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A NEW SPECIES OF *AEOLOTHRIPS* (THYSANOPTERA: AEOLOTHRIPIDAE) FROM MANGO CROPS IN OAXACA, MEXICO

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ABSTRACT

We describe *Aeolothrips romanruizi* sp. nova that has been recently discovered in mango orchards in the Isthmus region of Oaxaca in southern Mexico. *Aeolothrips romanruizi* sp. nova exhibits an ornamentation of the mesonotum and metanotum very different from others in this genus, except *A. microstriatus*, which is similarly ornamented; but these 2 species differ in forewing color pattern, body size and some other characters of chaetotaxy. A key to the *Aeolothrips* species of Central America and Mexico is provided.

Key Words: fruit, *Aeolothrips microstriatus*, predator, SEM

RESUMEN

Se describe una nueva especie del género *Aeolothrips* que ha sido recolectado en el cultivo de mango en la región del Istmo de Oaxaca en el sur de México. En las especies descritas del género *Aeolothrips* la ornamentación del meso y metanoto es completamente distinto de la descrita aquí, solo *A. microstriatus* es similar y la nueva especie difiere de esta en el patrón de color del ala anterior, el tamaño corporal y otros caracteres referentes a la chaetotaxia. Se anexa una clave para las especies de *Aeolothrips* de Centro América y México.

Palabras Clave: fruta, *Aeolothrips microstriatus*, depredador, SEM

Insect predators are one of the most important agents in insect pest management practices, especially in those scenarios where there are few known parasitoids to control microarthropod pests (Sánchez-Ruiz et al. 1997). Predatory thrips species of Thysanoptera: Aeolothripidae have been studied as potential biological control agents. For example, *Franklinothrips orizabensis* Johansen 1974 has received much attention as a possible biological control agent of thrips species that are harmful to crops (Hoddle 2003b).

Members of Aeolothripidae are medium-sized, usually with dark brown bodies about 2.5mm long (Mound & Marullo 1996). Adults and larvae of many species in this family appear to be facultative predators of other small arthropods, in that they feed on both floral tissues as well as on thrips and mites that live in flowers. Some species are almost certainly exclusively phytophagous (Tyagi et al. 2008), but in the warmer parts

of the world, a considerable number of species are predators (Hoddle 2003a). Worldwide, about 250 species are recognized in 26 genera of Aeolothripidae (Mound & Marullo 1996).

Studies in avocado groves in search of natural enemies of *Scirtothrips perseae* Nakahara 1997 have identified predator species in *Aeolothrips*, *Aleurodothrips*, *Franklinothrips*, *Leptothrips*, *Scolothrips*, and *Karnyothrips* as possible biological control agents (Hoddle et al. 2002; Cambero-Campos et al. 2011) for this pest.

Here we describe a new species of the genus *Aeolothrips* that has recently been discovered in mango crops in the Isthmus region of Oaxaca in southern Mexico. This predatory thrips may be important in controlling many species of phytophagous thrips that attack this crop.

Aeolothrips romanruizi sp. nova.

MATERIAL

HOLOTYPE ♀. MEXICO, Oaxaca, San Pedro Tapanatepec, N 16°27'18.5" W 94°13'23.5", 46 m asl. Paratypes: 14 ♀♀, same data the holotype. Holotype and 4 paratypes deposited in the collection IBUNAM of the Universidad Autonoma de Mexico, 5 paratypes deposited in the collection of the Universidad de Costa Rica and 5 paratypes deposited in the Centro Interdisciplinario de In-

vestigación para el Desarrollo Integral Regional (CIIDIR), IPN-Unidad Oaxaca.

Color. Body mostly dark brown. Legs with dark brown femora and tibiae. Wings pale translucent with two brown bands longer than wide (Fig. 1A). Major setae dark brown.

