Colombia; *Diptilomiopus camarae* Mohanasundaram, 1981 from India; *Eriophyes lantanae* (Mohanasundaram, 1981) from India; *Calacarus lantanae* Boczek & Chandrapatya, 1989 from Thailand; *Phyllocoptes lantanae* Abou-Awad & El-Banhawy, 1992 from Kenya; *Paraphytoptus magdalena* Craemer, 1993 and *Tegonotus stefneseri* Craemer, 1993 from South Africa (Abou-Awad & El-Banhawy, 1992; Craemer, 1993).

The genus *Eptrimerus* (Acari: Eriophyidae: Phyllocoptinae) was established by Nalepa (Nalepa, 1898) based on the type species *Tegonotus piri* (Nalepa, 1891) and characterized as: Body fusiform; scapular setae (*sc*) and tubercles ahead of rear shield margin, directed centrally, anterior lobe present; opisthosoma with 3 ridges, middorsal ridge fading simultaneously with subdorsal ridges; empodium entire; coxae I and coxae II with 3 pairs of setae.

Up to now, the genus holds 170 species from Asia, Africa, Europe and USA (Amrine *et al.* 2003; Xue & Hong 2005; Xue *et al.* 2007; Flechtmann, 2010; Ripka, 2010; Ou *et al.* 2014; Wang *et al.* 2014; Elhalawany *et al.* 2015; Soika & Woźnińska 2016). Up to date, the total number of eriophyoid mites reported from Egypt had increased to 92 species belonging to 32 genera; among of them, 5 species from genus *Eptrimerus* (Zaher 1984, Elhalawany 2012, 2016, 2017; Elhalawany *et al.* 2014, 2015, Elhalawany and Ueckermann 2015, Elhalawany and El-Adl, 2017) (see Table 1).

Table 1. List of *Eptrimerus* spp. from Egypt

Species	Host plant	Relation to host	References
<i>Eptrimerus pyri</i> (Nalepa, 1891)	<i>Malus domestica</i> Borkh., and <i>Pyrus communis</i> L., (Rosaceae)	The mites inhabit leaf blisters in summer and terminal buds in winter; damages leaves and buds.	Zaher, 1984
<i>Eptrimerus saudiarabis</i> Wang & Elhalawany, 2014	<i>Phoenix dactylifera</i> L. (Arecaceae)	Vagrant on leaf surface	Elhalawany <i>et al.</i> 2014
<i>Eptrimerus cupressi</i> Keifer, 1939	<i>Cupressus sempervirens</i> L. (Cupressaceae)	Vagrant of the tip of the twigs and squeezed into the crevices between leaf scale	Elhalawany <i>et al.</i> 2014
<i>Eptrimerus abousettai</i> Elhalawany, Wang & Xue, 2014	<i>C. sempervirens</i> L. (Cupressaceae).	Vagrants on the host plants	Elhalawany <i>et al.</i> 2015
<i>Eptrimerus lantanae</i> sp. nov.	<i>Lantana camara</i> L. (Verbenaceae).	Vagrant on the leaf surfaces of their host plant without damage	New species

One new species of the genus *Eptrimerus* was discovered. A key to species in the genus *Eptrimerus* in Egypt is listed herein.

MATERIALS AND METHODS

During 2015 to 2017, field surveys were conducted in Qalyubia governorate, Egypt. Eriophyid specimens were collected from plants by direct examination under stereo-microscope. Specimens were slide mounted in Keifer's F-medium according to protocol reported in Amrine and Manson (1996), and examined under a phase contrast microscope (BX46, Olympus). Illustrations were done with the use of drawing tube attached to the phase contrast microscope, and later processed using the Adobe Illustrator® CS5 program. The generic classification is based on Amrine *et al.* (2003), taxonomic concepts used herein follows that of Lindquist (1996). Measurements were done according to de Lillo *et al.* (2010). For each species, the holotype female measurement precedes the corresponding range for paratypes (given in parentheses). For immature stages, only the ranges are given. All measurements are given in micrometers (μm) and refer to the length of morphological traits unless otherwise specified. The count of ventral opisthosomal semiannuli starts from the first semi annulus after the coxa II. Dorsal opisthosomal semiannuli were counted from the first semi annulus behind the rear margin of the prodorsal shield.

