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THE ERIOPHYOID MITES (ACARINA)
FROM WALNUT TREES IN GRENOBLE
(ISERE, FRANCE)

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SUMMARY: The walnut eriophyid mites Aceria tristriata (Nalepa), Aceria erinea (Nalepa), Anthocoptes striatus Ponomareva and Phyllocopites unguiculatus are reported from Grenoble, France, described and illustrated. A translation of Nalepa's, Farkas', Bagdasarian's and Ponomareva's descriptions of these mites is presented.

The Genus Aceria

Two species in the genus Aceria were collected, A. tristriata (Nalepa, 1890) and A. erinea (Nalepa, 1891). They are rather similar morphologically and both have three-rayed empodia. For the protozoans of both species the illustration of A. erinea (Fig. 3) is to be regarded as basic and the main differences are: A. tristriata is distinct in presenting pointed microtubercles on the opisthosomal annuli, while these are rounded, somewhat flattened, in A. erinea; in A. tristriata the tarsus is three times as long as the tibia, while it is short in A. erinea.
Fig. 1: *Aceria tristriata* (Nalepa), deutogyne. D. — dorsal habitus; V. — ventral habitus. (For setal nomenclature, see text).
**Aceria tristriata (Nalepa)** (Figs. 1-2, deutogyne)

*Phytophthrus tristriatus*, Nalepa 1890: 51-53, 65.,
*Eriophyes tristriatus*, Keifer 1938:184.,
*Aceria tristriatus*, Farkas 1960:315.]

*A. tristriata*, the Persian walnut leaf gall or blister mite, is widespread in Europe and Asia (JEPPSON et al., 1975). It induces the walnut leaves to produce small, rigid, pustules on both surfaces, of approximately 1-2 cm in diameter, along the midrib and lateral veins. These pustules or galls are initially greenish, later turning yellow and brown. Highly infested leaves are twisted and drop prematurely.

Inside the pustules males and protogynes (females) are found; these have pointed dorso opisthosomal microtubercles. From midsommer on deutogynes (morphologically differentiated overwintering females) start to appear; these have smooth dorso-opisthosomal annuli and flattened microtubercles on the ventral annuli.

The description of the deutogyne is given below; measurements are in micrometers and refer to the length of the structure, unless otherwise stated.

**DEUTOGYNE (n = 7).** Idiosoma elongate, vermiciform, 176-198 long, widest at level of second pair of opisthosomal setae, 55-58 wide. Gnathosoma: basal setae 3-4; antapical setae 4-5; chelicerae 13-15. Pro-dorsal shield: 22-24 long, 35-38 wide; design consisting of two admedian longitudinal lines, diverging posteriorly towards bases of scapular setae; on mid posterior part, in between dorsal shield tubercles, three short longitudinal sclerodules. Dorsal shield tubercles 19-21 apart, directing scapular setae (sc) divergently backwards; these are 26-29. Legs (Fig. 2) with all normal setae present; legs I 28-31, from trochanter base; femora 7-9, femoral setae (bv) 11-13; genua 4-5, genual setae (l') 23-26; tibiae 4-5, tibial setae (l') 3, basally located; tarsi 9-10, claws (solenidia) 7-8, blunt, empodia 6-7, 3-rayed, dorsal setae (l') 10-11, lateral setae (l') 20-25, unguinal setae (u') 3-4. Legs II 26-28; femora 6-9, bv 11-12; genua 4-5, l' 11-13; tibiae 4-5; tarsi 8-9, claws (solenidia) 7-8, empodia 6-7, 3-rayed, l' 5-7, l'' 23-24, u' 3. Coxisternal area: sternal line 7-10; coxae smooth; coxal setae I (l') 8-9 apart, 3-4; coxal setae II (l') 7-8 apart, 31-34; coxal setae III (2a) 15-17 apart, 46-53. Coxisternal area smooth. Opisthosoma: lateral setae (c2) 11-13, on annulus 2-3 behind rear margin of genitalia; ventral setae I (d) 32-34 apart, 11-15, on annulus 15; ventral setae II (e) 17-18 apart, 11-13, on annulus 29-31; ventral setae III (f) 18-21 apart, 16-20, on annulus 53-58 or 5th from rear. Total ventral annuli 58-63, with faint, flattened, microtubercles. Total dorsal annuli 65-67, smooth. Caudal setae (h2) 97-106; accessory setae (h1) 12-15, robust, nail like. Genitalia: 16-17 wide, 9-11 long, with produced genital tubercles; genital setae (3a) 5-7; epigynium smooth.
FIG. 3: *Aceria erinea* (Nalepa), protogyne. AD. — anterior dorsal region; AL. — anterior lateral region; CL. — caudal lateral region; E. — empodium; GF. — female genitalia; L. — lateral habitus; LH. — lateral hysterosomal area; L1. — leg I; V. — ventral habitus. (From Keifer, 1938).
Aceria erinea (Nalepa) (Fig. 3)


Aceria erinea, Keifer 1952: 27.]

