EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION
ORGANISATION EUROPEENNE ET MEDITERRANEENNE POUR LA PROTECTION DES PLANTES

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This PRA document was modified in 2021 to clarify the phytosanitary measures recommended

Report of a Pest Risk Analysis for *Thaumatotibia leucotreta*

This summary presents the main features of a pest risk analysis which has been conducted on the pest, according to EPPO Decision support scheme for quarantine pests (PM 5/3(5). A full PRA record is also available (EPPO (2013) *Pest risk analysis for Thaumatotibia leucotreta*. EPPO, Paris. http://www.eppo.int/QUARANTINE/Pest_Risk_Analysis/PRA_intro.htm)

Pests: ***Thaumatotibia leucotreta***
PRA area: EPPO region
Assessors: Expert Working group for PRA for *Thaumatotibia leucotreta*

Assessors	1st meeting 2011-11-29/12-02	2nd meeting 2012-06-25/28
Mr Baker, Food and Environment Research Agency, United Kingdom	X	X
Mr Baufeld, Julius Kühn Institut (JKI), Germany	X	X
Mr Guitián Castrillón,Tecnologías y Servicios Agrarios, S. A. (TRAGSATEC), Spain	X	X
Mr Hattingh, Citrus Research International, South Africa	X	
Mr Panagiotis, Benaki Phytopathological Institute, Greece	X	
Mr Sarto I Monteys, Servei de Sanitad Vegetal, Spain	X	
Ms van der Straten, Plant Protection Service, Netherlands	X	X

EPPO Secretariat
Ms Françoise Petter

Date: 2011-11-29/12-02 and 2012-06-25/28. The PRA was further reviewed by 9 core members (Corinne Le Fay-Souloy, Dirk Jan van der Gaag, Alan MacLeod, Ernst Pfeilstetter, Gritta Schrader, Arild Sletten, Robert Steffek, Muriel Suffert, Nursen Ustun) between the 2012-07-19 and 2012-09-10.
The risk assessment part was reviewed by the Panel on Phytosanitary Measures on 2012-10.
The risk management part was reviewed on 2012-03.

STAGE 1: INITIATION

Reason for doing PRA: *Thaumatotibia* (=Cryptophlebia) *leucotreta* has been regularly intercepted by several EPPO member countries. *T. leucotreta* is a significant pest of fruit trees (particularly citrus) and field crops in African countries south of the Sahara. The EPPO Panel on Phytosanitary Measures decided that a PR should be conducted on this pest.

Taxonomic position of pest: Phylum: Arthropoda; Class: Insecta; Order: Lepidoptera; Family: Tortricidae; Tribe: Grapholitini; Species: *Thaumatotibia leucotreta*.

Comment: at the last Panel on Phytosanitary Measures (March 2013), it was noted that there is still uncertainty related to the situation of *T. leucotreta* in Israel. As mentioned in the pest risk assessment stage of the PRA, *T. leucotreta* was first found in 1984 on macadamia nuts (a crop which is no longer grown for commercial purposes in Israel). It is suspected that it was introduced on macadamia plants. In 2003, it was still present but with a limited distribution on cotton, macadamia nuts and castor bean only, which are minor crops for Israel (EPPO RS 2003/015). Recent information indicates that it is still found in the coastal area between Ashdod and Hadera (Opatowski, *pers. comm.* 2012) In February 2013, the Israeli NPPO provided a document entitled '*Israel's response to the Pest Risk Analysis prepared by EPPO's EWG for* Thaumatotibia leucotreta*'* with specific reference to citrus. In this document it is declared that *T. leucotreta* is not considered as a pest of *Citrus* in Israel. The EPPO Secretariat consulted the experts of the EWG from the EPPO region who agreed that the probability of entry with Citrus fruit from Israel is lower (unlikely) than from other countries. Investigations were conducted in April 2014 to verify the identity of specimens collected in Israel. These have been confirmed as *T. leucotreta* by Ms van Straten (Dutch National Reference Center) and Mr Gilligan (Colorado State University, international expert on Tortricids) based on morphology and sequencing. As explained in the PRA there is no reference of host strain and further research would be needed to determine if such strain exist.
The Panel on Phytosanitary Measures in March 2013 considered that the pest should be recommended for regulation as it presents a phytosanitary risk for the EPPO region and suggested that the measures could be reviewed at a later Panel meeting. It also considered that Israel should provide more evidence and data to support the recommendation of different measures (e.g. to show that their population does not damage citrus). The PRA report presents the main conclusions of the PRA (some indications regarding the possible difference in the evaluation regarding the risk arising from consignments originating from Israel compared to other countries where the pest is present are highlighted in green).

