Data Sheets on Quarantine Pests

Toxoptera citricidus

IDENTITY

Name: *Toxoptera citricidus* (Kirkaldy)
Synonyms: *Aphis tavaresi* Del Guercio
Toxoptera citricida (Kirkaldy)
Aphis citricida (Kirkaldy)
Aphis aeglis Shinji
Paratoxoptera argentiniensis Blanchard
Taxonomic position: Insecta: Hemiptera: Homoptera: Aphididae
Common names: Tropical citrus aphid, oriental black citrus aphid, brown citrus aphid (English)
Puceron tropical de l'oranger (French)
Braune Citrusblattlaus (German)
Pulgón café de los cítricos (Spanish)
Notes on taxonomy and nomenclature: In the past, *T. citricidus* has often been confused with *T. aurantii* (Boyer de Fonscolombe), the black citrus aphid, many records of the latter applying to *T. citricidus*, but only rarely the other way around.
Bayer computer code: TOXOCI
EPPO A1 list: No. 45
EU Annex designation: II/A1

HOSTS

Citrus spp. are the principal host plants, but *T. citricidus* occasionally attacks other Rutaceae. This also represents the potential host range within the EPPO region.

T. citricidus is recorded in the literature as a vector of pepper veinal mottle potyvirus and yam mosaic potyvirus, but in laboratory transmission studies. It is not clear whether the aphid naturally feeds on the hosts concerned.

GEOGRAPHICAL DISTRIBUTION

T. citricidus occurs predominantly in humid tropical regions and presumably originated in south-east Asia and spread on citrus plants to other tropical areas. It has also spread to areas of Mediterranean climate (Australia, South Africa, Chile).
EPPO region: Found in Madeira (Portugal) in 1994, where an eradication programme was immediately established. Supposed records from Cyprus, Italy, Malta and Spain refer to *T. aurantii*.
Asia: Widespread in south-east Asia, Japan (Honshu, Shikoku, Kyushu, Ryukyu Islands), India (including Assam, Meghalaya, Manipur, Arunachal Pradesh), Sri Lanka.
Africa: Widespread south of the Sahara: Burundi, Cameroon, Congo, Ethiopia, Ghana, Kenya, Malawi, Mauritius, Mozambique, Nigeria, Réunion, Seychelles, Sierra Leone,

Sudan, South Africa, Senegal, Swaziland, Togo, Tanzania, Uganda, Zaire, Zambia, Zimbabwe.
North America: USA (Hawaii only).
Central America and Caribbean: Trinidad and Tobago only (1980s); in the 1990s, there has been an alarming spread of this pest in the Caribbean. It now occurs in: Antigua and Barbuda, Cayman Islands, Costa Rica, Cuba, Dominica, Dominican Republic, Guadeloupe, Haiti, Jamaica, Martinique, Nicaragua, Panama, Puerto Rico, St. Lucia, St. Vincent and Grenadines, United States Virgin Islands.
South America: Widespread. Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guiana, Guyana, Peru, Paraguay, Suriname, Uruguay, Venezuela.
Oceania: Australia (New South Wales, South Australia, Queensland, Victoria, Western Australia (southern and eastern coastal areas), Tasmania), Cook Islands, Fiji, New Zealand (North Island), Papua New Guinea, Samoa.
Distribution map: See CIE (1961, No. 132).

BIOLOGY

Females are parthenogenetic and a single generation develops in 6-8 days. No successful sexual reproduction is known. Reproductive potential depends on the abundance of plant sap; ranging from more than 47 larvae being laid in 12 days to less than 22 larvae being laid in 20 days. In Zimbabwe, generation times of 8-21 days (average 11.8) are reported. Thus, about 30 generations may develop annually, depending on the temperature. Winged females give rise to new infestations.

The flight frequency is correlated with rainfall, and there are usually two daily flight peaks, 0900-1100 and 1700-dusk (in Suriname). Seasonal population peaks are observed in Taiwan; one in April and a smaller one in October. Heavy infestations are observed to follow seasons of heavy summer rainfall, probally due to increased shoot growth available to aphids for the winter. In Japan, three population peaks occur, May, June and September. Infestations are heaviest in the spring.

For more details, see Symes (1924) and Taylor (1958).

DETECTION AND IDENTIFICATION

Symptoms

Dark-brown to black colonies develop on young growths and are usually visited by ants. Growth of shoots is greatly impaired and they become distorted; leaves become brittle and wrinkled and curl downwards. Attacked flowers fail to open or do so abortively since the ovaries are deformed.

Morphology

The adult is sturdy, medium-sized, 1.5-2.4 mm long, shiny, reddish-brown to black.

