

**ENCARSIA VARIEGATA HOWARD (HYMENOPTERA: APHELINIDAE),
A PARASITOID OF WHITEFLIES PARALEYRODES SPP. (HEMIPTERA:
ALEYRODIDAE) IN THREE CITRUS-PRODUCING STATES OF
MEXICO**

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ABSTRACT The male of *Encarsia variegata* Howard is described by the first time and some additional characteristics of the original description of the female are included. A key for identification of members of the *luteola* species group of the genus *Encarsia* recorded in Mexico is presented. The distribution of *E. variegata* on citrus of three States of Mexico is included.

KEYWORDS: Aleyrodidae, *Paraleyrodes*, Aphelinidae, *Encarsia*, key, distribution.

RESUMEN Se describe por primera vez el macho de *Encarsia variegata* Howard y se agregan algunas características a la descripción de la hembra con base en material mexicano. Se presenta la clave para la identificación de especies del grupo *luteola* del género *Encarsia* registradas para México. Se incluye la distribución de *E. variegata* en cítricos de tres Estados de la República Mexicana.

DESCRIPTORES: Aleyrodidae, *Paraleyrodes*, Aphelinidae, *Encarsia*, clave, distribución.

INTRODUCTION

Citrus are important fruit crops for national consumption and export in Mexico. The areas with citrus crops occupy 495,500 ha, producing 6'324,000 tonnes of fruit per year. Citrus are the second agricultural crop in the State of Tamaulipas, where 35,000 ha produce 545,000 tonnes of fruits per year. In Tamaulipas, oranges represents 90% of citrus production, the other 10% are lemons, mandarins and grapefruits (SAGARPA 2002). As exotic crops, citrus are attacked by exotic pests, but also by native species. Hemipterous pests, including whiteflies, are common insects in citrus producing areas. Some species of Aleyrodidae should not be classified as permanent pests but may attain pest status in favorable conditions of temperature and

humidity or following depletion of their natural enemies by chemical control measures. Under such conditions, these species can become important pests on citrus and other fruit crops.

The Catalog of Aleyrodidae species associated with citrus throughout the world (Nguyen et al. 1993) includes about 75 species in 20 genera. In Mexico, 12 species of whiteflies associated more or less permanently with citrus have been recorded: *Aleurocanthus woglumi* Ashby, *Aleurothrixus floccosus* (Maskell), *Dialeurodes citri* (Ashmead), *D. citrifolii* (Morgan), *Paraleyrodes perseae* (Quaintance), *P. minei* Iaccarino, *P. spp.*, *Trialeurodes vitrinellus* (Cockerell), *T. abutilonea* (Haldeman), *T. floridensis* (Quaintance), *T. mirissimus* Sampson and Drews, *T. variabilis* (Quaintance) and

Tetraleurodes mori (Quaintance) (García 1977; Mound & Halsey 1978; MacGregor & Gutiérrez 1983; Nguyen et al. 1993; Schauff et al. 1996; Ruíz-Cancino 1997; Evans & Hamon 2002; Myartseva et al. 2004; Coronado Blanco et al. 2005; Ruíz-Cancino et al. 2005).

Two of the more common whiteflies on Mexican citrus are species of the genus *Paraleyrodes*: *P. perseae* and *P. minei*. *Paraleyrodes perseae*, plumeria whitefly or “polilla cenicienta” (Quaintance 1900; Anativia 1995), is a Neotropical species distributed in Central and South America, and also occurs in Mexico and Southern United States. *Paraleyrodes minei*, nesting whitefly or “mosca blanca filamentosa” (Iaccarino 1989), is distributed in America, Europe and Asia: Colombia, Haiti, Honduras, Puerto Rico, Dominican Republic, Mexico, United States (Florida, California), Spain, Syria, Turkey and Israel. *Paraleyrodes minei* appears to be of Neotropical origin and is similar to other Neotropical species (D. Martin, personal communication), for example *Tetraleurodes perseae* Nakahara that has invaded and established in other countries and continents (Nakahara 1995). In Mexico, these species are common.