STAGE 2: PEST RISK ASSESSMENT

PROBABILITY OF INTRODUCTION

Entry

Geographical distribution: (see PRA record for references)

EPPO region: **The pest has a limited distribution in the EPPO region.**
In Israel, it was first found in 1984 on macadamia nuts (a crop which is no longer grown for commercial purposes). In 2003, it was still present but with a limited distribution on cotton macadamia nuts and castor bean only which are minor crops for Israel (EPPO RS 2003/015). Recent information indicates that it is still found in the coastal area between Ashdod and Hadera (Opatowski, *pers. comm.* 2012). It should be noted that *T. leucotreta* is not considered as a crop pest in Israel. Investigations were undertaken to verify the identity of specimens and these have been confirmed as *T. leucotreta* species.
In 2009, an incursion of *T. leucotreta* was detected in the Netherlands on glasshouse *Capsicum chinense*, and was subsequently eradicated (EPPO, 2010). The insect has also been occasionally noticed by lepidopterists in several Northern European countries such as the Netherlands (Huisman & Koster, 2000), Sweden (Svensson, 2002), Ireland (database of Irish Lepidoptera[1], see comment below) and the UK (Langmaid, 1996; Knill-Jones, 1994). However it is very unlikely that these moths came from established populations (Karnoven, 1983). Residency in Ireland recorded in the database of Irish Lepidoptera was confirmed to be erroneous (Ken Bond, *pers. comm.,* 2011).

Africa: Angola, Benin, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Congo (Democratic Republic of), Côte d'Ivoire, Eritrea, Ethiopia, Gambia, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritius, Mozambique, Niger, Nigeria, Reunion, Rwanda, Saint Helena, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Near East:
The pest has been intercepted in the USA in a consignment of Pomegranate from Saudi Arabia (Taylor, 1988) but there is no reference confirming the presence of the pest in this country.

[1] www.npws.ie/publications/irishwildlifemanuals/IWM35.pdf

A distribution map is presented in the PRA record.

Major host plants or habitats:
(see PRA record for references)

T. leucotreta is a polyphagous pest which can feed on many host plants present in the EPPO region.

An extensive literature review on host plants of *T. leucotreta* was undertaken. A list of currently known hosts is provided in Appendix 1 of the PRA record. This includes remarks on the status of some of the recorded host plants, as for some of these (e.g. pear, tomato, pineapple) the EWG was not able to find sound references on their host status.

The list of the most relevant host plants to consider in this PRA is presented in Table 1. The selection of host is based on expert opinion taking into account the importance of the host in the PRA area, its host status (major or incidental) and the importance of the possible pathways (in terms of volume of imported commodities).

