

# A new species of myrmecophilous soft scale insect from Colombia in the genus *Akermes* Cockerell (Hemiptera: Coccoidea: Coccidae)

Una nueva especie de escama blanda mirmecófila en Colombia del género *Akermes* Cockerell (Hemiptera: Coccoidea: Coccidae)

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**Summary.** A new species of myrmecophilous soft scale in the genus *Akermes* Cockerell, collected in Colombia, is described and illustrated. Information on distribution, host plants and morphological variation is given. This is the first record of the genus *Akermes* in Colombia.

**Key words:** Coccid. Melastomataceae. *Ocotea*. *Persea*. *Psidium*.

**Resumen.** Una nueva especie de escama blanda mirmecófila del género *Akermes* Cockerell, colectada en Colombia, es descrita e ilustrada. Se incluye información sobre su distribución, hospederos y variación morfológica. Este es el primer registro del género *Akermes* en Colombia.

**Palabras clave:** Cócido. Melastomataceae. *Ocotea*. *Persea*. *Psidium*.

## Introduction

Thirteen species distributed in Africa, Australia, Central America, India and South America are currently assigned to the genus *Akermes* (Ben-Dov *et al.* 2003). However, only *A. bruneri* Ckll., *A. riograndensis* Hempel, *A. punctatus* (Ckll.), *A. townsendi* (Ckll.), *A. cordiae* Morrison, and *A. xylosma* Granara de Willink are properly placed in the genus, with the remaining seven species either belonging to other phylogenetic groups or of an uncertain taxonomic position (Kondo 2003). In this study, we provide diagnostic characters of the genus *Akermes*, and describe a new species from Colombia.

The diagnostic characters of the genus *Akermes* can be summarized as follows: (i) body of adult female convex and globular, often heavily sclerotized at maturity; (ii) submarginal tubercles absent; (iii) preopercular pores present; (iv) sclerotic crescent around anal plates present or absent; (v) eyes absent; (vi) marginal setae present or absent; (vii) ventral disc-pores variable, with one or more central loculi; (viii) ventral tubular ducts absent; (ix) anal plate setae present, often numerous, restricted to posterior end of plates; (x) antennae and legs greatly reduced, with segments mostly indistinct or fused; (xi) antennae 1-5 segmented; (xii) spiracular setae 1-3 in number, extending slightly to deeply onto dorsal submargin (Kondo 2003).

The genus *Akermes* Cockerell, 1902 has been revised by Hodgson (1994), Granara

de Willink (1999), and more recently by Kondo (2003). Hodgson (1994) included *Akermes* in the subfamily Myzolecaniinae (Coccidae), a group of myrmecophilous soft scales that share many morphological features adapted for a symbiotic life with ants. Based on a morphological study of the first-instar nymphs, Williams and Kondo (2002) noticed differences amongst the genera of Myzolecaniinae. In another study using a combination of adult female and first-instar nymph characters, Kondo and Williams (2002) indicated that the subfamily Myzolecaniinae appears to be composed of several unrelated lineages, and included *Akermes* in the *Toumeyella*-group.

The genus *Akermes* is strictly Neotropical in distribution with species found from México down to Argentina and Paraguay in southern South America. This is the first record of the genus *Akermes* in Colombia. One hundred seventy four species of scale insects (Hemiptera: Coccoidea) have been reported from Colombia, out of which 35 fall into the family Coccidae (Kondo 2001). With the addition of the new species herein presented, the list of soft scales in Colombia increases to 36 species.

## Materials and Methods

The new species was collected in Cali, El Topacio, Buga, and Tulúa, in the Departamento del Valle, Colombia in 1999 and 2000. Both male and female insects in all developmental stages were collected and slide mounted. However, only the adult

female and first-instar nymphs are described. Specimens were slide mounted according to the method discussed by Kosztarab (1996), and were studied under a Zeiss RA phase contrast compound microscope. Illustrations follow the typical style adopted for coccoids, with the dorsal side drawn on the left side and the ventral side drawn on the right side. Enlargements of important features were placed around, however, the enlargements are not in direct proportion to each other. Type specimens were designated from specimens collected in Cali and El Topacio. Specimens not included in the type series are listed in the section of "Other material studied". Because some slides contain more than one specimen, the studied material is represented by the number of slides followed by the total number of specimens in parentheses, e.g., 2(3) meaning 2 slides and 3 specimens.