RESULTS AND DISCUSSION

Taxonomy**Family Eriophyidae Nalepa, 1898****Genus: *Epitrimerus* Nalepa, 1898*****Epitrimerus lantanae* sp. nov. Figures (1-2)**

Diagnosis: *Epitrimerus lantanae* sp. nov. is the first eriophyid mite of the genus *Epitrimerus* to be found on the plant genus *Lantana* (Verbenaceae) and is distinguished by its prodorsal shield pattern, which is distinctive in having line of granules, median line only on posterior 1/4 of prodorsal shield, joined to admedians by dart-shaped mark, admedian lines entire, begin at anterior margin of prodorsal shield, run parallel to each other, along almost whole length of shield, and submedian lines forming one cell from each pair on either side. This species can also be distinguished by the presence of longitudinal lines and dashes on coxal plates I and II. Both legs with 5-rayed empodium.

Description.

FEMALE (n=12). Body spindleform, 192 (145–200); wide 45 (42–47), 40 (40–42) thick; whitish in color. **Gnathosoma** 18 (17–19), curved downward, pedipalp coxal seta (*ep*) 3 (3–4), dorsal pedipalp genual seta (*d*) 5 (4–5), cheliceral stylets 15 (15–16).

Prodorsal shield subtriangular, 33 (31–34) including frontal lobe, 32 (28–35) wide with frontal lobe rounded 4 (3–5); prodorsal shield ornamentation by line of granules, median line only on posterior 1/4 of prodorsal shield, joined to admedians by dart-shaped mark, admedian lines entire, begin at anterior margin of prodorsal shield, run parallel to each other, along almost whole length of shield, first submedian lines present, arising from base of scapular tubercles, connected at 2/3 on posterior to admedian lines, and forming one cell from each pair on either side second submedian lines present at anterior 1/3 connected with first submedian lines. Lateral lobes not prominent. Scapular tubercles ahead of rear margin, scapular setae *sc* 13 (12–14), 19 (18–20) apart, projecting centrad.

Legs with usual setae. **Leg I** 29 (27–29); femur 9 (8–9), basiventral femoral seta *bv* 11 (9–12), genu 4 (3–4), antaxial genual seta *l''* 15 (14–16); tibia 5 (5–6), paraxial tibial seta *l'4* (4–5); tarsus 6 (5–7), seta *ft'* 13 (12–14), *ft''* 21 (20–23), *u'3* (3–4); solenidion ω 10 (9–11), distally tapered; empodium 5 (5–6), simple, 5-rayed. **Leg II** 25 (24–25); femur 9 (8–9), basiventral femoral seta *bv* 12 (11–13); genu 3 (3–4), antaxial genual seta *l''* 8 (8–10); tibia 4 (4–5); tarsus 5 (5–6), setae: *ft''* 6 (5–8), *ft'* 20 (19–22), *u'4* (3–4); solenidion ω 11 (10–12), distally tapered; empodium 5 (5–6), simple, 5-rayed.

Coxigenital region: With six semiannuli between coxa and genital coverflap plus two transversal rows of lined granules at the base of genital coverflap. Coxae with distinct sparse granules and short lines, prosternal apodeme 7 (6–7), anterolateral seta on coxisternum I (*lb*) 6 (5–7), 8 (8–9) apart; proximal seta on coxisternum I (*la*) 17 (16–18), 7 (7–8) apart; proximal seta on coxisternum II (*2a*) 30 (27–32), 20 (18–23) apart.