HOST PLANT	COMMON NAME	PLANT FAMILY
Capsicum spp.	Pepper	Solanaceae
Citrus reticulata & hybrids	Mandarin orange	Rutaceae
Citrus sinensis & hybrids	Orange	Rutaceae
Citrus paradisi	Grapefruit	Rutaceae
Gossypium spp.	Cotton	Malvaceae
Litchi chinensis	Litchi, Litchee	Sapindaceae
Macadamia spp.	Macadamia	Proteaceae
Mangifera indica	Mango	Anacardiaceae
Prunus persica	Peach	Rosaceae
Prunus persica var. nucipersica	Nectarine	Rosaceae
Persea americana	Avocado	Lauraceae
Psidium guajava	Guava	Myrtaceae
Punica granatum	Pomegranate	Lythraceae
Quercus robur	Oak	Fagaceae
Ricinus communis	Castor oil plant	Euphorbiaceae
Rosa sp.	Rose	Rosaceae
Solanum melongena	Eggplant	Solanaceae
Vitis vinifera	Grape	Viticeae
Zea mays	Maize	Poaceae

Table 1: most relevant hosts to consider in the PRA

There are no known reports of *T. leucotreta* being a pest of roses, however larvae of *T. leucotreta* have been detected several times by the NPPO of the Netherlands in buds of Rosa cut flowers originating from countries where the pest is present (M van der Straten, *pers. comm.,* 2011). Most of the larvae boring into the flowers were successfully reared to adults on Rosa (on buds as well as on single petals). From this information the EWG considered that Rosa is a host of *T. leucotreta*.

It should be noted that in *C. limon* (lemon) *and C. aurantiifolia* (lime), larval development is rarely if ever completed (Catling & Ashenborn, 1978; Newton, 1998) and these citrus species are therefore not considered as hosts.

Host switching
Although a variety of hosts may be suitable for development, it has been widely

reported that, when given a choice, many insects tend to oviposit on the hosts they developed on and this behaviour is influenced by host availability (Cunningham & West, 2008; Coyle *et al.*, 2010). Oviposition preference may thus account for the different host ranges of *T. leucotreta* recorded in some countries, e.g. it has only been found on macadamia and *Ricinus communis* in Israel despite citrus orchards in close proximity (Opatowski, Israeli NPPO, *pers. comm.*, 2012). Since there is no evidence of host strains for *T. leucotreta* so far, there is thus a risk that it is capable of attacking different host species in the absence of preferred species on entry to the PRA area. This conclusion is supported by the fact that it has been able to adapt to *Q. robur*, an alien species in South Africa, and larvae extracted from *Rosa* were found to be able to complete their development on citrus fruits (van der Straten, *pers. comm.*, 2012). In addition, Daiber (1987) showed that high levels of infestation in peaches only occur where alternative winter host plants, like wild hosts and citrus, are present.

Which pathway(s) is the pest likely to be introduced on:

Two pathways have been studied in details:
Fruits of Citrus: *C. sinensis* (orange), *C. reticulata* (mandarin), *C. paradisi* (grapefruit)
Citrus fruits are considered as the main pathway for entry into the EPPO region. There is considerable variation in host suitability across these citrus species and furthermore across cultivars within these species (Newton, 1989 a,b; Newton & Anderson, 1985). The vast majority of citrus exports from Africa to the PRA area originate from southern Africa (South Africa, Zimbabwe and Swaziland) with the bulk coming from South Africa (approximately 75% of the volume of citrus is imported into the region during the EPPO summer season which is counter seasonal to the northern hemisphere production of citrus.

The association of the pest with the fruits taking into account the biology of the pest is very likely with a low uncertainty.
For Citrus fruits originating from Israel the association can considered unlikely with a medium uncertainty as the pest is not considered as a citrus pest there.
The association of the pest with the fruits taking into account management conditions is moderately likely with a medium uncertainty. and unlikely for Citrus fruits originating from Israel.
The probability of transfer is considered to be moderately likely when significant amounts of a particular commodity (e.g. a consignment) are stored for more than 1 week in the near vicinity of a production place, unless storage is at a low temperature (lower than around 12°C). The same goes for a situation where waste of processed commodity is disposed under open conditions at temperatures above 12°C. The probability is lower for fruits for retail sale to the final consumers.

