

SYSTEMATICS, MORPHOLOGY AND PHYSIOLOGY

A New Species of *Uroleucon* (Hemiptera: Aphididae) on *Madia* (Asteraceae) in Chile

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Neotropical Entomology 34(2):221-225 (2005)

Uma Nova Espécie de *Uroleucon* (Hemiptera: Aphididae) em *Madia* (Asteraceae) no Chile

RESUMO - *Uroleucon* é um dos poucos gêneros de afídeos com espécies nativas da América do Sul. Neste trabalho, é descrita e ilustrada uma nova espécie do Chile, *Uroleucon eumadiae* sp. nov., coletada em duas espécies sul-americanas do gênero *Madia* (Asteraceae): *M. sativa* Mol. e *M. chilensis* (Nutt.) Reiche. São discutidos os caracteres morfológicos e aqueles utilizados para distinguir *U. eumadiae* de outras espécies relacionadas. O último segmento rostral piloso desta espécie sugere uma adaptação alimentar, paralela a uma outra espécie que ocorre na América do Norte e que também se alimenta de plantas de do gênero *Madia*, mas que não é filogeneticamente próxima.

PALAVRAS-CHAVE: América do Sul, afídeo, *Uroleucon eumadiae*, adaptação de alimentação

ABSTRACT - *Uroleucon* is one of very few aphid genera that have species indigenous to South America. A new species of aphid from Chile is described and illustrated, *Uroleucon eumadiae* sp. nov., living on the two South American species of the genus *Madia* (Asteraceae): *M. sativa* Mol. and *M. chilensis* (Nutt.) Reiche. Morphological characters are discussed and the characters by which this aphid species may be distinguished from related ones are given. The long, hairy last rostral segment of the new species suggests strongly a feeding adaptation, and parallels that of a North American *Madia*-feeding species in the same genus which is not, however, closely related.

KEY WORDS: South America, aphid, *Uroleucon eumadiae*, feeding adaptation

Species of the aphid genus *Uroleucon* Mordvilko live on plants of the family Asteraceae, and are broadly distributed throughout the world (Blackman & Eastop 1984, Moran *et al.* 1999). The South American species are of special interest because they are one of the very few groups of the main aphid subfamily Aphidinae to have undergone recent speciation on native plants in southern temperate regions (Carvalho *et al.* 1998). Moran (1984) comments that biochemical, morphological, behavioral and life historical adaptations probably play a role in host specialization, but their relative importance is not clear. Interestingly, previous work has reported a positive correspondence between the length of the apical rostral segment and the hairiness of the host-plant (Moran 1984, 1986), suggesting a matching between aphid and host-plant traits. Such morphological specialization may occur secondarily with original benefits to specificity deriving from some other source (Moran 1984).

Uroleucon eumadiae sp. nov., was collected on *Madia chilensis* (Nutt.) Reiche and *M. sativa* Mol. (Asteraceae) in Chile. Both annual host plants show glandular trichomes on leaves and flower stems, and very sticky bracts of the

involucre. *Uroleucon eumadiae* sp. nov., shows a long and hairy ultimate rostral segment. *U. eumadiae* is described and illustrated and the morphological traits by which this species may be distinguished from related ones are given.

Uroleucon eumadiae sp. nov.

Type material

Holotype. Alate viviparous female collected on *Madia sativa* Mol. at Farellones (Región Metropolitana, Santiago, Chile) 10-I-2001, W. L. Gonzáles leg., in The Natural History Museum (BMNH; London, United Kingdom).

Paratypes. Three apterous viviparous females collected on *Madia chilensis* (Nutt.) Reiche at Farellones (Región Metropolitana, Santiago, Chile) 21-XI-2000, W. L. Gonzáles leg.; 19 apterous viviparous females and one alate viviparous female collected on *M. sativa* at Farellones (Región Metropolitana, Santiago, Chile) 08-V-2000, W. L. Gonzáles leg.; 24 apterous viviparous females and 19 alate viviparous female collected on *M. sativa* at Farellones (Región Metropolitana, Santiago, Chile) 14-I-2001, W. L. Gonzáles

leg.; 22 apterous viviparous females and 22 alate viviparous females collected on *M. sativa* Mol. at Farellones (Región Metropolitana, Santiago, Chile) 10-II-2001, W. L. Gonzáles leg.; collections of The Museo de Historia Natural (Santiago, Chile), Universidad Nacional de Córdoba (Córdoba, Argentina) and BMNH.

