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Acalitus kosahuatlus, a new species of eriophyid mite in central Mexico (Acari: Eriophyidae) and first report on the host plant *Ipomoea wolcottiana* (Convolvulaceae)

Jesús A. Acuña-Soto[1] | Juan M. Vanegas-Rico[2*] | Pedro E. De la Torre-Santana[3]

1. División de Ingeniería en Innovación Agrícola Sustentable, TecNM-Tlatlauquitepec, Puebla, México; E-mail: Jesus.Soto@tlatlauquitepec.tecnm.mx
2. Unidad de Morfología y Función, Facultad de Estudios Superiores Iztacala, Universidad Nacional Autónoma de México. Av. De los Barrios #1. Col. Los Reyes Iztacala, Tlalnepantla, Estado de México, México; E-mail: entomologo.mexicano@gmail.com
3. Laboratorio Central de Cuarentena Vegetal, Ayuntamiento Nº 231 entre San Pedro y Lombillo, Plaza, La Habana, Cuba; E-mail: acarologia.lccv@ulcsa.minag.gob.cu

**** Correspondence***
entomologo.mexicano@gmail.com

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ABSTRACT

Here we describe a new species of mite, *Acalitus kosahuatlus* Acuña-Soto & Vanegas-Rico **sp. nov.**, from the family Eriophyidae, collected in the state of Morelos, Mexico. This species causes galls on the leaves of *Ipomoea wolcottiana* Rose (Convolvulaceae), and is the first eriophyoid mite species recorded on this host plant worldwide and the second *Acalitus* species found on the plants of genus *Ipomoea*.

KEYWORDS

Convolvulaceae, diversity, gall forming, North America, taxonomy

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INTRODUCTION

The group of plants known as 'morning glory', (Solanales: Convolvulaceae), are widely distributed in tropical and subtropical regions of the world although they are better represented in tropical latitudes, especially in regions with dry seasons (McDonald 1994; Carranza 2007). It is currently included within the order Solanales, with 58 genera and around 1,880 species known worldwide, in the case of Mexico only 18 genera and 295 species are reported (Staples 2010; Villaseñor 2016) and include species of global economic importance, such as *Ipomoea batatas* (L.) Lam. (Loebenstein 2009). It is mostly recognized for its fused-petal flowers and its climbing habit, but at a morphological level, it presents a wide diversity that includes some parasitic species, as well as shrubs and trees (Ceja-Romero and Pérez-Olvera 2010) the latter being represented by *Ipomoea wolcottiana* Rose (Convolvulaceae).

Ipomoea wolcottiana is a pioneer tree whose distribution is concentrated in western Mexico, from Sonora to Chiapas, and some populations can be found in the center of the country. Mature trees of this species can measure between 3–13 meters and their trunks can be relatively large (Parra-Tabla 2002). Therefore, they have been used as fence posts, living barriers and currently their wood is considered for other uses (Ceja-Romero and Pérez-Olvera 2010). In Mexico since it is a tree with no economic importance, information on pests and diseases is almost non-existent, with only information on associated insects and pollinators, such as beetles from the families Curculionidae, Buprestidae, Melolonthidae, and Scolytidae, butterflies (Noctuidae) and some herbivores such as the grasshoppers from the family Acrididae, without any records of mites (Cervantes-Mayagoitia and Huajuca-Zamudio

2017).

In Mexico studies on eriophyid mites are rare, having only two records of these mites on the plants of family Convolvulaceae, a description of *Acalitus santibanezi* in *Ipomoea murocoides* Roem. & Schult. (García-Valencia and Hoffman 1997) and *Aceria malherbae* Nuzzacci, which was introduced to the country for the biological control of *Convolvulus arvensis* L. (Rodríguez-Navarro 2009; Rodríguez-Navarro *et al.* 2011). In both cases these mites cause galls on the leaves which are thought to reduce host plant vigor (Andersen and Mizell 1987; Kondo and Hiramatsu 1999). Twenty-four eriophyid mites species are associated with the family Convolvulaceae in the world, of which 13 have been reported from *Ipomoea* species; the genus *Acalitus* with only two species (Amrine and Stasny 1994; Amrine and de Lillo unpublished databases).