Conclusion of the EWG on the probability of entry on this pathway:

The probability of entry of *T. leucotreta* on C. *sinensis (*orange*) C. paradisi (*grapefruit*)* and *C. reticulata (*mandarines*)* fruits, is considered **moderately likely** with a medium uncertainty for fruits intended for sorting and re-packing.
Fruits originating from Israel:
The probability of entry of *T. leucotreta* on C. *sinensis (*orange*) C. paradisi (*grapefruit*)* and *C. reticulata (*mandarines*)* fruits, is considered unlikely with a medium uncertainty because of the low probability of association with the pest.

Fruits of Pepper (*Capsicum* spp.)
Fruits of Capsicum sp. infested by *T. leucotreta* have been intercepted by the USDA (USDA-APHIS 2010), the UK (Malumphy & Robinson 2002, *pers. comm.* A. Koricynska, 2012) and the Netherlands (van der Straten *pers. comm.*, 2012). There are no data on difference in susceptibility to the pest in different species or varieties of *Capsicum*.

The probability of entry with this pathway is considered moderately likely (in some

part of the region the transfer may be more likely than others (in particular those where hosts plants are grown outdoors or facilities where imported product is handled in facilities together with production). As for Citrus, the pest has never been recorded on Capsicum in Israel it is not present in the area where Capsicum are grown. The risk is considered unlikely with a medium uncertainty**.**

Risk of entry presented by other fruits: although these have not been studied in detail in the entry section because of lack of data, the EWG agreed that they should be considered for management.

***Fruits of Prunus persica* (peach & nectarine)**
As the pest is present all year round and is a pest of Prunus, it can be associated with fruits. However, regarding the likelihood of association with fruits. The probability of association of *T. leucotreta*, is lower in *Prunus* spp. than in *Citrus* spp.. There is also a difference in susceptibility within *Prunus* species and the late varieties are more likely to be associated with *T. leucotreta* than early ones.

Fruits of *Punica granatum* (pomegranate)
T. leucotreta is recorded as one of the most serious pest of pomegranate in South Africa (Wohlfarter *et al.* 2010). Unlike other fruits where usually only one larva per fruit is found, several larvae may be found in a pomegranate fruit.

Other pathways identified but not studied further:
Cut flowers of *Rosa* sp.:
Larvae of *T. leucotreta* have been detected by the NPPO of the Netherlands in buds of *Rosa* cut flowers originating from Ethiopia, Kenya, Malawi, Tanzania, Zambia, Zimbabwe and Uganda 59 times (2007– July 2012), with over 90% of the detections on imports from Uganda. However, taking into account the high import volumes compared to the number of detections, the percentage of infestations is considered very low. The risk of transfer was considered to be low.
The EWG considered the risk of *Rosa* cut flowers as a pathway as minor.

Other fruits

- *Litchi sinensis* (Litchi):

Infestation on *L. sinensis* is assumed to be extremely low and this commodity is therefore not considered to be an important pathway.

- *Mangifera indica* (mango):

Infestation on *M. indica* is assumed to be rare and this commodity is therefore not considered to be an important pathway.

- *Persea americana* (avocado)

Grové *et al.* 2000 states that avocado is a poor host of *T. leucotreta*. Caterpillars are able to develop if fruits are approaching maturity when infested (Grové *et al.*, 2010). As most avocados are harvested in a hard green state it can be concluded that the pest is unlikely to be present on imported avocados.

- *Psidium guava* (Guava):

Volume of trade is low.

- *Quercus robur* (acorn)

Acorns are not being imported into the EPPO region and therefore are not considered as a pathway.

- *Ricinus communis (*ricinus)

Fruits of *Ricinus* are only imported into the EPPO-region after processing (for instance as castor oil). Unprocessed fruits are not imported into the EPPO region. *Ricinus* is therefore not considered as a pathway.

- *Solanum melongena* (aubergine):

Although ubergine is being imported into e.g. the EU from several African countries and *T. leucotreta* has been detected occasionally on imported consignments of *Solanum melongena t*his commodity is not considered to be an important pathway.