External genitalia: 12 (10–12), 19 (18–19) wide, genital coverflap with 10 (10–12) longitudinal ridges; setae *3a* 20 (17–22), 12 (11–13) apart. Opisthosoma with narrow median and two lateral longitudinal ridges. **Opisthosoma:** dorso-ventral subequal 73 (70–77) dorsally with rounded microtubercles on ridges, placed on rear margin, area between median ridge and lateral ridges of dorsal opisthosoma smooth; ventral annuli with rounded microtubercles, placed on rear annuli margin except for

posterior annuli on which microtubercles elongated. Setae *c*2 15 (14–16), 38 (36–40) apart, on 11 (10–12th) annulus; setae *d* 37 (35–39), 32 (28–35) apart, on 26 (26–27th) annulus; setae *e* 15 (15–17), 12 (11–15) apart, on 45 (44–47th) annulus; setae *f* 19 (17–20), 14 (14–15) apart, on 68 (65–70th) annulus, 7th annulus from rear. Setae *h*1 3 (3–4), 5 (4–6) apart; setae *h*2 47 (40–50), 10 (9–11) apart.

MALE (n=4). Body spindleform, 140–156; wide 38–41, 40 thick. **Gnathosoma** 18–20, curved downward, pedipalp coxal seta *ep* 3–4, dorsal pedipalp genual seta *d* 4–5, cheliceral stylets 15–16. **Prodorsal shield** subtriangular, 31–33 including frontal lobe, 32–33 wide with frontal lobe rounded 3–4; prodorsal shield ornamentation similar to that of female. Scapular tubercles ahead of rear margin, scapular setae *sc* 12–13, 15–17 apart, are projecting centrad. **Leg I** 25–26; femur 7–8, basiventral femoral seta *bv* 7–9, genu 3–4, antaxial genual seta *l''* 15–17; tibia 5–6, paraxial tibial seta *l'* 4–5; tarsus 5–6, seta *ft'* 12–14, *ft''* 20–22, *u'* 3–4; solenidion ω 9–10, distally tapered; empodium 5–6, simple, 5-rayed. **Leg II** 23–24; femur 8–9, basiventral femoral seta *bv* 10–12; genu 3, antaxial genual seta *l''* 8–9; tibia 4–5; tarsus 5–6, setae: *ft''* 5–7, *ft'* 17–19, *u'* 3–4; solenidion ω 10–11, distally tapered; empodium 5 (5–6), simple, 5-rayed. Coxigenital region with 6–7 semiannuli between coxa and genitalia. Coxae with distinct sparse granules and short lines, prosternal apodeme 7 (6–7); setae *lb* 6–8, 8–9 apart; setae *la* 13–15, 5–6 apart; setae *2a* 20–25, 18–20 apart.

Male genitalia 10–11, 14–16 wide, surface below eugenital setae with granules; setae *3a* 16–17, 12–13 apart. **Opisthosoma** with narrow median and two lateral longitudinal ridges. Dorsal annuli 61–63 semiannuli with rounded microtubercles on ridges, placed on rear margin, area between median ridge and lateral ridges of dorsal opisthosoma smooth; ventral annuli 65–71 semiannuli with rounded microtubercles, placed on rear annuli margin except for posterior annuli on which microtubercles elongated. Setae *c* 214–15, 36–38 apart, on 10–11th annulus; setae *d* 25–28, 26–28 apart, on 22–24th annulus; setae *e* 14–16, 12–13 apart, on 42–43th annulus; setae *f* 14–16, 13–14 apart, on 62–63th annulus, 7th annulus from rear. Setae *h*1 3–4, 4–6 apart; setae *h*2 30–37, 9–10 apart.

