

A new species, first record and synonymy of eriophyid mites (Acari, Prostigmata) from Egyptian weeds

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ABSTRACT

Eriophyoids have a significant economic impact as weed pests, particularly when it comes to the malformations they can occasionally cause, such as rusting, bronzing, leaf rolling, erineum, bud galls, stunting, blisters, leaf galls, damaged seeds, and mosaic virus disease. Six eriophyoid mite species collected from Egyptian weeds are described. *Aceria newplucheae* **sp. nov.** is described as a vagrant on the leaf axil of *Pluchea dioscoridis* (L.) DC. (Compositae). A complementary description to the first-recorded species, *Aceria chenopodia* Xue, Sadeghi & Hong infesting *Chenopodium album* L. and *Chenopodium murale* L. (Amaranthaceae) in Egypt was done based on females, males and immature stages. Three eriophyoid mite species have been synonymized: *Aceria noxia* Flechtmann & Tassi is a junior synonym of *Aceria lividus* Elhalawany; *Aceria mosalahi* Lewandowski & Elsayed is a junior synonym of *Aceria dioscoridis* (Soliman & Abou-Awad); and *Aceria aegyptiacus* (Soliman & Abou-Awad) is a junior synonym of *Aceria tosichella* Keifer. Furthermore, *Vittacus plucheae* Abou-Awad & Nasr, a vagrant causing rusting on *P. dioscoridis*, is designated as a junior synonym of *Neooxyencus plucheae* Abou-Awad and re-described herein.

Keywords: Systematics, biological control, *Aceria*, *Neooxyencus*, *Pluchea dioscoridis*, Amaranthaceae, Poaceae.

INTRODUCTION

Eriophyoidea are an economically significant group due to the direct harm they can inflict on their hosts, their ability to spread dangerous plant diseases, and the potential for using them as biological weed control agents (Lindquist et al. 1996). Almost 80% of reports are about a single host species, 95% are about a single host genus, and 99% are about a single host family (Skoracka et al. 2010).

The weed *Pluchea dioscoridis* (L.) DC. (Compositae = Asteraceae) is a significant wild evergreen shrub. The plant can be found growing near water canals, roads, and marshes. It is most common in the Nile region, the Western Desert Oases, the Mediterranean coastal strip, the Eastern Desert, and Sinai Peninsula, Egypt (Boulos 2002). The genus *Amaranthus* is found all over the world, with approximately 65 species in tropical, subtropical, and warm climates (Boulos 1999). This weed is a major threat to a variety of agricultural crops in addition to vegetables and orchards. It is an annual spread made up of long-lived seeds that are mostly

propagated by wind and water, but also by machines (Zaki 2000).

Keifer (1969a) established the genus *Vittacus* based on the species *Vittacus mansonii*. This genus is distinguished by its fusiform body, gnathosoma that projects downward; flat dorsal opisthosoma, and semiannuli that appear as transverse thickened bands, forming a slight furrow, especially caudally; each band forms subdorsal ridges laterally. There are currently nine species of *Vittacus* known worldwide, only two species of which have previously been recorded from Egypt, *Vittacus plucheae* Abou-Awad & Nasr, 1986 on *P. dioscoridis* and *Vittacus bougainvilleae* (Keifer, 1959) on *Bougainvillea glabra* Choisy (Nyctaginaceae) (Guo et al. 2015; Elhalawany 2018).

Abou-Awad (1981) established the genus *Neooxyencus* based on *Neooxyencus plucheae* on *P. dioscoridis* and described it as having a fusiform, flattened body divided into broad dorsal semiannuli and narrow microtuberculate ventral semiannuli. The prodorsal shield is rounded and broader, with a prominent anterior lobe; the posterior portion is narrow and appears as a projection covering the anterior 2–3 dorsal

semiannuli; scapular tubercles are widely separated and located near posterolateral margins of the shield; subdorsal ridges bordering the furrow are somewhat prominent. So far, three *Neooxyceus* species are known worldwide, with only one species, *N. plucheae* previously recorded from Egypt.

In addition, approximately 30 eriophyoid species have been recorded on amaranthaceous plants; 21 of which are from the genus *Aceria*, with only one, *Aceria lividus* Elhalawany, 2018, being recorded on *Amaranthus lividus* L. (Elhalawany 2018; Lewandowski et al. 2021, Ripka and Takacs 2021; Amrine and de Lillo personal communication 2022).

More than 1,044 species have been assigned to the genus *Aceria* Keifer, 1944 with approximately 51 of them being found in Egypt to date. With this study, Egyptian eriophyoid fauna increased to 121 species from 37 genera (Zaher 1984; Elhalawany 2012, 2015, 2018; Elhalawany and Ueckermann 2015, 2018, 2022; Elhalawany et al. 2014, 2018, 2019a, b, 2020, 2021, 2022; Halawa 2015).

Thus, the aim of this work is to describe a new eriophyid species, *Aceria newplucheae* sp. nov. on *P. dioscoridis*, as well as to complete the descriptions of the female, male and immature stages of a new record, *Aceria chenopodia*. Moreover, four eriophyoid mite species have been synonymized based on new samples collected in Egypt.

MATERIALS AND METHODS

Live eriophyoid mites were collected from plant samples in four governorates: Qalyubia, Gharbia, Fayoum and Giza, Egypt. Specimens were cleared in Keifer's solution for two hr at 40°C and mounted on glass microscope slides in Keifer's F-medium (Amrine and Manson 1996). Mounted specimens were examined using a phase contrast (Carl Zeiss Nr, Germany) research microscope. According to de Lillo et al. (2010), line drawings were created by hand using a drawing tube attached to the phase contrast microscope. Generic classification is based on Amrine et al. (2003), and descriptions of all genera published after 2003. Morphological terminology mostly followed Lindquist (1996). All measurements are in micrometers (µm), and are taken with the software computer program (compuEye) (Bakr 2005). The range of the specimens (i.e., holotype and paratypes) is listed

in parentheses after the measurements of the female holotype. Only the measurement ranges for males and immature stages are provided.

The type materials of the new species have been deposited at the mite reference collection of Fruit Tree Mites Department, Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza governorate, Egypt (PPRI-ARC). Furthermore, some paratypes have been deposited at the mite reference collection of the Egyptian Society of Acarology Museum (ESAM), Zoology and Agricultural Nematology Department, the Faculty of Agriculture, Cairo University, Giza governorate, Egypt; the Arthropod/Mite Collection of the Department of Entomology, Nanjing Agricultural University, Jiangsu Province (NJAU), China; and the mite collection of Department of Plant, Soil and Food Sciences (Di.S.S.P.A.), University of Bari Aldo Moro, Italy (UNIBA, formerly indicated as UBI by Zhang 2018).

The following abbreviations were used according to Amrine et al. (2003): AD. Antero-dorsal view of mite; CGF. Coxi-genital region of female; D. Dorsal view of mite; DN. Dorsal view of nymph; em. Empodium; GM. Genital region of male; IG. Internal female genitalia; LO. Lateral view of semiannuli; L1. Leg I; L2. Leg II; LM. Lateral view of mite; VN. Ventral view of nymph.

RESULTS AND DISCUSSION

Eriophyidae Nalepa, 1898

Subfamily Eriophyinae Nalepa, 1898

Tribe Aceriini Amrine & Stasny, 1994

Genus *Aceria* Keifer, 1944

Aceria newplucheae sp. nov.

(Figures 1–3, Table 1).

Description

Female (n=16) body vermiform, 230 (170–238) long including gnathosoma, 45 (45–47) wide, 47 (40–54) thick; whitish in life. **Gnathosoma** 20 (18–20) long, projecting obliquely downwards, basal seta *ep* 2, antapical seta *d* 4 (3–4), cheliceral stylets 16 (15–16) long. **Prodorsal shield** 24 (21–25) long with short frontal lobe acuminate 3 (3–4), 30 (25–30) wide; subtriangular; prodorsal shield ornamentation generally faint, with dart-shaped mark of the faint median line and short admedians on posterior ¼ of prodorsal shield and transverse lines extending laterally curved ahead of scapular tubercles, also admedians connected to two cells lateral on each

side of prodorsal shield, sub-median line absent. Scapular tubercles on rear shield margin, 17 (16–19) apart, setae *sc* 19 (19–22), projecting posteriorly. **Coxigenital area** smooth, with three semiannuli between coxae and genitalia, prosternal apodeme present 4 (4–5); anterolateral setae on coxisternum I *lb* 7 (7–8), 9 (9–10) apart; proximal setae on coxisternum I *la* 19 (14–19), 11 (10–11) apart; proximal setae on coxisternum II *2a* 27 (21–28), 21 (20–22) apart. **Leg I** 25 (25–27), femur 7 (7–8), basiventral femoral seta *bv* 9 (9–10); genu 4 (3–4), antaxial genul seta *l''* 21 (20–23); tibia 3 (3–4), paraxial tibial seta *l'* 4 (3–4), setae located $\frac{1}{2}$ from dorsal base; tarsus 6 (6–7); tarsal empodium simple *em* 5 (5–6), 4-rayed, tarsal solenidion ω slightly tapered, 8 (7–9), paraxial fastigial tarsal seta *ft'* 15 (14–16), antaxial fastigial tarsal seta *ft''* 18 (18–20), tarsal setae *u'* 1–2. **Leg II** 24 (23–25), femur 8 (8–9), seta *bv* 10 (9–11); genu 3, seta *l''* 9 (8–10); tibia 3 (3–4); tarsus 6 (5–6); tarsal *em* simple 4 (4–5), 4-rayed, ω slightly tapered 8 (7–9), seta *ft'* 8 (7–9), seta *ft''* 22 (20–22), tarsal seta *u'* 1–2. **Opisthosoma** with 52 (50–56) dorso-ventral semiannuli, subequal; dorsal semiannuli with oval-elongate microtubercles on rear annular margins, 8–14 caudal dorsal semiannuli without microtubercles; ventrally with oval microtubercles on rear annular margins, the last 5th ventral microtubercles linear. Lateral setae *c2* 17 (15–20), 43 (43–44) apart, on annulus 7 (7–8) from coxae II; ventral setae, *d* 38 (35–48), 30 (28–31) apart, on annulus 19 (19–21); ventral setae, *e* 10 (8–10), 27 (25–27) apart, on annulus 30 (30–32); ventral setae, III *f* 22 (20–26), 19 (18–20) apart, on 5th annulus from rear. Setae *hl* 4 (4–5); setae *h2* 55 (52–60). **External genitalia** 12 (12–13), 20 (18–21) wide, coverflap with ten longitudinal ridges in a single row, proximal setae on coxisternum III *3a*, 10 (8–10), 18 (17–19) apart.

Male (n=4). Similar to female. Body vermiform, 130–188 long including gnathosoma, 30–41 wide and 38–40 thick; whitish in life. **Gnathosoma** 18–19, cheliceral stylets 14–15 long, setae *ep* 2–3, setae *d* 3–4. **Prodorsal shield** pattern similar to that of female, 21–22 long including frontal lobe, 25–27 wide; Scapular tubercles near the rear shield margin, 18–19 apart, setae *sc* 14–15, projecting diagonal posteriorly. **Coxigenital area** smooth, prosternal apodeme present 4–5; setae *lb* 5–6, 9–10 apart; setae *la* 13–19, 10–11 apart; setae *2a* 20–22, 20–22 apart. **Leg I** 22–23, femur

8–9, seta *bv* 6–8; genu 3–4, seta *l''* 17–20; tibia 3–4, seta *l'* 2–3; tarsus 5–6; empodium simple *em* 4–5, 4-rayed, tarsal solenidion ω 6–7 slight tapered, setae *ft'* 13–15, setae *ft''* 17–20, setae *u'* 1–2. **Leg II** 20–21, femur 5–6, seta *bv* 6–8; genu 3–4, seta *l''* 6–8; tibia 3; tarsus 4–5; *em* 4–5, 4-rayed, ω 7–8 tapered, seta *ft'* 5–7, seta *ft''* 15–16, seta *u'* 1–2. **Opisthosoma** with 45–46 dorsal semiannuli and 50–53 ventral semiannuli, microtubercles shape similar to that of female. Lateral setae *c2* 14–16, 37–39 apart, on annulus 8 from coxae II; ventral setae *d* 26–28, 28–30 apart, on annulus 18–19; setae *e* 8–9, 25–26 apart, on annulus 27–28; setae *f* 17–18, 18–19 apart, on 5th annulus from rear. Setae *hl* 4–6; setae *h2* 40–46. **External genitalia** 12–13 long, 16–18 wide, surface below eugenital setae with granules, setae *3a* 5–6, 14–15 apart.

Nymph (n=3). Body vermiform, 145–160 long including gnathosoma, 30–41 wide and 38–40 thick. **Gnathosoma** 14–15, cheliceral stylets 12–13 long, seta *ep* 1–2, seta *d* 3–4. **Prodorsal shield** subtriangular, smooth, 21–22 long, 25–27 wide; scapular tubercles on rear shield margin, 18–19 apart, setae *sc* 14–15, directed to the rear. **Coxigenital area** smooth; seta *lb* 4–5, 8–9 apart; seta *la* 11–13, 8–9 apart; seta *2a* 15–16, 16–17 apart; seta *3a* 6–7, 5–6 apart. **Leg I** 16–17, femur 4–5, seta *bv* 4–5; genu 2–3, seta *l''* 11–12; tibia 2–3, seta *l'* 2; tarsus 3; empodium simple *em* 4, 3-rayed, tarsal solenidion ω 5 tapered, seta *ft'* 9–10, seta *ft''* 11–12, seta *u'* 1–2. **Leg II** 15–16, femur 3–4, seta *bv* 4–5; genu 2–3, seta *l''* 7–9; tibia 2–3; tarsus 3–4; *em* 3–4, 3-rayed, ω 4–5 tapered, seta *ft'* 7–8, seta *ft''* 12–13, seta *u'* 1–2. **Opisthosoma** with 50–52 dorsal semiannuli and 44–46 ventral semiannuli, with linear elongate microtubercles situated on rear margin of dorsal semiannuli, pointed on ventral semiannuli, linear elongated on last four ventral semiannuli. Lateral setae *c2* 8–9, 35–37 apart, on annulus 8 from coxae II; ventral setae *d* 16–20, 33–34 apart, on annulus 17–18; setae *e* 5–6, 14–15 apart, on annulus 25–26; setae *f* 10–12, 18–19 apart, on 4th annulus from rear. Setae *hl* 1–2; setae *h2* 15–20.