Alatae can be identified, using a pocket lens, by the wholly black third antennal segment succeeded by a pale fourth. The median nervure of the forewings is normally forked twice. Siphunculi are about l/6 body length and strongly sculptured, while the cauda is rather bulbously rounded at the apex.

Apterae need to be examined microscopically to observe the very long, fine and erect hairs on the legs and body margins. Siphunculi as for alatae but relatively shorter. The cauda is thick and bluntly rounded at the apex.

A useful character to distinguish *T. citricidus* from *T. aurantii* is that disturbed colonies of the latter produce a distinct scraping sound, audible from up to 45 cm from the leaf, whereas those of *T. citricidus* do not. In addition, specimens of *T. citricidus* in a little alcohol turn the liquid deep red gradually, whereas specimens of other *Toxoptera* species do not.

For more details see Doncaster & Eastop (1956), Stroyan (1961), Eastop & Hille Ris Lambers (1976), Kranz *et al*. (1977).

Detection and inspection methods

In countries where *T. citricidus* occurs, groves should be inspected during the season, as should any plant material being transported. Particular attention should be paid to the young growth. At times when aphids are scarce, undersides of mature foliage should be examined for dead, parasitized aphids or mummies, which adhere to the leaves and can be used for identification in the absence of living specimens.

If the aphid cannot be positively identified on the spot using a pocket lens, specimens should be preserved in 2:1, v/v, 95% ethanol:75% w/w lactic acid, or kept alive in small tubes and taken to a laboratory for confirmation using microscopy.

MEANS OF MOVEMENT AND DISPERSAL

T. citricidus can spread locally by flight but is very unlikely to be introduced into the EPPO region by such natural means. It is much more likely to be introduced on plants for planting and associated transportation materials. It has been intercepted, but very infrequently, in the USA on citrus from Hawaii and the Philippines. It is more strongly attracted to yellow than are many other aphids and it may therefore be transported on yellow packaging or aircraft parts.

PEST SIGNIFICANCE

Economic impact

The aphid *per se* causes considerable damage to citrus trees by attacking shoots and flowers and sometimes young fruit. Even a few aphids on a young shoot will arrest blossom bud development and cause them to fall. Losses of up to 50% can result from feeding damage (Kranz *et al*., 1977). After petal fall, however, growth hardens and less damage results, even at relatively high population levels. Branches may become deformed and leaves shrivelled. Sooty mould forms on the aphid honeydew, interfering with leaf function and forming unsightly deposits on fruits, which lose their market value.

T. citricidus is an efficient vector of important virus diseases of citrus: citrus tristeza closterovirus (EPPO A2 list; EPPO/CABI, 1996), the most devastating (McClean, 1975), together with its stem-pitting and seedling yellows strains; also citrus vein-enation disease in California (USA) and South Africa.

Control

Control measures are intended (Kranz *et al*., 1977) to prevent damage to young shoots and fruits, and especially to suppress the formation of alatae, which are liable to transmit viruses. Dust applications are recommended for treatment of recognized foci. Young trees are treated preventively with systemic insecticides. Many natural enemies are known (e.g. predators, entomopathogenic fungi). Some are being considered for use in integrated control programmes, e.g. *Cycloneda sanguinea* and *Chrysopa* sp. in Brazil (Trevizoli & Gravena, 1979).

Phytosanitary risk

T. citricidus is considered to be an A1 quarantine pest by EPPO (OEPP/EPPO, 1980) and is also of quarantine significance for CPPC and OIRSA. Since it has become established in several areas of the world with a Mediterranean climate, it has the potential to survive in Mediterranean countries, though possibly not to be so direcly damaging there as in tropical countries. Its main risk for Mediterranean countries is as a much more efficient vector of citrus tristeza closterovirus than the native aphid species (Roistacher & Bar-Joseph, 1987). Its introduction would cause serious problems for citrus certification schemes, by creating a much higher risk of reinfection of certified material by tristeza, the most serious disease covered by the schemes. Plaza *et al*. (1984) note that tristeza remained very localized in Venezuela until *T. citricidus* was introduced in the 1970s; it is now widespread.

PHYTOSANITARY MEASURES

EPPO recommends (OEPP/EPPO, 1990) that importation of plants for planting and cut branches of citrus should be prohibited from all countries where *T. citricidus* occurs. Special attention should be paid to countries where citrus tristeza closterovirus also occurs, for which similar phytosanitary measures are recommended, including also an option to treat citrus fruits against vectors (EPPO/CABI, 1996). Fumigation with methyl bromide may be suitable for plants for planting and for fruits, but there is no specific recommendation (FAO, 1984).

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