Here we describe and illustrate a new species of *Acalitus* from morning glory in Mexico. This is only the second species from this genus to be described from leaves of *Ipomoea* spp. and the third record of eriophyoid mites on plants of the family Convolvulaceae in Mexico.

MATERIAL AND METHODS

Leaves from infested *I. wolcottiana* plants were collected in August 2008 from the municipality of Tlalnepantla in the state of Morelos, Mexico. In the laboratory, mite specimens were dissected from within leaf galls and examined directly under a dissecting stereomicroscope (Carl Zeiss® Stemi DV4®) at a magnification of 40×. Specimens were then mounted in modified Berlese medium (Amrine and Manson 1996) and examined further under a phase-contrast microscope (Carl Zeiss® Primo Star®) at a magnification of 40×. Specimens were then mounted in modified Berlese medium (Amrine and Manson 1996) and examined further under a phase-contrast microscope (Carl Zeiss® Primo Star®) at a magnification of 40× and 100× oil immersion objective lens for identification or measurement, description and illustration. Where possible, species were identified using the keys of Amrine *et al.* (2003) and from comparisons with original species descriptions (Keifer 1977; García-Valencia and Hoffmann 1997). When the mites did not match existing descriptions, morphological characteristics were measured in micrometers (μm), according to Amrine and Manson (1996) and de Lillo *et al.* (2010). In the description of the new species, measurements of structures for the holotype are presented, followed, in parenthesis, by the size range of the corresponding structures in the paratypes. General terminology used in this study follows Lindquist (1996) and Amrine *et al.* (2003).

RESULTS

TAXONOMY

Family Eriophyidae Nalepa

Subfamily Eriophyinae Nalepa

Tribu Aceriini Amrine & Stasny

Genus *Acalitus* Keifer

Acalitus kosahuatlus Acuña-Soto & Vanegas-Rico sp. nov. (Figs 1–2)

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Description

Female (measured specimens = 10; holotype and 9 paratypes) – Body vermiform, 230 (220–240) long, 50 (45–53) wide, whitish when alive.

Gnathosoma – Projects downward, 20 (18–25) long, seta *d* simple 2 (1.5–3.0), seta *ep* and *v* very small.

Prodorsal shield – Subsemicircular, 44 (40–47), 30 (28–33) wide. Median, admedian and submedian lines discernable with numerous longitudinal lines across most of the shield and with heavily

granular anterior areas and sides of the shield. The central lines project backwards forming a semicircle beyond the scapular tubercles interrupting the first three annuli. In the anterior margin is a small lobe which is formed by the union of two lines that are part of the ornamentation of the shield. Scapular tubercles on rear shield margin, 20 (17–22) apart, setae *sc* 16 (14–15) long, projecting posteriorly.