Larva (n=3). Body vermiform, 130–145 long including gnathosoma and 38–40 wide. **Gnathosoma** 13–14, cheliceral stylets 11–12 long, seta *ep* 1–2, seta *d* 3–4. **Prodorsal shield** subtriangular, smooth, 16–17 long, 25–26 wide. Tubercles *sc* on rear shield margin, 14–15 apart, setae *sc* 9–10, directed to the rear.

Table 1. Differences between *Aceria* species associated with *Pluchea dioscoridis* in Egypt

Characters	<i>Aceria alfierii</i> (Dębski, 1919) †	<i>Aceria dioscoridis</i> ‡	<i>Aceria dioscoridis</i> §	<i>A. dioscoridis</i> Current study	<i>Aceria newpluchaeae</i> sp. nov.
Body length	180	217.5–232.5	214 (166–250)	215(180–243)	230 (170–238)
Body width	41	41.3–45	46 (37–51)	52(47–60)	45 (45–47)
body Thickness	–	–	46 (37–51)	48 (36–50)	47 (40–54)
Gnathosoma Length	–	19	15 (15–18)	18 (16–20)	20 (18–20)
Cheliceral stylets Length	–	–	11 (10–14)	12 (12–16)	16 (15–16)
Prodorsal shield Length	–	–	20 (20–25)	26 (24–30)	24 (21–25)
Prodorsal shield width	–	–	32 (30–36)	34 (32–39)	30 (25–30)
Seta <i>sc</i> length	15.6	19	19 (18–22),	19 (17–21)	19 (19–22)
Seta <i>sc</i> apart	–	12.5	12 (10–14)	20 (18–22)	17 (16–19)
Leg I length	37.4+ <i>em</i>	22.5	24 (19–24)	26 (22–30)	25 (25–27)
Leg II length	36.9 + <i>em</i>	21	19 (17–21)	24 (20–28)	24 (23–25)
Number of Empodial rays	4	4	4	4	4
Tarsal solenidion ω	tapered	Tapered	Tapered	Tapered	Tapered
Setae <i>lb</i> length	6.5	–	10 (9–12)	8 (8–9)	7 (7–8)
Tubercles <i>lb</i> apart	–	–	6 (5–7)	9 (6–9)	9 (9–10)
Setae <i>la</i> length	16.1	–	26 (20–30)	20 (18–22)	19 (14–19)
Tubercles <i>la</i> apart	–	–	5 (5–7)	9(9–11)	11 (10–11)
Setae <i>2a</i> length	26.9	35	35 (31–39)	30 (25–30)	27 (21–28)
Tubercles <i>2a</i> apart	–	–	16 (15–18)	24 (22–24)	21 (20–22)
Coxae I & II surface	smooth	Smooth	Smooth	Smooth	Smooth
Dorsal semiannuli number	60	66	59 (54–64)	55 (54–58)	51 (50–52)
Ventral semiannuli number	60	66	56 (52–58)	57 (55–60)	55 (52–56)
Dorsal semiannuli shape	elongate	large spine	sharp conical	large spine	oval-elongate
Ventral semiannuli shape	elongate	large spine	sharp conical	spine	Oval
Setae <i>c2</i> length	13.1	17	18 (17–23)	19 (17–21)	17 (15–20)
On annulus	–	10	7 (7–8)	8 (7–8)	7 (7–8)
Setae <i>d</i> length	28.7	39	46 (42–50)	34 (30–46)	38 (35–48)
On annulus	–	26	18 (18–20)	19 (18–20)	19 (19–21)
Setae <i>e</i> length	6	11	12 (10–16)	12 (11–16)	10 (8–10)
On annulus	–	38	33 (29–34)	33 (32–43)	30 (30–32)
Setae <i>f</i> length	15	20	20 (17–24)	20 (18–22)	22 (20–26)
On annulus	–	5 th	5 th	5 th	5 th
Setae <i>h1</i> length	3.6	3.75	5 (5–7)	5 (5–6)	4 (4–5)
Setae <i>h2</i> length	41.3	52	53 (50–70)	40 (38–50)	55 (52–60)
Female genitalia length	16.4	14	11 (9–12)	12 (12–14)	12 (12–13)
Female genitalia width	–	19	22	19 (19–24)	20 (18–21)
Ridges number	6	7	6 (5–9)	8 (8–10)	10
Setae <i>3a</i> length	10.1	11	15 (14–19)	12 (12–14)	10 (8–10)
Relation to host	gall	Gall	Gall	Gall	vagrant on the leaf axil

†After Sayed (1946), ‡ after Soliman and Abou-Awad (1977), § after Lewandowski et al. (2021)

Coxigenital area smooth; seta *lb* 3–4, 8–9 apart; seta *la* 9–10, 9–10 apart; seta *2a* 15–17, 17–18 apart; seta *3a* 3, 6–7 apart. **Leg I** 13–15, femur 3–4, seta *bv* 4–5; genu 2, seta *l''* 8–9; tibia 2, setae *l'* 1–2; tarsus 2–3; empodium *em* 3–4 simple, 3-rayed, tarsal solenidion ω 4–5 tapered, setae *ft'* 9–10, setae *ft''* 11–12, setae *u'* 1–2. **Leg II** 11–13, femur 3–4, seta *bv* 3–4; genu 2, seta *l''* 3–4; tibia 2–3; tarsus 2–3; *em* 3, 3-rayed, ω 4–5

tapered, seta *ft'* 5–7, seta *ft''* 9–11, seta *u'* 1–2. **Opisthosoma** with 45–47 dorsal semiannuli and 40–42 ventral semiannuli, with pointed microtubercles on semiannuli margin. Lateral setae *c2* 6–7, 30–32 apart, on annulus eight from coxae II; ventral setae *d* 11–12, 26–27 apart, on annulus 16–17; setae *e* 4–5, 13 apart, on annulus 25; setae *f* 10–12, 17 apart, on 4th annulus from rear. Setae *h1* 1–2; setae *h2* 14–15.

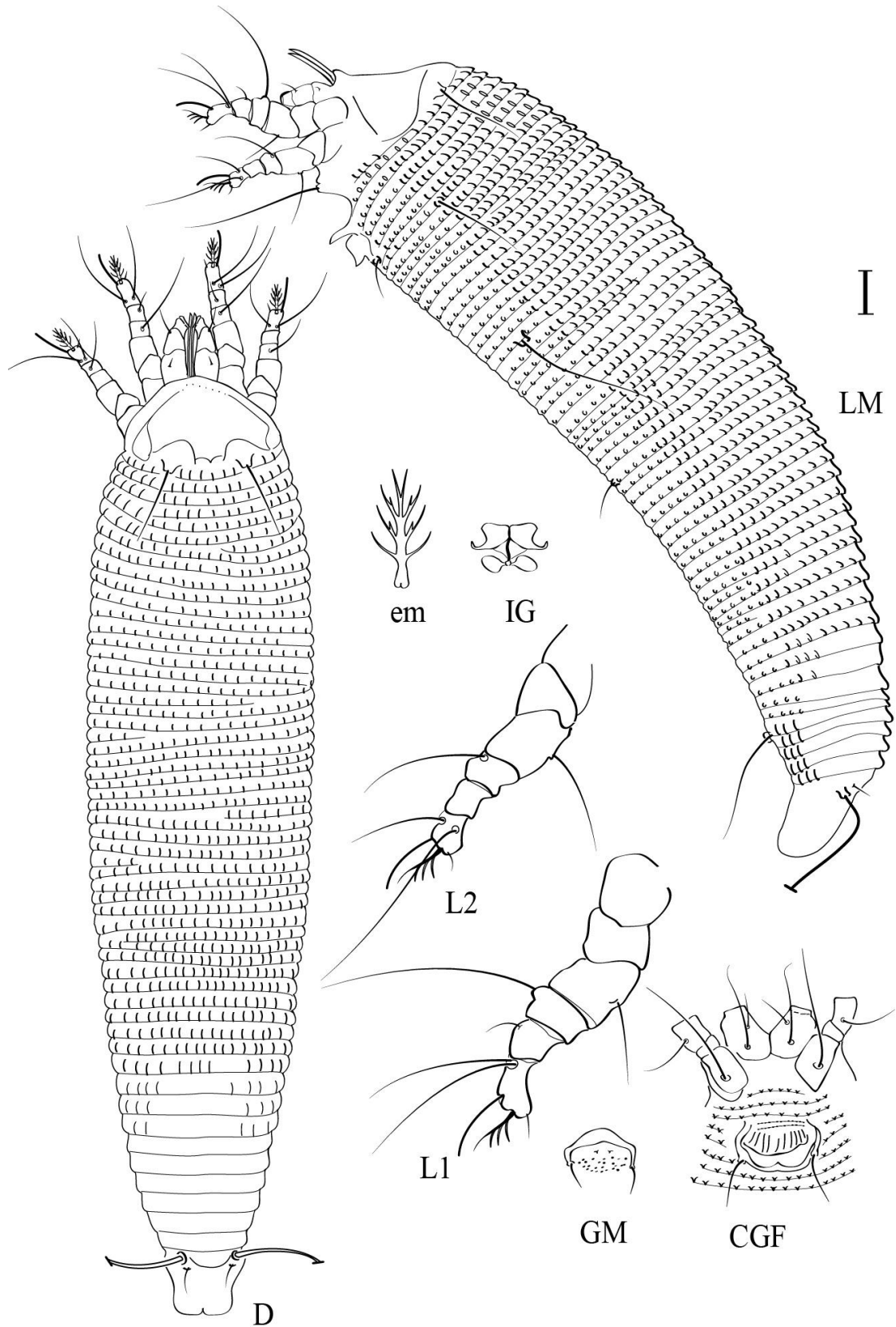


Figure 1. Line drawings of *Aceria newplucheae* sp. nov. Scale bar: 10 μ m for D, CGF, GM, IG; 10 μ m for L1, L2; 2.5 μ m for em.

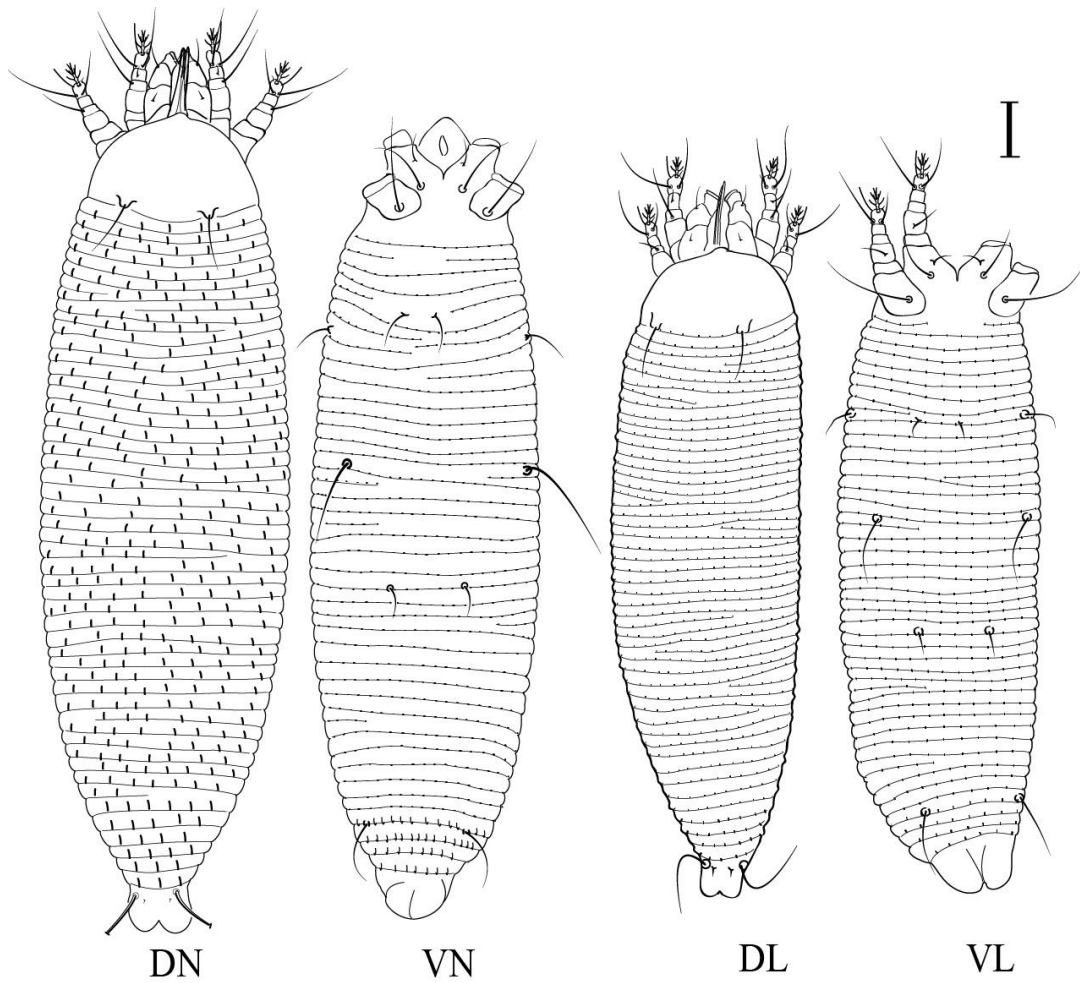


Figure 2. Line drawings of *Aceria newplucheae* sp. nov. Scale bar: 10 μ m for DN, VN, DL, VL.

