

Diagnostics¹ Diagnostic

Diaphorina citri

Specific scope

This standard describes a diagnostic protocol for *Diaphorina citri*.

Specific approval and amendment

Approved in 2004-09.

Introduction

Diaphorina citri is confined to *Rutaceae*, occurring on wild hosts as well as on *Citrus*, especially lemon and lime. The main economic importance of *D. citri* is as the vector of the very serious citrus disease (citrus greening) caused by *Liberobacter asiaticum* (EPPO/CABI, 1996). Fourth and fifth instar nymphs, as well as the adults born from these nymphs, are capable of transmitting *L. asiaticum* to citrus. In addition, *D. citri* typically causes defoliation and dieback. Serious damage to growing points can occur, which can lead to dwarfing as well as lack of juice and taste in fruits. Heavy infestations can cause blossom and fruitlet drop. *D. citri* is present throughout Asia, and has been introduced into some South and Central American countries, and to Mauritius and Réunion (Catling, 1970; EPPO/CABI, 1996).

Identity

Name: *Diaphorina citri* Kuwayama

Taxonomic position: *Insecta, Hemiptera, Sternorrhyncha, Psylloidea, Psyllidae*

EPPO computer code: DIAACI

Phytosanitary categorization: EPPO A1 list: no. 37; EU Annex designation: II/A1

Detection

D. citri has three developmental stages: egg, 5 nymphal instars and adult (Web Fig. 1). Plants for planting of citrus material (budwood, grafted trees, rootstock seedlings) can carry eggs and/or nymphs over long distances. The rutaceous plant

Murraya paniculata, frequently used as an ornamental bush or hedge, is one of the best hosts of this psyllid. During inspection of plant material for the presence of *D. citri*, attention should be paid to twisted and stunted growth of young shoots. Sometimes, the leaves are badly curled and they may be covered with honeydew and sooty mould. Heavily infested plants are characterized by the rosette appearance of shoot tips.

The eggs are orange-coloured and almond-shaped, 0.31 (long)–0.15 (wide) mm. Eggs are laid singly inside half-folded leaves of the buds, in leaf axils and other suitable places on the young tender parts of the tree. The nymphs pass through five instars. They are light-yellow to dark-brown, bearing well-developed wing pads. Nymphs will move away when disturbed but normally lead a sedentary existence clustered in groups. Adults are 2.5 mm long with yellowish-brown body and greyish-brown legs. Wings are transparent with white spots or light-brown with a broad, beige, longitudinal band in the centre. Adults are very active and jump on the slightest disturbance.

Identification

A key to the genera of Psylloidea is given by Yang (1984). The genus *Diaphorina* is characterized by the following combination of characters:

- antennae usually very short (0.48 mm), with two apical short setae
- aedeagus with first segment curved
- genal cones flat and broad, not conical in outline and as long as or longer than broad, perfect, apices narrowly rounded or truncate
- forewing broad subapically, rounded at apex and narrow in basal half.

At present, no key is available for the species of *Diaphorina* and identification is done by comparison with the following description by Yang (1984).

¹The Figures in this Standard marked 'Web Fig.' are published on the EPPO website www.eppo.org.

Adult

(Web Fig. 1): general colour brown. Head (Web Fig. 2A) slightly narrower than thorax. Vertex and genal cones greyish white. Antennae with two basal segments brown, 3rd to 8th segments yellowish with apices of 4th, 6th, 8th and last two segments black. Eyes dark brown. Pronotum ribbon-like, rounded and weakly sinuate anteriorly with two impressed fovea on each lateral side. Mesoscutum brown to dark brown with black markings. Femora dark brown, tibiae and tarsi yellowish white to brown. Abdomen black dorsally and greenish white ventrally. Forewings (Web Fig. 2B) hyaline with scattered maculation, 2.4 times as long as wide, narrow at base, broadest near apex, rounded apically, without distinct pterostigma. Hind wings (Web Fig. 2C) long and slender, 0.9 times as long as forewings, 3 times as long as wide. Male and female genitalia are shown in Web Figs 2 (D and E). Length of body: male 1.53–1.66 mm; female 1.90–2.06 mm; length of antenna: 0.48 mm.

Egg

(Web Fig. 3A): light yellow when fresh, and turn bright orange (with two distinct red eye spots) at maturity; length 0.31 mm, width 0.15 mm.