Antennal segments I-IX dark brown, except segment III (and extreme base of segment IV) which is completely yellow (Fig. 1B). Antennal segments III-V longer than wide and cylindrical,

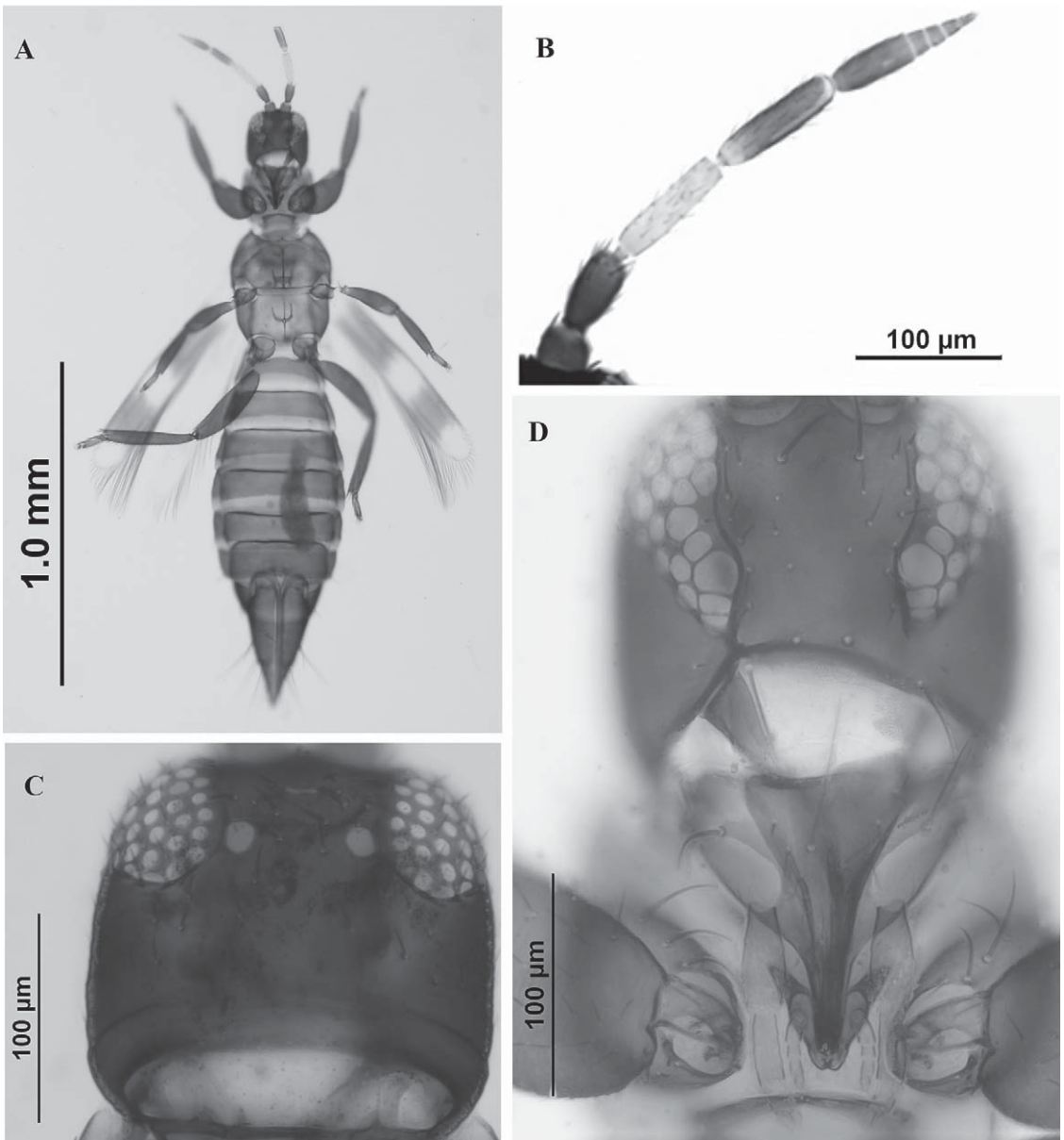


Fig. 1. Phase contrast photographs of *Aeolothrips romanruizi* sp. nova. A) Ventral view of the body, B) Antenna, C) Dorsal view of the head, and D) Mouth cone and maxillary palpi well developed, with 3 segments.

with parallel sides and with several rows of microtrichia. Segments VI-IX forming a style, sensoria on III-IV well developed, linear and longer than half the length of the segment (Fig. 3A)

Head. As long as wide, with many randomly-placed, long, thin setae in the postocular region. Ocellar setae short. Back of the head with widely-spaced striations. Well-developed eyes with multiple ommatidia, the eye is longer in the ventral face than on the dorsal face (Figs. 1C and 3B). Mouth cone long and strong, maxillary palpi well developed, with 3 segments (Fig. 1D).