- *Vitis vinifera* (grape):

V. vinifera is being imported into the EPPO region in significant volumes. However, *T. leucotreta* has only been detected occasionally on grapes in the field and is considered a marginal host (Hattingh *pers. comm.* 2011). It has only incidentally been detected at pre-clearance inspections in consignments intended for the USA (J.P. Floyd, USDA, *pers. comm.*, 2011). This commodity is not considered to be an important pathway.

Fruits of other hosts are not imported into the EPPO region or only in limited volumes and are not further considered in the analysis.

For other pathways not considered see PRA record.

Establishment

Plants at risk in the PRA area:

T. leucotreta is extremely polyphagous with over 70 hosts. Several of these are economically important crops in the EPPO region such as *Capsicum* (peppers), *Citrus reticulata* (and hybrids), *C. sinensis* (and hybrids), *Macadamia ternifolia* (macadamia nut), *Prunus persica* (peach), *Prunus persica var nucipersica* (nectarine), *Punica granatum* (pomegranate), and *Zea mays* (maize).
Most hosts occur primarily in the southern part of the EPPO region, but *Zea mays* (maize), *Rosa* sp. (rose), *Prunus domestica* (Plum, see Appendix 1 second table of the PRA record) and *Quercus robur* are found much further north. In Israel, *T. leucotreta* populations on macadamia nuts are sustained on the castor oil plant, *Ricinus communis* (Hamburger *et al*, 2001, Opatowski, Israeli NPPO, *pers. comm.*, 2011).

Climatic similarity of present distribution with PRA area (or parts thereof):

Although hosts are more widespread in the EPPO Region, after careful study (see Appendix4 of the PRA record), only areas near the Mediterranean coast in North Africa (Morocco, Algeria and Tunisia), the Near East (Israel and Jordan) and Europe (Spain, Italy (Sicily), Malta and Cyprus) together with Portugal, the Canary Islands and the Azores where:

a) cool minimum night time winter temperatures greater than 1°C are balanced by day time maximum temperatures that are up to 15-17°C higher,
b) fruits of host plants (e.g. *Ricinus communis*) are available year-round. It should be noted that the pest can lay eggs on *Rosa* sp. as demonstrated by several detections in *Rosa* cut flowers from Uganda.
c) host plants are irrigated (or have naturally available water) to withstand the summer drought.

were shown clearly to be suitable climatically for *T. leucotreta*.

Characteristics (other than climatic) of the PRA area that would favour establishment:

No factor other than climatic have been identified that would favour establishment

Which part of the PRA area is the area of potential establishment:

The area of potential establishment corresponds to areas where climatic conditions are suitable outside where the probability of establishment is considered to be likely. There is also the possibility that the pest establishes in protected cultivation but probability of establishment was considered to be unlikely to moderately likely in these areas because control of the pest is more likely to be effective including periods with no host production (stopping production during a given period).

POTENTIAL ECONOMIC CONSEQUENCES

How much economic impact does the pest have in its present distribution:

T. leucotreta is a pest of economic importance to many crops throughout sub-Saharan Africa and the islands of the Atlantic and Indian Oceans (Schwartz & Kok, 1976; Daiber, 1979, 1980; La Croix & Thindwa 1986a, b; Wysoki, 1986; Blomefield, 1989; Newton, 1989b; Newton & Crause, 1990; Silvie, 1993; Sétamou *et al.*, 1995). However, the importance of damage recorded varies considerably across the distribution range and fruit type. For example, whereas *T. leucotreta* has been recorded as a pest of maize and cotton in the northern African part of the species' distribution range, it is not known as a pest of these crops in South Africa. *T. leucotreta* has been recorded as a pest of Macadamia in Israel but is not reported to

attack Citrus (Opatowski, Israeli NPPO, *pers. comm.* 2012).
Damage on *Capsicum* sp. can occur but there is conflicting information on the level of damage that can occur.