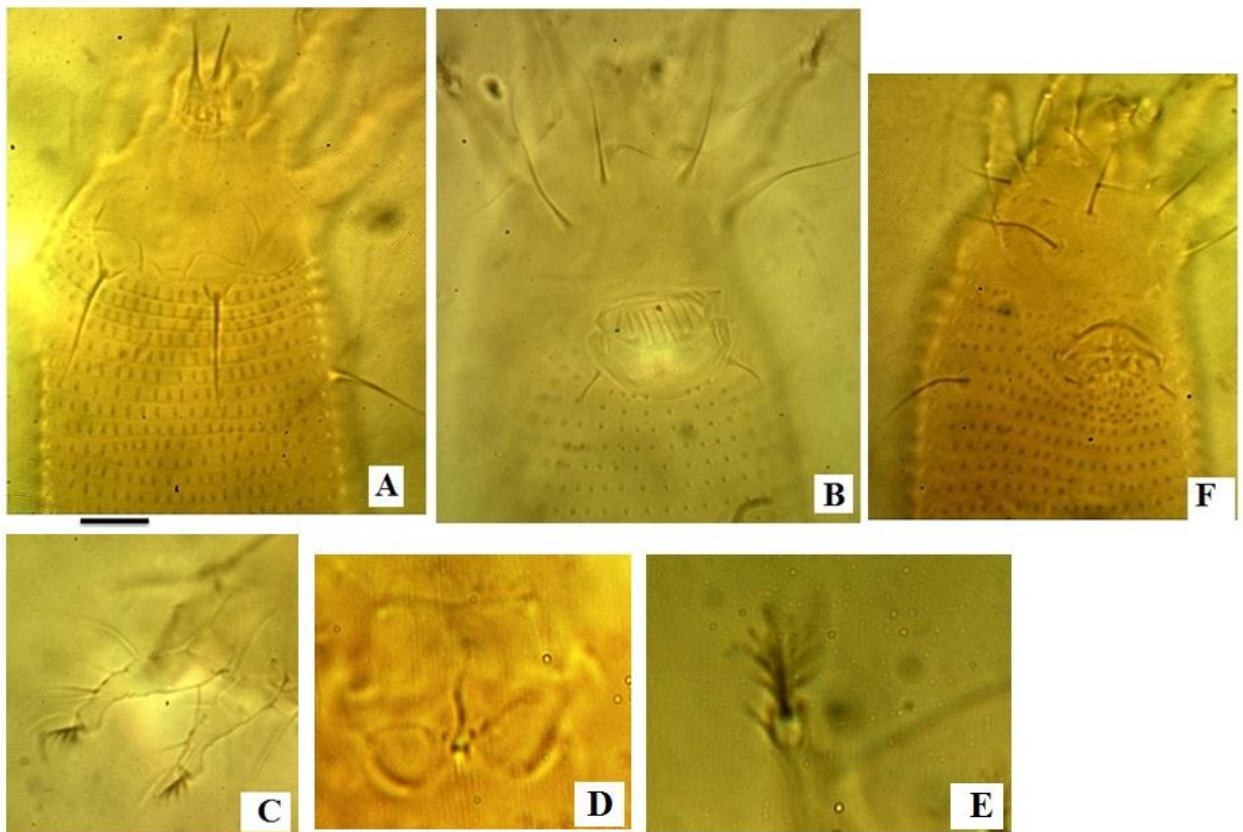


Figure 3. Phase microphotograph of *Aceria newplucheae* sp. nov.: A. Dorsal shield of female B. Coxi-genital region of female; C. Legs; D. Internal female genitalia; E. Empodium F. Coxi-genital region of male. Scale bar: 10 μ m for A, B, C, F, 20 μ m for D and E.

Host plant. *Pluchea dioscoridis* (L.) DC. (Compositae).

Relation to the host plant. Vagrant on the leaf axil, no damage was observed.

Type Locality. El-Sad village, Qalyubia governorate (30°15'50.46"N, 31°14'51.85"E), Egypt 30 September, 2020 and 20 September 2021. Giza governorate (30°1'8.21"N, 31°12'28.04"E), Egypt, 20 October, 2020. Kafr Ibri, Gharbia governorate (30°41'56.00"E, 31°10'49.07"N), Egypt, 10 November, 2022; coll. A.S. Elhalawany.

Type material. Holotype female on a slide (slide no. EGYErio118.1), deposited at (PPRI-ARC), Egypt. Paratypes: 20 females, five males, five nymphs and four larvae on nine slides (EGYErio118.2–118.10), deposited at (PPRI-ARC), Egypt. Four paratype females on two slides (EGYErio118.11–118.12), deposited at (ESAM), Egypt. Two paratype females on two slides (EgPID05-06), deposited at (UNIBA), Italy. Four paratype females on two slides (NJAUAcariE20.1-20.2), deposited at (NJAU) China.

Etymology. The species name "*newpluchae*", is a composition of *new*, and + *pluchae*, referring to the specific name of the host plant.

Differential diagnosis. The new species collected from leaf axil of *P. dioscoridis* in Egypt was compared with all *Aceria* species found on *Pluchea dioscoridis*, it is similar to *Aceria alfierii* (Dębski, 1919) and *Aceria dioscoridis* (Soliman & Abou-Awad, 1977) collected from galls on stem and leaves of *P. dioscoridis* from Egypt. The former species differs from the new species by having prodorsal shield smooth, with short curved line at rear third between tubercles (with dart-shaped mark of the faint median line, short admedians on posterior ¼ of prodorsal shield, and transverse lines extending laterally curved ahead of scapular tubercles in *A. newpluchae* sp. nov.); length of setae *sc* 15.6 (19–22 in *A. newpluchae* sp. nov.), setae *c2* 13.1 (15–20 in *A. newpluchae* sp. nov.), setae *d* 28.7 (35–48 in *A. newpluchae* sp. nov.), setae *e* 6 (8–10 in *A. newpluchae* sp. nov.); number of dorsal semiannuli 60 (50–52 in *A. newpluchae* sp. nov.); and number of ridges on genital coverflap six (ten in *A. newpluchae* sp. nov.); furthermore *A. alfierii* caused galls on the leaves, whereas *A. newpluchae* sp. nov. is a vagrant on the leaf axil without causing damage (Table 1). *Aceria dioscoridis* differs by having incomplete median line at middle third, faint; admedian lines

divergent to the rear, curved in the rear part, forming U-shape (with dart-shaped mark of the faint median line, short admedians on posterior ¼ of the prodorsal shield, and transverse lines extending laterally curved ahead of scapular tubercles; submedian lines I and II present only in the rear part of the shield parallel to admedian lines and curved inwards just before the rear edge of the shield in *A. newpluchae* sp. nov.); with large spine (conical) microtubercles (oval-elongate microtubercles in *A. newpluchae* sp. nov.) (Table 1).

***Aceria dioscoridis* (Soliman & Abou-Awad, 1977)**

Eriophyes dioscoridis Soliman & Abou-Awad, 1977: 673.

Eriophyes dioscoridis—Davis et al. 1982: 125.

Aceria dioscoridis.—Zaher et al. 1978: 42; Amrine and Stasny 1994: 42; Chandrapatya et al. 2016: 63; Chandrapatya et al. 2017: 11.

Aceria mosalahi Lewandowski & Elsayed in Lewandowski et al. 2021: 1401 (**new synonymy**).

(**Figures 4, 5, 6a, Table 1**)

Relation to the host plant. The mite was found in gall on the upper and lower surfaces of the leaves and stem (Figure 6a).

Type host. *Pluchea dioscoridis* (L.) DC. (Compositae).

Type locality. Egypt (Soliman and Abou-Awad 1977).

Distribution in Egypt. All over Egypt.

Geographic distribution. Egypt; Thailand (Chandrapatya et al. 2017).

Materials examined. Twenty females and five males on five slides (slides no. EGYErio82.1–82.5) from *P. dioscoridis*, El-Sad village, Qalyubia governorate (30°15'50.46"N, 31°14'51.85"E), Egypt, 30 September 2020 and 20 September 2021, deposited at (PPRI-ARC), Egypt. Eight females and two males on two slides (slides no. EGYErio82.6–82.7), Kafr Ibri, Gharbia governorate (30°41'56.00"E, 31°10'49.07"N), 10 November, 2021, 10 February 2022, deposited at (ESAM), Egypt. Five females on two slides (slides no. EGYErio82.8–82.9), Fayoum governorate (29°20'0.48"N, 31°42'18.23"E), 20 March, 2021, deposited at (PPRI-ARC), Egypt. Two slides (slides no. EgPID07-08), deposited at (UNIBA), Italy; coll. by A.S. Elhalawany.

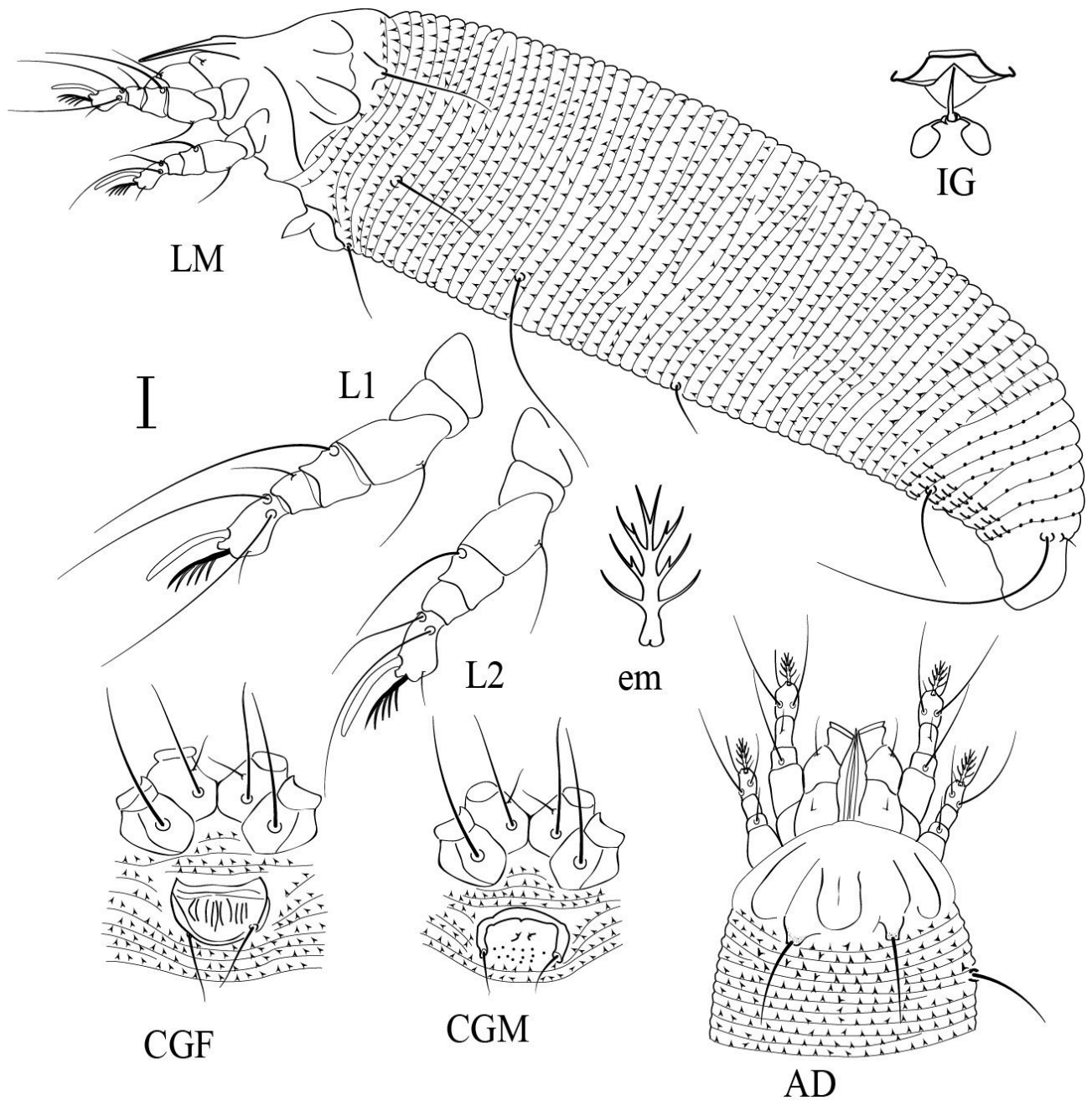


Figure 4. Line drawings of *Aceria dioscoridis* (Soliman & Abou-Awad, 1977): Scale bar: 10 μm for AD, CGF, CGM, IG; 5 μm for L1, L2; 2.5 μm for em.

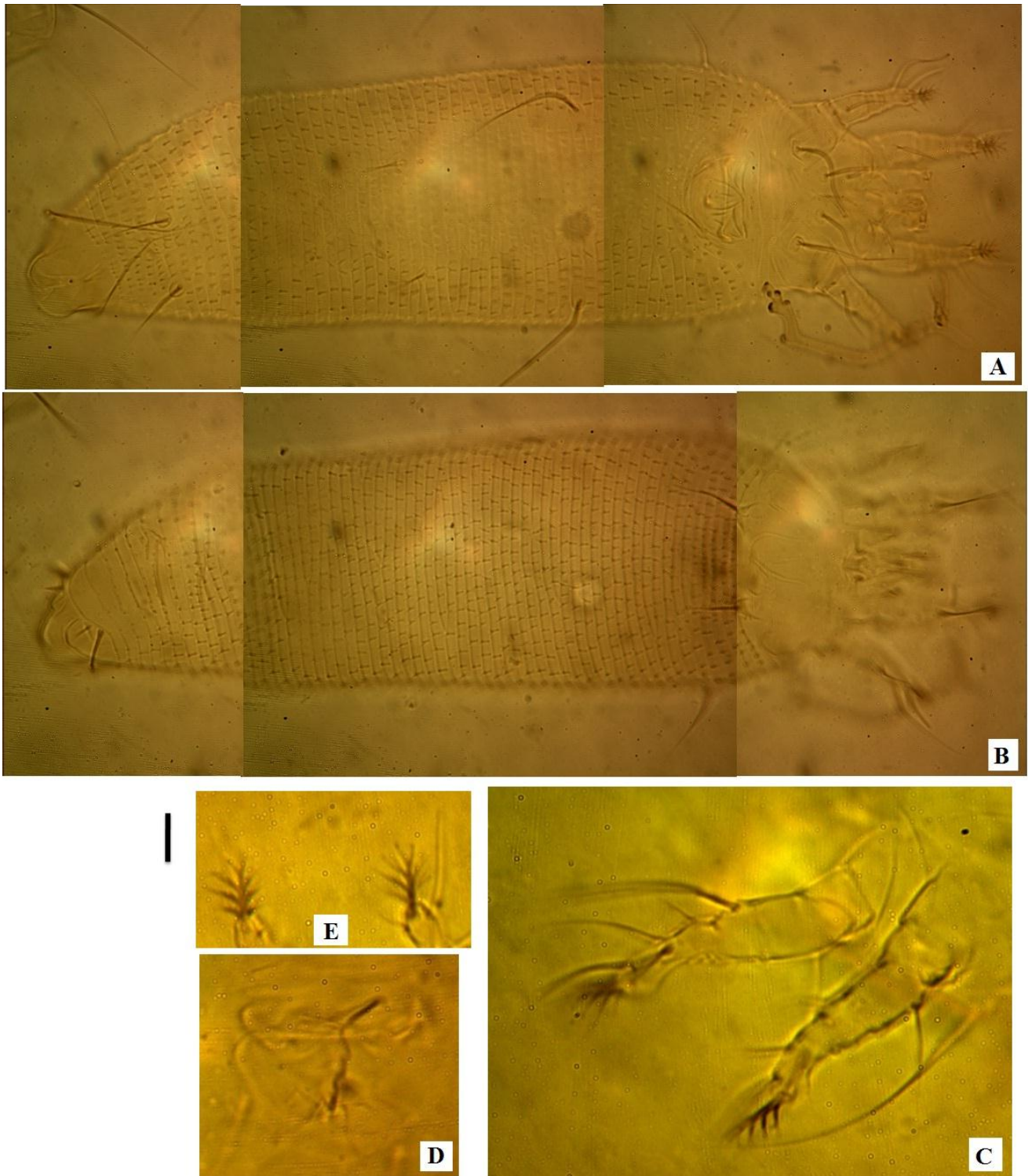


Figure 5. Phase microphotograph of *Aceria dioscoridis*: A. Ventral view of female B. Dorsal view of female; C. Legs; D. Internal genitalia; E. Empodium. Scale bar: 10 μm for A, B; 20 μm for C, D and E.