A. erinea, the Persian walnut erineum mite, referred to as walnut blister mite by Keifer (1952), is distributed world wide over the same area as its host plant, J. regia, that is, Europe, Asia, Americas, Australia and New Zealand. It induces the formation of rather large felty masses of thick trichomes or erineum pads on the underside of leaves. On the upper surface, corresponding to the erineum, inflated bumps are visible.

Although Nalepa (1891) considered this species a variety of A. tristrictata, he already pointed out morphological differences: the tarsi are three times as long as the tibia in A. tristrictata while they are short in A. erinea; A. tristrictata has rounded, pointed, dorso opisthosomal microtubercles, while in A. erinea these are elliptical and rather flattened. Farkas (1960) pointed out that the antapical setae (on the palpus) are spine-like and 15 µm long in A. tristrictata and are filiform and 7 µm in A. erinea; and, the caulodial setae (h2) in A. tristrictata measure 105 µm and in A. erinea 48 µm.

A. erinea was redescribed by Keifer (1938) and his illustration is reproduced here (Fig. 3).

Deutogynes have not been reported for A. erinea; Jeppson et al. (1975) consider that this species might possibly have non structural deutogyny.

Anthocoptes striatus Ponomareva (Fig. 4)


Deutogyne. Misidentification,


New synonymy.]

Ponomareva (1978) described A. striatus female and male, which she called the “striped walnut mite”, from Kirghizia, from wintering sites on the surface of buds. Bagdasarian (1981) in describing V. uNGuiculatus (Nalepa) (syn : Phylocoptes uNGuiculatus Nalepa) and unaware of Ponomareva’s paper, considered this mite (A. striatus) as the deutogyne of P. uNGuiculatus. Domes (1998), also unaware of Ponomareva’s paper, described A. juglandis from females and males collected, in spring and summer, from leaves, in autumn and winter, from buds of J. regia in Germany. We observed high infestations and populations of A. striatus on walnut buds in January, in Grenoble, France. Additional description and measurements of females are based on these specimens.

Female (n=12). Body 145-167 long and 49-55 wide. Gnathosoma: antapical setae 7; chelicerae 23-25. Prodorsal shield: 34-36, and 37-39 wide; design consisting of two admedian lines; scapular setae (sc) 18-19, on strong tubercules, directing setae laterally. Legs: legs I: 25-28; femora 8-10, femoral setae (bv) 12-15; genua 3-5, genual setae (g) 18-19; tibia 4-5, tibial setae (t) 4-7; tarsi 5-7, solenidia 11-12, slightly enlarged distally, empodia 6-7, 6-rayed, dorso setae (Jt) 14-21, lateral setae (Jt‘) 19-24, ungual setae (u‘) 4-5. Legs II: 22-24; femora 8, bv 12-14; genua 3, t‘ 5; tibia 3; tarsi 5-7, solenidia 11-12, empodia 7-8, 6-rayed, ft‘ 6-7, ft‘ 18-21, u‘ 4-5. Coxisternal area: sternal line 5-6; coxae ornamented with short lines; coxal setae I (Ib) 9-11, 8-9 apart; coxal setae II (Ia) 18-19, 7-8 apart; coxal setae III (2a) 33-39, 18-19 apart. Coxisternal area with 6-7 annuli, smooth. Opisthosoma: lateral setae (c2) 11-15, on anusculus 5-8; ventral setae I (d) 48-53, 27-31 apart, on anusculus 16-20; ventral setae II (e) 10-11, 18-19 apart, on anusculus 28-33; ventral setae III (f) 15-16, 11-11 apart, on anusculus 46-52, or 5th from rear. Dorsum with 7 big, broadly rounded annuli, followed by 4-5 smaller, entire annuli; total ventral annuli 50-56, microtuberculate. Caudal setae (h2) 68-72, accessory setae (hl) minute, 1-2. Genitalia: 18-20 wide, 12-14 long, genital setae (3a) 1:13-18; epigynium with 8-14 longitudinal lines.

