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Previous volumes (2010-2018): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France
ISSN 0044-586X (print), ISSN 2107-7207 (electronic)

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d’avenir » programme (Labex Agro: ANR-10-LABX-0001-01)

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

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(Accepted February 2001)

SUMMARY: The walnut eriophyid mites Aceria tristiata (Nalepa), Aceria erinea (Nalepa), Anthocoptes striatus Ponomareva and Phyllocopites unguiculatus Nalepa 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.

Several eriophyid mites are known to occur on walnuts (Juglans regia L.) and other species of Juglans (Amrine & Stasny, 1994). A recent overview of eriophyid mites on nut trees (Castagnoli & Oldfield, 1996) mentions Aceria tristiata (Nalepa), and A. erinea (Nalepa) as the most injurious eriophyids found on walnuts in Europe (and elsewhere). In the course of investigation of eriophyid mites in the Station d’Expérimentation Nucidole Rhône-Alpes, Chatte, Grenoble, France, two of us (AV and NC) collected four species of eriophyid mites from nut-producing varieties of walnuts, J. regia, which are discussed, described and illustrated.

The Genus Aceria

Two species in the genus Aceria were collected, A. tristiata (Nalepa, 1890) and A. erinea (Nalepa, 1891). They are rather similar morphologically and both have three-rayed empodia. For the protoyynes of both species the illustration of A. erinea (Fig. 3) is to be regarded as basic and the main differences are: A. tristiata is distinct in presenting pointed microtubercles on the opisthosomal annuli, while these are rounded, somewhat flattened, in A. erinea; in A. tristiata the tarsus is three times as long as the tibia, while it is short in A. erinea.

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Fig. 1: Aceria tristriata (Nalepa), deutogyne. D. — dorsal habitus; V. — ventral habitus. (For setal nomenclature, see text).
**Aceria tristriata** (Nalepa) (Figs. 1-2, deutogyne)  

*Phytoptus tristriatus*, Nalepa 1890: 51-53, 65.,  
*Eriophyes tristriatus*, Keifer 1938:184.,  
*Aceria tristriata*, Parkas 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 midsummer 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, vermiform, 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. Prososomal 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 (*f*) 23-26; tibiae 4-5, tibial setae (*f*) 3, basally located; tarsi 9-10, claws (solenidia) 7-8, blunt, empodia 6-7, 3-rayed, dorsal setae (*f*) 10-11, lateral setae (*f*) 20-25, unguinal setae (*u*) 3-4. Legs II 26-28; femora 6-9, *bv* 11-12; genua 4-5, *f* 11-13; tibiae 4-5; tarsi 8-9, claws (solenidia) 7-8, empodia 6-7, 3-rayed, *ft* 5-7, *ft* 23-24, *u* 3. Coxisternal area: sternal line 7-10; coxae smooth; coxal setae I (*ab*) 8-9 apart, 3-4; coxal setae II (*aa*) 7-8 apart, 31-34; coxal setae III (*aa*) 15-17 apart, 46-53. Coxisternal area smooth. Opisthosoma: lateral setae (*c*) 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 (*h*) 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).
Material examined—14 deutogynes, on 7 microscopic preparations, from open pustules or galls on *J. regia*, Chatte, Grenoble, France, coll. AV and NC, April 2000.

*Aceria erinea* (Nalepa) (Fig. 3)


*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. tristriata*, he already pointed out morphological differences: the tarsi are three times as long as the tibia in *A. tristriata* while they are short in *A. erinea*; *A. tristriata* 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 spinelike and 15 μm long in *A. tristriata* and are filiform and 7 μm in *A. erinea*; and, the caudal setae (h2) in *A. tristriata* 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)


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: *Phyllocopites 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 (fr) 18-19; tibia 4-5, tibial setae (f') 4-7; tarsi 5-7, solenidia 11-12, slightly enlarged distally, empodia 6-7, 6-rayed, dorsal setae (fr") 14-21, lateral setae (fr") 19-24, unguinal setae (u') 4-5. Legs II: 22-24; femora 8, bv 12-14; genua 3, f' 5; tibia 3; tarsi 5-7, solenidia 11-12, empodia 7-8, 6-rayed, f" 6-7, f' 18-21, u' 4-5. Coxisternal area: sternal line 5-6; coxae ornamented with short lines; coxal setae I (lb) 9-11, 8-9 apart; coxal setae II (la) 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 annulus 5-8; ventral setae I (d) 48-53, 27-31 apart, on annulus 16-20; ventral setae II (e) 10-11, 18-19 apart, on annulus 28-33; ventral setae III (f) 15-16, 10-11 apart, on annulus 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 (h1) minute, 1-2. Genitalia: 18-20 wide, 12-14 long, genital setae (3a) 13-18; epigynium with 8-14 longitudinal lines.