NYMPH (n=3). Body spindleform, 105–116; wide 32–35, 36 thick. **Gnathosoma** 16–17, curved downward, pedipalp coxal seta *ep* 2–3, dorsal pedipalp genual seta *d* 4–5, cheliceral stylets 13–14. **Prodorsal shield** subtriangular, 27–29 including frontal lobe, 28–30 wide; prodorsal shield pattern of median line present only on rear 1/4 of prodorsal shield, admedian lines distinct, running in an almost straight line to area between the dorsal tubercles. Granules on side of prodorsal shield. Scapular tubercles ahead of rear margin, scapular setae *sc* 6–8, 14–16 apart, are projecting centrad. **Leg I** 18–19; femur 6–7, seta *bv* 6–7, genu 3, seta *l''* 11–13; tibia 3–4, seta *l'* 3–4; tarsus 3–4, seta *ft'* 10–11, *ft''* 14–16, *u'* 2–3; solenidion ω 7–8, distally tapered; empodium 4–5, simple, 4-rayed. **Leg II** 16–17; femur 5–6, seta *bv* 6–7, genu 3, seta *l''* 5–6; tibia 3; tarsus 3–4, seta *ft'* 5–6, *ft''* 11–12, *u'* 2–3; solenidion ω 7–8, distally tapered; empodium 4–5, simple, 4-rayed. Coxae with distinct sparse granules and short lines, setae *lb* 3–4, 4–5 apart; setae *la* 12–13, 4–5 apart; setae *2a* 16–18, 14–15 apart. Setae *3a* 6–7, 6–7 apart. Opisthosoma with equal dorso-ventral annuli 50–55 semiannuli with pointed microtubercles on rear annuli margin. Coxigenital annuli 10–11. Setae *c* 2 8–9, 23–25 apart, on 10–11th annulus; setae *d* 14–15, 16–18 apart, on 21–22th annulus; setae *e* 10–11, 11–12 apart, on 31–33th annulus; setae *f* 10–12, 8–9 apart, on 47–48th annulus, 6th annulus from rear. Setae *h*1 3; setae *h*2 30–37, 9–10 apart.

Differential diagnosis: *Eptrimerus lantanae* sp. nov. is the first eriophyid mite belonging to genus *Eptrimerus* to be found on the plant genus *Lantana*

(Verbenaceae) and is distinguished by its prodorsal shield pattern, which is distinctive in having one cell from each pair on either side of the median longitudinal cell and empodium 5-rayed. The new species has many similarities with *E. virginiana* Keifer, 1959 and *E. demissae* Keifer, 1959 which were collected from *Prunus virginiana* L. (Rosaceae), and *E. chaenomeli* Soika & Wozińska, 2016 from *Chaenomeles x superba* (Frahm) (Rosaceae) in the pattern on the prodorsal shield is created by lines of granules, the median line is present in the rear fifth of the shield and joined to the admedians by a dart-shaped mark, the admedian lines begin at the front edge of the prodorsal shield and run along the whole length of the shield.

However the newly described species differs from *E. virginiana* by the shape of frontal lobe of the prodorsal shield, which is rounded, whereas in *E. virginiana* Keifer it is sharp. Also the new species has one pair of cells clearly visible on each side of the prodorsal shield, in contrast to *E. virginiana*, which has seven cells; empodium with 5-rayed in new species versus 4-rayed in *E. virginiana*.

These species differ in the prodorsal shield pattern, the number of empodial rays, number of dorsal and ventral annuli, the lengths and widths of the prodorsal shield, *sc*, *3a*, *c2*, *d*, *e* and *f* and Number of ridges on genital coverflap (Table 2). In addition, these species inhabit different host plants which significantly differ in geographical distribution.

Table 2: Main morphological differences between four *Epitrimerus* spp.

Characters	<i>A. aegyptimperata</i> n. sp.	<i>E. virginiana</i>	<i>E. demissae</i>	<i>E. chaenomeli</i>
Prodorsal shield pattern	Admedian and submedian lines are connected by one transverse line forming two pairs of cells in the central part of the shield.	Admedian and submedian lines are connected by two transverse lines forming three pairs of cells in the central part of the shield.	Admedian lines connected at 2/3, and submedian lines are connected by one transverse line forming two pairs of cells in the central part of the shield, median line absent, lateral shield obscure.	Admedian and submedian lines are connected by two transverse lines forming three pairs of cells in the central part of the shield.
Frontal lobe	rounded	sharp	rounded	rounded
L. of prodorsal shield	31-34	42	50	46-50
W. of prodorsal shield	28-35	50	30	54-59
L. of <i>sc</i>	12-14	7	10	7-9
Empodium rays	5	4	4	4
N. of dorsal annuli	70-77	43	58	43-47
N. of ventral annuli	70-77	65-70	70	61-69
L. of <i>3a</i>	17-22	20	22	30-38
L. of <i>c2</i>	14-16	20	20	24-30
L. of <i>d</i>	35-39	20	45	37-62
L. of <i>e</i>	15-17	18	20	23-38
L. of <i>f</i>	17-20	24	25	20-32
N. of ridges on genital coverflap	10-12	14	10-11	10-12