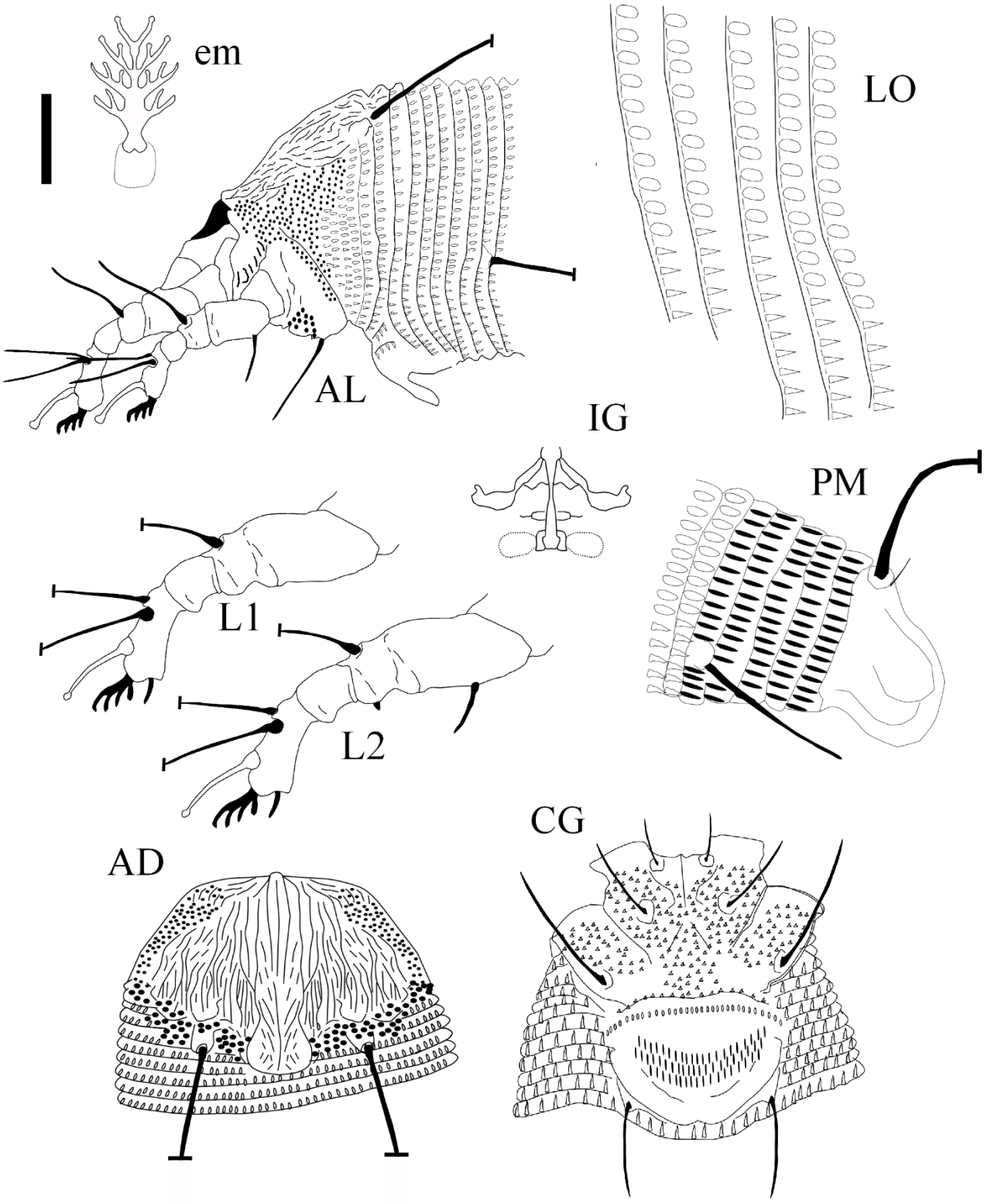

Figure 1. Schematic drawings of *Acalitus kosahuatlus* Acuña-Soto & Vanegas-Rico **sp. nov.** (female) – **AD.** Prodorsal shield; **AL.** Lateral view of anterior body region; **CG.** Female coxigenital region; **em.** Empodium; **IG**. Internal female genitalia; **LO.** Lateral view of annuli; **L1-L2.** Leg I and leg II; **PM.** Lateral view of posterior ophistosoma. **Scale bar:** 10 μm for AD, AL, CG, IG, PM; 7 μm for LO, L1-L2; 2.5 μm for em.

Coxal plates – With spine-like granules, setae *1b* 14 (12–16), 10 (8–11) apart; setae *1a* 5 (4–6), 9 (7–10) apart; setae *2a* 17 (15–20), 21 (20–22) apart, prosternal apodeme present but inconspicuous.

Legs I – 37 (36–37); femur 7 (7.5–8), without spines, genu 4 (3–4), setae *l″* 9 (7–10), tibia 4 (3–5), tarsus 7 (7–8), setae *ft′* 13 (11–15), setae *ft″* 17 (15–19), empodium simple 5 (4–6), 4-rayed, tarsal solenidion *ω* 9 (7–8), slightly knobbed.

Legs II – 27 (25–29), femur 7 (6–8), setae *bv* 5 (3–6), genu 4 (3–5), with a small spine, setae *l″* 8 (7–10), tibia 5 (3–4), setae *l′* 4 (3–5), tarsus 7 (7–8), setae *ft′* 13 (11–15), setae *ft″* 17 (15–19), empodium simple 5 (4–6), 4-rayed, tarsal solenidion *ω* 9 (7–8), slightly knobbed.