Material examined — 28 females, from *J. regia*, Grenoble, France, January 2001, A. Verhaeghe, 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.
*Phyllocopites unguiculatus* Nalepa (FIGS. 5-6)

[Phyllocopites unguiculatus, Nalepa 1897: 119.]

[Phyllocopites unguiculatus, Nalepa 1911: 257.]

[Phyllocopites unguiculatus, Farkas 1965: 84.]

[Phyllocopites 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 (*r’) 16-18; tibiae 5-6, tibial setae (*t’) 6-8; tarsi 6-7, claws (solenidia) about twice as long as empodia, 10-11, empodia 6, 5-6-rayed, dorsal setae (*fr’) 13-17, lateral setae (*fr”) 21-26, unguinal setae (*u’) 5-6. Legs II 24-28; femora 7-9, *bv* 13-17; genua 3-4, *r’* 6-10; tibiae 4; tarsi 6-8, claws (solenidia) 11-12, empodia 6, 5-6-rayed, *fr’* 7-9, *fr”* 20-25, *u’* 4-6. Coxisternal area: sternal line 5-6; coxae with a few transverse, short, lines. Coxal setae I (*ib*) 10-11 apart, 9-11; coxal setae II (*ia*) 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.
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, 6' 16-17; tibiae 5, 6' 6; tarsi 5-6, claws (solenidia) 9, empodia 5-6, 5-6-rayed, 6' 13-15, 6' 22-25, u' 3-4. Legs II: 22-25; femora 6-7, bv 11-14; genua 3, 6' 6-9, tibiae 3; tarsi 5-7, claws (solenidia) 10-11, empodia 5-6-rayed, 7-8, 6' 19-21, u' 4-5. Coxisternal area: sternal line 5-6; ib 10-11 apart, 9-12; ia 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: 16-18 wide, 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. Epigynal cover flap lined; genital setae long. Female 0.15 : 0.036 mm; male 0.12 : 0.036 mm. Bronzing 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 feather claw. Abdomen with 22 smooth, dorsal half rings. Setae a (abdominal or accessory?) unusually delicate. Epignyrium 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.

Female. Body brownish, with light, transverse bands on the dorsum, formed from deep (profound) dorsal semirings [annuli]. Body crescent shaped, sinuous, the posterior end tapered. On the dorsal surface are nine large humps, of these, from the first after the dorsal shield to the eight are considerable larger than the rest, and the four last are smaller and completely ring the abdomen. Ventral annuli smaller, somewhat larger toward the anal end of the body. Length of the body, 130, width 45, height 54. The rostrum long, 27.3, apical setae 7-8. Length of the dorsal shield 32.5, width 33.8; the projection [frontal lobe] slightly covering the base of chelicerae. The figure of the shield with two longitudinal lines, diverging at center. Dorsal setae stout, directed posteriorly, their length 15.6; and 15.6 apart. The distance between the bases of the first coxal setae, 11.7; second, 6.5; from second to third, 5.2; length of coxal 3-45.5. Length of leg I 28.6, patellar seta 16.9, tibial 5.2, tarsus 6.5, claw 10.4, empodium 6-7-rayed. Abdomen with 13 dorsal and 52 ventral annuli, the venter being distinctly microtuberculately as a whole, but weakly microtuberculate on the three penultimate setae, 11.7; second, 6.5; from second to third, 5.2; length of coxal 3-45.5. Length of leg I 28.6, patellar seta 16.9, tibial 5.2, tibial 5.2, tarsus 6.5, 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.l. 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 subungual 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.l. 7-8 sternites, from s.l. 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 sternite, s.v. II to 22-25 th, III to 5 th sternite counting from the back. Accessory setae absent. Length of 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.l. 13-14, I 40-45, II 17-20, III 18-20, c.s. 50-60.

Male: not observed.

Host plant: Greek walnut (J. regia).

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


Distribution: SSR (Armenia), Central Europe.