The parasitoid species attacking blackfly in Mexico are reasonable well known (Myartseva & Ruíz-Cancino 2000) whereas parasitoid species of *Paraleyrodes* spp. in Mexico are unknown. The “Whitefly taxonomic and ecological Website” (Evans & Hamon 2002) mentions only one species of *Encarsia* from Mexico, that was reared from *P. minei* and preserved in Evans’ Collection in Florida. Parasitoids of *Paraleyrodes* spp. have been recorded from four species in Central America and Southern United States (Table 1). The known hosts of *Encarsia variegata* are: *A. spiniferus*, *A. floccosus*, *P. perseae*, *P. naranjiae* Dozier and *P. minei* (Paulson & Kumashiro 1985; Nguyen et al. 1993; Noyes 2002). Host plants belong mainly to the genus *Citrus*. Apparently, *E. variegata* confines its parasitic activities to *Paraleyrodes* whitefly species.

Table 1. Distribution of parasitoids of *Paraleyrodes* spp. in the New World.

Family and species	Distribution	References
Aphelinidae		
<i>Encarsia variegata</i> Howard	Cuba, Haiti, Hawaii, Puerto Rico, United States (Florida), Mexico	Howard 1908; Dozier 1933; Viggiani 1986; Schauff et al. 1996; Myartseva & Ruíz-Cancino 2000; Evans & Serra 2002; Evans & Hamon 2002; Noyes 2002; Amal et al. 2003; Vázquez 2004
<i>Encarsia dominicana</i> Evans	Dominican Republic, Haiti, United States (Florida), Mexico	Evans & Hamon 2002; Noyes 2006
<i>Encarsia meritoria</i> Gahan	Bahamas, Bermuda, Brazil, Dominican Republic, Italy, Sicily, Spain, Trinidad & Tobago, United States, Mexico	Viggiani 1989; Schauff et al. 1996; Noyes 2002
Encyrtidae		
<i>Metaphycus</i> sp.	Trinidad & Tobago	Kairo et al. 2001

Table 2. *Encarsia variegata* reared from *Paraleyrodes* spp. on *Citrus* spp.

State	Municipality	Locality	Date	Collector	No. specimens	
					Female	Male
Nuevo León	Monterrey	20 km S	7.VI.2005	S. Myartseva	2	-
San Luis Potosí	Tamuín	Tamuín	30.I.2005	S. Varela	1	-
		Hidalgo	Cruz y Cruz	30.XI.2004	S. Varela	1
			14.II.2005	S. Varela	1	-
El Barretal	28.II.2005		S. Varela	1	-	
Tamaulipas	Güémez	Plan de Ayala	30.IV.2005	S. Varela	6	-
			14.IV.2005	S. Varela	2	1
			17.IV.2005	S. Varela	1	1
			10.V.2005	S. Myartseva	18	4
		Cerrito Nuevo	30.IV.2005	S. Varela	2	-
		Orchard San Pedro	14.III.2005	S. Varela	7	3
		Orchard Cristina	30.IV.2005	S. Varela	3	-
		Victoria				
		Orchard Samuel	30.IV.2005	S. Varela	1	-
			25.V.2005	S. Myartseva	7	-

All materials of *E. variegata* are preserved in the Insects Collection of the Universidad Autónoma de Tamaulipas in Ciudad Victoria, Tamaulipas.

Encarsia dominicana Evans (as *brasiliensis*) was introduced to Veracruz State, Mexico, against woolly whitefly *A. floccosus* (García Martell 1973). *Encarsia meritoria* Gahan distributed also in South America, has many hosts of whiteflies, but was recorded for Mexico without hosts (Schauff et al. 1996). The objective of this article was to give the description of the earlier unknown male of *E. variegata* and to provide additional characteristics to the original description of the female based on Mexican specimens reared from *Paraleyrodes* spp. on citrus. Also, a key is provided for female identification of species belonging to the *luteola* species group of the genus *Encarsia* distributed in Mexico. Morphological terminology follows that of Hayat (1998).

MATERIALS AND METHODS

In 2004-2005 *Paraleyrodes* spp. were found and collected at intervals in commercial citrus areas of the States of Tamaulipas, Nuevo León and Veracruz, Mexico. The orchards of the State of Tamaulipas were the main zone of our surveys. *Paraleyrodes* spp. have only been studied from citrus. *Paraleyrodes perseae* and *P. minei* are easily confused in the field because of the morphological similarity of their pupae and adults. Therefore, in this article, parasitoid species are given for these whitefly species together. Often they were situated on leaves of citrus with the blackfly, *A. woglumi*. Although colonies of these species were found adjacent to one another, each whitefly species has a different parasitoid