Description

Apterous Viviparous Female. Color in life is shining green. Cleared specimens with head pale, antennal segments I and II dusky; remainder of antenna except small basal part of segment III dark. Rostrum same color as antennal segments I and II, except apical rostral segment brown to almost black. Thorax pale. Legs with coxae and trochanters pale, femora with basal third to half pale, remainder dark brown; tibiae smoky, gradually becoming darker toward distal apex; tarsi similar in color to apical tibiae and antennal flagellum. Abdomen pale with peritreme brown; dorsum with distinct sclerites at the bases of the hairs, some of them pale dusky to transparent. Siphunculi mainly rather pale with dusky apices; some specimens with them lighter brown at base gradually changing to a dark brown toward apex, or they can be entirely dark brown. Cauda and anal plate pale dusky, and genital plate slightly paler.

Morphological Characters. Head smooth with antennal tubercles developed, divergent, about two-thirds as long as antennal segment I; and median frontal tubercle small (Fig. 1a, Table 1). Cephalic hairs have indistinct apices. Antennal segment I smooth, faint imbrication on II; III: without imbrications on zone around the secondary rhinaria; IV: faintly imbricated on base and more strongly so on segments V and VI. Proportions of segments III–VI = 100 (III): 65–87 (IV): 58–69 (V): 20–23 (base of VI) + 87–88 (proc. term.); processus terminalis 2.65–4.00 times as long as base of antennal segment VI. Secondary rhinaria 8–26, irregularly scattered on nearly the whole length of antennal segment III (Fig. 1b). Antennal hairs of segment III with indistinct apices. Longest hair 0.87 to 1.35 times as long as basal diameter of segment III (0.028–0.042 mm). Rostrum reaching to third coxae; ultimate rostral segment 1.56–1.81 times as long as segment II of hind tarsus, and bearing 18–24 accessory hairs. Prothorax with lateral tubercles, which have height 0.50 of length of adjacent hair. Hind femora and hind tibiae; 0.30–0.43 and 0.51–0.79 times as long as body length, respectively; ratio hind tibiae / femora 1.77–1.94. First tarsal segment with 5 hairs (Fig. 1h). Lateral abdominal tubercles present on abdominal segments II–IV, some of which are distinctly lobulate (Fig. 1f). Dorsal abdominal hairs with indistinct apices, and sometimes arising from small dark sclerites; usually four hairs (rarely five) dorsally on abdominal segment VIII: 0.050–0.070 mm. Siphunculi slightly enlarged at base, otherwise cylindrical; reticulated distally (0.17–0.26 of siphunculi length), and remainder imbricated to almost smooth on basal portion, about 0.20–0.29 of the body length, 0.77–1.07 times as long as antennal segment III, 1.28–1.56 times as long as cauda. Cauda, slender and acuminate, shows 10–26 hairs on apical two-thirds (Fig. 1g).

Alate Viviparous Female. Cleared specimens differ from apterae in having pale brown head and thorax. The abdomen is pale, except for light brown marginal sclerites.

Morphological Characters. Antennal segment III with basal diameter 0.028–0.036 mm, 0.88–1.15 times as long as the longest hair. Proportions of segments III–VI = 100 (III): 70–85 (IV): 61–72 (V): 18–22 (base of VI) + 76–89 (proc. term.); processus terminalis 4.00–4.67 times as long as base of antennal segment VI. Antennal hairs with indistinct apices, on segment III about 0.028–0.040 mm long. Secondary rhinaria 29–50, irregularly distributed over nearly entire length of antennal segment III (Fig. 1c). Ultimate rostral segment 1.71–1.94 times as long as segment II of hind tarsus, and bearing 22–24 accessory hairs (Fig. 1d). Hind femora and hind tibiae 0.35–0.42 and 0.67–0.82 times as long as body length, respectively. Ratio hind tibiae / femora 1.92–2.03. Siphunculi reticulated distally (0.24–0.31 of the siphunculi length) (Fig. 1e), 0.21–0.28 of the body length, 0.81–0.90 times as long as antennal segment III, 1.54–1.70 times as long as cauda. Other characters like apterae specimen.