Abbreviations for the depositories are as follows: Auburn University Coccoidea Collection, Auburn University, Auburn, Alabama, U.S.A. [AUCC]; Bohart Museum of Entomology, Department of Entomology, University of California, Davis, California, U.S.A. [BME]; The Natural History Museum, London, England [BMNH]; Colección de Insectos, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá D.C., Colombia [UNCB]; The National Museum of Natural History Coccoidea Collection, Beltsville, Maryland, U.S.A. [USNM]; and the Museo de Entomología, Universidad del Valle, Cali, Colombia [UVCO].

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***Akermes colombiensis* sp.n., adult female**

**Diagnosis.** The adult female of this species can be diagnosed by the following combination of characters: (i) discoidal pores abundant and often touching each other on area anterior to anal plates, with several scattered on mid-dorsum, fused pores often present; (ii) sclerotic crescent present around anal plates, crescent not incorporating discoidal pores; (iii) anal plates with 7-15 setae on dorsal surface; (iv) marginal setae sharply spinose and/or with apex gradually or abruptly tapering to a point; (v) spiracular setae 3 in number, found submarginally on dorsal surface; (vi) legs and antennae greatly reduced, with segmentation poorly defined; (vii) multi-locular disc-pores (spiracular and perivulvar pores) with 4 - 7 loculi, mostly 5-locular; (viii) ventral tubular ducts absent.

**Description. Adult female (Fig. 1)**

**Unmounted material.** Fully grown insects highly convex, shiny, derm rugose, strongly sclerotized, particularly around anal plates. Color highly variable, ranging from pale weak yellow, ferruginous, ochre, orange-to reddish-brown, often mottled with dark brown. Young adult females normally ochre, with a narrow dark line running longitudinally across mid-dorsum, sclerotic crescent around anal plates reddish-brown to dark in color. The insects were found tended by arboreal ants, covered by ant cartons, or exposed on tree trunk, twigs and fruits of host.

**Mounted material.** Body outline oval to elongate oval, 2.4-4.3 mm long, 2.0-3.8 mm wide (n = 41).

**Dorsum.** Derm membranous (magnification of derm shown in figure 1A), becoming heavily sclerotized at maturity, occasionally with granular dermal patches (Fig. 1G). Dorsal setae (Fig. 1F) length 8.5-15  $\mu\text{m}$ , slender, sharply spinose, often missing or undetected. Submarginal tubercles absent. Discoidal pores (Fig. 1H) 6.4-15  $\mu\text{m}$  wide, convex, invaginated, abundant and often touching, or almost touching on area anterior to anal plates, several scattered on mid-dorsum. Simple disc-pores (Fig. 1D) 2.7-3.6  $\mu\text{m}$  wide, scattered evenly throughout dorsum. Dorsal microducts (Fig. 1E) appearing bilocular under high magnification, width of duct rim 2.7-3.6  $\mu\text{m}$ . A narrow sclerotic crescent present around anal plates. Anal plates (Fig. 1I) each triangular, 149-164  $\mu\text{m}$  long, 81-96  $\mu\text{m}$  wide, anterolateral margin 117-128  $\mu\text{m}$  long, posterolateral margin 102-115  $\mu\text{m}$  long, with 8-15 setae on dorsal surface and with about 4 ventral subapical setae. Anal ring (Fig. 1J) with 10 setae. Anal cleft extending about 1/5 of body length. Eyes absent.

**Margin.** Margins smooth. Marginal setae (Fig. 1B) sharply spinose, with apex gradually or abruptly tapering to a point, 10-25  $\mu\text{m}$  long, with about 8-25 setae on

body margin between anterior and posterior spiracular setae. Spiracular setae (Fig. 1C) conical, or bluntly spinose, often bifurcate or trifurcate, much thicker than marginal setae, present in a group of 3 on dorsal submargin, all subequal in length, or often median seta longest, each setae 12-45  $\mu\text{m}$  long. Spiracular clefts shallow, showing slight sclerotization.

