EPPO Datasheet: *Thaumatotibia leucotreta*

Last updated: 2021-09-14

IDENTITY

Preferred name: *Thaumatotibia leucotreta*
Authority: (Meyrick)
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Lepidoptera: Tortricidae
Other scientific names: *Argyroploce leucotreta* Meyrick, *Cryptophlebia leucotreta* (Meyrick)
Common names: citrus codling moth, false codling moth, orange codling moth, orange moth
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EPPO Categorization: A2 list
view more categorizations online...
EU Categorization: Quarantine pest ((EU) 2019/2072 Annex II A)
EPPO Code: ARGPLE



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Notes on taxonomy and nomenclature

The genus *Thaumatotibia* is currently comprised of fourteen species (Komai, 1999); Timm and Brown (2014). *Thaumatotibia leucotreta* (Meyrick) is regarded as a clearly defined taxonomic entity.

HOSTS

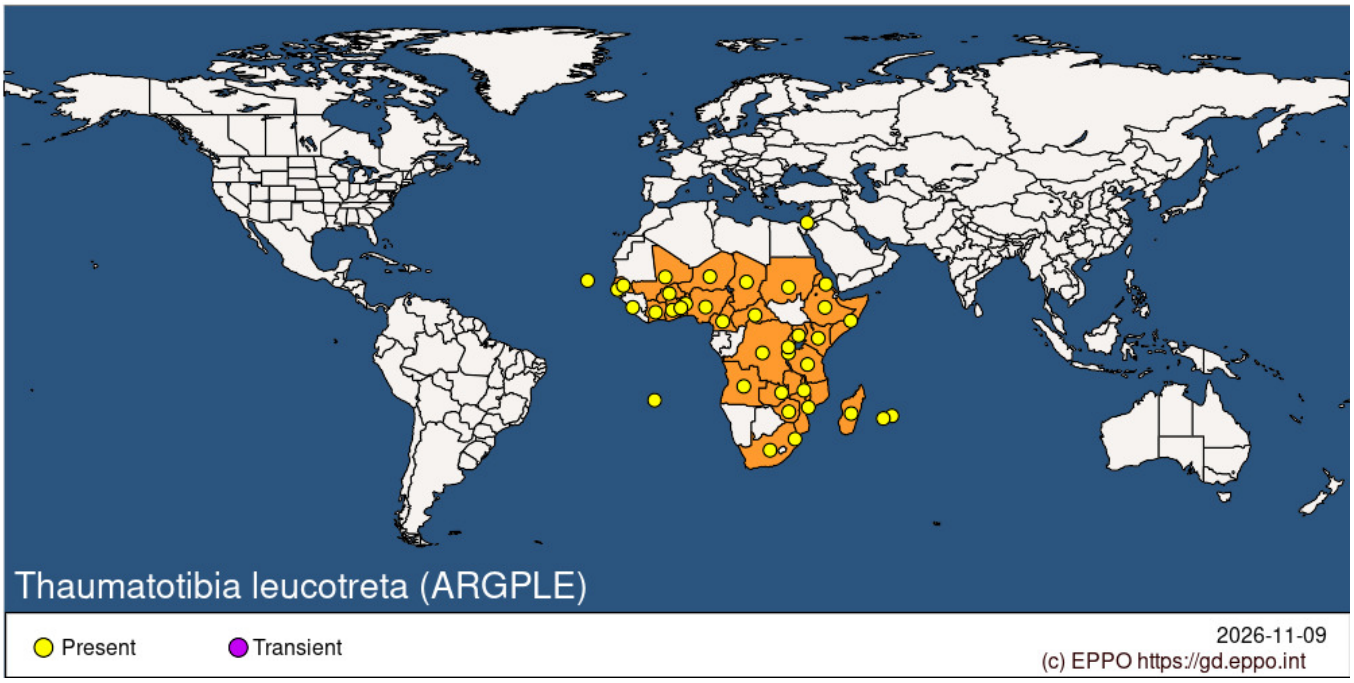
Most taxa within the genus appear to have a restricted distribution and a limited, but poorly known host plant range. *Thaumatotibia leucotreta* (Meyrick, 1913) and *T. batrachopa* (Meyrick, 1908) shifted from native hosts to (introduced) cash crops, and have become major agricultural pests (Gilligan & Passoa, 2014; Timm & Brown, 2014). Larvae of *T. leucotreta* were found to feed on the fruiting stage of more than 130 taxa from more than 50 plant families (CABI, 2021; De Prins & De Prins, 2019; Gilligan *et al.*, 2018; Gilligan & Passoa, 2014; van der Geest *et al.* , 1991). Many crops which have been shown to be hosts of this pest are cultivated in the EPPO region (EPPO, 2013).