complex. In order to rear parasitoids, 100 leaves infested by whiteflies were collected randomly twice per month on different citrus trees during the period July 2004-July 2005. Leaves in paper bags were transferred to laboratory, where all leaves were examined. Most of the leaves were placed in dark paper bags, which were kept in a Biotronette Mark III (Labline Instruments Inc.) for emergence of parasitoids at 30-32° C and daylight 12 h. Separate pieces of leaves with whitefly pupae were kept in plastic tubes for parasitoid emergence. Emerged parasitoids were preserved in 70% alcohol. For morphological studies of parasitoids, microscopic slides were prepared using Canada balsam following Noyes (1982). Identification was performed using keys to species of *Encarsia* (Schauff et al. 1996; Hayat 1998; Huang & Polaszek 1998; Evans & Serra 2002) and original descriptions of resembling *Encarsia* species. Morphological characteristics were studied in males (nine specimens) and females (53 specimens) (Table 2). The emerged parasitoids of *Paraleyrodes* spp. were all *E. variegata*. A key to species was prepared. Description of male and some additions and comments to the female description are also presented here.

RESULTS AND DISCUSSION

Species of this group have a 4-segmented tarsus of middle leg, fore wing uniformly setose and scutellar placoid sensilla widely placed. This group has six species distributed in Mexico, including *E. variegata*.

1. Body entirely yellow or orange (axillae and base of metasoma sometimes infuscated).....2
 - Body with at least most of the midlobe of mesoscutum dark brown.....4
2. First funicular segment quadrate or nearly so, second to sixth segments subequal in length.....
 -*haitiensis* Dozier

- First funicular segment longer than wide or cylindrical, second-sixth segments increasing in length towards to apex.....3
- 3. Second funicular segment intermediate in length between first and third and usually without linear sensillum; sixth segment longer than fifth (X 1.2-1.3).....*hispidata* De Santis
 - Second funicular segment as long as, or slightly shorter than third and usually with one linear sensillum; sixth segment about as long as fifth*meritoria* Gahan
- 4. Mesosoma entirely dark brown. Metasoma entirely yellow.....5
 - Mesosoma with pronotum and midlobe of mesoscutum dark brown, scutellum yellow. Metasomal tergites each with lateral brownish-black spot.....
 -*variegata* Howard
- 5. Head entirely dark brown. Reticulations on mesosoma without internal striations. Ovipositor usually shorter than middle tibia. First funicular segment with linear sensillum.....*formosa* Gahan
 - Head mostly orange with dark brown base. Reticulations on mesosoma with internal striations. Ovipositor usually longer than middle tibia. First funicular segment without linear sensillum.....
 -*luteola* Howard

Encarsia variegata Howard, 1908

Trichaporus variegatus (Howard, 1908)

Type species: *Encarsia variegata* Howard, 1908: 64. Described from United States, Florida, Orlando. Two females were reared from "*Aleurodicus perseae*" on lemon leaves. Lectotype ♀, subsequent designation by Viggiani, 1986: 75. Type depository: Washington, DC, United States, National Entomological Collection, U.S. National Museum of Natural History, type No. 11707.

Species group: *luteola*.

References: Howard, 1908: 64; Mercet, 1912: 166-167. Dozier, 1933: 92; Peck, 1951: 438, 1963: 287; Thompson, 1953: 19; Herting, 1972: 104-105; De Santis, 1979: 330; Viggiani, 1986: 75, 1987: 35, 1989: 210; Schauff et al. 1996: 33; Myartseva & Ruíz-Cancino, 2000: 21; Myartseva et al. 2004; Evans & Serra, 2002: 209; Noyes, 2002; Evans & Hamon, 2002; Arnal et al. 2003: 183-191.