Host Plants and Life Cycle. *U. eumadiae* was collected on *M. sativa* and *M. chilensis* in the following locations: Farellones, El Cerro “El Roble”, and the Parque Nacional Río Clarillo (Región Metropolitana, Santiago, Chile), during the spring and summer seasons (2000 and 2001) by W. L. Gonzáles. These annual host-plants have glandular trichomes on the leaves and flower stems. *M. sativa* shows an amphitropical distribution between South America (Chile and Argentina) and North America (Raven 1963; Zardini 1992); *M. chilensis* is a Chilean endemic (Hoffman *et al.* 1997). Other *Madia* species are in North America (Kyos *et al.* 1990).

U. eumadiae colonizes the inflorescences and stems of its host plants and after the flowers are in bloom it may also be found among the sticky bracts of the involucre. This species establishes dense colonies that often cover several stems. The sexual forms are not yet known.

Discussion

Both aptera and alate female of this new species can easily distinguished from all other South American *Uroleucon* by the long hairy ultimate rostral segment; 0.21–0.24 mm, bearing 18–24 accessory hairs, whereas no other species has simultaneously an ultimate rostral segment longer than 0.22 mm, with more than 10 accessory hairs. Only *Uroleucon muermosum* (Essig) has ultimate rostral segment 0.23–0.27 mm long but with 6–10 accessory hairs (Carvalho *et al.* 1998). The only other species of *Uroleucon* living on *Madia* is *U. madia* (Swain 1919), which belongs to the subgenus *Lambersius*. It was first described as a color variety of *U. rudbeckiae* (Fitch) in California (North America). According to Swain (1919), *U. madia* is dark-green, slightly pruinose in life; the alate viviparous female has the processus terminalis about six times as long as the base of VI; antennal segment III has 25–35 secondary sensoria; the rostrum reaches to the second coxae, the siphunculi are 0.91 mm long, slightly tapering, black except for the basal one-third which shows the same color as the