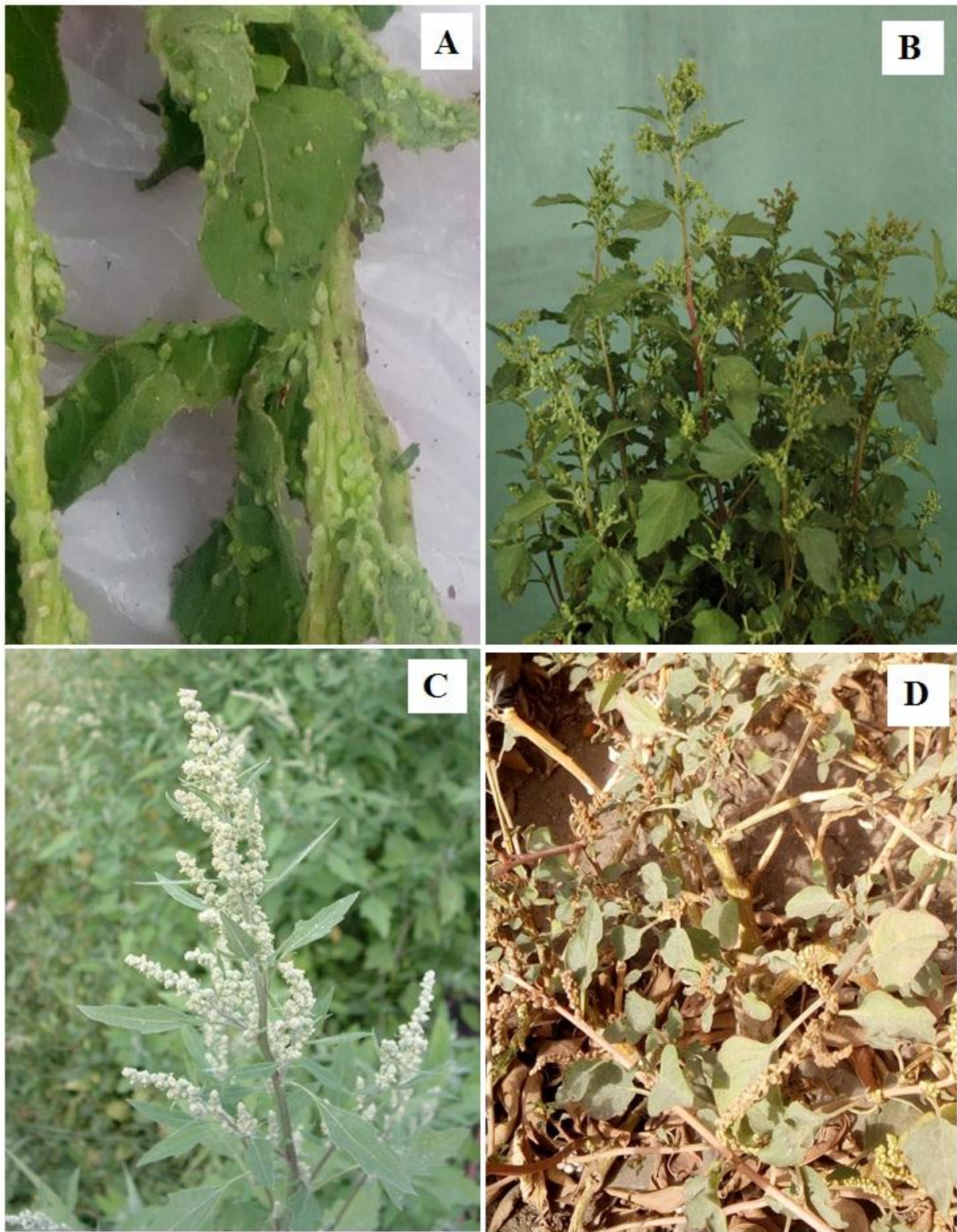


Figure 6. Galls induced by *Aceria dioscoridis* on leaves and stem of *Pluchea dioscoridis* (A); *Chenopodium murale* L. (B); *Chenopodium album* L. (C); *Amaranthus lividus* L. (D).

Remarks

Aceria dioscoridis was originally described by Soliman and Abou-Awad (1977) in Egypt based on adult female. Lewandowski et al. 2021 described female, male and immature stages of this mite species under the name *Aceria mosalahi* Lewandowski & Elsayed inducing galls on the leaves and stems of *Chenopodium murale* (L.) (= *Chenopodium murale* L.) (Amaranthaceae)

Figure 6b, but the host plant is incorrectly identified as shown in Lewandowski et al. 2021 (page 1400: Figure 1a). *Pluchea dioscoridis* is the correct host plant (Figure 6). The female morphometrics match the original description by Soliman and Abou-Awad (1977) (Table 1).

Aceria chenopodia Xue, Sadeghi & Hong, 2009: 461.

(Figures 7–8, Table 2)

Female (n=10) body vermiform, 250 (198–280) long including gnathosoma, 40 (37–49) wide, 45 (41–45) thick; light yellow in life. **Gnathosoma** 22 (20–24) long, projecting obliquely downwards, basal setae *ep* 3 (2–3), antapical setae *d* 7 (7–8), cheliceral stylets 20 (18–22) long. **Prodorsal shield** 30 (26–30) long with short frontal lobe acuminate, 35 (32–39) wide; sub-triangular; prodorsal shield ornamentation with median line complete, broken medially; admedian and first submedian lines complete, gently diverging to rear, and parallel, second submedian lines incomplete on posterior third of prodorsal shield ahead of scapular tubercles; lateral lines complete parallel to lateral shield; numerous granules in area between median and admedian lines, and lateral sides of prodorsal shield. Scapular tubercles on rear shield margin, 27 (26–29) apart, setae *sc* 48 (39–50), projecting posteriorly. **Coxigenital area** with minor granules, with 6 (6–7) semiannuli between coxae and genitalia, prosternal apodeme present 6 (5–7); setae *1b* 8 (7–9), 12 (11–12) apart; setae *1a* 21 (19–25), 9 (9–10) apart; setae *2a* 45 (31–46), 23 (22–24) apart. **Leg I** 35 (31–35), femur 10 (8–10), basiventral femoral seta *bv* 10 (10–12); genu 5 (5–6), antaxial genual seta *l''* 25 (22–26); tibia 7 (7–8), paraxial tibial seta *l'* 7 (6–8), seta located ¼ from dorsal base; tarsus 7 (6–8); empodium *em* simple 6 (6–7), 5-rayed, simple, tarsal ω slightly tapered, 8 (8–9), tarsal seta *ft'* 15 (14–17), tarsal seta *ft''* 22 (20–23), tarsal seta *u'* 5–6. **Leg II** 29 (29–30), femur 7 (7–8), seta *bv* 10 (8–10); genu 5 (4–5), seta *l''* 10 (9–10); tibia 5 (5–6); tarsus 7 (7–8); tarsal *em* simple 6 (6–7), 5-rayed, ω 8 (7–9) slightly tapered, seta *ft'* 9 (9–11), seta *ft''* 23 (22–26), tarsal seta *u'* 5–6. **Opisthosoma** dorsally with 67 (65–70) semiannuli, with elliptical microtubercles on rear annular margins, last 9–10 semiannuli with pointed microtubercles; ventrally with 65 (58–65) semiannuli, with elliptical to round microtubercles on rear annular margins, the last 9–10th ventral microtubercles linear. Lateral setae *c2* 50 (37–50), 39 (38–42) apart, on annulus 10 (9–10) from coxae II; ventral setae *d* 55 (40–55), 36 (35–38) apart, on annulus 23 (22–23); ventral setae *e* 40 (25–40), 21 (20–23) apart, on annulus 42 (41–43); ventral setae *f* 34 (25–complete, gently diverging to rear, and parallel, short line between admedian and submedian lines

36), 20 (20–21) apart, on 6th annulus from rear. Setae *h1* 7 (7–8), setae *h2* 57 (52–70). **External genitalia** 16 (14–18) long and 24 (23–25) wide, coverflap with ten longitudinal ridges in a single row plus three transverse lines at the base, proximal setae on coxisternum III *3a*, 40 (36–45), 19 (18–19) apart. **Internal genitalia** spermathecae ovoid, oriented posterolaterad; spermathecal tubes relatively short; transverse genital apodeme trapezoidal, distally folded.

Male (n=10). Similar to female. Body vermiform, 160–220 long including gnathosoma, 32–35 wide and 42–45 thick; light yellow in life. **Gnathosoma** 20–24, cheliceral stylets 18–20 long, setae *ep* 3–4, setae *d* 5–6. **Prodorsal shield** shape and patterns similar to those of female, 26–29 long including frontal lobe, 27–29 wide; scapular tubercles on the rear shield margin, 21–22 apart, setae *sc* 29–40, projecting diagonal posteriorly. **Coxigenital area** with minor granules, prosternal apodeme present 5–6; setae *1b* 7–8, 11–12 apart; setae *1a* 20–23, 8–10 apart; setae *2a* 28–32, 18–22 apart. **Leg I** 30–32, femur 9–10, seta *bv* 7–10; genu 5–6, seta *l''* 22–25; tibia 6–7, seta *l'* 6–7; tarsus 7–8; tarsal empodium *em* simple 6–7, 5-rayed, tarsal solenidia ω distally slight tapered 8–9, seta *ft'* 13–15, seta *ft''* 19–21, seta *u'* 3–4. **Leg II** 27–28, femur 8–9, setae *bv* 7–9; genu 4–5, setae *l''* 9–10; tibia 5–6; tarsus 5–6; tarsal empodium *em* simple 6–7, 5-rayed, tarsal solenidia ω distally slight tapered 8–10, setae *ft'* 9–10, setae *ft''* 20–22, setae *u'* 3–4. **Opisthosoma** dorsally with 65–70 semiannuli; ventrally with 60–62 semiannuli, microtubercles shape similar to those of female. Lateral setae *c2* 30–33, 30–33 apart, on annulus ten from coxae II; ventral setae *d* 44–60, 30–31 apart, on annulus 22–23; setae *e* 35–40, 22–23 apart, on annulus 38–39; setae *f* 22–35, 16–17 apart, on 6th annulus from rear. Setae *h2* 46–50; setae *h1* 5–6. **External genitalia** 13–15 long and 18–21 wide, with granules, setae *3a* 35–38, 18–19 apart.

Nymph (n=5). Body vermiform, 150–170 long and 36–40 wide. **Gnathosoma** 22–23, curved downward, setae *ep* 1–2, *d* 5–6; cheliceral stylets 15–17 long. **Prodorsal shield** sub-circular, 26–27, including frontal lobe 2–3 over the gnathosomal base 30–35 wide, prodorsal shield ornamentation with median line complete, broken at middle; admedian and submedian lines at base of prodorsal shield, lateral line incomplete, on posterior third of prodorsal shield;

numerous granules in area between median and admedian lines, and lateral sides of prodorsal shield. Tubercles *sc* on rear shield margin, 21–22 apart; *sc* 29–40. **Coxisternal plates** smooth, *Ib* 4–5, 8–9 apart; *Ia* 12–13, 6–7 apart; *2a* 19–22, 18–19 apart; *3a* 6–7, 5–6 apart. **Leg I** 19–22; femur 4–5, *bv* 6–7; genu 3–4, *l''* 13–15; tibia 3–4, *l'* 4–5; tarsus 4–5, *ft'* 13–15, *ft''* 18–20, setae *u'* 2–3; tarsal *ω* 5–6; *em* 4–5, simple, 5-rayed. **Leg II** 16–18; femur 4–5, *bv* 7–8; genu 3–4, *l''* 6–8; tibia 3–4; tarsus 4–5, *ft'* 7–9, *ft''* 18–20, setae *u'* 2–3; *ω* 5–6; *em* 4–5, simple, 5-rayed. **Opisthosoma** with

50–54 dorsal semiannuli, with elliptical microtubercles situated on rear margin of each annulus, 48–53 ventral semiannuli with minute round microtubercles, situated on rear margin of each annulus; elongated on the posterior semiannuli. Setae *c2* 27–30, 35–37 apart, on ten ventral annuli; setae *d* 31–43, 21–22 apart, on 19–20 ventral annuli; setae *e* 24–26, 14–15 apart, on 28–29 ventral semiannuli; setae *f* 20–22, 15–16 apart, on 5th annulus from rear. Setae *h1* 2–3; *h2* 40–58.

Table 2. Measurements of females and males of *Aceria chenopodia* associated with *C. album* and *C. murale* in Egypt and Iran, the measurement precedes the mite corresponding range for paratypes (given in parentheses).

