EPPO Datasheet: *Trioza erytreae*

Last updated: 2020-09-04

IDENTITY

Preferred name: *Trioza erytreae*
Authority: (Del Guercio)
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Hemiptera: Sternorrhyncha: Triozidae
Other scientific names: *Spanioza erythreae* Del Guercio, *Spanioza merwei* (Pettey), *Trioza merwei* Pettey
Common names: African citrus psyllid, citrus psylla, citrus psyllid, two-spotted citrus psyllid
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EPPO Categorization: A2 list
view more categorizations online...
EU Categorization: A2 Quarantine pest (Annex II B)
EPPO Code: TRIZER

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HOSTS

T. erytreae is confined to Rutaceae, occurring on wild and ornamental hosts (*Clausena anisata*, *Vepris lanceolata*) and on *Citrus*, especially lemons (*C. limon*) and limes (*C. aurantiifolia*). Within the EPPO region, the host species are generally confined to countries surrounding the Mediterranean Sea.

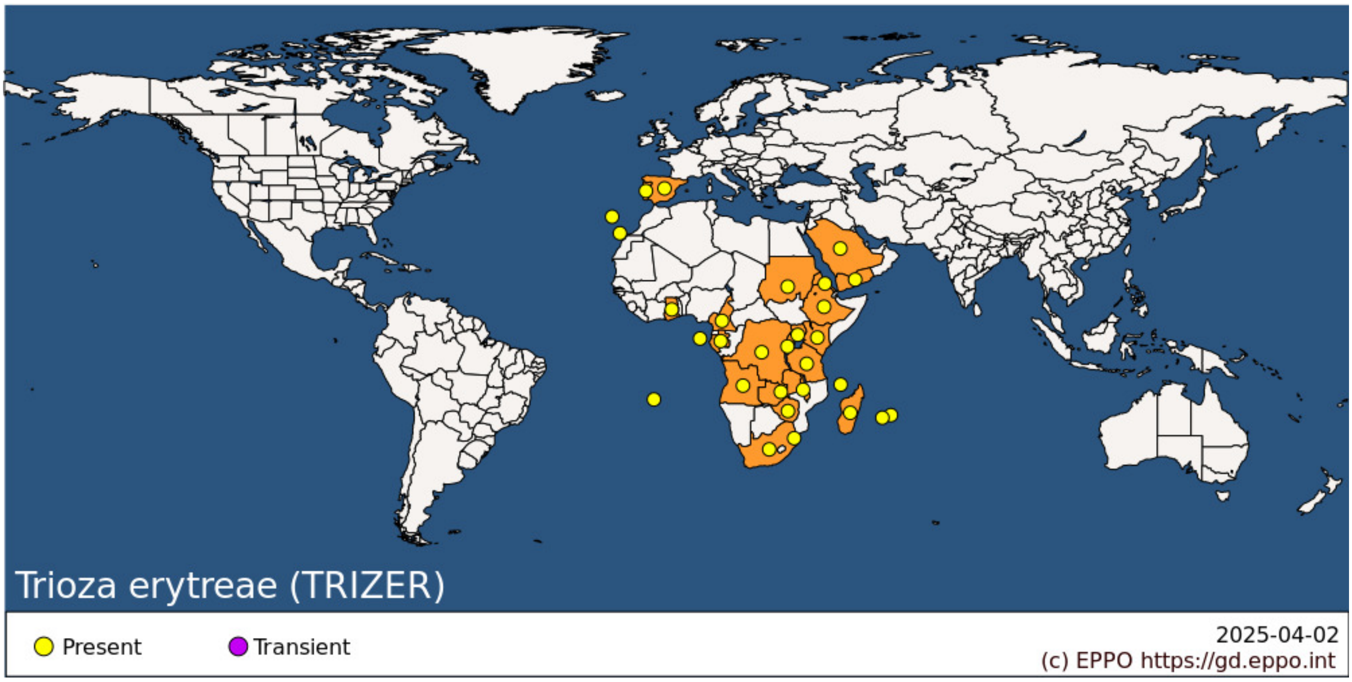
Host list: *Calodendrum capense*, *Casimiroa edulis*, *Choisya ternata*, *Citroncirus*, *Citrus australasica*, *Citrus maxima*, *Citrus medica*, *Citrus reticulata*, *Citrus trifoliata*, *Citrus x aurantiifolia*, *Citrus x aurantium var. deliciosa*, *Citrus x aurantium var. paradisi*, *Citrus x aurantium var. sinensis*, *Citrus x aurantium var. tangerina*, *Citrus x aurantium var. unshiu*, *Citrus x limon*, *Citrus x limonia var. jambhiri*, *Citrus x limonia var. volkameriana*, *Citrus x nobilis*, *Citrus*, *Clausena anisata*, *Fortunella*, *Murraya koenigii*, *Murraya paniculata*, *Rutaceae*, *Vepris lanceolata*, *Vepris nobilis*, *Vepris*, *Zanthoxylum asiaticum*, *Zanthoxylum sp.*, *x Citrofortunella microcarpa*