Prothorax. Wider than long, with many discal setae, anteromarginals setae reduced, posteromarginal setae stronger and longer than the oth-

er setae on the pronotum. Posteromarginal setae I more developed than posteromarginal II and III. Discal region without ornamentation with several discal setae shorter than posteromarginals I and II (Figs. 2A and 3B). Fera entire.

Pterothorax. Meso and metanotum with many closely spaced striations (Fig. 2B). Ventral region with many discal setae on the meso- and metasternum (Figs. 2C and 3C).

Wings. Broad with transverse veins evident and well developed between the longitudinal veins (Figs. 2D and 3D).

Abdomen. Terga smooth, sterna IV-VI without discal setae (Fig. 3D). Ovipositor well developed with many very small teeth (Fig. 3C).

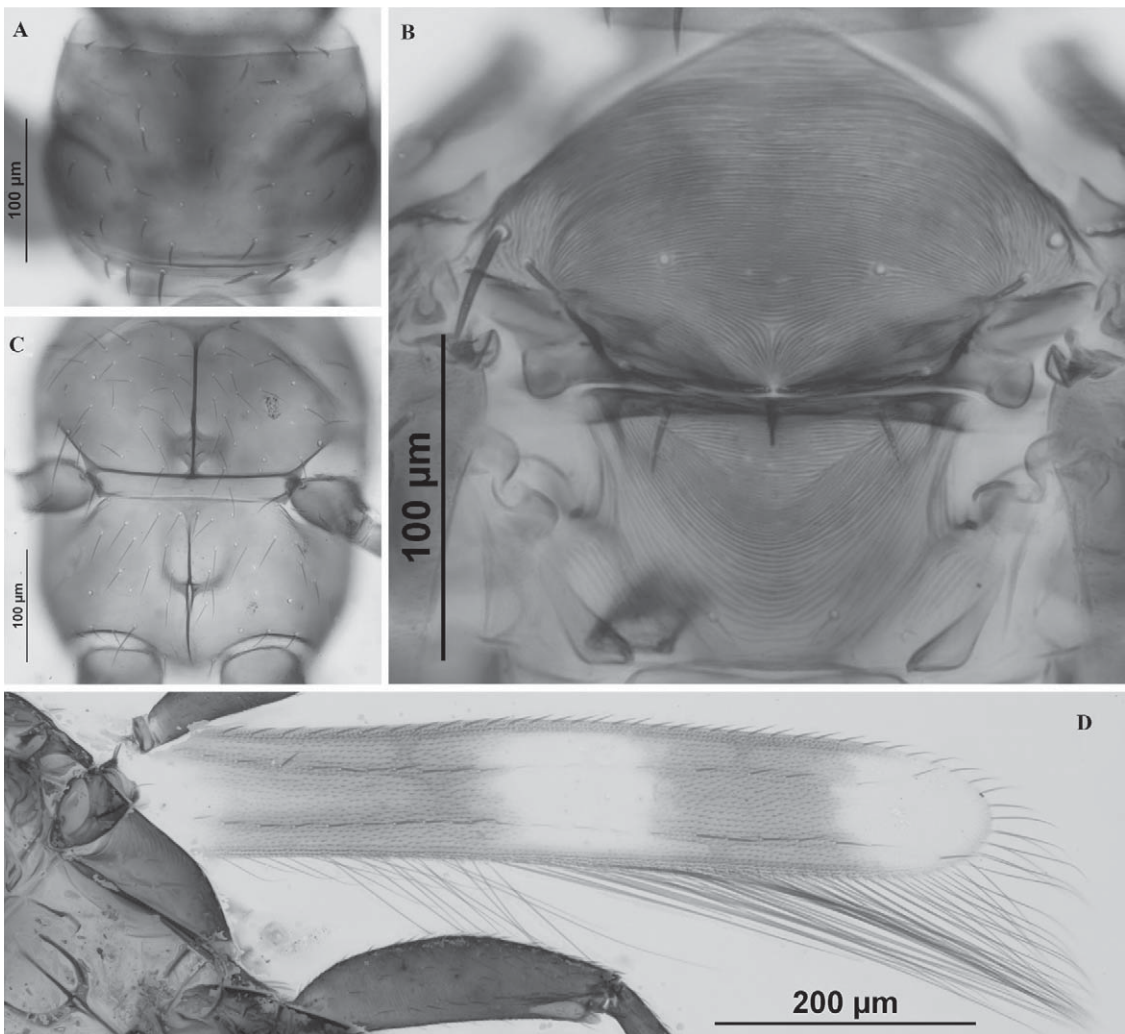


Fig. 2. Phase contrast photographs of *Aeolothrips romanruizi* sp. nova. A) Prothorax, B) Pterothorax, mesonotum and metanotum with many closely spaced striations, C) Mesosternum and metasternum with many discal setae, and D) Wing, pale translucent with transverse veins evident and well developed between the longitudinal veins.

