

## NOTA CIENTÍFICA

**FIRST REPORT OF *TAMARIXIA RADIATA* (WATERSTON) (HYMENOPTERA: EULOPHIDAE), A PARASITOID OF THE ASIAN CITRUS PSYLLID *DIAPHORINA CITRI* KUWAYAMA (HEMIPTERA: PSYLLIDAE) IN THE DEPARTMENT OF VALLE DEL CAUCA, COLOMBIA**

**Takumasa Kondo, Edgar Mauricio Quintero Q.**

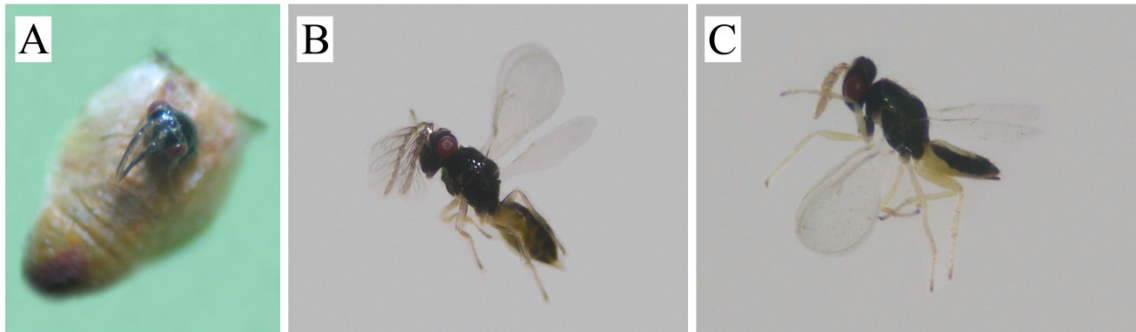
*Corporación Colombiana de Investigación Agropecuaria (CORPOICA), Centro de Investigación Palmira, Colombia; correo electrónico: takumasa.kondo@gmail.com; emquinteroq@gmail.com*

**Mauricio Campuzano, Kris A. G. Wyckhuys**

*International Center for Tropical Agriculture CIAT, Recta Palmira-Cali, Cali, Valle del Cauca, Colombia; correo electrónico: ngeniero.agropaisajes@gmail.com; kwyck2012@gmail.com*

**John Heraty**

*Department of Entomology, University of California, Riverside, C A, USA; correo electrónico: john.heraty@ucr.edu*



**Figure 1.** *Tamarixia radiata* (Waterston). A, emerging from *Diaphorina citri* nymph; B, male. Note plumose antennae; C, female. Photos by E.M. Quintero.

Here we report for the first time the presence of *Tamarixia radiata* (Waterston) (Hymenoptera: Eulophidae) (Figure 1) parasitizing the Asian citrus psyllid *Diaphorina citri* Kuwayama (Hemiptera: Psyllidae) in three municipalities, i.e. Palmira, Sevilla and Zarzal, in the Department of Valle del Cauca, Colombia.

The Asian citrus psyllid *D. citri* is an economically important citrus pest in many citrus growing regions of the world (Halbert & Manjunath 2004; Manjunath et al. 2008). *Diaphorina citri* has a

wide distribution, recorded from Asia [Afghanistan, Bangladesh, Cambodia (unconfirmed), China, Hong Kong, India, Indonesia, Japan (Ryukyu Islands), Lao, Macau, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Saudi Arabia, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam], Africa [Mauritius, Réunion], the Caribbean [Bahamas, Belize (from interception), Cayman Islands, Cuba, Dominican Republic, Guadeloupe, Jamaica, Puerto Rico, and St. Thomas (from interception)], Central America [Honduras (from interception) and Mexico], South America [Argentina, Brazil,

Colombia, Paraguay, Uruguay and Venezuela] and North America [USA] (Augier et al. 2006, Cermeli et al. 2007, EPPO 2005, Étienne et al. 2001, Halbert & Núñez 2004, ICA 2010, Villalobos et al. 2005). *Diaphorina citri* was reported in Colombia for the first time in 2007 and has been recorded since from the Departments of Antioquia, Atlántico, Bolívar, Caldas, Cauca, Cesar, Córdoba, Cundinamarca, Magdalena, Meta, Norte de Santander, Quindío, Risaralda, Santander, Sucre, Tolima, and Valle del Cauca (ICA 2010).