Material examined — 28 females, from J. regia, Grenoble, France, January 2001, A. Verhaege, from large populations on buds; on 6 microscopic preparations.
FIG. 4: *Anthocoptes striatus* Ponomareva — female. CGF — coxigenital area; D-V — semidorsal habitus; L1 — leg I; L2 — leg II.
**Phyllocetes unguiculatus** Nalepa (FIGS. 5-6)

[Phyllocetes unguiculatus, Nalepa 1897: 119.
Phyllocetes unguiculatus, Nalepa 1911: 257.
Phyllocetes unguiculatus, Farkas 1965: 84.
Phyllocetes unguiculatus, Bagdasarian 1981: 122.]

*P. unguiculatus* was described as a leaf rusting mite from *J. regia*, in Germany (see Addenda). Other than Nalepa's description, Farkas (1965) published a drawing of a lateral view of a female and a dorsal view of its prodorsal shield, and Bagdasarian (1981) described and illustrated the female (see Addenda).

The female is redescribed and the male described for the first time, based on specimens collected in France.

**FEMALE** (**n** = 6). Idiosoma elongate, slightly fusiform, 161-198 long, 57-63 wide. Gnathosoma: rostrum 20-23; basal setae 3-4; antapical setae 4-5; chelicerae 16-20. Prodorsal shield: triangular with strong, evident, shield lines, as figured; shield 37-40 long; frontal lobe rounded, 7-9. Dorsal shield tubercles conspicuous, at shield rear margin, 18-21 apart, directing scapular setae (*sc*) backwards, these 18-21.

Legs with all normal setae present. Legs I 26-29; femora 7-10, femoral setae (*bv*) 11-15; genua 4, genual setae (*f') 16-18; tibiae 5-6, tibial setae (*f') 6-8; tarsi 6-7, claws (solenidia) about twice as long as empodia, 10-11, empodia 6, 5-6-rayed, dorsal setae (*f") 13-17, lateral setae (*f") 21-26, unguinal setae (*u") 5-6. Legs II 24-28; femora 7-9, *bv* 13-17; genua 3-4, *f"* 6-10; tibiae 4; tarsi 6-8, claws (solenidia) 11-12, empodia 6, 5-6-rayed, *f"* 7-9, *f"* 20-25, *u"* 4-6. Coxisternal area: sternal line 5-6; coxae with a few transverse, short, lines. Coxal setae I (**lb**) 10-11 apart, 9-11; coxal setae II (**la**) 10-13 apart, 25-27; coxal setae III (**2a**) 23-28 apart, 44-51. Coxisternal area with 10-12 annuli, microtuberculate. Opisthosoma: lateral setae (**c2**) 13-17, on annulus 4-6 from rear margin of genitalia; ventral setae I (**d**) 38-44 apart, 49-57, on annulus 15-19; ventral setae II (**e**) 22-26 apart, 19-25, on annulus 28-33; ventral setae III (**f**) 13-15 apart, 17-19, on annulus 48-55 or 5th from rear. Total ventral annuli 53-60, with small, pointed microtubercles, last 8 annuli with fine, elongate, as long as annulus, microtubercles. Total dorsal annuli 22-28, with fine, elongate microtubercles. Caudal setae (**h2**) 57-63; accessory setae (**h1**) minute, 2. Genitalia: 20-23 wide, 11-13 long, genital setae (**3a**) 18-22. Epigynium with longitudinal, straight, 6-10 lines.
Fig. 6. *Phyllocoptes unguiculatus* Nalepa. female. CGF. — coxigenital area of female. D. — dorsal habitus; L1. — leg I; L2. — leg II. Male: GM. — genitalia.
MALE (n = 4). Smaller than female, 154-171 long, 55-57 wide. Gnathosoma: rostrum 18; basal setae 2-3; antapical setae 5-6; chelicerae 16-19. Prodorsal shield: 34-41 long; sc 17-18 apart, 16-18. Legs I: 24-27; femora 7-8, bv 11-14; genua 4, f ′ 16-17; tibiae 5, f ′ 6; tarsi 5-6, claws (solenidia) 9, empodia 5-6, 5-6-rayed, f ′′ 13-15, f ′′′ 22-25, u ′ 3-4. Legs II: 22-25; femora 6-7, bv 11-14; genua 3, f ′ 6-9, tibiae 3-4; tarsi 5-7, claws (solenidia) 10-11, empodia 5, 5-6-rayed, f ′′ 7-8, f ′′′ 19-21, u ′ 4-5. Coxisternal area: sternal line 5-6; 1b 10-11 apart, 9-12; 1a 11-12 apart, 20-25; 2a 22-26 apart, 33-42. Coxisternal area with 8-10 annuli, microtuberculate. Opisthosoma: c2 17-21, on annulus 2-4; d 36-39 apart, 49-53, on annulus 11-17; e 23-26 apart, 19-25, on annulus 24-30; f 12-15 apart, 16-17, on annulus 44-51 or 5th from rear. Total ventral annuli 49-56; total dorsal annuli 18-24; h2 55-60; hl 2-3. Genitalia: 12-14 long, granulated; 3a 15-19.