L., length; W., width; N, number

Type material- Holotype female (slide no. EGTERio94.1) from *Lantana camara* L. (Verbenaceae), at Qalyubia governorate (30°20'2.83"N, 31°12'31.22"E), 14 May 2017, Collected by A.S. Elhalawany, deposited in the mite reference collection of Fruit Trees Mites Department, Plant Protection Research Institute, Agricultural Research Centre, Dokii, Giza governorate; 10 paratypes females, 5 paratypes males and 4 nymph paratypes on 10 slides (slides no. EGPERio94.2–94.11), 10 May 2016 with the same data as holotype; 6 paratypes females and 2 paratypes males on 2 slides (slides no. EGPERio94.12–94.13), 22 April 2015 with the same data as

holotype, deposited in the mite reference collection of Zoology and Agricultural Nematology Department, the Faculty of Agriculture, Cairo University, Giza.

Relation to the host plant: The mites are vagrants on the lower and upperleaf surfaces of their host plant. No damage to the host was observed.

Etymology: The species name is based on the host plant species name, *lantana*.

A key of the species belonging to the genus *Epitrimerus* collected in Egypt

- | | | |
|---|---|--|
| 1 | Median line presents on prodorsal shield, female genital coverflap with 10 to 12 ridges | 2 |
| - | Median line absent on prodorsal shield, female genital coverflap variable | 3 |
| 2 | Median line complete, dorsal annuli smooth, prosternal apodem absent, basiventral femoral seta I absent, Tarsal empodium 4-rayed | <i>Epitrimerus saudiarabis</i> Wang & Elhalawany, 2014 |
| - | Median line at 1/4, dorsal annuli with microtubercles, prosternal apodem present, basiventral femoral seta I present, Tarsal empodium 5-rayed | <i>Epitrimerus lantanae</i> sp. nov. |
| 3 | Prodorsal shield without granules, tarsal empodium 6-rayed, coxal plate with granules | 4 |
| - | shield with many granules, tarsal empodium 4-rayed, coxal plate smooth | <i>Epitrimerus pyri</i> (Nalepa, 1891) |
| 4 | Sub-median lines of prodorsal shield absent, dorsal annuli with microtubercles | <i>Epitrimerus cupressi</i> Keifer, 1939 |
| - | Sub-median lines of prodorsal shield present, dorsal annuli smooth | <i>Epitrimerus abousettai</i> Elhalawany, Wang & Xue, 2014 |