First instar nymph

(Web Fig. 3B): general colour yellow, body elongate; antennae 2-segmented, relative length of each segment about 1 : 5, with 1 sensorium; legs segmented, tibiotarsus with 2 claws; abdomen margin with 7 pairs of sectasetae. Length of body 0.33–0.35 mm; length of antennae 0.06 mm.

Second instar nymph

(Web Fig. 3C): general colour yellow; antennae 2-segmented, relative length of each segment about 1 : 2.8, with 1 sensorium; wing pads developed and separated; tibiotarsus with 1 golf-club-shaped seta; abdomen with stripe like sclerites at base and a large apical plate with margin with 7–8 pairs of sectasetae. Length of body 0.49–0.53 mm; length of antennae 0.08 mm.

Third instar nymph

(Web Fig. 3D): general colour yellow, antennae and abdomen somewhat dark; antennae 2-segmented, relative length of each segment about 1 : 4.5, with 2 sensoria on segment II; wing pads developed and overlapping; tibiotarsus with 1 golfclub-shaped seta; apical plate of abdomen margin with 15–17 pairs of sectasetae. Length of body 0.69–0.72 mm; length of antennae 0.14 mm.

Fourth instar nymph

(Web Fig. 3E): general colour from yellow to yellowish brown. Antennae 3-segmented, relative length of each segment about 1.5 : 1 : 6, with 3 sensoria and two strong spines. Apical plate of

abdomen margin with 27–30 pairs sectasetae. Length of body: 0.98–1.05 mm; length of antenna: 0.19 mm.

Fifth instar nymph

(Web Fig. 3F): body broadly oval, about 1.2 times as long as wide. General colour yellow to yellowish brown, 3rd antennal segment black. All sclerites and wing pads vermiculated or punctuated. Legs relatively short, 4-segmented, tarsus with two claws, a funnel-shaped pulvillus and golf-club-shaped seta. Abdomen with strip-like sclerites at base and a large apical plate, margin with 25–29 pairs sectasetae. Anal opening ventral, seta far away from apex of abdomen. Circum-anal pore ring composed of single row of slit-like pores, enclosing another ring of minute pores. Length of body: 1.45–1.58 mm; length of antenna: 0.27–0.30 mm.

Five other species of *Diaphorina* have been reported from citrus (*D. punctulata* and *D. zebrana* from Swaziland, *D. auberti* and *D. amoena* from the Comoros, and *D. communis* from India; Da Graça, 1991), but these are non-vector species of relatively little importance (Mead, 1977; Hollis, 1987). *D. citri* can be distinguished from *Trioza erytrae* (Del Guercio), the African citrus psyllid or two-spotted citrus psyllid (OEPP/EPPO, 2005), another vector of *Liberobacter* spp. causing greening, by a pair of spots on the base of the abdomen in late stage nymphs in the latter species. In *T. erytrae* the head is black and the forewing is broadest at the middle, unspotted and transparent and the antennae are nearly all black. Advanced nymphs in *Trioza* have 2 basal dark abdominal spots (none in *D. citri*), small wing pads (broad in *D. citri*) and a fringe of white filaments around the whole body, including the head. *D. citri* is closely related to species belonging to the genus *Euphalerus*. Species of this genus differ in the genal cones (head), which are broad and quadrate in *Euphalerus* and thick and perrect with narrowly rounded or truncate apices in *Diaphorina* and in the forewing, which is rounded or somewhat angulate at apex in *Euphalerus* and broad subapically, rounded at apex, narrow at basal half in *Diaphorina* (Yang, 1984).

For a positive diagnosis, the characters listed in this section should be present. A positive identification is possible on adult females and advanced larval instars. Microscope-slide preparation of stages of *D. citri* is strongly advised to allow proper identification (see Appendix I in OEPP/EPPO, 2005).

Reference material

Kuwayama (1908); Trans. Sapporo Nat. Hist. Soc., 2: 160, pl. III, Fig. 16 (deposition types: five syntypes and 10 non-type specimens in the Hokkaido University Insect collection). The specimen should preferably be compared with other slide-mounted specimens, which have been identified by a specialist.

Reporting and documentation

Guidelines on reporting and documentation are given in EPPO Standard PM7/– (in preparation).

Further information

Further information on this organism can be obtained from: H. Stigter, Plant Protection Service, Section of Entomology, PO Box 9102, 6700 HC Wageningen (Netherlands).

Acknowledgements

This protocol was originally drafted by H. Stigter, Plant Protection Service, Wageningen (NL).

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