**Venter.** Ventral setae (Fig. 1M) sharply spinose, straight or slightly bent, 8.6-13  $\mu\text{m}$  long, those anterior to vulvar region on last abdominal segments longer, 21-43  $\mu\text{m}$  long. Antennae (Fig. 1P) short, 36-76  $\mu\text{m}$  long, segmentation often not discernible, about 2-5 segmented. Legs (Fig. 1L) greatly reduced, about size of spiracular peritreme, segments mostly indistinct, total length 54-107  $\mu\text{m}$ , without tibio-tarsal sclerotization, tarsal and claw digitules spiniform, claw without a denticle. Spiracles relatively large; anterior peritreme 75-90  $\mu\text{m}$  wide, posterior peritreme 81-94  $\mu\text{m}$  wide. Spiracular pores (Fig. 1O) with 3-7 loculi, mostly 5-locular, each 5.3-6.2  $\mu\text{m}$  wide, found in a band from area around each spiracle towards spiracular setae on dorsal submargin. Perivulvar pores (Fig. 1K) similar to spiracular pores, predominantly 5-locular, 6.2-7.1  $\mu\text{m}$  wide. Clypeolabral shield 189-216  $\mu\text{m}$  wide. Ventral microducts (Fig. 1N) scattered evenly throughout venter, width of duct rim 2.7-3.6  $\mu\text{m}$ . Ventral tubular ducts usually absent, rarely present in some specimens (see section on morphological variation).

***Akermes colombiensis* sp.n., first instar nymph (Fig. 2)**

**Diagnosis.** The first-instar nymphs of *Akermes colombiensis* sp.n. are characterized by the following combination of characters: (i) antennae 5-segmented; (ii) spiracular pores 4-locular; (iii) ventral submedian setae 3 pairs; (iv) claw with a denticle; (v) spiracular setae 3 in number, with median spiracular setae longest; (vi) a pair of dorsal setae present on head region; (vii) dorsal microducts appearing bilocular under high magnification, positioned submarginally and in 2 submedian longitudinal rows, with a pair of additional microducts between submarginal and submedian rows on area of mid-thoracic region; and (viii) a simple disc pore present near each dorsal microduct.

**Description. First-instar nymph**

**Unmounted material.** First- and second-instar nymphs elongate oval, light yellow in color, with area of spiracular furrows often of a whitish or lighter color, anal plates usually darker than surrounding derm, often of an orange color.

**Mounted material.** First-instar nymphs elongate oval, 415-469  $\mu\text{m}$  long, 256-313  $\mu\text{m}$  wide (n = 27).

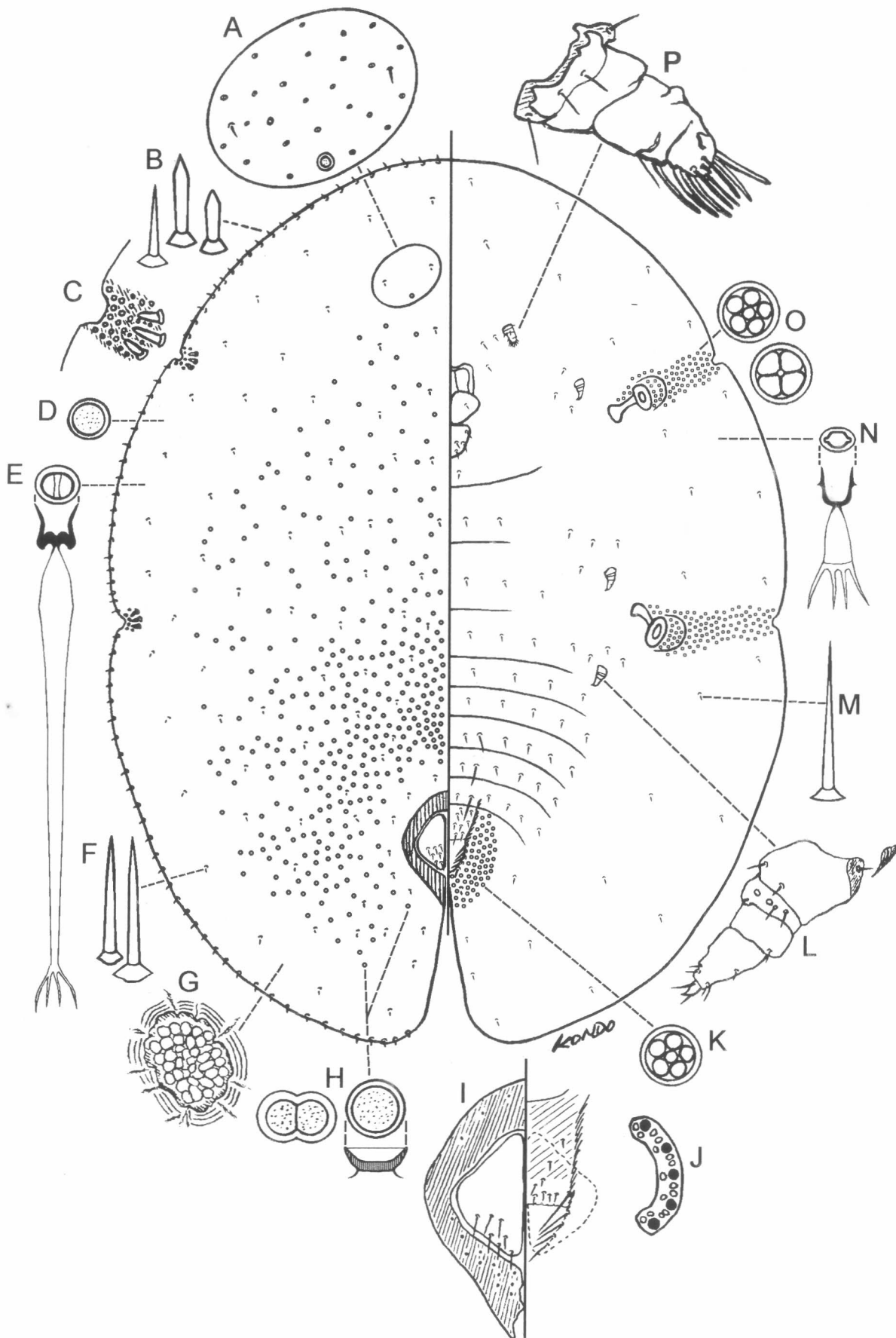
**Dorsum.** Derm membranous, roughly delineated by membranous folds. One pair of dorsal setae on head region (Fig. 2B)