Characters	From Iran		From Egypt		
	Females n= 8	Females n= 10	Males n= 5	Nymphs n= 5	Larvae n= 3
Body length	255 (255–262)	250 (198–280)	160–220	150–170	110–130
Body width	53 (52–56)	40 (37–49)	32–35	36–40	27–30
Gnathosoma length	20 (20–23)	22 (20–24)	20–24	22–23	13–14
Cheliceral stylets length	17 (16–17)	20 (18–22)	18–20	15–17	12–13
Prodorsal shield length	28 (28–30)	30 (26–30)	26–29	26–27	20–21
Prodorsal shield width	42 (40–43)	35 (32–39)	27–29	30–35	24–25
Seta <i>sc</i> length	58 (56–63)	48 (39–50)	29–40	35–37	12–14
Distance between <i>sc</i>	22 (22–23)	27 (26–29)	21–22	18–19	11–12
Leg I length	40 (38–41)	35 (31–35)	30–32	19–22	19–20
Leg II length	36 (35–38)	29 (29–30)	27–28	16–18	15–17
Number of empodial rays	6	5	5	5	4
Seta <i>Ib</i> length	12 (12–13)	8 (7–9)	7–8	4–5	4–5
Distance between <i>Ib</i>	12 (12–13)	12 (11–12)	11–12	8–9	6–7
Seta <i>Ia</i> length	31 (31–35)	21 (19–25)	20–23	12–13	12–13
Distance between <i>Ia</i>	10 (9–10)	9 (9–10)	8–10	6–7	4–5
Seta <i>2a</i> length	45 (43–48)	45 (31–46)	28–32	19–22	16–18
Distance between <i>2a</i>	23 (23–24)	23 (22–24)	18–22	18–20	13–14
Seta <i>3a</i> length	33 (33–34)	40 (36–45)	35–38	6–7	3–4
Dorsal semiannuli number	65 (60–66)	67 (65–70)	65–70	50–54	49–52
Ventral semiannuli number	62 (58–64)	65 (58–65)	60–62	48–53	38–40
Seta <i>c2</i> length	50 (50–53)	50 (37–50)	30–33	27–30	19–25
Seta <i>c2</i> on semiannuli	10 (10–11)	10 (9–10)	10	10	9–10
Seta <i>d</i> length	53 (46–53)	55 (40–55)	44–60	31–43	17–20
Seta <i>d</i> on semiannuli	22 (21–22)	23 (22–23)	22–23	19–20	17–18
Seta <i>e</i> length	52 (52–56)	40 (25–40)	35–40	24–26	9–12
Seta <i>e</i> on semiannuli	39 (39–39)	42 (41–42)	38–39	28–29	25–26
Seta <i>f</i> length	33 (31–33)	34 (25–36)	22–35	20–22	13–15
Seta <i>f</i> on semiannuli	6 th	6 th	6 th	5 th	4 th
Seta <i>h1</i> length	7 (7–8)	7 (7–8)	5–6	2–3	2–3
Seta <i>h2</i> length	83 (80–89)	60 (52–70)	46–50	40–58	30–33
Genital coverflap length	14 (13–15)	16 (14–18)	13–15	–	–
Genital coverflap width	24 (21–25)	24 (23–25)	18–21	–	–
Longitudinal ridges	8	10	–	–	–

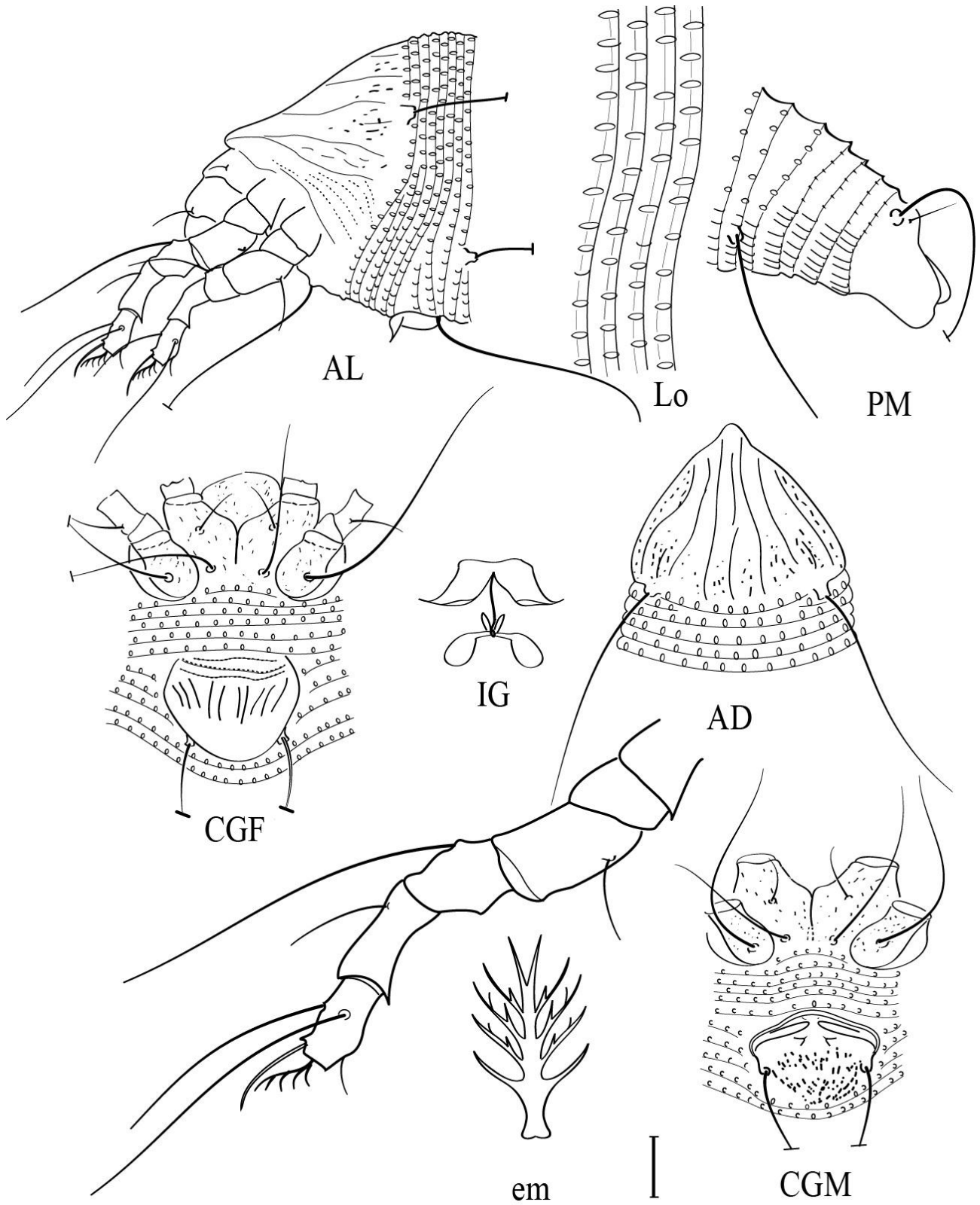


Figure 7. Line drawings of *Aceria chenopodia* Xue, Sadeghi & Hong, 2009: Scale bar: 10 μ m for AD, AL, CGF, CGM, IG, PM; 5 μ m for L1, LO, L2; 2.5 μ m for em.

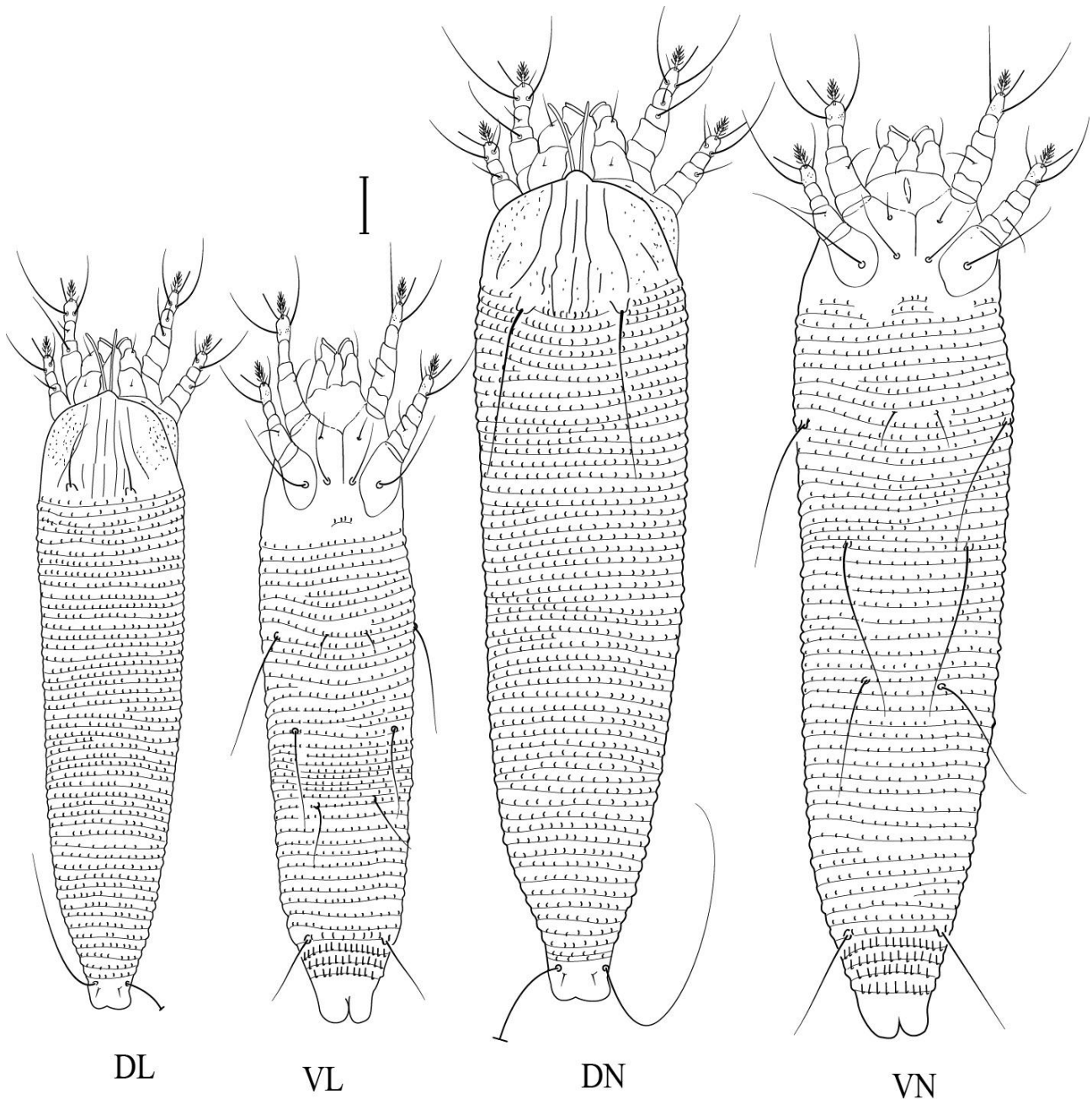


Figure 8. Line drawings of *Aceria chenopodia* Xue, Sadeghi & Hong, 2009: Scale bar: 10 μ m for DN, VN, DL, VL.

Larva (n=3). Body vermiform, 110–130 long and 27–30 wide. **Gnathosoma** 13–14 curved downward, setae *ep* 1–2, *d* 3–4, cheliceral stylets 12–13 long. Prodorsal shield sub-circular, 20–21 long and 24–25 wide; with incomplete median line broken at middle, first sub-median short at base $\frac{1}{4}$ between scapular tubercles, second sub-median lines complete sub-parallel to admedian lines; granules present on lateral sides of prodorsal shield. Tubercles *sc* near the rear shield margin, 11–12 apart; setae *sc* 12–14 directed anteriorly. **Coxisternal plates** smooth, setae *1b* 4–5, 6–7 apart; *1a* 12–13, 4–5 apart; *2a* 16–18, 13–14 apart. Setae *3a* 3–4, 6–7 apart. **Leg I** 19–

20; femur 4–5, *bv* 4–5; genu 3–4, *l''* 8–9; tibia 3–4, setae *l'* 5–6; tarsus 3–4, *ft'* 9–10, *ft''* 13–15; *ω* 5–6; *em* 4–5, simple, 4-rayed. **Leg II** 15–17; femur 4–5, *bv* 5–6; genu 2–3, *l''* 5–7; tibia 2–3; tarsus 3–4, *ft'* 6–8, *ft''* 13–15; *ω* 5–6; *em* 4–5, 4-rayed. **Opisthosoma** dorsally with 49–52 semiannuli, ventrally with 38–40 semiannuli, with minute round microtubercles situated on rear margin of each annulus. Setae *c2* 19–25, 24–25 apart, on 9–10 ventral semiannuli; setae *d* 17–20, 17–18 apart, on 17–18 ventral semiannuli; setae *e* 9–12, 10–11 apart, on 25–26 ventral semiannuli; setae *f* 13–14, 13–14 apart, on 4th annulus from rear; *h1* 2–3; *h2* 30–33.

Host plants in Egypt. *Chenopodium album* L. (Figure 6c) and *Chenopodium murale* L. (Figure 6b). (Amaranthaceae).

Distribution. Iran and Egypt.

Relation to the host plant. Vagrant on buds and flowers, no damage symptom to the host was observed.

Type Locality. Razavi Khorasan Province, Iran.

Material examined. Single female on a slide (slide no. EGYErio122.1), from *C. album*, Toukh distinct, Qalyubia governorate (30°17'20.02"N; 31°14'51.85"E), Egypt, 30 October, 2020, deposited at (PPRI-ARC), Egypt. Twenty females, five males, six nymph and four larvae on five slides (slide no. EGYErio122.2-122.6), from *C. murale*, deposited at (PPRI-ARC), Egypt. Four females and two males on two slides from *C. murale*, with the same previous data, deposited at (ESAM), Egypt; coll. A.S. Elhalawany.

Remarks.

This is the first record of *A. chenopodia* females and males in Egypt. Xue et al. (2009) described this species based on adult female from Iran. Except for the lengths of the following characters, the morphometry of the female resembles the original description: gnathosoma, body width, prodorsal shield width, cheliceral stylets length, lengths of setae *c2* and legs, and number of ridges on genital coverflap. Setae *sc*, *1b*, *1a*, *e*, and *h2* are slightly longer in Iranian specimens than Egyptian specimens; genital coverflap with ten longitudinal striae in Egyptian specimens (eight in Iranian specimens); and tarsal empodium in Iranian specimens is 6-rayed (5-rayed in Egyptian specimens) (Table 2).