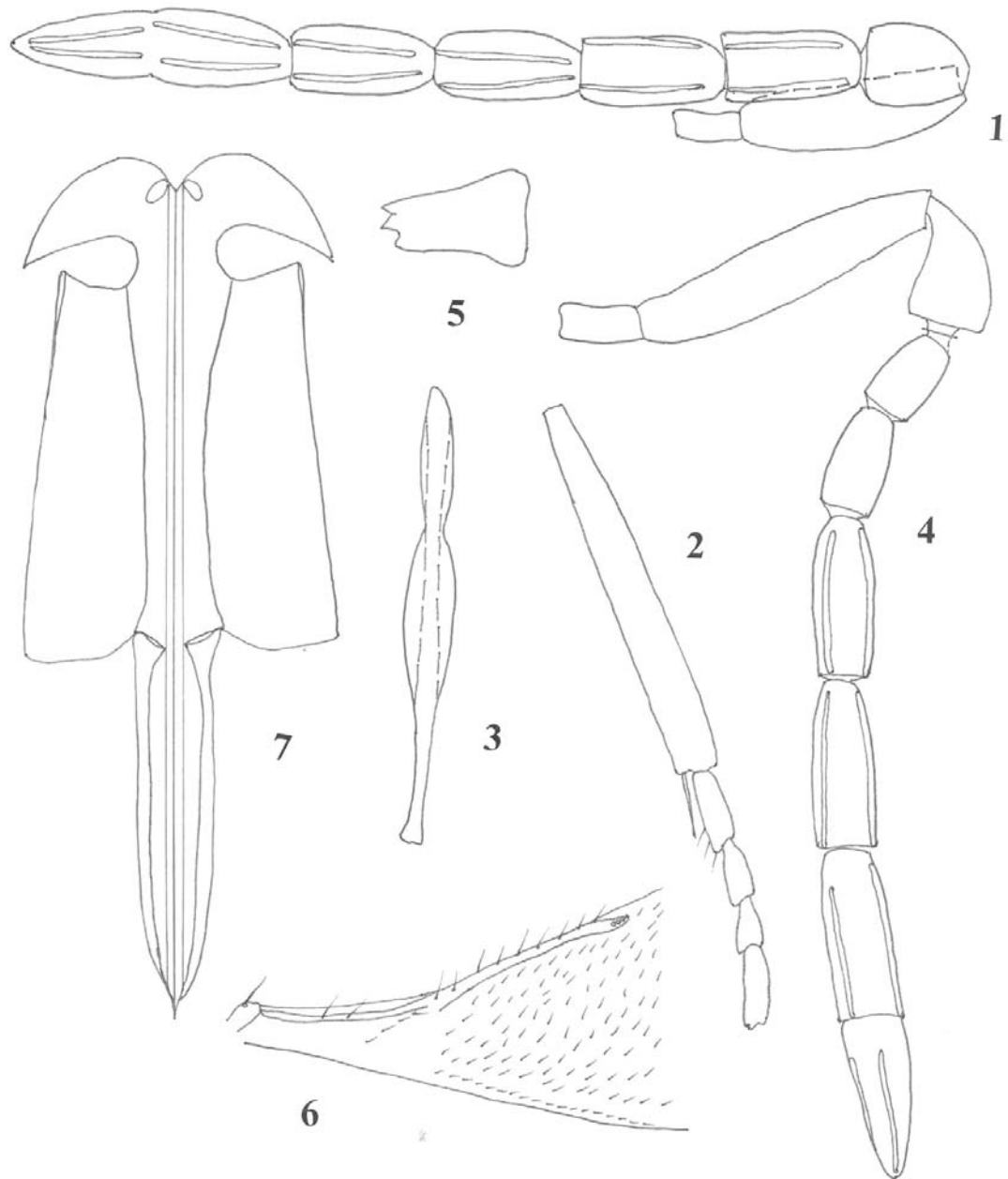
Description. *Male.* Length of body: 0.5-0.6 mm.

Coloration. Head brownish-black, orbits and borders of ocellar triangle narrowly yellow, clypeus and mouth margin black. Mandibles yellow, antennae whitish-yellow. Occiput above foramen yellow. Oculi and ocelli reddish. Mesosoma black, side lobes of mesoscutum (except median spot anteriorly) and metanotum yellow, scutellum brownish-yellow with wide longitudinal brownish strips on each side. Fore wings hyaline. Legs, including coxae, yellowish-white, apices of middle and hind femora infuscate.

Structure. Head wider than mesosoma, 1.2 times wider than its height and about two times as wide as long. Frontovortex slightly wider than 0.5 of head width and about two times as wide as long, transversely striate. Ocelli forming small triangle with apical angle slightly more than 90°; hind ocelli arranged in about one diameter of an ocellus to eye margin. Eyes finely setose, about 1.7 times as long as cheeks. Cheeks with malar sulcus. Mandible with two distinct teeth and one obtuse tooth, similar to short truncation. Antennae (Fig. 1) inserted on the level of lower margin of eyes. Distance between toruli about 1.5 times less than to eye margin and slightly longer than to mouth margin. Scape about 3.5 times as long as wide. Pedicel about