GEOGRAPHICAL DISTRIBUTION

Until the 1990s, *T. erytreae* was present in Sub-Saharan Africa, Saudi Arabi and the Yemen and on the islands of St. Helena, Mauritius, Reunion and Madagascar. In 1994 and 2002, this psyllid invaded Madeira and the Canary Islands, respectively, in Macaronesia (West Palaearctic). In 2014, *T. erytreae* reached mainland Europe, where it spread from Galicia (northwestern Spain) to Lisbon in Portugal.

A recent study has suggested that the *T. erytreae* individuals found in Europe (Madeira, Canary Islands and Galicia) have a similar haplotype and most likely originated from South Africa, although the possibility of a Kenyan origin cannot be excluded (Ajene *et al.*, 2020).

The distribution of *T. erytreae* is wider than that of the causal agent of citrus huanglongbing (HLB) disease originally associated with this vector, '*Candidatus* Liberibacter africanus', because the vector occurs in Congo, Sudan and Zambia in Africa, and Portugal and Spain in Europe, where '*Ca.* Liberibacter africanus' has not yet been recorded.



EPPO Region: Portugal (mainland, Madeira), Spain (mainland, Islas Canárias)
Africa: Angola, Cameroon, Comoros, Congo, The Democratic Republic of the, Eritrea, Eswatini, Ethiopia, Gabon, Ghana, Kenya, Madagascar, Malawi, Mauritius, Reunion, Rwanda, Saint Helena, Sao Tome & Principe, South Africa, Sudan, Tanzania, United Republic of, Uganda, Zambia, Zimbabwe
Asia: Saudi Arabia, Yemen

BIOLOGY

Cocuzza *et al.* (2017) compiled a bibliography for *T. erytreae* up to 2017, and general reviews have been published by van den Berg & Fletcher (1988) and van den Berg (1990). *T. erytreae* has a temperature sensitivity similar to that of the '*Ca.* Liberibacter africanus' (Schwarz & Green, 1970; Catling, 1973). It is very sensitive to extreme heat (temperatures above 32°) and dry weather, with the eggs and first-instar nymphs being particularly vulnerable. Based on this climatic profile and the mortality of the psyllid, Green & Catling (1971) used the maximum saturation deficit as an accurate predictor of the geographical distribution of *T. erytreae*. It is favoured in cool and moist areas, in which citrus growth flushes tend to be prolonged.