Describe damage to potential hosts in PRA area:

On citrus: larvae bore into the albedo and usually feed just below the fruit surface. The rind around the point of infestation turns yellowish-brown as the tissue decays and collapses. Infestations lead to premature fruit drop.
On capsicum, as for other hosts the pest causes fruit damage.
On stone fruits: larvae bore into the fruit at the stem end and begin to feed around the stone. Infestation may be detected by the presence of brown spots and dark brown frass.
On cotton: damage caused by *T. leucotreta* is similar to *Pectinophora gossypiella*. Larvae penetrate cotton bolls, they first mine in the walls of the bolls and then feed on the seeds. Infested bolls are then often invaded by secondary rots. Larval presence is often characterized by the occurrence of a filamentous waxy secretion protruding from the entry hole.

larvae of *T. leucotreta*
Source :
http://idtools.org/id/leps/tortai/Thaumatotibia_leucotreta.htm

damaged fruits
Source :
http://idtools.org/id/leps/tortai/Thaumatotibia_leucotreta.htm

How much economic impact would the pest have in the PRA area:

There is some uncertainty about the pest population levels that are likely to develop across production areas and host types given the variability occurring within the pest's current distribution range.

Assuming that *T. leucotreta* was to become established in one or more of the major crops, the economic impact would be major in the short term because of the cost of additional control measures and the loss of trade opportunities or the additional phytosanitary measures required to maintain trade. The impact will vary among the different crops depending on their respective IPM programs (basically whether pyrethroids are needed and regularly used or not in the crop due to the presence of other pests).

The long term impact is however considered to be moderate. IPM programs will need to be adjusted to incorporate *T. leucotreta*. The EPPO region can benefit from experience in South Africa to establish these programmes. Adjustments of control strategies could be achieved within a 5 years period (as happened with *T. absoluta).* Control cost for producers will increase and are likely to be partly borne by consumers.

CONCLUSIONS OF PEST RISK ASSESSMENT

Summarize the major factors that influence the acceptability of the risk from this pest:

The pest is a pest of major crops in the EPPO region (e.g. Citrus) specific control programmes will have to be established if introduced.

Estimate the probability of entry:

The pest can be present on imported commodities but the risk of entry is mainly dependent on the success of transfer.

Estimate the probability of establishment:

The climate is suitable in part of the PRA area and hosts present. The pest has already been introduced into Israel. Outdoors conditions are suitable in areas near the

	Mediterranean coast in North Africa (Morocco, Algeria and Tunisia), the Near East (Israel and Jordan) and Europe (Spain, Italy (Sicily), Malta, Cyprus and southern Greece), together with Portugal, the Canary Islands and the Azores. Establishment is less likely in protected cultivation where control of the pest is more likely to be effective including periods with no host production (stopping production during a given period).
Estimate the probability of spread:	Because commodities of host fruits are traded within the region the EWG considered that the rate of spread was high (but it should be noted that as for entry a transfer to suitable hosts needs to occur for the pest to establish further away).
Estimate the potential economic impact:	The whole area of potential establishment is at risk of short term major economic impact (long term moderate). Environmental and social impacts are likely to be minor.
Degree of uncertainty	The main uncertainties are : • List of hosts • Association of the pest with the pathways taking into account current management measures • Likelihood of the pest to enter the PRA area undetected • Transfer from fruit or Rosa cut flowers to suitable habitats • Volumes and frequency of import of Capsicum spp. • Climatic suitability • Establishment despite existing pest management procedures • Adaptability of the pest • Rate of spread of the pest (and consequently possibility of eradication and containment) • Level of negative effect of the pest for some crops without measures and with measures. • Pest management procedures for some hosts. Regarding the specific situation in Israel information would be needed on • what citrus varieties are grown near the Israeli populations on macadamia/Ricinus • Information from the area where the pest is present concerning: pest distribution, the amount/locations etc of monitoring/trapping and the findings. Presence on other hosts, e.g. peach and capsicum, should also be investigated. • can Israel provided a guarantee that Israeli citrus is not sorted/repacked?
OVERALL CONCLUSIONS	Introduction of the pests in the PRA area is rated as moderately likely with a medium uncertainty (unlikely with a medium uncertainty for Citrus or Capsicum fruits originating from Israel). Interceptions have already occurred.