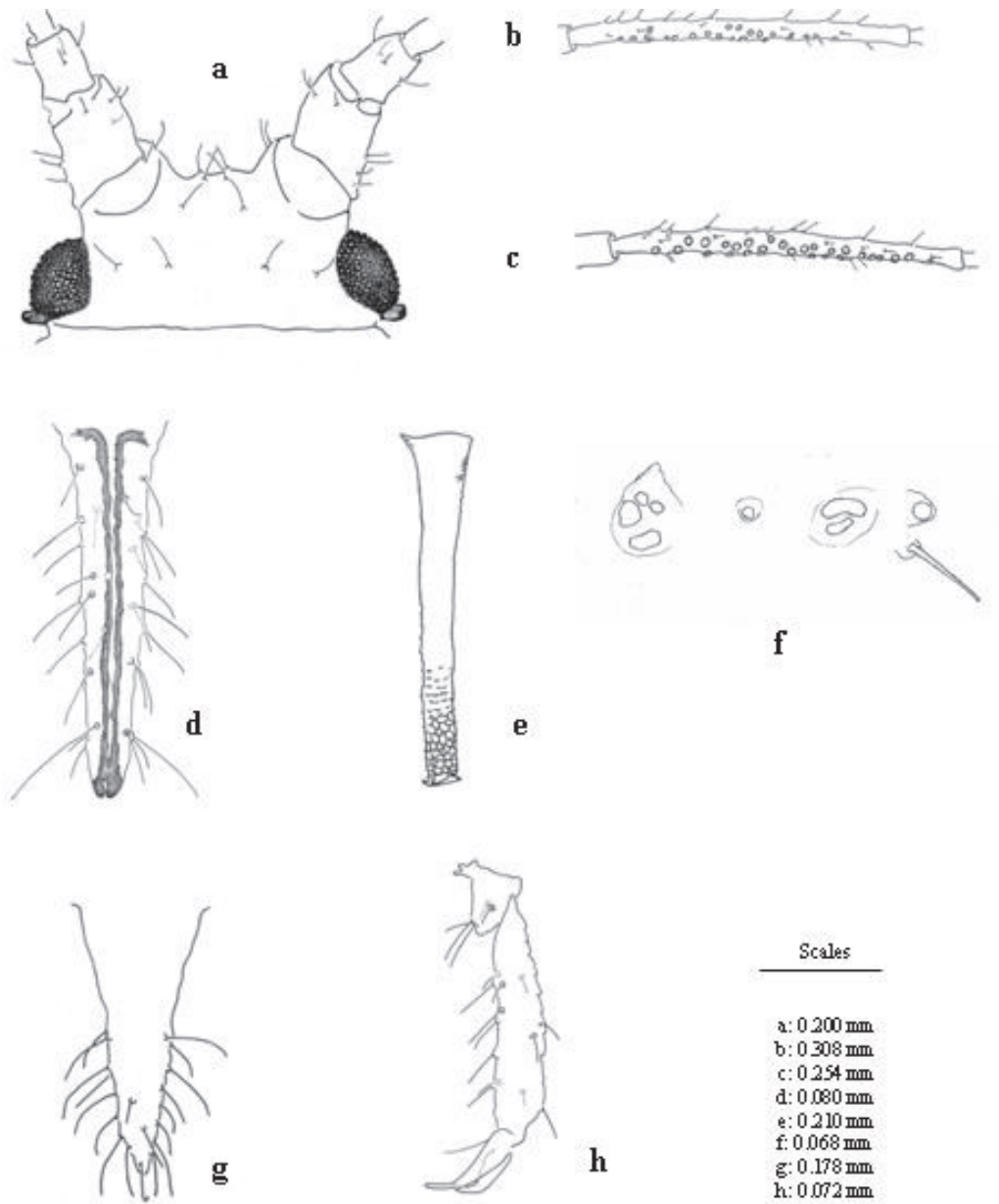


Figure 1. Morphological characters of *U. eumadiae*. a - Head, apterous viviparous female (apt.); b - Antennal segment III (apt.); c - Antennal segment III, alate viviparous female (al.); d - Ultimate rostral segment (al.); e - Siphunculus (al.); f - Different shape of lobulate lateral tubercles present on abdominal segments II- IV; g - Cauda (apt.); h - Hind tarsus (apt.).

abdomen, apical one-fifth reticulate; and the cauda is 0.45 mm long, about one-half as long as the siphunculi. *U. eumadiae* is shining green in life; the alate viviparous female has the processus terminalis 4.00 – 4.67 times as long as the base of VI; antennal segment III has 29 – 50 secondary sensoria; the rostrum reaches to the third coxae; the siphunculi are 0.49 – 0.65 mm long, apical one-quarter to one-third reticulate; and the cauda is 0.31 – 0.42 mm long.

According to Robinson (1986) the ultimate rostral segment of *U. madia* bears 14 – 18 accessory hairs, whereas *U. eumadiae* has 18 – 24.

U. eumadiae should currently be placed in subgenus *Uroleucon* (*Uroleucon*), as defined by such characters, as the reduced dorsal sclerotization and absence of antesiphuncular sclerites, despite the distinctly pigmented siphunculi, cauda and green color in life, which are untypical

Table 1. Morphometric data (mm) for *U. eumadiae* new species, apterous and alate viviparous females. Range is shown followed by the mean in parenthesis.

Character	Aptera	Alate
Body length	2.00 - 3.07 (2.49)	2.21 - 2.73 (2.49)
Hind tibiae	1.21 - 1.72 (1.56)	1.56 - 2.03 (1.84)
Hind femora	0.68 - 1.04 (0.81)	0.77 - 1.05 (0.94)
Siphunculi	0.46 - 0.67 (0.57)	0.49 - 0.65 (0.59)
Cauda	0.35 - 0.46 (0.41)	0.31 - 0.42 (0.36)
Extent of reticulation on siphunculi	0.10 - 0.17 (0.13)	0.15 - 0.19 (0.16)
Antennal segment III	0.49 - 0.70 (0.61)	0.56 - 0.77 (0.69)
Antennal segment IV	0.35 - 0.51 (0.44)	0.45 - 0.63 (0.54)
Antennal segment V	0.30 - 0.42 (0.38)	0.35 - 0.54 (0.45)
Base of antennal segment VI	0.13 - 0.15 (0.14)	0.12 - 0.15 (0.14)
Processus terminalis	0.39 - 0.56 (0.46)	0.49 - 0.65 (0.57)
Diameter of antennal segment III	0.028 - 0.042 (0.030)	0.028 - 0.036 (0.032)
Longest hair antennal segment III	0.028 - 0.042 (0.035)	0.028 - 0.040 (0.035)
Ultimate rostral segment	0.21 - 0.23 (0.22)	0.21 - 0.24 (0.23)
Hind tarsal segment II	0.12 - 0.15 (0.13)	0.12 - 0.13 (0.12)