1.2 times as long as wide. First funicular segment slightly shorter than the next second-fourth segments, twice as long as wide, the others slightly less than two times as long as wide, all of the same width. Club very slightly wider than funicle, its two segments nearly conjoined. All flagellar segments with three thin longitudinal sensilla each. Midlobe of mesoscutum, axillae and scutellum with reticulate sculpture, cells on axillae and middle part of scutellum elongate. Midlobe of mesoscutum with five pairs of setae situated symmetrically along middle and three setae on each anterior corner. Axillae with one seta each, situated near anterior margin, side lobes each with three setae. Mesoscutum about 1.5 times wider than length and longer than scutellum. Scutellum more than 1.5 times as wide as long. Scutellar placoid sensilla widely placed, separated by a distance of about 3-4 diameters of one sensillum. Distance between anterior setae slightly longer than that between posterior setae. Fore setae slightly longer than hind setae (14:16). Propodeum medially divided. Fore wing about two times as long as maximum width, marginal fringe about 1/5 width of wing; discal setae uniformly distributed, base of wing with row of four setae. Submarginal and marginal veins almost subequal in length, submarginal vein with two setae, marginal vein with 6-7 long setae along anterior margin. Hind wing narrow, about six times as long as wide, its marginal fringe about as long as width of wing. Tarsal formula 5-4-5. Midtibial spur slightly shorter than basitarsus (Fig. 2); basitarsus with four thin setae near apex, slightly longer than the next two segments combined. Gastral tergites 2nd-7th with 1+1, 1+1, 1+1, 2+2, 2+2 and four setae, respectively. Genitalia long, slightly longer than middle tibia (Fig. 3).

Female. Diagnosis. Length of body: 0.7-0.8 mm.



Figs. 1-7. *Encarsia variegata* Howard: 1, antenna, male; 2, middle tibia and tarsus; 3, genitalia; 4, antenna, female; 5, mandible; 6, base of fore wing; 7, ovipositor.

Female is easily distinguished from other species of *luteola* species group by coloration (yellow face with brownish-black antennal scrobes, brownish-black pronotum and

midlobe of mesoscutum, silvery white scutellum with iridescent properties, lateral brownish-black spots on metasomal tergites), also by long ovipositor (1.7 times longer than

middle tibia), 3rd-6th flagellar segments with subequal length and each more than 2.5 times as long as wide.

Comments. Mexican specimens of *E. variegata* (53 females) were found to possess some morphological characteristics which update the original description of Howard (1908) and the redescription of Viggiani (1986). Figures of antenna, tarsi and part of the fore wing venation are included. In addition, variations in coloration and structure were found.

Coloration (living and alcohol preserved materials were studied): head brownish-black, with yellow orbits, border of ocellar triangle and face (except antennal scrobes). Mesosoma yellow, with brownish-black pronotum, midlobe of mesoscutum, anterior part of axillae, spot on middle of side lobes and on sides of propodeum. Scutellum with iridescent properties, more clearly visible in living adults. The same characteristic and iridescent coloration of scutellum is also present in *Encarsiella noyesi* Polaszek and Hayat. Metasoma yellow, each tergite with brownish-black spot laterally (except last tergite). Apices of stylets brownish-black.

Structure: frontovertex slightly wider than 0.5 of head width, with transversely striated sculpture, as in male. Ocelli arranged from eye margins as in male. Distance between toruli and eye margin rather longer, and to mouth margin about two times shorter than that between toruli. Scape (Fig. 4) slightly more than four times as long as wide (in Viggiani Fig. XI, 9, 1986— rather more than five times), pedicel about 1.5 times as long as wide (in Viggiani Fig. XI, 9, 1986— two times). Second funicular segment only slightly longer than first segment (12:10), not the longest. Third to sixth segments subequal in length and width, slightly less than 2.5 times as long as wide, all with two longitudinal sensilla. Mandible as in Fig. 5. Marginal vein slightly longer than submarginal, with seven setae along anterior

margin (Fig. 6). Ovipositor rather protruded (Fig. 7), about 1.7 times longer than middle tibia. Third valvula about 0.7 times as long as second valvifer.