present, often broken off or undetectable. A pair of trilocular pores (Fig. 2A) present on head region. Simple disc pores (Fig. 2F) present, duct rim about 1.8  $\mu\text{m}$  wide, often hard to detect or indiscernible in specimens over treated with potassium hydroxide. Bilocular microducts (Fig. 2E) 3.6-4.4  $\mu\text{m}$  wide. Anal plates each triangular, 60-64  $\mu\text{m}$  long, 21-26  $\mu\text{m}$  wide. Number of setae on each plate 4, including long apical setae. Anal ring (Fig. 2G) with 6 setae. Eyes present, located about same level as antennal scape.

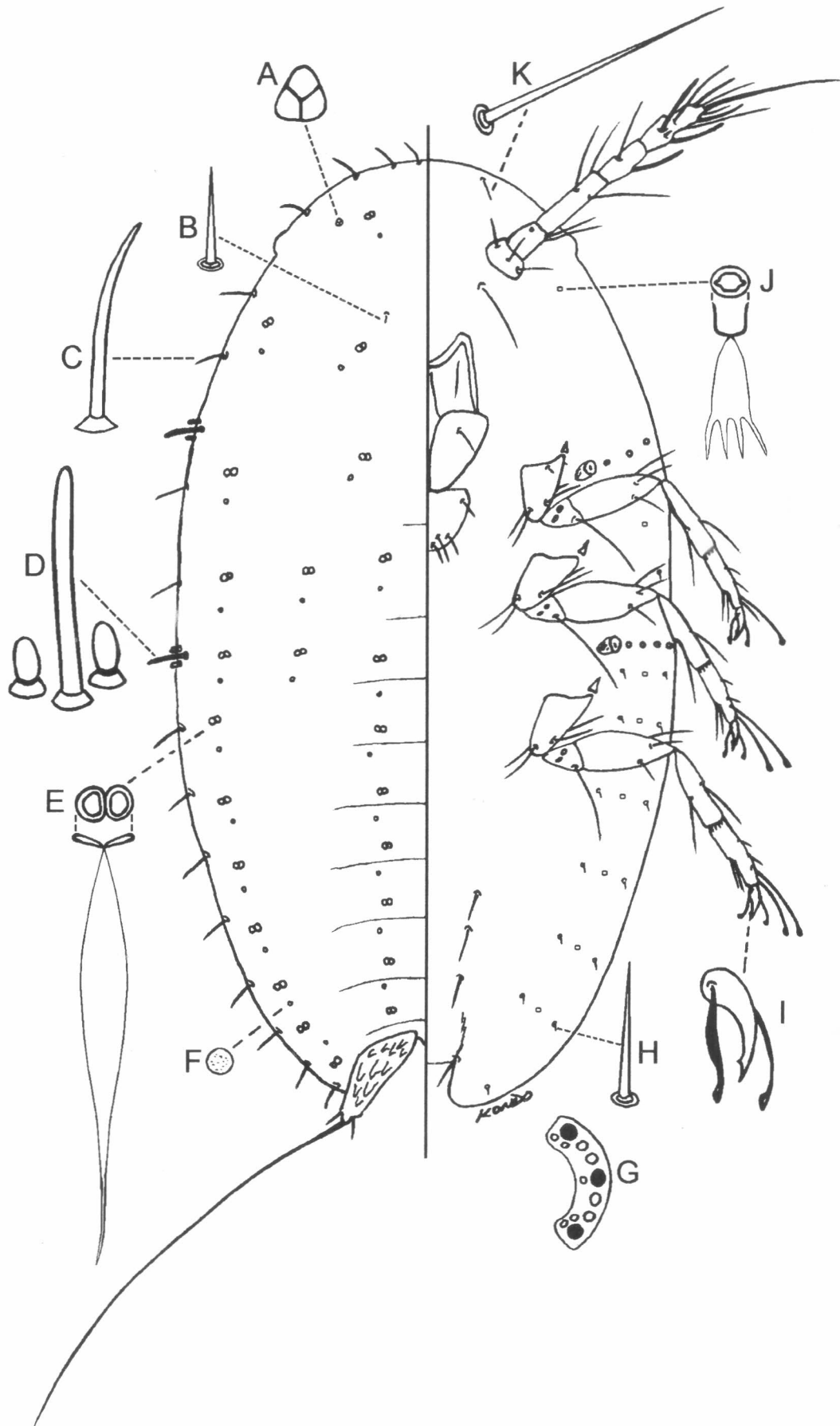
**Margin.** Marginal outline smooth. Marginal setae (Fig. 2C) sharply spinose, with straight or bent tips, 13-20  $\mu\text{m}$  long. Total number of marginal setae 32: 8 anteriorly between eyes, 2 between each eye and anterior spiracular setae, 2 between anterior and posterior spiracular setae, and 8 on posterior end of body (between posterior spiracular setae and abdominal apex). Spiracular setae (Fig. 2D) numbering 3, bluntly or sharply spinose, median spiracular setae longest, 15-19  $\mu\text{m}$  long, lateral spiracular setae shorter, 4.3-6.4  $\mu\text{m}$  long.

**Venter.** Derm membranous. Six inner and 7 outer submarginal setae (Fig. 2H) on each side of abdominal margins, 1 on each side between anterior and posterior spiracle, and 1 ventral cephalic seta (Fig. 2L). Antennae 5-segmented, total length 119-139  $\mu\text{m}$ . Interantennal setae 1 pair. Legs well developed, trochanter + femur 68-77  $\mu\text{m}$  long, tibia + tarsus (claw not included) 79-85  $\mu\text{m}$  long. Microtenidia at tibial apex present. Prothoracic tarsal digitules dissimilar: 1 knobbed, 1 spiniform; mesothoracic and metathoracic tarsal digitules similar, knobbed. Claw (Fig. 2I) with a denticle, claw digitules knobbed, one thicker than other. Spiracular peritremes 7.1-8.9  $\mu\text{m}$  wide. Spiracular pores (Fig. 2J) with 4 loculi, numbering 3 on anterior spiracular furrow, and 4 on posterior spiracular furrow. Clypeolabral shield 66-68  $\mu\text{m}$  wide. Ventral microducts (Fig. 2K) present, duct rim about 1.8  $\mu\text{m}$  wide, numbering 8 on each side of body, 6 between inner and outer submarginal setae in the abdominal region, 1 between anterior and posterior spiracle, and 1 present near base of antennal scape.

**Morphological variation.** Specimens from guava (*Psidium guajava*) collected in Cali are morphologically identical to the type specimens collected in El Topacio on Melastomataceae. Specimens from Buga collected on avocado (*Persea americana*) and aguacatillo (*Ocotea* sp.) also closely match the morphology of the types, except that a few specimens from these hosts have 1-2 ventral tubular ducts on the vulvar region. (Ventral tubular ducts are always absent in the other species of *Akermes*). Scales collected on guava at the Juan Maria Cespedes Botanical Garden in Tulúa, usually have fewer and slightly smaller discoidal pores, a highly irregular body outline, and more pronounced granular dermal patches. No differences were found between first-instar nymphs from any locality.