Opisthosoma – Dorsally with 86 (84–87) semiannuli, the first three semiannuli interrupted by the extension of the prodorsal shield, dorsally with oval microtubercles on the rear annular margins, ventrally with 83 (81–85) semiannuli and with acuminated microtubercles on rear annular margins. Setae *c2* 16 (14–15) on ventral semiannulus 11 (9–12), setae *d* 21 (19–23) on ventral semiannulus 30 (28–31), setae *e* 28 (25–30) on ventral semiannulus 51 (49–52), setae *f* 4 (3–5) long on ventral semiannulus 78 (75–80), setae *h1* 1 (0.5–1.5), setae *h2* 35 (32–37), last 5–6 last ventral semiannuli with elongated microtubercles.

Genitalia –15 (14–17), 18 (16–17) wide, epigynum with three lines of small longitudinal striae, setae *3a* 17 (15–18), 20 (19–22) apart.

Male – unknown.

Type host plant

Ipomoea wolcottiana Rose (Convolvulaceae) known in Mexico as Acotope, Casahuate, Cazahuate, Palo bobo, Pájaro bobo, Quiebra platos, Palo muerto, Patancán blanco.

Type locality

Parcela del Bigotes, Tlalnepantla, Morelos (18° 57' N and 98° 14' W, altitude 2,400 m) by J.M.Vanegas-Rico on 15 August 2008.

Type material

Female holotype and 10 female paratypes from *I. wolcottiana* collected by J.M.Vanegas-Rico on 15 August 2008. Seven preparations were deposited in the National Collection of Mites (CNAC) at the Instituto de Biología, Universidad Autónoma de México (UNAM) and three in the mite collection of the TecNM-Tlatlauquitepec.

Relationship with the host – The mites made irregular bead-like galls that projected from the upper leaf surface in large numbers. The galls were hairy trichrome inside (Fig. 2).

Figure 2. Galls produced by *Acalitus kosahuatlus* Acuña-Soto & Vanegas-Rico **sp. nov.**: **a.** Gall forming; **b.** Detail of gall (longitudinal view); **c.** *A. kosahuatlus* within the gall. Scale bars for a and b: 1mm, for c: 100 μm.

Etymology

Based on the Mexican ancient name, "kosahuatl", of its host plant.

Differential diagnosis

This new species was closer to *Acalitus ipomocarneae* Keifer, 1977 and *A. santibanezi* García-Valencia and Hoffman, 1997, both causing galls in Convolvulaceae leaves.

Acalitus ipomocarnea - It differs in the length of the idiosoma and the prodorsal shield, it has a smaller number of dorsal rings; setae *sc* longer, legs I smaller, setae *d* and *e* longer, and *h2* short. Other morphometric characters are similar in both species (Table 1). The author mentions a ventral spine near the apex of the femur and the genu on legs II, in the new species only present the spine of the genu. The genital coverflap is granular with a series of defined lines of small longitudinal striations as in the new species, but it differs because it has five lines, and they are similar because they have smooth anterior and posterior areas. The prodorsal shield has numerous longitudinal lines, the median, the admedian and submedian, although present, are not continuous as in the new species, and do not project beyond the dorsal tubercles joining in a semicircle, it also lacks the small lobe in the anterior part.

Acalitus santibanezi - The length of the idiosoma is short, being the smallest of the three, and the distance between the dorsal tubercles is small. Compared to the new species, legs I and II are longer as well as the empodia; the genitalia are reduced in length and the setae *d* and *e* are longer than the other two, in the other morphological characters they are similar in both species (Table 1). The prodorsal shield, there is no distinction between the median line, the admedias and the submedian since it is multistriated. The authors mention that sometimes the lines can be distinguished, and as in the new species, they are curve beyond the margin of the dorsal tubercles, but without closing forming the semicircle; this species does not have the small spines on the femur and genu. Unlike the other two species there are no smooth anterior and posterior areas in the genital coverflap, their design is completely granular with no defined pattern throughout their area.

Table 1. Gross comparison of some important characters between *Acalitus kosahuatlus* Acuña-Soto & Vanegas-Rico **sp. nov.**, *Acalitus ipomocarneae* Keifer, 1977 and *Acalitus santibanezi* García-Valencia & Hoffman, 1997.