The Asian citrus psyllid *D. citri* can cause direct damage by sucking large amounts of sap, injecting toxins that cause malformation of leaves and shoots and by inducing sooty molds that grow on its excreted honeydew (Michaud 2004). Moreover, *D. citri* is a vector of the phloem limited gram-negative bacterium *Candidatus Liberibacter asiaticus*, one of the pathogens that cause the devastating citrus disease “Huanglongbing” (HLB) or citrus greening disease (Halbert & Manjunath 2004).

Because of the importance of *D. citri* as a vector of HLB, controlling this insect is a critical component of disease prevention, containment and management. In Reunion Island where *D. citri* has been introduced, the psyllid has been controlled successfully with the introduction of the ectoparasitoid *T. radiata* introduced from Pakistan (Étienne & Aubert 1980).

*Tamarixia radiata* has been reported in Argentina, Brazil, China, Guadeloupe, India, Indonesia, Malaysia, Mauritius Mexico, Nepal, Pakistan, Philippines, Puerto Rico, Réunion, Saudi Arabia, Taiwan, Thailand, USA (Florida and Texas), Venezuela and Vietnam (Cermeli et al. 2007, Lizondo et al. 2007, Mann & Stelinski 2010, Zuparko et al. 2011). In mid 2011, *T. radiata* was suspected to parasitize *D. citri* in citrus orchards in the Colombian State of Cundinamarca (Rubio et al. 2011), but taxonomic confirmation is pending. This is the first scientific report of *T. radiata* in Colombia.

Samples of parasitoids species of *Diaphorina citri* were collected on the leaves of three *Citrus* spp. (Rutaceae): *Citrus reticulata* Blanco, *Citrus sinensis* (L.) Osbeck cv. Salustiana and *Citrus latifolia* Tanaka. Specimens were identified as *Tamarixia radiata* (Waterston) by JH using the original description (Waterston 1922) and additional comments by Prinsloo (1980) and Hayat & Shahi (2004). There are 47 described species of *Tamari-*

*xia* and only identification to regional faunas in North America, Europe and India (Zuparko et al. 2011). Prior to the introduction of *T. radiata*, *Tamarixia* was not recorded from South America other than a casual record of some unplaced species (LaSalle 1994). *Tamarixia radiata* can be distinguished by a combination of having the wing speculum with sparse setae, the femora and tibia usually completely yellow, at most slightly darkened dorsally, the propodeal disc smooth and lacking carinae between the spiracle and median carina, and the abdomen dark laterally and dorso-medially yellow (less pronounced and more anterior in male). The male has a distinct ventral sense organ located in the basal third of the scape (cf. fig. 7, Waterston 1922) rather than being located medially. Because of recent biological control efforts, *T. radiata* is being spread in citrus-growing regions worldwide (Michaud 2004, Noyes 2011, Zuparko et al. 2011).