***Aceria lividus* Elhalawany, in Elhalawany et al., 2018 (Figures 6d, 9, Table 3)**

Aceria lividus Elhalawany, in Elhalawany et al., 2018: 18.

Aceria noxia Flechtmann & Tassi, 2020: 312, figures 1–6 (**new synonym**).

Type data. *Amaranthus lividus* L. (Amaranthaceae).

Geographic distribution. Egypt, Brazil.

Host plant in Egypt. *Amaranthus lividus* L. and *A. viridis* L. (Amaranthaceae).

Relation to host. Vagrant on buds and flowers causes stunted, deformed flowers (Figure 6d).

Remarks. Elhalawany et al. (2018) reported this species from Egypt. Following the description of *Aceria noxia* Flechtmann & Tassi, 2020, the author of the current study contacted Prof. Carlos Flechtmann to inquire whether he was aware of the

description of *Aceria lividus* on *Amaranthus lividus* in Egypt (Elhalawany et al. 2018). The Egyptian specimens slightly differ from the Brazilian specimens by small differences in the length of setae *sc* and *c2* (Table 3).

Material examined. Forty females, ten males, six nymphs, and five larvae paratypes on 20 slides (slide no. EGYErio62.1–62.20), Qalyubia governorate (30°15'50.46"N, 31°14'51.85"E), Egypt, 15 October, 2015 and 2021, deposited at (PPRI, ARC), Egypt. Ten females and two males on two slides (slides no. EGYErio62.21–62.22), with the same previous data, deposited at (ESAM), Egypt. Two slides (slides no. EgAV01-02), deposited at (UNIBA), Italy. Two slides (slides no. NJAUAcariE19.1-19.2), deposited at (NJAU) China, coll. by A.S. Elhalawany.

Table 3. Measurements of females of *Aceria noxia* and *Aceria lividus* associated with *Amaranthus lividus* and *Amaranthus viridis* from Brazil and Egypt.

Characters	<i>Aceria noxia</i> From Brazil	<i>Aceria lividus</i> From Egypt
Body length	224 (160–227)	200 (173–213)
Body width	61 (50–62)	52(50–62)
Gnathosoma length	–	25 (25–28)
Cheliceral stylets length	8 (8–16)	17 (16–18)
Prodorsal shield length	31 (28–33)	34 (33–35)
Prodorsal shield width	49 (43–49)	45 (42–50)
Seta <i>sc</i> length	18 (18–23)	26 (24–27)
Distance between <i>sc</i>	26 (20–26)	30 (26–30)
Leg I length	38 (40–33)	33 (30–35)
Leg II length	–	29 (28–32)
Number of Empodial rays	5	6
Seta <i>1b</i> length	8 (8–10)	7 (7–9)
Seta <i>1a</i> length	27 (18–27)	23 (22–25)
Seta <i>2a</i> length	40 (40–45)	27 (25–33)
Seta <i>3a</i> length	18 (13–18)	17 (15–18)
Dorsal semiannuli number	93 (76–93)	65 (63–68)
Ventral semiannuli number	71 (61–76)	65 (63–68)
Seta <i>c2</i> length	40 (28–40)	25 (25–27)
Seta <i>d</i> length	57 (42–58)	55 (53–60)
Seta <i>e</i> length	14 (11–15)	11 (9–12)
Seta <i>f</i> length	27 (26–28)	25 (24–30)
Seta <i>h1</i> length	4	3 (3–4)
Seta <i>h2</i> length	77 (65–77)	65 (64–70)
Genital coverflap length	15 (15–18)	16 (15–18)
Genital coverflap width	21 (21–24)	23 (22–25)
Longitudinal ridges	16 (14–16)	12–14

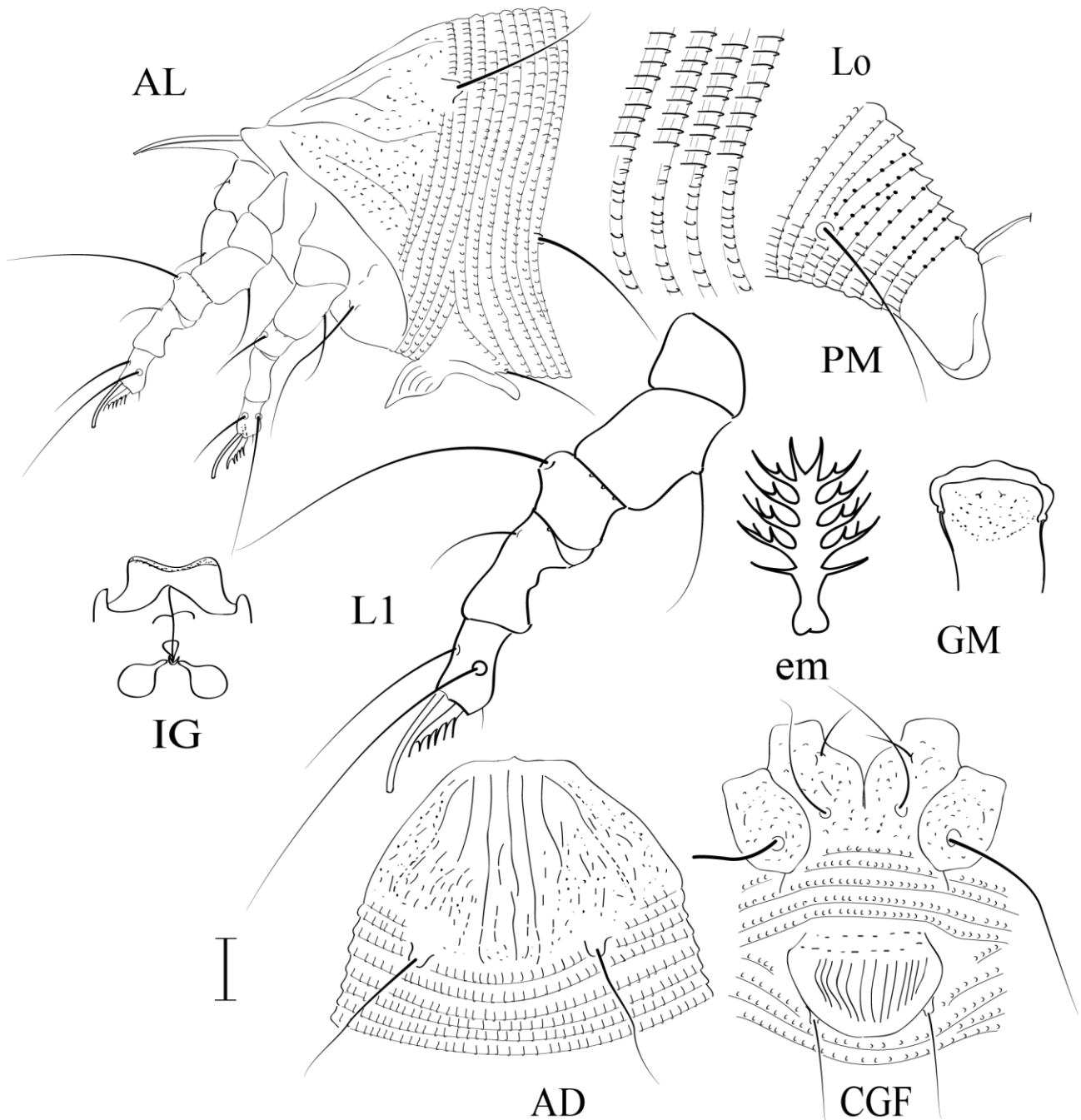


Figure 9. Line drawings of *Aceria lividus* Elhalawany, 2018: Scale bar: 10 μm for AD, AL, CGF, GM, IG; 5 μm for L1, L2; 2.5 μm for em.

***Aceria tosichella* Keifer, 1969**

Aceria tosichella Keifer, 1969a: 2.

Eriophyes tulipae Keifer, 1938: 185.

Aceria tulipae.—Keifer 1944: 22, 1954: 123.

Aceria tosichella.—Keifer et al. 1982: 160; Amrine and Stasny 1994: 92; Navia et al. 2006: 189; Skoracka et al. 2005: 64; Xue et al. 2011: 143; Denizhan et al. 2015: 30.

Aceria aegyptiacus Soliman & Abou-Awad, 1977 (new synonymy).

Figure (10 A-E)

Type data. *Triticum sativum* Lam. (Poaceae); Zemun-Beograd, Serbia.

Geographic distribution. Africotropical, Antarctic, Australian, Indomalayan, Nearctic, Neotropical, Palaearctic (Denizhan et al. 2015).

Host plant in Egypt. *Bromus catharticus* Vahl (Poaceae).

Relation to host. The mites live at the leaf bases, under the leaf surface, they cause the leaves to curl.

Remarks. *Aceria aegyptiacus* was described by Soliman and Abou-Awad (1977), based on a single female collected from litter and weeds in orange

orchards at Luxor and Qena governorates, Egypt. In the present study *A. tosichella* was collected on the weed, *Bromus catharticus* also in citrus orchards at Qalyubia governorate, Egypt. Comparing the morphological characters of both *A. aegyptiacus* and *A. tosichella*, no consistent differences were found. Thus, *Aceria aegyptiacus* is a junior synonym of *Aceria tosichella*.

Distribution in Egypt. Qalyubia governorate, Egypt.

Material examined. Twenty females, five males, four nymphs and six larvae on ten slides (slides no. EGYErio12.1–12.10) from *B. catharticus*, in Vahl, Kaha (30°17'20.1"N 31°12'45.2"E), Qalyubia governorate, Egypt, 23 February 2021, deposited at (PPRI-ARC), Egypt, coll. A.S. Elhalawany. Ten females and two males on two slides (slides no. EGYErio12.11–12.12), with the same previous data, deposited at (ESAM), Egypt. Five females on two slides (slides no. NJAUAcariE5.1-5.2), deposited at (NJAU), China.

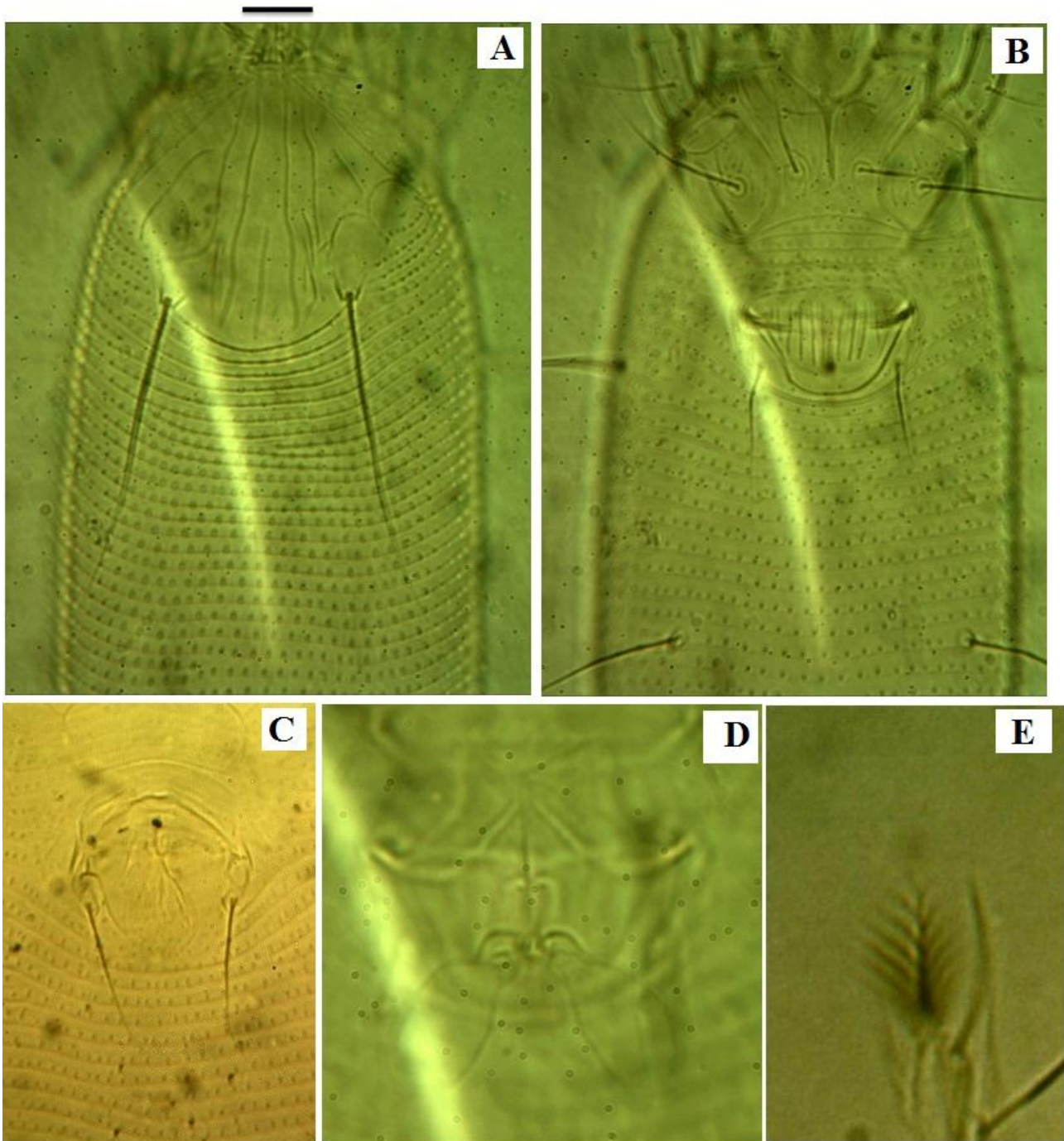


Figure 10. Phase microphotograph of *Aceria tosichella* Keifer, 1969: A. prodorsal shield of female B. Coxi-genital region of female; C. Genitalia of male; D. Internal genitalia; E. Empodium. Scale bar: 10 μ m for A, B, C; 20 μ m for D and E.

Subfamily Phyllocoptinae Nalepa, 1892**Tribe Anthocoptini Amrine & Stasny, 1994*****Neooxycenus plucheae* Abou-Awad, 1981**

Neooxycenus plucheae Abou-Awad, 1981: 368, figure 1.