STAGE 3: PEST RISK MANAGEMENT

IDENTIFICATION OF THE PATHWAYS

Pathways studied in the pest risk management

- **Fruits of *C. sinensis* (orange), *C. reticulata* (mandarin), *C. paradisi* (grapefruit).**
- **Fruits of *Punica granatum* (pomegranate)**
- **Fruits of Capsicum spp. (pepper)**
- **Fruits of *Prunus persica* (peach & nectarine)**

Comment:
The probability of entry with imports of fruit of *C. sinensis* (orange), *C. reticulata* (mandarin), *C. paradisi* (grapefruit) and *Capsicum* spp. from Israel is considered unlikely so for this origin measures could be less stringent; However it would be important that further information is provided by the Israeli NPPO.

IDENTIFICATION OF POSSIBLE MEASURES

For fruits of *C. sinensis* (orange), *C. reticulata* (mandarin), *C. paradisi* (grapefruit), *Prunus persica* (peach & nectarine) the measures provided in the table below can reduce the risk of introduction of the pest:

Measures related to the crop or to places of production:

- Visual inspection is not sufficient as a standalone measure.
- Treatment of the crop will reduce infestation levels but cannot guarantee pest freedom.
- Pest-free area (although pest prevalence varies significantly across the regions of Southern Africa, it occurs in all citrus-growing areas. The feasibility of the establishment of PFAs should be carefully evaluated). Some details on the measures to establish a PFA are provided in the PRA record.
- Pest-free place of production/pest-free production site. The EWG considered that this option could be appropriate because sensitive methods for detection of the pest exist. Some details on the measures to establish a pest-free place of production/pest-free production site are provided in the PRA record.

Measures related to consignments:

- Visual inspection is not sufficient as a standalone measure to detect all life stages of the pest.
- Cold treatment (-0.55 ºC or below for an exposure period of 24 days) the pest is effectively destroyed by cold treatment in *Citrus* spp. and *Prunus persica*.
- The Panel on Phytosanitary Measures noted that limiting distribution in the PRA area (under a bilateral agreement) is a possible option but will be difficult to implement in practice.

Systems approach

Measures can be combined in a Systems Approaches as follows:

- In the crop trapping programme, visual inspection of fruits in the orchard and culls, sanitation of fruits and pest control.
- Visual examination at harvest and during handling/packing of the consignment, and visual inspection at export.

The efficacy of such Systems Approach is not known and would require bilateral discussions with the exporting countries to evaluate if these can be accepted.

Fruits of Capsicum & *Punica granatum* (pomegranate)

Measures related to the crop or to places of production:

- Visual inspection is not sufficient as a standalone measure
- Treatment of the crop will reduce infestation levels but cannot guarantee pest freedom
- For *Capsicum* spp. only, fruits can be grown under complete physical protection (details to be further elaborated)
- Pest-free area. The feasibility of the establishment of PFAs should be carefully evaluated. Some details on the measures to establish a PFA are provided in the PRA record.
- Pest-free place of production/production site. The EWG considered that although the pest has many host plants this option could be appropriate because the natural spread of the pest is slow and over short distances and sensitive methods for detection exist. Some details on the measures to establish a pest-free place of production/production site are provided in the PRA record.

Measures related to consignments:

- Visual inspection is not sufficient as a standalone measure to detect all life stages of the pest.
- Cold treatment is not an option for Capsicum spp as peppers are sensitive to chilling injury. No information is available for *P. granatum.*
- The Panel on Phytosanitary Measures noted that limiting distribution in the PRA area (under a bilateral agreement) is a possible option but will be difficult to implement in practice.