**Material studied.** *Tamarixia radiata* (Waterston).

**Colombia:** Valle del Cauca, Palmira, Corpoica Research Station, 03°30'32"N, 76°19'12"W, 1015 m, 08.ix.2011, E.M. Quintero & T. Kondo, ex *Diaphorina citri* Kuwayama (Hemiptera: Psyllidae) on *Citrus reticulata* Blanco (Rutaceae), TK001 (5 females); same data except TK002 (1 male); TK003 (1 male); same data except on *Citrus sinensis* (L.) Osbeck cv. Salustiana, TK004 (1 male), TK005 (1 male), TK006 (3 males), TK010 (5 females and 3 males). **Colombia:** Valle del Cauca, Zarzal, finca Las Lajas, 04°25'33"N, 76°04'06"W, 914 m, 14.vii.2011, Mauricio Campuzano, ex *Diaphorina citri*, on *Citrus latifolia* Tanaka, CIAT-002 (1 male, no head and in poor shape, identity questionable); same data as CIAT-002 except CIAT-003 (1 female); same data, except CIAT-004, 07.x.2011 (1 female). **Colombia:** Valle del Cauca, Sevilla, vereda Altomira, finca Frutales Altomira, 04°21'59.05"N, 75°53'18"W, 1158 m, 06.x.2011, Mauricio Campuzano, ex *Diaphorina citri*, on *Citrus reticulata*, CIAT-005 (1 female). **Colombia:** Valle del Cauca, Sevilla, vereda Altomira, finca El Danubio, 04°20'29"N, 75°52'51"W, 1182 m, 02.xi.2011, Mauricio Campuzano, ex *Diaphorina citri*, on *Citrus reticulata*, CIAT-006 (1 male). All material deposited at the Department of Entomology, University of California, Riverside (UCRC). Voucher specimens for material collected by EMQ and TK are deposited at the Entomology collection of Corpoica Palmira Research Station.

## ACKNOWLEDGEMENTS

The authors thank the Colombian Ministry of Agriculture and Rural Development (MADR) that funded the short-termed research project: “Plan de contingencia para el manejo de *Diaphorina citri* vector de HLB (enfermedad catastrófica de cítricos) y caracterización de enemigos naturales”.

Many thanks to Juan Humberto Guarín for managing the funds for Corpoica. Part of the sampling was carried out within the project “Agricultura Específica por Sitio Compartiendo Experiencias (AESCE)”, which is funded through Asohfrucol. Funds of the latter project were managed by CIAT.