Host list: *Abelmoschus esculentus, Afrocarpus gracilior, Agelaea pentagyna, Albuca sp., Allophylus ferrugineus, Annona muricata, Aristolochia albida, Asparagus sp., Averrhoa carambola, Blighia unijugata, Bridelia micrantha, Capsicum annuum, Capsicum chinense, Capsicum frutescens, Capsicum, Citrus reticulata, Citrus x aurantium var. paradisi, Citrus x aurantium var. sinensis, Citrus, Coffea arabica, Crassula ovata, Croton sylvaticus, Diospyros kaki , Donella viridifolia, Drypetes natalensis, Eriobotrya japonica, Eugenia uniflora, Feijoa sellowiana, Gambeya albida , Gossypium hirsutum, Gossypium, Guettarda speciosa, Landolphia sp., Lepisanthes senegalensis, Lettowianthus stellatus, Litchi chinensis, Macadamia integrifolia, Macadamia ternifolia, Macadamia tetraphylla, Mangifera indica , Mimusops bagshawei, Mimusops obtusifolia, Monodora grandidieri, Musa x paradisiaca, Ochna atropurpurea, Olea europaea, Opuntia ficus-indica, Pappea capensis, Passiflora sp., Persea americana, Phaseolus lunatus, Plinia cauliflora, Prunus domestica, Prunus persica var. nucipersica, Prunus persica, Psidium cattleyanum, Psidium friedrichsthalianum, Psidium guajava, Punica granatum, Quercus robur, Ricinus communis, Rosa, Rourea minor, Salacia elegans, Solanum aethiopicum, Solanum lycopersicum, Solanum melongena, Sorghum, Stephania abyssinica, Syzygium cordatum, Syzygium guineense, Syzygium jambos, Syzygium paniculatum, Syzygium samarangense, Theobroma cacao, Uvaria acuminata, Vepris nobilis, Vitis vinifera, Ximenia afra, Ximenia americana , Xylopia longipetala, Zanha golungensis, Zea mays, Ziziphus jujuba, Ziziphus mauritiana, Ziziphus mucronata, Ziziphus pubescens*

GEOGRAPHICAL DISTRIBUTION

The genus *Thaumatotibia* is currently distributed across the Afrotropical region, Asia, Australia, and the Pacific

Islands, *Thaumatotibia leucotreta* is restricted to Africa and Israel.



EPPO Region: Israel
Africa: Angola, Benin, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Congo, The Democratic Republic of the, Cote d'Ivoire, Eritrea, Eswatini, Ethiopia, Gambia, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritius, Mozambique, Niger, Nigeria, Reunion, Rwanda, Saint Helena, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, United Republic of, Togo, Uganda, Zambia, Zimbabwe
Asia: Israel

BIOLOGY

Thaumatotibia leucotreta is a multivoltine species with up to 10 generations per year with adults present year-round (Gilligan & Epstein, 2012), but see Daiber (1980), de Jager (2013) and Opoku-Debrah *et al.* (2014) for more conservative estimates concerning development time. *Thaumatotibia leucotreta* completes its life cycle from egg, through five larval instars (Daiber, 1979c) and the pupal-phase to adulthood without diapause. Adult females live for 2-10 weeks and can lay up to 800 eggs during their lifetime (Daiber, 1980). Eggs are mostly laid singly (Daiber, 1979b) on the surface of smooth fruit or or on flower buds or (cotton) boll. Larvae bore into the fruit (or flower bud or cotton boll) until ready to pupate. Fifth instar larvae exit the fruit (or flower bud or cotton boll) and drop to the ground prior to pupation in order to form a loosely woven silk and soil cocoon among the leaf litter (Sullivan, 2007). See EFSA *et al.* (2020) and references therein for a more elaborate discussion on the biology of *T. leucotreta*.