of this subgenus. Holman (1975) stated that the presence or absence of pigment in the cauda should not be considered as an absolute criterion in the classification of some groups of aphids, even though they may be a valuable guide to separate groups of species or subgenera which are uniform in other morphological and ecological characters. *U. madia* belongs to subgenus *Lambersius* according to Robinson (1986) and Remaudière & Remaudière (1997); nevertheless Carvalho *et al.* (1998) comments that this subgenus is not clearly defined and it needs to be reassessed, and that the endemic South American species of *Uroleucon* may form a monophyletic group on their own. It is interesting that *eumadiae* and *madiae* are evidently not closely related but converge in characters of the rostrum that allow them to feed on *Madia*.

Acknowledgments

We thank R.L. Blackman and E. Fuentes-Contreras for their valuable comments on an early draft of this manuscript. WLG was supported by a postdoctoral grant of FONDECYT (3040036) during the writing process.

Literature Cited

- Blackman, R.L. & V.F. Eastop. 1984.** Aphids on the world's crops. An identification guide. Wiley, New York, 474p.
- Carvalho, R.C.Z., R.L. Blackman & J.M. Spence. 1998.** The Genus *Uroleucon* Mordvilko (Insecta, Aphidoidea) in South America, with a key and descriptions of four new species. Zool. J. Linn. Soc. 123: 117-141.
- Hoffmann, A., M.T.K. Arroyo, F. Liberona, M. Muñoz & J. Watson. 1997.** Plantas altoandinas en la flora silvestre de Chile. Ediciones Fundación Claudio Gay, Santiago, 281p.
- Holman, J. 1975.** Aphids of the genus *Uroleucon* from Mongolia (Homoptera, Aphididae). Acta Entomol. Bohemoslov. 72: 171-183.
- Kyos, D.W., Carr G.D. & B.G. Baldwin. 1990.** Biodiversity and cytogenetic of the tarweeds (Asteraceae: Heliantheae-Madiinae). Ann. Miss. Bot. Garden 77: 84-95.
- Moran, N.A. 1984.** The genus *Uroleucon* (Homoptera:Aphididae) in Michigan: Key, host records, biological notes, and descriptions of three new species. J. Kansas Entomol. Soc. 57: 596-616.
- Moran, N.A. 1986.** Morphological adaptation to host plants in *Uroleucon* (Homoptera: Aphididae). Evolution 40: 1044-1050.
- Moran, N.A., M.E. Kaplan, M.J. Gelsey, T.G. Murphy & E.A. Scholes 1999.** Phylogenetics and evolution of the aphid genus *Uroleucon* based on mitochondrial and nuclear DNA sequences. Syst. Entomol. 24: 85-93.
- Raven, P. 1963.** Amphitropical relationship in the flora of North and South America. Quarterly Rev. Biol. 38: 151-177.
- Remaudière, G. & M. Remaudière. 1997.** Catalogue des Aphididae du monde. INRA, Paris, 473p.
- Robinson, A.G. 1986.** Annotated list of *Uroleucon*

(*Lambersius*) (Homoptera: Aphididae) of America north of Mexico, with a key and descriptions of new species. Can. Entomol. 118: 559-576.

Zardini, E. 1992. *Madia sativa* Mol. (Asteraceae-Heliantheae-Madiinae): An ethnobotanical and geographical disjunct. Econ. Botany 46: 34-44.

Swain, A.F. 1919. A synopsis of the Aphididae of California. Univ. Calif. Publ. Tech. Bull. Entomol. 3: 1-221.

Received 22/IX/04. Accepted 22/XII/04.