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LITERATURE CITED

- Anativia B., L. G. 1995.** Situación actual y perspectivas de las exportaciones de palta de Chile. Santiago, Chile. 124 p.
- Arnal, E., A. Chavéz & F. Ramos. 2003.** Parasitoides registrados en moscas blancas (Homoptera: Aleyrodidae) colectados en Venezuela durante el período 1991-2000. *Entomotropica*, 18: 183-191.
- Coronado Blanco, J. M., E. Ruíz Cancino & S. N. Myartseva. 2005.** Aphelinidae (Hymenoptera: Chalcidoidea) parasitoides de plagas de cítricos en Tamaulipas, México, pp. 69-71. *In:* 16° Encuentro de Investigación Científica y Tecnológica del Golfo de México. 6 y 7 de Mayo, 2004. Cd. Mante, Tamaulipas, México.
- De Santis, L. 1979.** Catálogo de los himenópteros calcidoideos de América al sur de los Estados Unidos. Comisión de Investigaciones Científicas, La Plata, Provincia de Buenos Aires. Publicación Especial. 490 p.
- Dozier, H. L. 1933.** Miscellaneous notes and descriptions of chalcidoid parasites (Hymenoptera). *Proc. Entomol. Soc. Wash.*, 35: 85-100.
- Evans, G. A. & A. B. Hamon. 2002.** Whitefly Taxonomic and Ecological Website. An On-line Interactive Catalog of the Whiteflies

- (Hemiptera: Aleyrodidae) of the World and their Parasites and Predators. Florida State Collection of Arthropods, Florida Department of Agriculture and Consumer Services, Gainesville, FL. 5 Nov. 2002. 19 Jan. 2007. <http://www.fsca-dpi.org/homoptera_hemiptera/Whitefly/whitefly_catalog.htm>.
- Evans, G. A. & C. A. Serra. 2002.** Parasitoids associated with whiteflies (Homoptera: Aleyrodidae) in Hispaniola and descriptions of two new species of *Encarsia* Förster (Hymenoptera: Aphelinidae). *J. Hym. Res.*, 11: 197-212.
- García, C. 1977.** Lista de insectos y ácaros perjudiciales a los cultivos en México. *Fitófilo*, 30: 1-165.
- García Martell, C. 1973.** Primera lista de insectos entomófagos de interés agrícola en México. *Fitófilo*, 26: 1-41.
- Hayat, M. 1998.** Aphelinidae of India (Hymenoptera: Chalcidoidea): a taxonomic revision. *Mem. Entomology International*, 13. Associated Publishers, Gainesville, FL. 416 p.
- Herting, B. 1972.** Homoptera. A catalogue of parasites and predators of terrestrial arthropods, Section A: Host or prey/enemy. 2: 1-210.
- Howard, L. O. 1908.** On two new species of parasites of Aleyrodidae. *Proc. Entomol. Soc. Wash.*, 10: 63-65.
- Huang, J. & A. Polaszek. 1998.** A revision of the Chinese species of *Encarsia* Förster (Hymenoptera: Aphelinidae): parasitoids of whiteflies, scale insects and aphids (Hemiptera: Aleyrodidae, Diaspididae, Aphidoidea). *J. Nat. Hist.*, 32: 1825-1966.
- Iaccarino, F. M. 1989.** Description of *Paraleyrodides minei* n. sp. (Homoptera: Aleyrodidae), a new aleyrodid of citrus, in Syria. *Boll. Lab. Entomol. Agr. "Filippo Silvestri"*, Portici, 46: 131-149.
- Kairo, M. T. K., V. F. López, G. V. Pollard & R. Hector. 2001.** Biological control of the coconut whitefly, *Aleurodicus pulvinatus*, in Nevis. *Biocontr. News Inform.*, 22: 45N-50N.
- Mac Gregor, R. & O. Gutiérrez. 1983.** Guía de insectos nocivos para la agricultura en México. Editorial Alambra Mexicana, S.A. México. 166 p.
- Mercet, R. G. 1912.** Los enemigos de los parásitos de las plantas. Los Afelínidos. *Trabajos de Museo de Ciencias Naturales, Madrid*. 10: 1-306.
- Mound, L. A. & S. H. Halsey. 1978.** Whitefly of the World. A systematic catalogue of the Aleyrodidae (Homoptera) with host plant and natural enemy data. *Brit. Mus. (Natural History)*, London. 329 p.
- Myartseva, S. N. & E. Ruíz-Cancino. 2000.** Annotated checklist of the Aphelinidae (Hymenoptera: Chalcidoidea) of México. *Folia Entomol. Mex.*, 109: 7-33.
- Myartseva, S. N., E. Ruíz Cancino & J. M. Coronado Blanco. 2004.** Aphelinidae (Hymenoptera), pp. 753-757. *In: J.L. Bousquets, J.J. Morrone, O.Y. Ordóñez & I.V. Fernández (eds.), Biodiversidad, Taxonomía y Biogeografía de Artrópodos de México: Hacia una síntesis de su conocimiento. Universidad Nacional Autónoma de México, México, Vol. IV.*
- Nakahara, S. 1995.** Taxonomic studies of the genus *Tetraleurodes* (Homoptera: Aleyrodidae). *Insecta Mundi*, 9: 105-150.
- Nguyen, R., R. I. Sailer & A. B. Hamon. 1993.** Catalog of Aleyrodidae on Citrus and their natural enemies (Homoptera: Aleyrodidae). *Occasional Papers of the Florida State Collection of Arthropods. Vol. 8. Florida Department of Agricultural Consumer Services, Division of Plant Industry. Bureau of Entomology, Gainesville, FL.* 57 p.
- Noyes, J. S. 1982.** Collecting and preserving chalcid wasps. *J. Nat. Hist.*, 16: 315-334.
- Noyes, J. S. 2002.** Interactive catalogue of World Chalcidoidea 2001. Compact Disc. Taxapad. Vancouver, Canada.
- Paulson, G. G. & B. R. Kumashiro. 1985.** Hawaiian Aleyrodidae. *Proc. Hawaiian Entomol. Soc.*, 25: 103-124.
- Peck, O. 1951.** Superfamily Chalcidoidea, pp. 1-1420. *In: Muesebeck, C. F. W., Krombein, K. V. & Townes, H. K. (eds.), Hymenoptera of America North of Mexico- Synoptic Catalog. Vol. 2. Agriculture Monographs. United States Department of Agriculture.*
- Quaintance, A.L. 1900.** Contributions towards a monograph of the American Aleurodidae.