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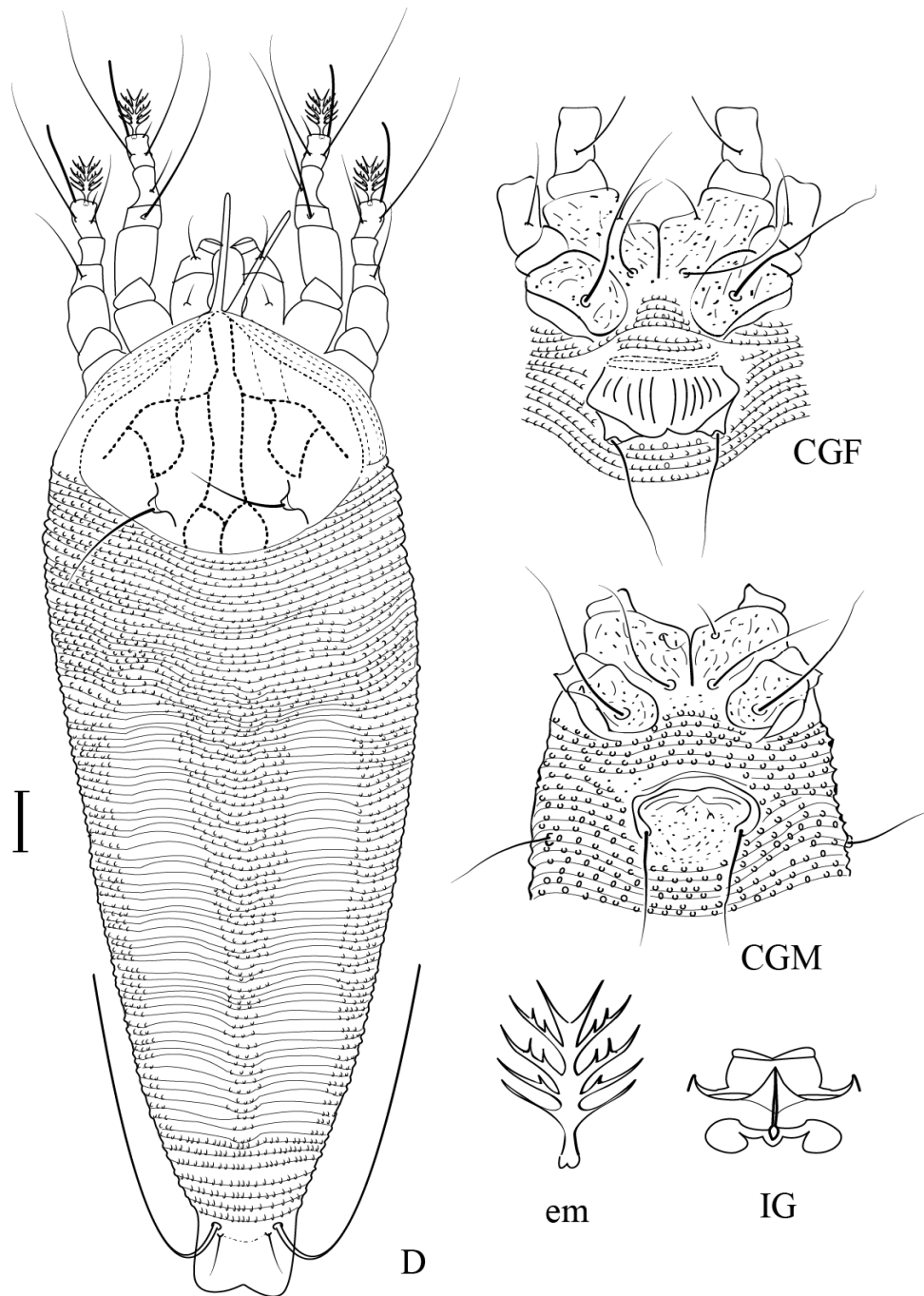


Fig. 1: *Epitrimerus lantanae* sp. nov.: D– dorsal view of mite; CGF – Coxigenital region of female; CGM – Coxigenital region of male; em – Empodium; IG – Internal female genitalia. Scale bar 10 μ m for D, CGF, CGM, IG; 2.5 μ m for em.