The sex ratio fluctuates in the field, but females always predominate. There is a pre-oviposition period of 3-7 days, but this is considerably extended in the absence of young foliage; longevity is also prolonged under such conditions. Mating occurs two to four times per day, and eggs may be laid immediately. The eggs are equipped with a sharp point that is driven through the leaf epidermis and is thought to be responsible for maintaining a favourable internal water relationship. Females remain fertile for 11-16 days in the absence of males, and maximum egg production occurs towards the middle of their lifespan, which is normally 17-50 days. Each female may lay up to 2000 eggs. There is an incubation period of 5-17 days and nymph development (five instars) takes 17-47 days, the lengths of both these periods being inversely related to mean temperature and directly related to the nutritional value of the leaves. The temperature threshold for nymph development appears to be around 10-12°C. There is no diapause. Van den Berg *et al*. (1990) studied the daily activities and habits of adults, and egg hatching and moulting, in *T. erytreae*, whereas van den Berg *et al*. (1991a) studied mating, fertility and oviposition.

T. erytreae transmits '*Candidatus* Liberibacter africanus' under natural conditions in Africa, parts of Arabia, and some Indian Ocean islands (McClean & Oberholzer, 1965; Gottwall, 2010). *T. erytreae* has also been shown to transmit '*Candidatus* Liberibacter asiaticus' and '*Candidatus* Liberibacter americanus' (Ajene *et al.*, 2020; Gottwall, 2010).

DETECTION AND IDENTIFICATION

Symptoms

T. erytreae severely distorts leaves, which become stunted and galled, and appear to be dusted with solid white honeydew excreted by the psyllid. High psyllid densities and humid environmental conditions may be associated with the development of sooty mold on the honeydew.

Morphology

Eggs

Yellow-orange, cylindrical, with a sharp point at the anterior; laid at the margins of young, actively growing leaves.

Nymph

Dorso-ventrally compressed and varying in colour from yellow to olive-green or dark grey; has a marginal fringe of white, waxy filaments; largely sedentary; forms distinct colonies and settles on the underside of young leaves, where, after a few days of feeding, it produces distinctive cup-shaped, open galls.

Adult

Adults are about 3-4 mm long. Winged, with a yellowish-green body, initially delicate, later becoming light-brown. Males are smaller than females and have a blunt tip to the abdomen, whereas the abdomen of the female ends in a sharp point. Adults adopt a distinctive stance while feeding, with the abdomen raised at an angle of about 35° to the feeding surface.

Details of the sizes of the nymphs and adults of *T. erytreae* have been provided by Cocuzza *et al.* (2016) and Aidoo *et al.* (2019). The EPPO Diagnostic Protocol for *T. erytreae* provides guidance on how to detect and identify the pest (EPPO Standard PM 7/57).

Detection and inspection methods

The distinctive cup-shaped, open galls produced by *T. erytreae* nymphs can be used to detect its presence in recently invaded areas. These galls are produced by nymphs after a few days of feeding on young and tender leaves, and the galls remain in the leaves when the adults emerge and the leaves mature. These galls can, therefore, be used to detect the presence of the psyllid in the current and previous flushes. For the detection of nymphs and adults, monitoring should be carried out during flushing periods. In the Mediterranean Basin, there are three flushing periods for most citrus species: spring, mid-summer and late autumn. The spring flush is the most important in terms of size. However, lemon species flush throughout the year. For confirmation of the detection of *T. erytreae* and identification of the adults, yellow sticky traps or suction sampling devices can be used to capture the adults. Detailed protocols for surveillance, sampling and detection are indicated in the EPPO Standard PM 9/27 (2020) and in the EFSA pest survey card (EFSA, 2019).

PATHWAYS FOR MOVEMENT

T. erytreae is can spread locally by natural means of dispersal, over distances of up to 1.5 km (van den Berg & Deacon, 1988). Eggs and nymphs may be carried over longer distances on citrus material (budwood, grafted trees, rootstock seedlings). Both adults and nymphs can acquire the causal agent of huanglongbing, but only adults can transmit it (McClean 1974; Moll and van Vuuren 1977). The illegal introduction of plant material can lead to the introduction of the disease or the vector. Adults can survive for up to 12 days on recently harvested lemon fruits at 13.5 ± 2ºC, 85.4 ± 10% RH, under an L14 hours:D10 hours photoperiod (Urbaneja-Bernat *et al.*, 2020). Introduction on citrus fruits that have passed through packing house processes involving brushing, washing and the removal of stems and leaves is unlikely.