DETECTION AND IDENTIFICATION

Symptoms

Small entrance or exit holes (with or without protruding frass) and discoloration of the fruit skin can be symptoms of larval feeding in the most important host plants (EFSA *et al.*, 2020). Subsequent destructive inspection of the infected fruits or flower buds (*Rosa*) will often reveal partial blackening of the flesh, as a result of secondary fungal or bacterial rotting, as well as abundant frass surrounding the larva (EPPO, 2019).

These symptoms however, are by no means specific for *T. leucotreta*, and may apply to other fruit boring insects belonging to orders such as Lepidoptera, Coleoptera and even Diptera, although in the last case frass is absent and often multiple larvae are present. Packaging material of infested commodities should be checked for cocoons and

pupae.

Morphology

Egg

T. leucotreta eggs are small, slightly convex, oval-shaped (0.6 mm wide, 0.77 mm long), translucent and covered with a granulated colorless egg shell with rough edges (Daiber, 1979b; EPPO, 2019). With the progressive development of the caterpillar inside the egg, the colour changes from creamy white to orange with hues of yellow and red. Prior to eclosion the caterpillar's brown thorax shield and head capsule become visible.

Larva

Young larvae are cream colored, bearing a brown head capsule, thorax and anal shield, their body is covered with fairly large greyish-brown pinacula. Late larval stages are orange-pink with a caramel coloured head capsule and prothoracic plate, with pinacula still prominent in these later larval stages. As for most tortricid larvae, *T. leucotreta* caterpillars are covered with microspinules resulting in a skin texture resembling sandpaper.

A prothorax with three L-setae and a somewhat cigar-shaped L-pinaculum extending beneath and beyond the spiracle and the presence of an anal comb are among the key characters useful for species identification of this species (CABI, 2021). Gilligan & Passoa (2014) and the EPPO Diagnostic Protocol PM 7/137 (EPPO, 2019) provide a full set of properties, including those of other economically important tortricids.

Pupa

T. leucotreta has a typical tortricid pupa with a maximum length 10 mm, it lacks distinct species specific characters that allow for a reliable identification, but EPPO Diagnostic Protocol PM 7/137 include pictures and a more detailed description.

Adult

Adults are sexually dimorphic and differ in wing span, wing shape and secondary sexual characters. *T. leucotreta* adults are mottled brown, their thorax bears two dorsal tufts (Sullivan, 2007). Adults are variable in color but most individuals exhibit at least some of the following elements: a small white dot at the distal end of the discal cell, a patch of raised, rust colored scales in the middle of the wing, a dark colored 'question mark' along the termen, and a less prominent broad semi-circular band of dark scales in the middle of the costa (EPPO, 2019). A prominent semi-circular patch of opalescent scales at the lower margin of the hindwing plus heavily tufted metatibia will help separate *T. leucotreta* males from most other tortricids. Gilligan & Epstein (2012) and EPPO Diagnostic Protocol PM 7/137 provide more extensive details including descriptions of male and female genitalia.

In addition to morphological identification, EPPO Standard PM 7/129 provide guidance for molecular identification of specimens using DNA barcoding (EPPO, 2020).

Detection and inspection methods

Commercially available pheromone delta traps with sticky inserts are effective for early detection of adult males in storage facilities, import ports, orchards or greenhouses. Light traps can be used to attract both sexes, but see (EFSA *et al.*, 2020) for more detailed description of key elements of a proper survey design. When looking for larval stages, buds, flowers (petals and sepals) and fruits of host plants should be examined for the presence of eggs (with a 10x hand-held magnifier), internally feeding caterpillars, minute entrance holes, and frass (EFSA *et al.*, 2020). Within orchards and greenhouses, cocoons can be found hidden between leaf litter or in top soil surrounding the host plants (Daiber, 1979a). Inside packing stations, import locations and storage facilities cocoons might be found in the vicinity of the consignments (EFSA *et al.*, 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 *et al.*, 2020) to assist EU Member States in planning their annual survey activities.