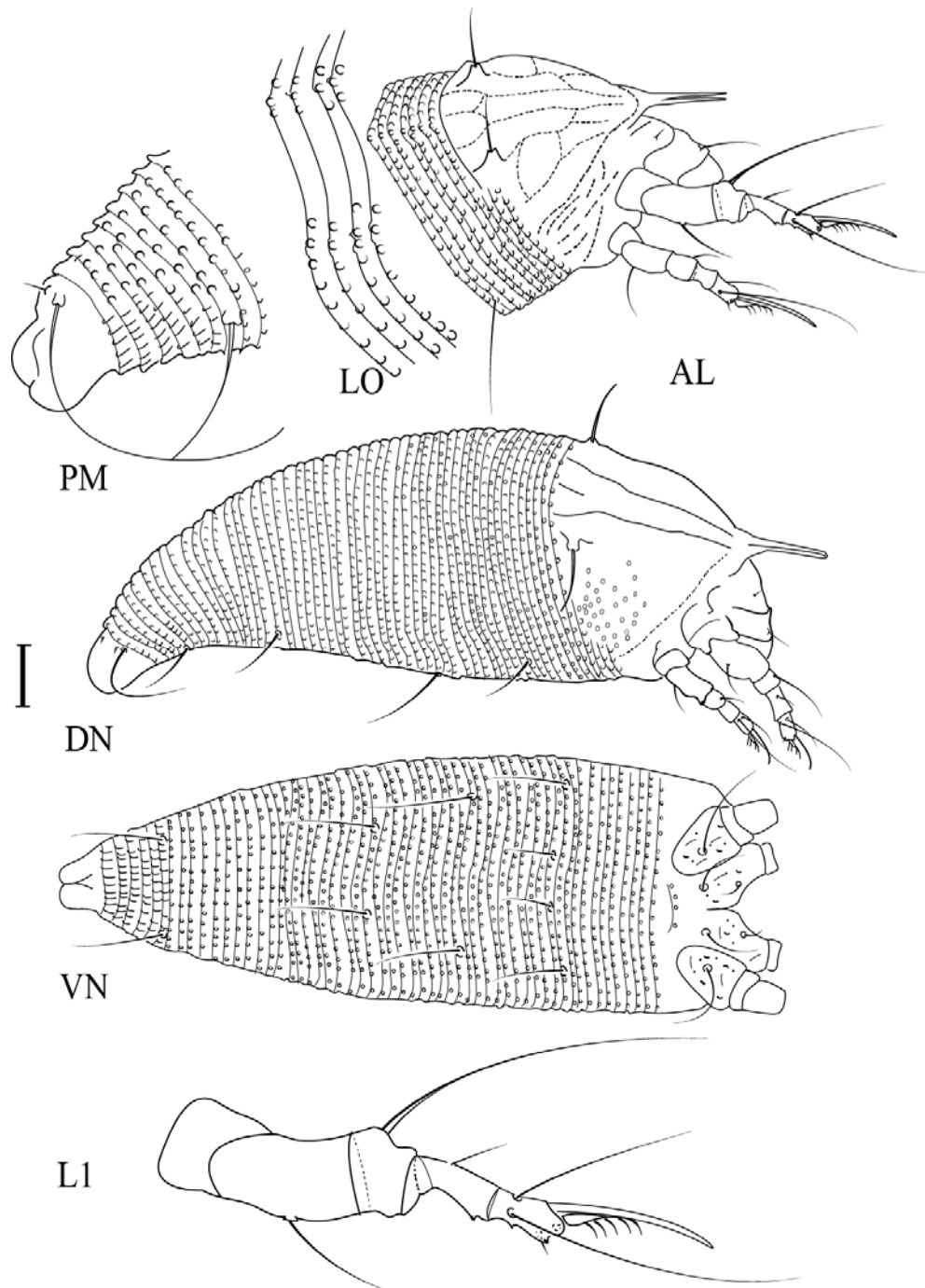


Fig. 2: *Eptrimerus lantanae* sp. nov.: AL-Anterolateral; LO- Lateral view of annuli; PM - Posterolateral of opisthosoma; DN - dorsal view of nymph; VN - view of nymph; L1 - Leg I. Scale bar 10 μm for AL, PM, DN, VN; 5 μm for L1.