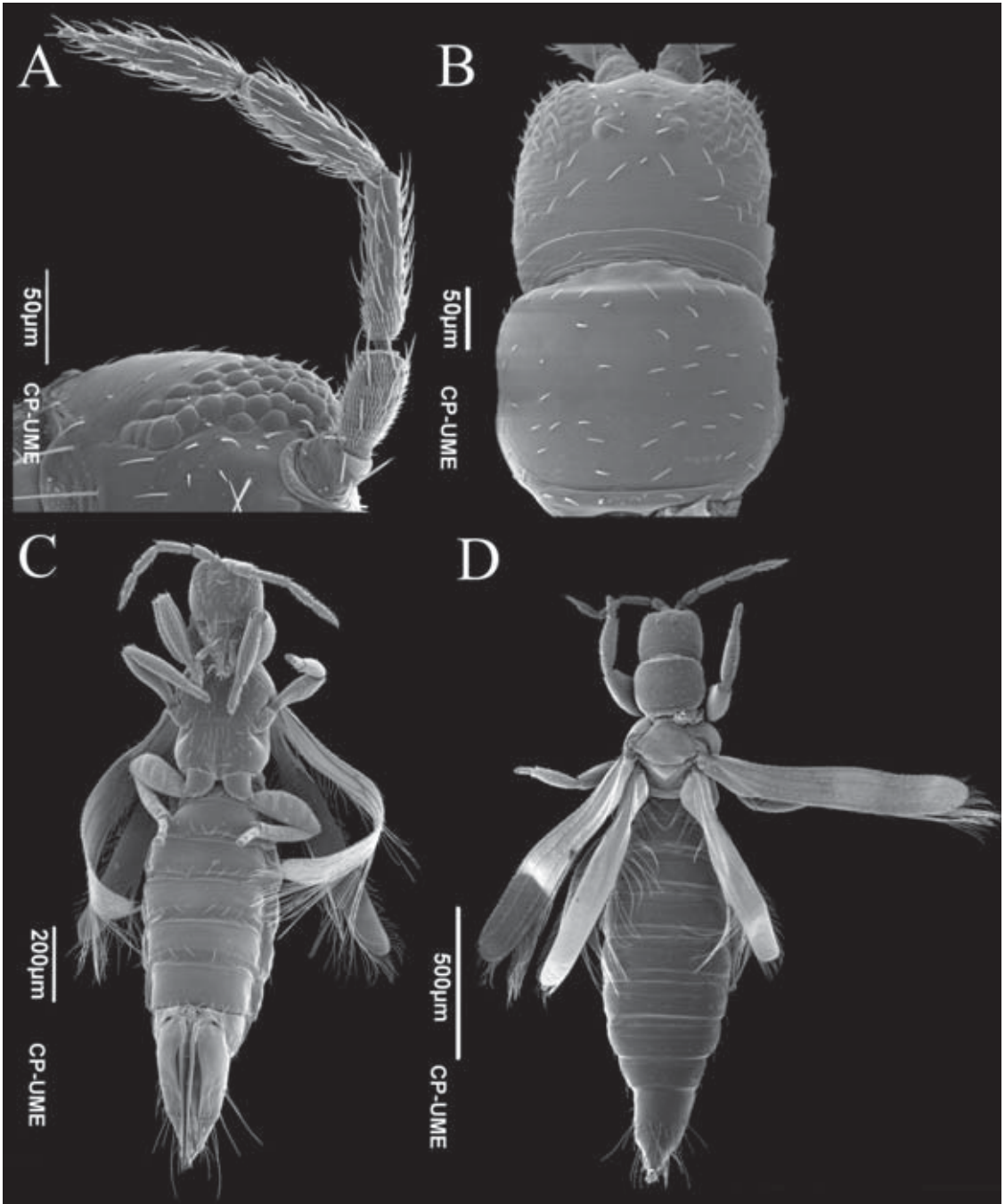


Fig. 3. Scanning electron micrographs of *Aeolothrips romanruizi* **sp. nova**. A) Antennal segments with parallel sides and with several rows of microtrichias, B) Head and Prothorax. Well-developed eyes with multiple ommatidia, ocellar setae short. Pronotum with anteromarginals setae reduced, C) Ventral view of the female, D) Dorsal view of the female.