Character	***A. kosahuatlus* sp. nov. (female; n = 10)**		***A. ipomocarneae* (female; n = 4)**		***A. santibanezi* (female; n = 6)**	
	Mean	**Min.-Max.**	**Mean**	**Min.-Max.**	**Mean**	**Min.-Max.**
Opisthosoma L.	230	220–240	182	170–195	153	153–173
Opisthosoma W.	50	45–53	40	-	47	45–55
Prodorsal shield L.	44	40–47	20	-	24	24–28
Prodorsal shield W.	30	28–33	28	-	28	28–37
Scapular setae (*sc*) L.	16	14–15	26	-	28	21–28
Distant between scapular tubercles	20	17–22	16	-	3	3–6
Chelicerae L.	20	18–25	20	-	18	14–21
Leg I L.	36	36–37	28	-	43	41–50
Tibia I L.	4	3.5	4.5	-	4	4–6
Empodium I rays number	4	4–4	4	4–4	4	4–4
Leg II L.	27	25–29	28	-	44	41–46
Tibia II L.	5	3–4	3	-	4	3–4
Tarsus II L.	7	7–8	6	-	7	6–7
Empodium II L.	5	4–6	6	-	10	10–11
Empodium II rays number	4	4–4	4	4–4	4	-
Genitalia L.	15	14–17	16	-	10	10–14
Genitalia W.	18	16–17	18	-	16	14–18
Genital setae (*3a*) L.	17	15–18	8	-	9	7–13
Lateral setae (c*2*) L.	16	14–15	15	-	14	13–21
Lateral setae (c*2*) on semiannulus	11	9–12	8	-	13	11–13
Ventral setae (*d*) L.	21	19–23	53	-	63	50–64
Ventral setae I (*d*) on semiannulus	30	28–31	21	-	27	27–27
Ventral setae II (*e*) L.	28	25–30	36	-	33	28–38
Ventral setae II (*e*) on semiannulus	49	49–51	36	-	46	46–46
Ventral setae III (*f*) L.	4	3–5	-	-	14	14–17
Ventral setae III (*f*) on semiannulus	78	75–80	-	-	77	–
Total dorsal semiannuli	86	84–87	60	-	83	77–84
Caudal setae (*h2*) L.	35	32–37	16	-	-	-
Accessory setae (*h1*) L.	1	0.5–1.5	2	-	-	-

L. = Length; W. = Wide

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Acalitus kosahuatlus، گونهٔ جدید هرنای اریوفید در مرکز مکزیک (Acari: Eriophyidae) و نخستین گزارش در مورد گیاه میزبان *Ipomoea wolcottiana* (Convolvulaceae)

خسوس اِی. آکونا-سوتو[۱] | خوآن ام. وانگاس-ریکو[۲*] | پدرو ای. دِ لا توره-سانتانا[۳]

۱. بخش مهندسی در نوآوری در کشاورزی پایدار، TecNM-Tlatlauquitepec، پوئبلا، مکزیک؛ رایانامه: Jesus.Soto@tlatlauquitepec.tecnm.mx

۲. بخش ریخت‌شناسی و عملکرد، دانشکدهٔ مطالعات عالی ایستاکالا، دانشگاه ملی خودمختار مکزیک، شماره ۱ خیابان لس بوریس، محلهٔ تلانپانتلا، لس ریِیس ازتاکالا، ایالت مکزیک، مکزیک؛ رایانامه: entomologo.mexicano@gmail.com

۳. آزمایشگاه مرکزی قرنطینه گیاهی، شهرداری شماره ۲۳۱ بین سن پدرو و لومبیّو، پلازا، هاوانا، کوبا، شهر، کشور؛ رایانامه: acarologia.lccv@ulcsa.minag.gob.cu

* نویسندهٔ مسئول

entomologo.mexicano@gmail.com

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دبیر تخصصی
پ. لطف‌الهی

چکیده

در این مقاله گونهٔ جدید هرنا، *Acalitus kosahuatlus* Acuña-Soto & Vanegas-Rico **sp. nov.** از خانواده Eriophyidae توصیف می‌شود که در ایالت مورلوس، مکزیک جمع‌آوری شد. این گونه باعث ایجاد گال روی برگ‌های *Ipomoea wolcottiana* Rose (Convolvulaceae) می‌شود و نخستین گونهٔ هرنای اریوفیوئید گزارش شده روی این گیاه میزبان در سراسر جهان و دومین گونهٔ *Acalitus* است که روی گیاهان جنس *Ipomoea* یافت شده است.

واژگان کلیدی: پیچکیان، تنوع، گالزا، آمریکای شمالی، آرایه‌شناسی

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