**Figure 1.** *Akermes colombiensis* sp.n., adult female. A. Dorsal derm magnification. B. Marginal setae. C. Spiracular setae. D. Simple disc-pore. E. Dorsal microduct. F. Dorsal setae. G. Discoidal pore. H. Anal plates. I. Perivulvar pore. J. Anal ring (right half). K. Leg. L. Ventral seta. M. Ventral microduct. N. Spiracular pores. O. Antenna.



**Figure 2.** *Akermes colombiensis* sp.n., first-instar nymph. A. Trilocular pore. B. Dorsal seta. C. Marginal seta. D. Spiracular seta. E. Dorsal microduct. F. Simple disc pore. G. Anal ring (right half). H. Ventral submarginal seta. I. Claw. J. Spiracular pore. K. Ventral microduct. L. Ventral cephalic seta.

**Distribution.** Neotropical region: Colombia, Valle (Buga, Cali, El Topacio, Tulúa).

**Host plants.** Lauraceae: *Ocotea* sp., *Persea americana* Mill.; Melastomataceae: species undetermined, with purple flowers and similar to *Tibouchina*; Myrtaceae: *Psidium guajava* L.

**Associated ants.** Dolichoderinae: *Azteca* sp.; Formicinae: *Myrmelachista* sp.; Myrmicinae: *Crematogaster* sp.

### Type Material

Adult female. HOLOTYPE: COLOMBIA. **Valle.** El Topacio. 13-dic-1999. *Kondo, T.*, ex Melastomataceae, inside ant cartons of *Myrmelachista* sp., AL-093-2000: 1(1) [USNM]; PARATYPES: same data as holotype: 2(2) [AUCC], 1(1) [BME], 2(2) [UNCB], 2(2) [USNM]; COLOMBIA. **Valle.** El Topacio. 18-ago-1999. *Kondo, T.*, ex Melastomataceae, inside ant cartons of *Myrmelachista* sp., AL-089-2000: 2(2) [AUCC], 2(2) [BME], 2(2) [UNCB], 2(2) [USNM], 4(5) [UVCO]; COLOMBIA. **Valle.** Cali. 18-Ago-1999. *Kondo, T.*, ex guava, inside cartons of *Azteca* sp. ants, AL-094-2000: 3(3) [AUCC], 3(3) [BME], 5(5) [BMNH], 1(2) [UNCB], 4(4) [USNM], 1(1) [UVCO]. Males. AL-094-2000: 1(1) [AUCC], 1(1) [BME], 1(1) [UNCB], 3(3) [USNM]; Immature stages. Same data as holotype: 2(2) [AUCC], 1(1) [BME], 2(4) [UNCB], 4(5) [USNM], 1(1) [UVCO]; AL-089-2000: 7(7) [USNM]; AL-094-2000: 2(2) [AUCC], 2(2) [BME], 6(6) [BMNH], 2(2) [UNCB], 5(13) [USNM], 2(2) [UVCO].

### Other material studied

Adult female. COLOMBIA. **Valle.** Tulúa. 18-ago-1999. *Kondo, T.*, ex guava, inside cartons of *Azteca* sp. ants, AL-092-2000: 2(2) [AUCC], 2(2) [BME], 2(2) [UNCB], 6(6) [USNM], 2(2) UVCO; COLOMBIA. **Valle.** Buga. 12-dic-2000. *Kondo, T.*, ex *Ocotea* sp., inside ant cartons of *Azteca* sp., AL-104-2000: 3(3) [USNM]; COLOMBIA. **Valle.** Buga. 12-ene-2000. *Kondo, T.*, ex avocado, tended by *Crematogaster* sp., AL-105-2000: 2(2) [AUCC], 2(2) [BME], 3(3) [BMNH], 2(2) [UNCB], 5(5) [USNM], 2(2) [UVCO]. Males. AL-105-2000: 2(2). Immature stages. AL-092-2000: 3(7) [AUCC], 3(6) [BME], 3(3) [UNCB], 9(14) [USNM], 3(3) [UVCO]; AL-104-2000: 3(3) [AUCC], 3(3) [BME], 4(4) [BMNH], 2(3) [UNCB], 4(4) [USNM], 2(5) [UVCO]; AL-105-2000: 2(3) [AUCC], 2(3) [BME], 1(2) [BMNH], 1(2) [UNCB], 2(6) [USNM], 1(1) [UVCO].

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