Sizes in μm of morphological traits of the holotype: total body length= 1850, total length of the antenna = 372.5; I = 30, II = 55, III = 95, IV = 92.5, V = 57.5, VI-VIII = 10, IX = 12.5, pedicel length of antennal segments III and IV, 7.5 and

2.5 respectively; am = 15, amm = 15, PMI = 25, PMII = 20, PMIII = 15, = 430 ovipositor.

Male

Unknown.

Etymology

The species name is dedicated to the memory of Roman Ruiz Sánchez in recognition of his dedication and hard work as an evangelical pastor.

DISCUSSION

Specimens of *Aeolothrips romanruizi* sp. nova collected in Oaxaca possess the following characters (those in italics are considered diagnostic of *Aeolothrips* by Mound & Marullo (1996)): antenna with 9 segments, sensory in segments III-IV linear VI-IX short and condensed to form a unit, compound eyes prolonged ventrally, *maxillary palpi with 3 segments*, head and pronotum without setae, posteromedial pair of setae on the metanotum, *forewing with 1 or 2 bands of dark color with clear apex, abdominal sternites IV-VI with setae and without discal setae marginal or ancillary*, sternite VII with 2 pairs of accessory setae submarginal.

The previously described species of *Aeolothrips* have ornamentation of the mesonotum and metanotum different from that of *A. romanruizi* sp. nova. In most species the ornamentation of the mesonotum is striated and with widely spaced lines, and usually the metanotum is reticulated. The only described species showing ornamentation similar to that of *A. romanruizi* sp. nova is *microstriatus* (Hood 1935). *Aeolothrips romanruizi* sp. nova is known only from the holotype, from a male collected in Panama, and from a specimen collected in Brazil by an anonymous reviewer that has not been described because of insufficient material. Hood (1935) stated that

the species, *A. microstriatus*, differs from others by having a bicolored body, especially in the abdomen, antennae with light brown segments, a single band on the anterior part of the wing I, and unique ornamentation of the pterothorax. The new species *A. romanruizi* sp. nova has an entirely dark brown body (Fig. 1A), the segments of the antenna are dark brown with the exception of III, which is bright yellow (Fig. 1B). The wing has 2 dark brown bands and the many striations on the mesonotum and metanotum of the pterothorax with many closely spaced together (Fig. 2D), similar to *microstriatus*.

Color pattern in *Aeolothrips*

The color pattern in many groups of thrips is critical in separating species, as evidenced by keys developed by multiple authors (zur Strassen 1997). Recently it has been shown that in some groups like in *Frankliniella* some color patterns may be of phylogenetic importance and may be useful in determining groups of species (Retana-Salazar 2010). The key of Mound & Marullo (1996) is still the most complete for the determination the New World *Aeolothrips* species. In this key 60% of the items involve the use the color pattern in the separation of species, and this is valid for both males and females.

A review of the main *Aeolothrips* species found in America (Table 1) indicates that the greatest variation in color pattern between males and females is manifested in the coloration of the antennomeres, especially in the coloration of antennomere III. In some species antennomere III is

TABLE 1. COMPARISON BETWEEN THE PRINCIPAL CHARACTERS RELATING TO SEXUAL DIMORPHISMS IN THE MOST ABUNDANT *AEOLOTHRIPS* SPECIES IN AMERICA, NAMELY, THE COLOR PATTERNS OF THE BODY, ANTENNAE AND WINGS, AS WELL AS CLASPERS, SETAE AND TUBERCLES IN MALES.