MATERIAL EXAMINED—55 females, 14 males, on 10 microscopic preparations, from J. regia, Chatte, Grenoble, France, coll. AV and NC, July 2000. Vagrant on leaves, bronzing.

ACKNOWLEDGEMENTS

We are deeply indebted to Dr. James W. AMRINE Jr. for the translation of BAGDASARIAN’S and PONOMAREVA’S descriptions presented in the Addenda.

REFERENCES


ADDENDA

NALEPA’S 1897 description of P. unguiculatus:

Body elongate, weakly spindleform. Shield triangular with strong, forward extending, curved lines; dorsal setae shorter than shield, inserted ahead of the rear margin. Legs week, claw nearly twice as long as the 5-rayed empodium. Femoral setae very long, slender; ventral setae of the second pair as long as lateral setae; caudal setae short, accessory setae absent. Epigynial cover flap lined; genital setae long. Females 0.15 : 0.036 mm; males 0.12 : 0.036 mm. Browning of the leaves of Juglans regia L. (collected by Schlechtendal), St. Goar am Rhein.
Farkas' 1965 description of P. unguiculatus:

Shield as in Fig. 59a. Dorsal setae 16 μm, inserted far ahead of the rear margin [?]—only 4-5 μm according to the drawing. Front leg 27 μm, tibia 4 μm, tarsus 5.5 μm, claw 10 μm, almost as long as the 5-rayed featherclaw. Abdomen with 22 smooth, dorsal half rings. Setae a [abdominal or accessory?] unusually delicate. Epignyium 19 μm wide, coverflap lined. Genital setae 14 μm long. Female 150 μm, 36 μm wide; male 120 μm long, 36 μm wide (Fig. 59) V. unguiculatus. J. regia; browning of the leaves; Europe.

Ponomareva's 1978 description of A. striatus:

pp.24-25. A. striatus Ponomareva n.sp.—the striped walnut mite. Male: not observed. 

Host plant: Greek walnut (J. regia).

Relationship to host plant: it lives on the under side of leaves together with A. erinea. In usual circumstances, mites are almost always collected from galls, together with A. erinea. The deutogyne females overwinter covered in little protected places on one-year-old twigs.


Distribution: SSSR (Armenia), Central Europe.

Deutogyne female (fig. 38a). Body widely-spindleshaped, colored whitish with greenish tint; length 140-160, width 50-60. Dorsal shield net-like, length of dorsal shield 30-31, width 30-34. Frontal lobe of shield anteriorly pointed, its length 6-7, width at the base [on average] 1.5-2. Tarsus of leg with subunguinal setae present ['w']. Empodium 5-rayed. Genital coverflap with 11-12 lines, its length 9-10, width 23-24. Tergites large and smooth; sternites fine and covered with microtubercules. Normally 22 tergites, sometimes their number is 25-26; sternites 56-60. Width of tergites 4-6, sternites 1 to 1.5. From coxae of legs to s.v. [lateral setae]7-8 sternites, from s.v. to s.v. [ventral setae]I 11-12; from s.v. I to s.v. II 13-14, from s.v. II to s.v. III 19-20; from s.v. II to caudal lobe 5; s.v. extends to the 49-50 th sternite, s.v. I to 37-38 th sternite, s.v. II to 24-25 th, III to 5 sternites counting from the back. Accessory setae absent. Length of the chelicerae 17-18, rostrum 21-23. Length of leg I 27-28, tibia 5-6, tarsus 6-7, claw 9-10. Length of coxal setae: I 10, II 35, III 40. Length of setae: d.s. 18-19 (the distance between them 16-17), s.I 13-14, I 40-45, II 17-20, III 18-20, c.s.50-60.