- United States Department of Agriculture. Div. Entomol. Tech. Ser., 8: 1-48.
- Ruíz-Cancino, E. 1997.** Control natural y biológico de plagas citrícolas en Tamaulipas, México, pp. 131-135. *In:* II Curso Internacional de Citricultura. Cd. Victoria, Tamaulipas, México.
- Ruíz Cancino, E., J. M. Coronado Blanco & S. N. Myartseva. 2005.** Plagas de cítricos y sus enemigos naturales en el Estado de Tamaulipas, México. *Entomol. Mexicana*, 4: 931-936.
- [SAGARPA] Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación. 2002.** Padrón Nacional de Cítricos 2002. Dirección General de Sistema de Información. CD-Rom.
- Schauff, M. E., G. A. Evans & J. M. Heraty. 1996.** A pictorial guide to the species of *Encarsia* (Hymenoptera: Aphelinidae) parasitic on whiteflies (Homoptera: Aleyrodidae) in North America. *Proc. Entomol. Soc. Wash.*, 98: 1-35.
- Thompson, W. R. 1953.** A catalogue of the parasites and predators of insect pests. Section 2. Host parasite catalogue. Part 2. Hosts of the Hymenoptera (Agaonidae to Braconidae). Commonwealth Institute of Biological Control. Ottawa, Ontario, Canada. 190 p.
- Vázquez, L. L. 2004.** Lista de moscas blancas (Hemiptera: Auchenorrhyncha: Aleyrodidae) y sus plantas hospedantes en el Caribe. *Fitosanidad*, 8: 1-67.
- Viggiani, G. 1986.** Notes on some species of *Coccophagus* Westwood, *Coccophagoides* Girault, *Encarsia* Förster and *Encarsiella* Hayat (Hymenoptera: Aphelinidae), mainly from the Nearctic and Neotropical regions. *Boll. Lab. Entomol. Agr. "Filippo Silvestri"*, Portici, 43: 59-78.
- Viggiani, G. 1987.** New species of *Encarsia* Förster (Hymenoptera: Aphelinidae) parasitoids of whiteflies. *Boll. Lab. Entomol. Agr. "Filippo Silvestri"*, Portici, 44: 33-41.
- Viggiani, G. 1989.** Notes on some Nearctic and Neotropical *Encarsia* Förster (Hymenoptera: Aphelinidae). *Boll. Lab. Entomol. Agr. "Filippo Silvestri"*, Portici, 46: 207-213.

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