Species	Claspers in male at IX	Body (Color)			Antennomere III color		Color of Wings
		♀ compared to ♂	Setae in male	Tubercles in male	♀ compared to ♂	♀ compared to ♂	
<i>Aeolothrips fasciatus</i>	✓	Similar	X	✓	♂ Darker	Similar	
<i>Aeolothrips intermedius</i>	✓	Similar	—	—	Similar	Similar	
<i>Aeolothrips albicinctus</i>	X	Similar	—	—	Similar	Similar	
<i>Aeolothrips vittipennis</i>	X	Similar	X	X	♂ Darker	Similar	
<i>Aeolothrips melaleucus</i>	✓	Similar	—	✓	Similar	Similar	
<i>Aeolothrips fuscus</i>	✓	Similar	X	X	♂ Darker	Similar	
<i>Aeolothrips kuanaii</i>	✓	Similar	✓	✓	♂ Darker	Similar	
<i>Aeolothrips crucifer</i>	✓	Similar	✓	✓	Similar	Similar	
<i>Aeolothrips hartleyi</i>	✓	Similar	X	X	♂ Darker	Similar	
<i>Aeolothrips hesperus</i>	✓	Similar	X	X	Similar	Similar	
<i>Aeolothrips collaris</i>	✓	Similar	✓	✓	Similar	Similar	
<i>Aeolothrips auricestus</i>	✓	Similar	X	X	Similar	Similar	
<i>Aeolothrips brunneipictus</i>	Condition of material is not adequate to make reliable assessments						

✓ = Present, X = Absent, and — = No data.

dark in males and clear in females. Furthermore, and consistent with the key by Mound & Marullo (1996), the color pattern of the body and wings remains constant between female and male *Aeolothrips*. Consequently these well studied characters are widely used in the segregation of species within *Aeolothrips*.

Among the most notable color variations of the wings that are widely used in the separation of species are; (1) the type of the banding of wing I, (2) the width of the bands, and (3) the presence or absence of a longitudinal band on the posterior edge of wing 1. In the descriptions the wing has arbitrarily been divided into the sections anterior and posterior, dividing the wing into the fraction close to the body and the other fraction distant from the body which includes the apical end of the wing.

The correct terms for the two parts are proximal, the part nearest to the body, and distal the part including the apical end. In this text we use the terms proximal and distal.

In the new species, *A. romanruizi* **sp. nova**, described in this paper the color pattern consists of a dark brown body and a pale translucent wing with two discontinuous dark brown bands. In contrast the body of *A. microstriatus* is bicolored; being brownish red and the wings have a dark band, according to the original description of Hood (1935). In view of the stability of the coloration of the 2 genders of *Aeolothrips* in which wing color pattern is of importance in the separation of species, we consider that the metanotum striations and the distinct wing color pattern of *A. romanruizi* **sp. nova** indicate that it belongs to the *Aeolothrips microstriatus* group.

On the other hand, the widely different distribution of *A. microstriatus* and the new species, *A. romanruizi* **sp. nova** found in Oaxaca, Mexico, makes it difficult to assume that it is the female of *microstriatus*. The wing color pattern of *A. romanruizi* **sp. nova** seems to approach the new species more to other Mexican species, but differing in the structure of the metanotum.

KEY TO CENTRAL AMERICAN AND MEXICAN SPECIES OF *AEOLOTHRIPS*

- 1a) Body bicolored 2
- 1b) Body entirely dark in color 3
- 2a) Forewing with one dark band in the second fourth, abdominal segments III-VIII pale *microstriatus* Hood 1935
- 2b) Forewing with two dark bands, abdominal segments II-III pale *bicolour* Hinds 1902
- 3a) Forewing with posterior margin with a dark area well defined from base to apex, eventually a dark transverse band may be arise from this longitudinal dark margin 4
- 3b) Forewing with two transverse dark bands, posterior margin pale between bands 5
- 4a) Head length shorter than 190 μm *major* Bailey 1951
- 4b) Head length longer than 220 μm *mexicanus* Priesner 1924
- 5a) Antennal segment III largely dark brown, yellowish brown in basal half *duwali* Moulton 1927
- 5b) Antennal segment III with at least clear yellow in basal three quarters 6
- 6a) Antennal segment III clear yellow in basal three quarters, metanotal sculpture weakly reticulated *surcalifornianus* Johansen 1989
- 6b) Antennal segment III totally clear yellow, metanotal sculpture striated with closely spaced lines transverse in anterior third but concentric in posterior area *romanruizi* **sp. nova**.

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