Deutogyne female (fig. 39b). Body widely spindleshaped, color whitish; length 120-130, width 50-55. Dorsal shield net-like, its length 30-33. Frontal lobe of shield anteriorly pointed, its length 7, width at base (on average) 1. Tarsus of leg with subunguinal setae present ['w']. Empodium 5-rayed. Genital coverflap with 11-12 lines, its length 9-10, width 22-23. It has 7 large and 5 smaller tergites; they are smooth; the breadth of the largest tergite extends to 15 micrometers, the smaller ones 2.5. The sternites are fine and covered with microtubercules, numbering 53-58. From coxae to s.v. 7-8 sternites, from s.v. to s.v. I 11-12, from s.v. I to s.v. II 13-14, from s.v. II to s.v. III 17-20, from s.v. III to caudal lobe 5, s.v. extends to 48-49 th sternite, ventral seta I to 36-38 th, II to 22-25 th, III to 5 th sternite counting from the back. Accessory setae absent. Length of the chelicerae 18-20, rostrum 22-25. Length of leg I 27-28, leg II 23-25. Length of setae: s.d. 16-17, s.g. 16-17, s.l. 12-13, s.v. I 40-45, II 10-12, III 14-15, s.c. [caudal setae] 45-60.

Male: not observed.

Protogyne female (fig. 38a). Body widely spindleshaped, colored whitish with greenish tint; length 140-160, width 50-60. Dorsal shield net-like, length of dorsal shield 30-31, width 30-34. Frontal lobe of shield anteriorly pointed, its length 6-7, width at the base [on average] 1.5-2. Tarsus of leg with subunguinal setae present ['w']. Empodium 5-rayed. Genital coverflap with 11-12 lines, its length 9-10, width 23-24. Tergites large and smooth; sternites fine and covered with microtubercules. Normally 22 tergites, sometimes their number is 25-26; sternites 56-60. Width of tergites 4-6, sternites 1 to 1.5. From coxae of legs to s.v. [lateral setae]7-8 sternites, from s.v. to s.v. [ventral setae]I 11-12; from s.v. I to s.v. II 13-14, from s.v. II to s.v. III 19-20; from s.v. II to caudal lobe 5; s.v. extends to the 49-50 th sternite, s.v. I to 37-38 th sternite, s.v. II to 24-25 th, III to 5 sternites counting from the back. Accessory setae absent. Length of the chelicerae 17-18, rostrum 21-23. Length of leg I 27-28, tibia 5-6, tarsus 6-7, claw 9-10. Length of coxal setae: I 10, II 35, III 40. Length of setae: d.s. 18-19 (the distance between them 16-17), s.I 13-14, I 40-45, II 17-20, III 18-20, c.s.50-60.

Deutogyne female (fig. 39b). Body widely spindleshaped, color whitish; length 120-130, width 50-55. Dorsal shield net-like, its length 30-33. Frontal lobe of shield anteriorly pointed, its length 7, width at base (on average) 1. Tarsus of leg with subunguinal setae present ['w']. Empodium 5-rayed. Genital coverflap with 11-12 lines, its length 9-10, width 22-23. It has 7 large and 5 smaller tergites; they are smooth; the breadth of the largest tergite extends to 15 micrometers, the smaller ones 2.5. The sternites are fine and covered with microtubercules, numbering 53-58. From coxae to s.v. 7-8 sternites, from s.v. to s.v. I 11-12, from s.v. I to s.v. II 13-14, from s.v. II to s.v. III 17-20, from s.v. III to caudal lobe 5, s.v. extends to 48-49 th sternite, ventral seta I to 36-38 th, II to 22-25 th, III to 5 th sternite counting from the back. Accessory setae absent. Length of the chelicerae 18-20, rostrum 22-25. Length of leg I 27-28, leg II 23-25. Length of setae: s.d. 16-17, s.g. 16-17, s.l. 12-13, s.v. I 40-45, II 10-12, III 14-15, s.c. [caudal setae] 45-60.

Male: not observed.

Host plant: Greek walnut (J. regia).

Relationship to host plant: it lives on the under side of leaves together with A. erinea. In usual circumstances, mites are almost always collected from galls, together with A. erinea. The deutogyne females overwinter covered in little protected places on one-year-old twigs.


Distribution: SSSR (Armenia), Central Europe.

Bagdasarian's 1981 description of V. unguiculatus (Nalepa);