Systems approach

Measures can be combined in a systems approach as follows:

- In the crop trapping programme, visual inspection of fruits in the orchard and culls, sanitation of fruits and pest control.
- Visual examination at harvest and during handling/packing of the consignment**,** and visual inspection at export.

The efficacy of such systems approach is not known and would require bilateral discussions with the exporting countries to evaluate if these can be accepted.

IDENTIFICATION OF POSSIBLE MEASURES

PC= Phytosanitary certificate

For fruits of *C. sinensis* (orange), *C. reticulata* (mandarin), *C. paradisi* (grapefruit), *Prunus persica* (peach & nectarine)	PC and • Pest free area or • Pest-free place of production/pest-free production site or • Cold treatment or • Limited distribution in the PRA area (under a bilateral agreement) or • Systems approach (in the framework of a bilateral agreement): In the crop trapping programme, visual inspection of fruits in the orchard and culls, sanitation of fruits and pest control + Visual examination at harvest and during handling/packing of the consignment and visual inspection at export
Fruits of *Capsicum* & *Punica granatum (*pomegranate*)*	PC and • Fruits grown under complete physical protection (for Capsicum only) or • Pest-free area or • Pest-free place of production/pest-free production site or • Limited distribution in the PRA area (under a bilateral agreement) or • Systems approach (in the framework of a bilateral agreement): In the crop trapping programme, visual inspection of fruits in the orchard and culls, sanitation of fruits and pest control + Visual examination at harvest and during handling/packing of the consignment and visual inspection at export

EVALUATION OF THE MEASURES IDENTIFIED IN RELATION TO THE RISKS PRESENTED BY THE PATHWAYS

The trade in some commodities from outside the EPPO region is very large so impact on trade will be major.

Fruits of *C. sinensis* (orange), *C. reticulata* (mandarin), *C. paradisi* (grapefruit), *Prunus persica* (peach & nectarine) and *Punica granatum* (pomegranate)

The measures are expected to interfere with citrus trade because *T. leucotret*a is not currently a regulated pest for most EPPO countries (except Jordan). Mr Hattingh (expert from South Africa who attended the 1st meeting of the EWG) provided a study conducted by the Citrus Growers Association of Southern Africa. This evaluation is presented for information in Appendix 5 of the PRA record.

The EWG considered that:
Establishing a pest-free area or pest-free place of production/production site may not always be possible in countries where the pest occurs.
Cold treatment T107-k (-0.55 ºC; 24 days) and T107-e (-0.55 ºC; 22 days) is a requirement for some countries such as the USA. However, there are limitations regarding capacities in exporting countries to perform this treatment for larger volumes (see Appendix 5 of the PRA record).

A Systems Approach may provide an alternative to the measures above but would require bilateral discussions with the exporting countries to be able to judge on the efficacy. .

A judgment is difficult to be made for other fruits but imported volumes are lower.

Fruits of *Capsicum* spp.
Measures may interfere with trade because the pathway is currently unregulated in most EPPO Member countries. Growing *Capsicum* spp. under protected conditions is common; however, additional measures will be needed. Pest-free areas may not be feasible for most of the exporting countries. Other options such as pest-free place of production/production site or Systems Approach are common measures in trade but are not required so far.

The measures proposed at origin would have costs related to physical isolation of greenhouses, monitoring and control to the crop and consignment.

T. leucotreta could be difficult to eradicate or contain if introduced in the citrus and horticultural-growing areas of the Mediterranean Basin. The possible measures at origin have lower cost than attempting eradication or bearing the costs of impact and spread should it become established.

Measures regarding safe disposal of wastes to be implemented in the PRA area would have a cost for the processing and packing companies concerned. Separation of packing and production would also have a cost.

Degree of uncertainty Efficacy of a systems approach
Feasibility of the establishment of a PFA.