PEST SIGNIFICANCE

Economic impact

T. erytreae results principally from its role as a vector of huanglongbing, the most damaging citrus disease in the world (Gottwald, 2010). Heavy infestations with *T. erytreae* also cause severe leaf distortion, the development of conspicuous pits on the leaf surface and the development of sooty mold on the excreted honeydew.

Control

Several active ingredients of different groups can be used against *T. erytreae*. In South Africa, control is based on the use of organophosphates and neonicotinoids that are banned in Europe. A list of active ingredients, with their efficacy and mode of action against *D. citri*, the other vector of huanglongbing, has been published by Qureshi *et al.* (2014). *T. erytreae* can enter orchards from other host plants in the surrounding vegetation (van den Berg *et al.*, 1991b), the removal of which is, therefore, recommended.

Experience in areas to which *T. erytreae* already has spread or into which it has recently been introduced suggests that the eradication of this species is almost impossible (Cocuzza *et al.*, 2017).

On Reunion Island and the Canary Islands, *T. erytreae* has been successfully controlled by the introduction of the parasitoid *Tamarixia dryi* from South Africa (Aubert *et al.*, 1980; Hernández-Suárez *et al.* 2020). This species of parasitoid is highly specific and does not, therefore, represent an environmental risk for native psyllid species (Urbaneja-Bernat *et al.*, 2019). In South Africa, three primary parasitoids and numerous predators occur, but have not been found to reduce populations to economically acceptable levels, probably due to the presence of a hyperparasitoid complex (van den Berg *et al.*, 1987; Pérez-Rodríguez *et al.*, 2019). In Cameroon, the psyllid is also attacked by a complex of parasitoids (Tamesse 2009).

Phytosanitary risk

Trioza erytreae is now established in mainland Europe (Galicia in Spain and the Portuguese coast from the northern part of the country to Lisbon), but it has not yet reached the main citrus-producing areas. A study based on water vapor deficit pressure has suggested that the psyllid will be able to spread along the entire Portuguese coast to the Algarve (southern Portugal), the main citrus-producing area in Portugal (Paiva *et al.*, 2020). It would probably be able to establish itself and spread in Mediterranean countries without difficulty, because citrus crops are mostly produced in areas close to the coast with a high relative humidity, but further studies are required to confirm this. In addition to its role as a vector of huanglongbing, this psyllid has a significant potential for damage in its own right. Biological control may be possible, at least on islands, but there is no guarantee that it could keep populations at sufficiently low levels to prevent transmission of huanglongbing.

PHYTOSANITARY MEASURES

Considering the severity of huanglongbing, EPPO has recommended to prohibit the importation of citrus plants for planting and cut branches or buds of citrus from areas or countries where citrus huanglongbing (or either of its vectors) are present. In the EU territory, it is also forbidden to import fruit from third countries with their peduncles and leaves. In disease free countries as those of the Mediterranean area, awareness, monitoring, surveillance, pest risk assessment, quarantine measures and action plans are advised (Duran-Vila *et al.*, 2014; Siverio *et al.*, 2017). Procedures for official control with the aim of detecting, containing and eradicating huanglongbing and its vectors are provided in the EPPO Standard PM 9/27 (EPPO, 2020)**.** As surveys should be carried out in all the EU member countries, a pest survey card was prepared by the European Food Safety Authority (EFSA, 2019) to assist EU Member States in planning their huanglongbing annual survey activities.

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Datasheet history

This datasheet was first published in the EPPO Bulletin in 1988 and revised in the two editions of 'Quarantine Pests for Europe' in 1992 and 1997, as well as in 2020. It is now maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', 'Hosts', and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

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