Vittacus plucheae Abou-Awad & Nasr, 1986: 159 figure 1 (**new synonym**).

(**Figures 11–14, Table 4**).

Redescription

Female (n=15) body fusiform, 194 (183–216) long including gnathosoma, 65 (61–69) wide, and 70 (65–72) thick; light yellow in life.

Gnathosoma 28 (26–31) long, projecting obliquely downwards, basal setae *ep* 2 (2–3), antapical setae *d* 6 (5–6), cheliceral stylets 16 (16–17) long. **Prodorsal shield** 75 (64–75) long, including round frontal lobe 7 (6–8), 65 (65–70) wide; oval; prodorsal ornamentation obscure and with variations, two slight shoulders anteriorly, middle portion broad, posterior portion narrow and appears as a projection covering the first three dorsal semiannuli; median and submedian lines absent, admedian lines incomplete meeting and forming flask shape, sometimes with short transverse line at middle between admedian lines forming hexagonal shape at middle of the shield (Figure 14). Scapular tubercles on rear shield margin widely separated, 50 (45–50) apart, setae *sc* 8 (7–9), directed posteriad divergently.

Coxigenital area smooth, with 4 (3–4) semiannuli between coxae and genitalia, sternal line forked; anterolateral setae on coxisternum I *lb* 8 (7–8), 13 (13–14) apart; proximal setae on coxisternum I *la* 23 (21–25), 11 (11–12) apart; proximal setae on coxisternum II *2a* 36 (32–41), 28 (27–31) apart. **Leg I** 31 (30–33), femur 9 (8–10), basiventral femoral seta *bv* 9 (9–11); genu 6 (5–6), antaxial genual seta *l''* 19 (18–20); tibia 6 (6–7), seta *l'* 3 (3–4), seta located in middle of segment; tarsus 7 (6–8); empodium *em* simple 6 (5–6), 4-rayed, simple, tarsal ω slightly knobbed, 8 (7–9), tarsal seta *ft'* 18 (17–19), tarsal seta *ft''* 22 (20–23), tarsal seta *u'* 2–3. **Leg II** 29 (27–30), femur 8 (8–9), seta *bv* 9 (9–11); genu 5 (4–5), seta *l''* 10 (6–10); tibia 6 (5–6); tarsus 7 (7–8); tarsal *em* simple 6 (5–6), 4-rayed, ω 8 (7–8) slightly knobbed, seta *ft'* 7 (5–8), seta *ft''* 20 (20–22), tarsal seta *u'* 2–3. **Opisthosoma** with two subdorsal ridges, prominent, begin near scapular tubercles and ending before setae *f*. Dorsally with 25 (24–26) semiannuli, smooth, last 3–4 semiannuli with pointed microtubercles; ventrally

with 70 (63–71) semiannuli, with round microtubercles on rear annular margins, the last 13–17th ventral semiannuli with microtubercles linear. Lateral setae *c2* 9 (8–10), 55 (54–60) apart, on annulus 10 (10–14) from coxae II; ventral setae *d* 32 (30–35), 32 (31–34) apart, on annulus 22 (22–26); ventral setae *e* 14 (14–15), 14 (14–15) apart, on annulus 38 (38–42); ventral setae III *f* 22 (22–23), 20 (20–21) apart, on 5th annulus from rear. Setae *hl* 3 (no range), setae *h2* 40 (35–45). **External genitalia** 14 (13–16), 25 (24–26) wide, coverflap with 10 (9–10) longitudinal ridges in a single row plus three transverse lines at the base, proximal setae on coxisternum III *3a* 15 (12–15), 12 (12–14) apart.

Male (n=3). Similar to female. Body fusiform, 155–170 long including gnathosoma, 55–58 wide, and 63–67 thick; light yellow in life. **Gnathosoma** 25–29, cheliceral stylets 15–16 long, setae *ep* 2–3, setae *d* 4–5. **Prodorsal shield** shape and patterns similar to those of female, 60–65 long including frontal lobe, 50–55 wide; scapular tubercles on the rear shield margin, 40–45 apart, setae *sc* 7–8, projecting diagonal posteriorly. **Coxigenital area** smooth, sternal line forked; setae *lb* 6–7, 11–12 apart; setae *la* 22–23, 9–10 apart; setae *2a* 32–35, 27–29 apart. **Leg I** 24–26, femur 8–9, seta *bv* 8–9; genu 4–5, seta *l''* 18–19; tibia 5–6, seta *l'* 3–4; tarsus 5–6; tarsal empodium *em* simple 5–6, 4-rayed, tarsal solenidia ω distally knobbed 7–8, seta *ft'* 15–18, seta *ft''* 19–21, seta *u'* 2–3. **Leg II** 24–25, femur 7–8, seta *bv* 8–9; genu 4–5, seta *l''* 8–9; tibia 5–6; tarsus 5–6; tarsal empodium *em* simple 5–6, 4-rayed, tarsal solenidia ω distally knobbed 7–8, seta *ft'* 5–8, seta *ft''* 19–21, setae *u'* 2–3.

Opisthosoma similar to female, dorsally with 24–25 semiannuli; ventrally with 50–55 semiannuli, microtubercles shape similar to those of female. Lateral setae *c2* 8–9, 50–55 apart, on semiannuli 10–11 from coxae II; ventral setae *d* 30–31, 29–30 apart, on semiannuli 19–20; setae *e* 13–14, 12–13 apart, on semiannuli 31–32; setae *f* 20–21, 18–19 apart, on 5th annulus from rear. Setae *hl* 3; setae *h2* 28–30. **External genitalia** 12–13 long and 18–19 wide, with granules, setae *3a* 13–15, 13–15 apart.

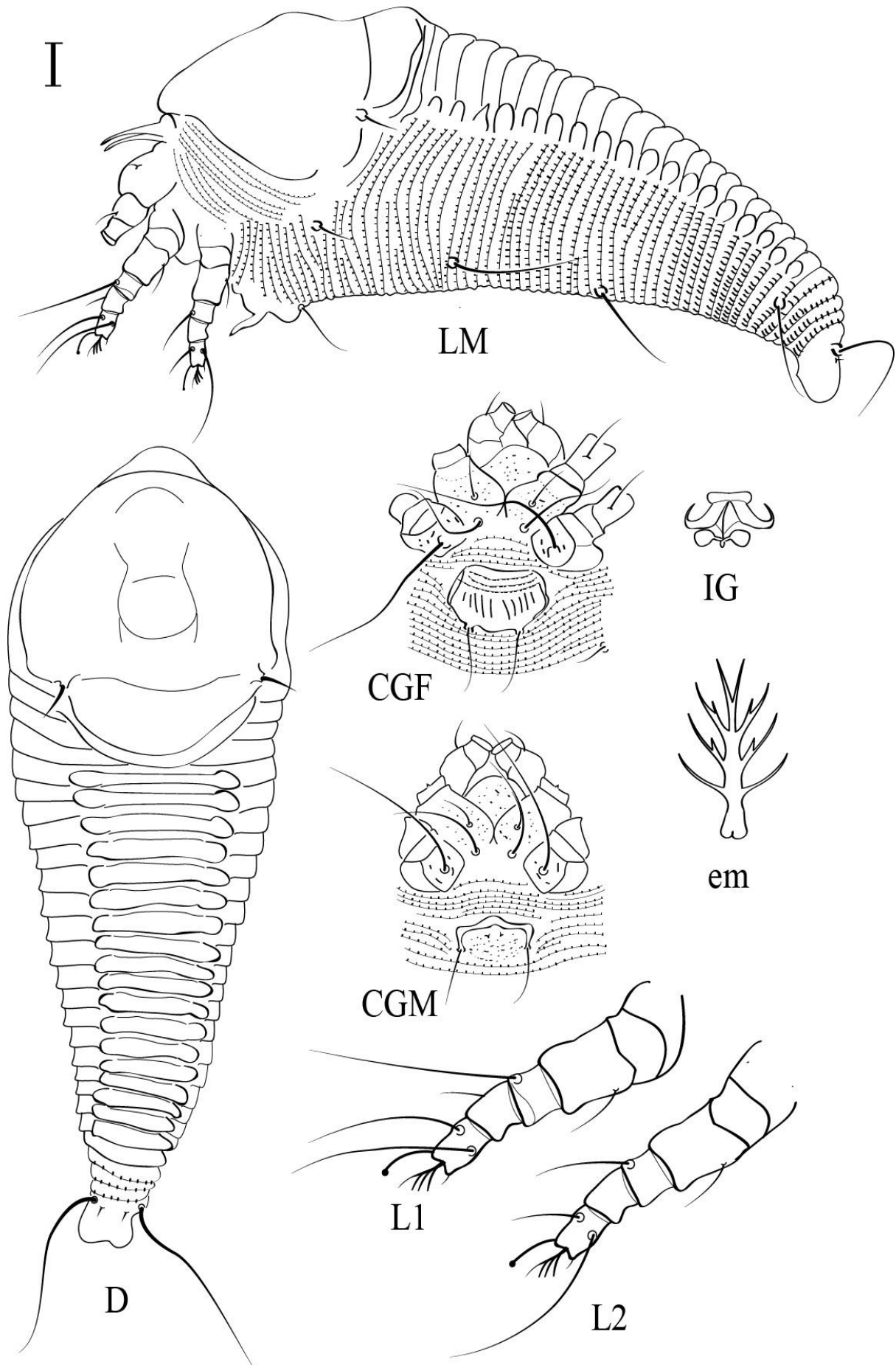


Figure 11. Line drawings of *Neooxycenus pluchae* Abou-Awad, 1981: Scale bar: 10 μm for D, CGF, GM, IG, LM; 5 μm for L1, L2; 2.5 μm for em.

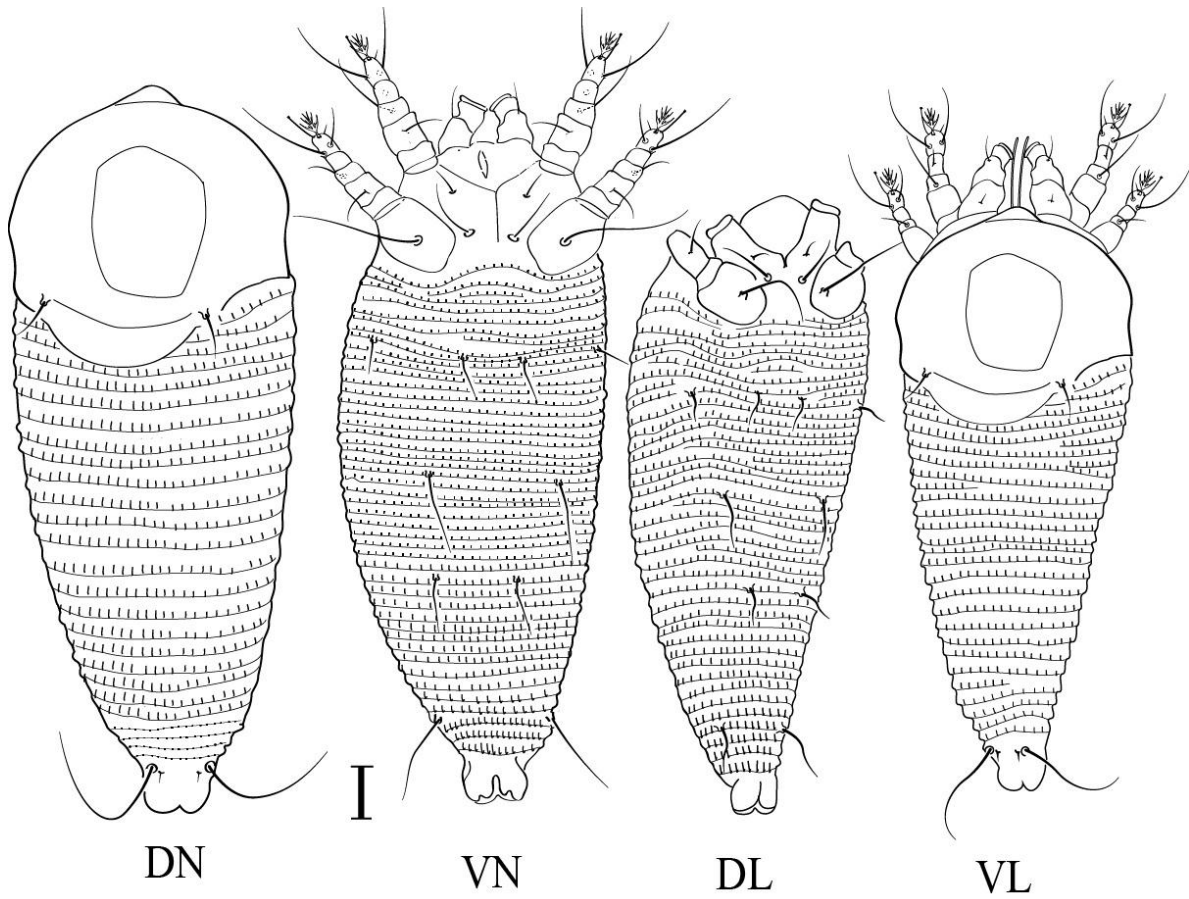


Figure 12. Line drawings of *Neooxycenus plucheae* Abou-Awad, 1981: Scale bar: 10 μm for DN, VN, DL, VL.