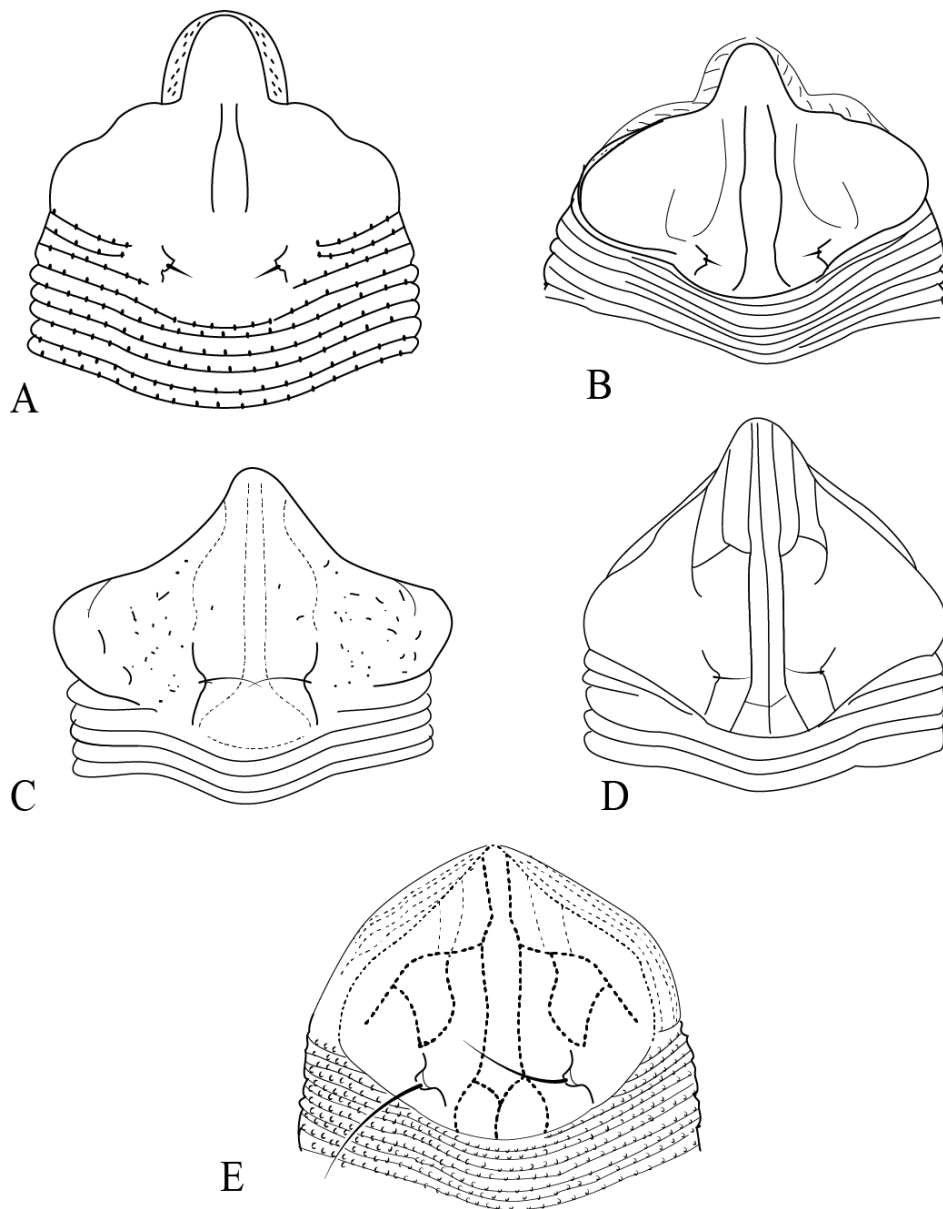


Fig. 3: Prodorsal shield for: A, *Epitrimerus cupressi* Keifer, 1939; B, *Epitrimerus abousettai* Elhalawany, Wang & Xue, 2014; C, *Epitrimerus pyri* (Nalepa, 1891); D *Epitrimerus saudiarabis* Wang & Elhalawany, 2014; E, *Epitrimerus lantanae* sp. nov.

ARABIC SUMMARY

نوع جديد تابع لجنس *Epitrimerus* (أكاريدى: اريوفيدى) على اللانتانا في مصر

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قسم بحوث أكاروس الفاكهة- معهد بحوث وقاية النباتات- مركز البحوث الزراعية- الدقي- جيزة- مصر

تم وصف ورسم نوع جديد تابع لجنس *Epitrimerus* في مصر، يسمى *Epitrimerus lantanae* sp. nov. على نبات اللانتانا (العائلة اللوزية). وجد هذا النوع متجولا على السطح السفلى للأوراق بدون ظهور أي أعراض أو خسائر. تم إعداد مفتاح تقسيمي للأنواع التابعة لجنس *Epitrimerus* في مصر. بالإضافة إلى قائمة بأنواع الحلم الدودي المسجلة على اللانتانا.

كلمات مفتاحية: اللانتانا، نوع جديد، حلم دودي، قائمة مرجعية، مصر