## LITERATURE CITED

- Augier, L., G. Gastaminza, M. Lizondo, M. Argañaraz & E. Willink. 2006. Presencia de *Diaphorina citri* (Hemiptera: Psyllidae) en el Noroeste Argentino (NOA). *Revista de la Sociedad Entomológica Argentina* 65 (3-4): 67-68.
- Cermeli, M., P. Morales Valle, J. Perozo & F. Godoy. 2007. Distribución del psílido asiático de los cítricos (*Diaphorina citri* Kuwayama (Hemiptera, Psyllidae) y presencia de *Tamarixia radiata* (Waterston) (Hymenoptera, Eulophidae) en Venezuela. *Entomotrópica*. 22(3): 181-184.
- Étienne, J. & B. Aubert. 1980. Biological control of psyllid vectors of greening disease on Reunion Island. Pp. 118-121, in: Proceedings, 8th Conference of the International Organization of Citrus Virologists, 13-31 May 1979, Sidney, Australia. University of California Press, Riverside, CA.
- Étienne, J., S. Quilici, D. Marival & A. Franck. 2001. Biological control of *Diaphorina citri* (Hemiptera: Psyllidae) in Guadeloupe by imported *Tamarixia radiata* (Hymenoptera: Eulophidae). *Fruits*, 56: 307-315.
- European and Mediterranean Plant Protection Organization (EPPO). 2005. Data Sheets on Quarantine Pests: *Diaphorina citri*. [http://www.eppo.org/QUARANTINE/insects/Diaphorina\\_citri/DIAACI\\_ds.pdf](http://www.eppo.org/QUARANTINE/insects/Diaphorina_citri/DIAACI_ds.pdf) (accessed on 3/01/2012).
- Halbert, S. E. & K. L. Manjunath. 2004. Asian citrus psyllids (Sternorrhyncha: Psyllidae) and greening disease of citrus: a literature review and assessment of risk in Florida. *Florida Entomologist*, 87: 330-353.
- Halbert, S. E. & C. A. Núñez. 2004. Distribution of the Asian citrus psyllid, *Diaphorina citri* Kuwayama (Rhynchota: Psyllidae), in the Caribbean basin. *Florida Entomologist*, 87 (3): 401-402.
- Hayat, M. & M. H. Shahi. 2004. Taxonomic notes on Indian Eulophidae (Hymenoptera: Chalcidoidea) - 1. On the types of some Tetrastichinae. *Oriental Insects*, 38: 303-314.
- Instituto Colombiano Agropecuario (ICA). 2010. Situación actual de HLB (Huanglongbing) y su vector el psílido asiático de los cítricos (*Diaphorina citri* Kuwayama) en Colombia. *Boletín epidemiológico*.
- LaSalle, J. 1994. North American genera of Tetrastichinae (Hymenoptera: Eulophidae). *Journal of Natural History*, 28: 109-236.
- Lizondo, M. J., G. Gastaminza, V. A. Costa, L. Augier, M. L. Gómez Torres, E. Willink & J. R. P. Parra. 2007. Records of *Tamarixia radiata* (Hymenoptera: Eulophidae) in Northwestern Argentina. *Revista Industrial y Agrícola de Tucumán*, 84(1): 21-22.
- Manjunath, K. L., S. E. Halbert, C. Ramadugu, S. Webb & R. F. Lee. 2008. Detection of ‘*Candidatus Liberibacter asiaticus*’ in *Diaphorina citri* and its importance in the management of Citrus Huanglongbing in Florida. *Phytopathology*, 98(4): 387-396.
- Mann, R. S. & L. L. Stelinski. 2010. An Asian citrus psyllid parasitoid, *Tamarixia radiata* (Waterston). *Featured Creatures*. EENY-475. [http://entnemdept.ifas.ufl.edu/creatures/beneficial/wasps/tamarixia\\_radiata.htm](http://entnemdept.ifas.ufl.edu/creatures/beneficial/wasps/tamarixia_radiata.htm) (accessed on 3/01/2012).
- Michaud, J. P. 2004. Natural mortality of Asian citrus psyllid (Homoptera: Psyllidae) in Central Florida. *Biological Control*, 29(2): 260-269.
- Noyes, J. S. 2011. Universal Chalcidoidea Database website. [www.nhm.ac.uk/entomology/chalcidoids/index.html](http://www.nhm.ac.uk/entomology/chalcidoids/index.html) (accessed on 4/01/2012).
- Prinsloo, G. L. 1980. Annotated records of economically important Chalcidoidea (Hymenoptera) from South Africa. I. *Phytophylactica*, 12: 159-163.
- Rubio, T., M. Zambrano, A. Castro A., V. A. Costa & E. Ebratt 2011. *Diaphorina citri* Kuwayama y *Tamarixia radiata* (Waterston) en cultivos de cítricos de Cundinamarca, Colombia. Pp. 105, in: Abstracts

- of the XXXVIII Congreso de la Sociedad Colombiana de Entomología (SOCOLEN). July 27-29, 2011. Manizales, Colombia.
- Villalobos, W., D. Hollis, C. Godoy & C. Rivera. 2005. First report of *Diaphorina citri* (Hemiptera: Psyllidae) in Costa Rica. *Insecta Mundi*, 19(3): 151-152.
- Waterston, J. 1922. On the chalcid parasites of psyllids (Homoptera). *Bulletin of Entomological Research*, 13: 41-58.
- Zuparko, R. L., D. L. De Queiroz & J. LaSalle. 2011. Two new species of *Tamarixia* (Hymenoptera: Eulophidae) from Chile and Australia, established as biological control agents of invasive psyllids (Hemiptera: Calophyidae, Triozidae) in California. *Zootaxa*, 2921: 13-27.

*Recibido enero 6, 2012, publicado julio 2012*