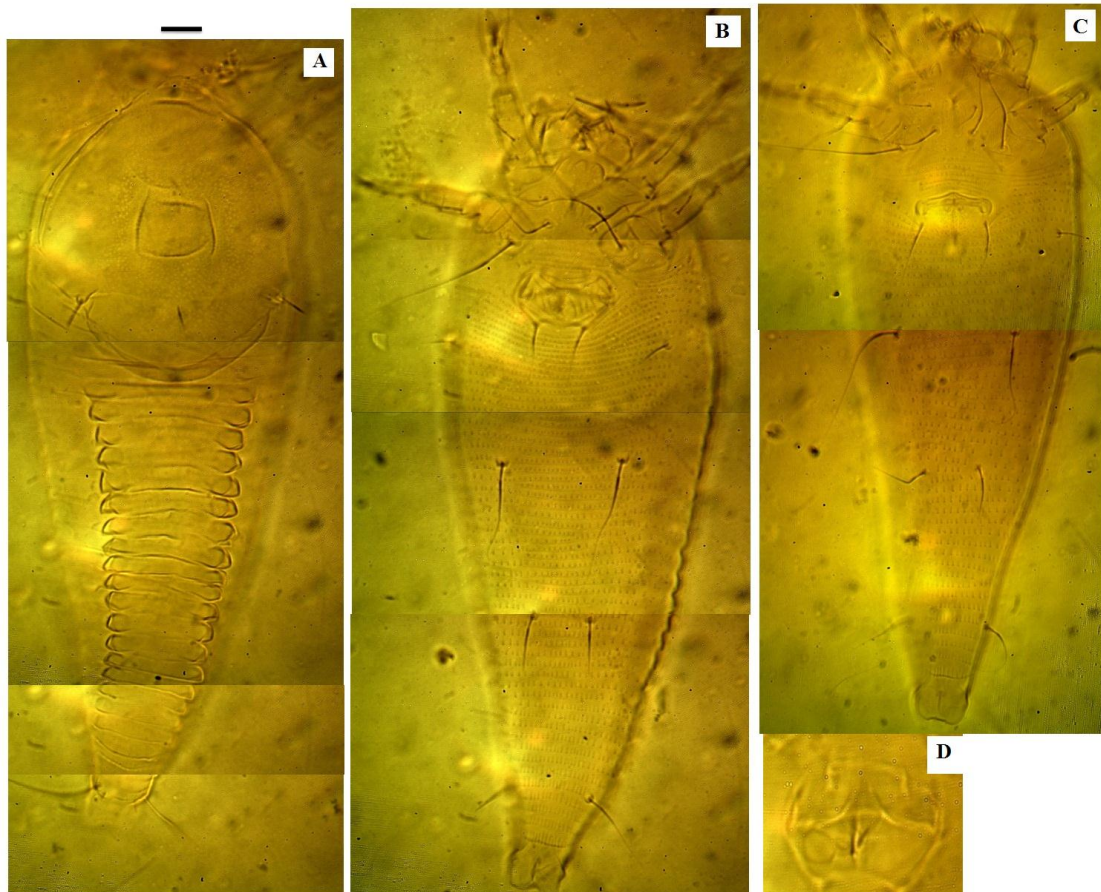


Figure 13. Phase microphotograph of *Neooxycenus plucheae* Abou-Awad, 1981: A. Dorsal view of female B. Ventral view of female; C. Ventral view of male; D. Internal genitalia; E. Empodium. Scale bar: 10 μm for A, B, C; 20 μm for D.

Nymph (n=4). Body fusiform, 140–150 long and 49–50 wide. **Gnathosoma** 17–18, curved downward, setae *ep* 1–2, *d* 3–4, cheliceral stylets 12–15 long. **Prodorsal shield** sub-circular, 54–66, including frontal lobe 3–4 over the gnathosomal base 50–54 wide, prodorsal ornamentation obscure and with hexagonal shape at middle of the shield. Tubercles *sc* on rear shield margin, 31–39 apart; *sc* 6–8. **Coxisternal plates** smooth, *Ib* 5–6, 13–14 apart; *Ia* 11–13, 8–9 apart; *2a* 22–23, 28–30 apart; *3a* 7–9, 10–12 apart. **Leg I** 22–24; femur 6–7, *bv* 7–8; genu 3–4, *l''* 13–15; tibia 3–4, *l'* 2–4; tarsus 5–6, *ft'* 10–12, *ft''* 16–18, seta *u'* 1–2; tarsal ω 5–6; *em* 4–5, simple, 3-rayed. **Leg II** 19–20; femur 5–6, *bv* 7–8; genu 3, *l''* 6–7; tibia 3–4; tarsus 4–5, *ft'* 6–7, *ft''* 15–17, seta *u'* 1–2; ω 5–6; *em* 4–5, simple, 3-rayed. **Opisthosoma** with 25–26 dorsal semiannuli, with elliptical microtubercles situated on rear margin of each annulus, 45–48 ventral semiannuli with pointed microtubercles, situated on rear margin of each annulus; elongated on the posterior semiannuli. Setae *c2* 6–7, 42–44 apart, on ten ventral annuli; setae *d* 15–16, 25–26 apart, on 22–23 ventral semiannuli; setae *e* 10–11, 14–15 apart, on 31–32 ventral semiannuli; setae *f* 16–17, 18–20 apart, on 4th annulus from rear. Setae *h1* 1–2; *h2* 30–33.

Larva (n=3). Body fusiform, 125–135 long and 40–45 wide. **Gnathosoma** 15–16, curved downward, setae *ep* 1–2, *d* 3–4, cheliceral stylets 12–13 long. **Prodorsal shield** sub-circular, 54–58, including frontal lobe 3–4 over the gnathosomal base 48–55 wide, prodorsal ornamentation obscure and with hexagonal shape at middle of the shield. Tubercles *sc* on rear shield margin, 25–27 apart; *sc* 6–7. **Coxisternal plates** smooth, *Ib* 3–4, 10–11 apart; *Ia* 8–9, 6–7 apart; *2a* 17–18, 15–16 apart; *3a* 5–6, 7–8 apart. **Leg I** 19–20; femur 5, *bv* 4–5; genu 2–3, *l''* 10–11; tibia 2–3, *l'* 2–3; tarsus 4, *ft'* 10–11, *ft''* 13–14, seta *u'* 1–2; tarsal ω 4–5 knobbed; *em* 4, simple, 3-rayed. **Leg II** 16–17; femur 5, *bv* 4–5; genu 2, *l''* 5; tibia 3; tarsus 4, *ft'* 6–7, *ft''* 13–14, seta *u'* 1–2; ω 4–5; *em* 4, simple, 3-rayed. **Opisthosoma** with 23–24 dorsal semiannuli, with elliptical

microtubercles situated on rear margin of each annulus, 37–41 ventral semiannuli with pointed microtubercles, situated on rear margin of each annulus; elongated on the posterior semiannuli. Setae *c2* 4–5, 32–33 apart, on 8–9 ventral annulus; setae *d* 10–12, 19–20 apart, on 18–19 ventral annulus; setae *e* 7–8, 10–11 apart, on 27–28 ventral annulus; setae *f* 10–11, 11–12 apart, on 4th annulus from rear. Setae *h1* 1–2; *h2* 16–20.

Host plant. *Pluchea dioscoridis* (L.) DC. (Compositae).

Distribution in Egypt. Qalyubia, Gharbia, Kafr El-Sheikh.

Relation to the host plant. Vagrant on the lower leaf surface, no damage symptom to the host was observed.

Material examined. Twenty-two females, four males, three nymphs and two larvae on ten slides (slide no. EGYErio83.1–83.10), from *P. dioscoridis*, Qalyubia governorate (30°15'50.46"N, 31°14'51.85"E), Egypt, 30 September, 2020 and 20 September, 2021, deposited at (PPRI-ARC), Egypt. Four females and one male on two slides (slide no. EGYErio83.11–83.12), Gharbia governorate (30°41'56.00"E, 31°10'49.07"N), 10 November, 2021, 10 February, 2022, deposited at (ESAM), Egypt. Two slides (slides no. EgPID03-04), deposited at (UNIBA), Italy; coll. by A.S. Elhalawany.

Remarks.

Abou-Awad (1981) described *Neooxycenus pluchae* from only females collected on *Pluchea dioscoridis*. Abou-Awad and Nasr (1986) described the same species as *Vittacus pluchae* based on the variations in the design of the prodorsal shield. Females, males and immature stages of *N. pluchae* were collected in the current study. After examining many samples from different localities in Egypt, the morphometry of the female matches the original description by Abou-Awad (1981) (Table 4). Therefore, the current research suggests *Vittacus pluchae* is a junior synonym of *Neooxycenus pluchae*.

Table 4. Differences between *Vittacus plucheae* and *Neooxycenus plucheae* on *Pluchea dioscoridis* in Egypt

Characters	<i>Vittacus plucheae</i> †	<i>Neooxycenus plucheae</i> ‡	<i>N. plucheae</i> female (15)	<i>N. plucheae</i> male (3)
Body length	145–183	123–163	194 (183–216)	155–170
Body width	53–59	55–63	65 (61–69)	55–58
Body thickness	–	–	70 (65–72)	63–67
Gnathosoma length	19	25	28 (26–31)	25–29
Cheliceral stylets length	15	–	16 (16–17)	15–16
Prodorsal shield length	55	63	75 (64–75)	60–65
Prodorsal shield width	53	54	65 (65–70)	50–55
Setae <i>sc</i> length	6	7.5	8 (7–9)	7–8
Setae <i>sc</i> apart	33	36	50 (45–50)	40–45
Leg I length	24	29	31 (30–33)	24–26
Leg II length	21	27	27 (27–32)	24–25
Number of empodial rays	4	4	4	4
Tarsal solenidion ω	knobbed	Knobbed	Knobbed	Knobbed
Setae <i>lb</i> length	–	–	8 (7–8)	6–7
Tubercles <i>lb</i> apart	–	–	13 (13–14)	11–12
Setae <i>la</i> length	–	–	23 (21–25)	22–23
Tubercles <i>la</i> length	–	–	11 (11–12)	9–10
Setae <i>2a</i> length	25	43	36 (32–41)	32–35
Tubercles <i>2a</i> apart	–	–	28 (27–31)	27–29
Coxae I & II surface	Smooth	Smooth	Smooth	Smooth
Dorsal semiannuli number	23	24	25 (24–26)	24–25
Ventral semiannuli number	67	48	70 (63–71)	50–55
Dorsal semiannuli shape	Smooth	Smooth	Smooth	Smooth
Ventral semiannuli shape	rounded	Rounded	Rounded	Rounded
Setae <i>c2</i> length	8	7.5	9 (8–10)	8–9
On annulus	13	7	10 (10–14)	10–11
Setae <i>d</i> length	25	30	32 (30–35)	30–31
On annulus	27	16	22 (22–26)	19–20
Setae <i>e</i> length	13	16	14 (14–15)	13–14
On annulus	45	29	38 (38–42)	31–32
Setae <i>f</i> length	13	20	22 (22–23)	20–21
On annulus	5 th	5 th	5 th	5 th
Setae <i>h1</i> length	3	3	3	3
Setae <i>h2</i> length	32	43	40 (35–45)	30–32
Female genitalia length	14	14	14 (13–16)	12–13
Female genitalia width	17	19	25 (24–26)	18–19
Ridges no.	10	8	10 (9–10)	–
Setae <i>3a</i> length	9	9	15 (12–15)	13–15

†After Abou-Awad and Nasr 1986, ‡ after Abou-Awad 1981.

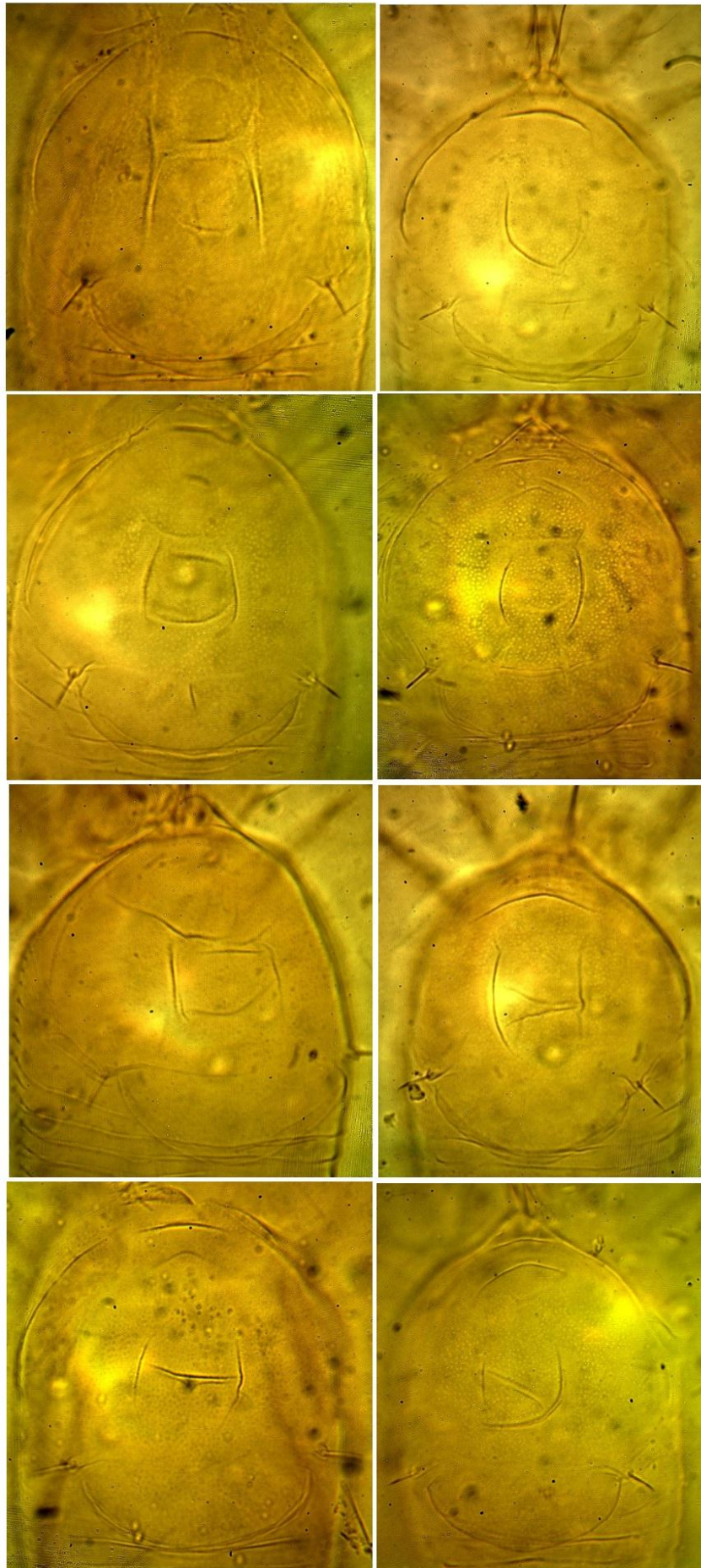


Figure 14. Phase microphotograph of *Neoxycenus plucheae* Abou-Awad, 1981: Variant prodorsal shield. Scale bar: 10 μ m.

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