PATHWAYS FOR MOVEMENT

The most likely pathway of introduction to previously pest free areas is the transport of infested fruits. Import of citrus fruits (*Citrus sinensis, C. reticulata, C. paradisi*), pepper (*Capsicum* spp.), peach and nectarine (*Prunus persica*) and pomegranate (*Punica granatum*) are considered as major pathways, and import of rose (*Rosa sp*.) as a minor pathway for introduction of *T. leucotreta* into the EPPO region (EPPO, 2013). *T. leucotreta* is regulated by the EU, and reports have been made of interceptions from fruit species not previously known to be a host (Adom *et al.*, 2021). Adults can fly short distances. Given its presence in Israel since 1986, and the apparent lack of dispersal under seemingly favorable conditions, natural spread of *T. leucotreta* from infected orchards to adjacent areas is thought to be medium to low (EFSA *et al.*, 2020; Wysoki, 1986).

PEST SIGNIFICANCE

Economic impact

Throughout sub-Saharan Africa (and nearby islands in the Atlantic and Indian Ocean) *T. leucotreta* is a pest on many economically important crops, though infestation levels may vary extensively among regions and cultivars of a single crop (EPPO, 2013; Moore & Hattingh, 2016). Larvae can cause significant yield loss, directly as a result of feeding damage, premature ripening and fruit drop, and indirectly as a result of secondary fungal or bacterial infections (EPPO, 2013). *T. leucotreta* is a quarantine pest in a number of countries worldwide and its presence may therefore restrict import markets (e.g. Mutyambai *et al.*, 2020).

Control

For a long time pest control relied on broad spectrum insecticides (EPPO, 2013; Moore & Hattingh, 2016), although such treatments may no longer be permitted in the EPPO region in case of an introduction. As Integrated Pest Management (IPM) is used in many host crops, consumers and retailers tend to get more demanding with respect to limiting pesticide use and pesticide residues and improving sustainability (Mutyambai *et al.*, 2020).

For early detection purposes commercially available pheromone baited (delta) traps are effective for trapping adult males (Moore & Hattingh, 2016; EFSA *et al.*, 2020). Sterile insect technique (SIT) is IPM compatible and successfully implemented in South African citrus orchards resulting in a reduction of crop losses and fewer rejected consignments of exported fruit (EFSA *et al.*, 2021; Hofmeyr *et al.*, 2015; Hofmeyr *et al.*, 2019). However, SIT is not (yet) readily available in the EPPO region.

Phytosanitary risk

The host range of *T. leucotreta* includes a number of important crops in the EPPO region and its introduction could lead to significant economic losses, especially in Citrus and Capsicum (see EPPO, 2013 for details). Considering the temperatures needed for its development and the need for available host plants year-round, EPPO (2013) and EFSA *et al.* (2020) concluded that the area of potential distribution is the Mediterranean coast in North Africa (Morocco, Algeria and Tunisia), the Near East (Israel and Jordan) and Europe (Spain, Italy (Sicily and Sardinia), Malta, Southern Greece and Cyprus) together with Southern Portugal, the Canary Islands and the Azores.

The probability of transfer of the pest from imported infested fruits to host plants in the EPPO region is low but transfer may occur if the imported commodity is stored in the vicinity of a production place, or if waste of processed commodities is disposed of outdoors when temperatures are above 12°C.

PHYTOSANITARY MEASURES

Fruits of host species, in particular *Citrus*, *Capsicum*, peaches and nectarine, and pomegranate should be free of the pest. This can be achieved by an appropriate cold treatment of the consignment (e.g. for *Citrus*). Establishing pest-free areas may not be feasible for most exporting countries but a systems approach such as the one considered in EFSA *et al.* (2021) may decrease the risk to an acceptable level. Establishing a pest-free place of production may be feasible under protected conditions (e.g. for *Capsicum* and roses) (EPPO, 2013). Ionizing radiation may be an option

for fruit susceptible to chilling injuries (Adom *et al.*, 2021; Hofmeyr *et al.*, 2016).

Early detection is a key factor in the probability of success. Eradication measures are possible and likely to be successful in protected environments such as greenhouses, and may be successful, but less straightforward in outdoor conditions (EPPO, 2013). Containment and rapid eradication action are both essential for the successful prevention of establishment.

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Datasheet history

This datasheet was first published in 2021. It is 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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