



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

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WPPR Point 7.4

Report of a Pest Risk Analysis for *Keiferia lycopersicella*

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)).

Pests: *Keiferia lycopersicella*

PRA area: EPPO region

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Date: 2011-09-19/22. Core members (Robert Steffek, Philippe Reynaud, Leif Sundheim, Dirk Jan Van der Gaag, Gritta Schrader, Alan MacLeod, Nursen Ustun, Lucio Montecchio, Françoise Petter) reviewed the draft PRA between 2011-12-05 and 2012-02-15. The risk management part was reviewed by the Panel on Phytosanitary Measures on 2012-03-15.

STAGE 1: INITIATION

Reason for doing PRA:

Keiferia lycopersicella, the tomato pinworm, came to EPPO's attention because it was detected in 2008 damaging a tomato crop in Italy (Liguria). *K. lycopersicella* originates from the Americas (probably Central America) where it is considered as a significant pest of tomato (and sometimes eggplant). It was then considered as eradicated but this incursion showed that a pathway for entry existed to the EPPO region. As this pest has quite a similar profile to *Tuta absoluta*, whose recent establishment had disastrous consequences on tomato production in the EPPO region, it was added to the EPPO Alert List in November 2010. The Working Party on Phytosanitary Regulations decided in June 2011 that a PRA for this species should be performed.

Taxonomic position of pest:

Insecta: Lepidoptera: Gelechiidae

Common names:

tomato pinworm (English)

enrollador de la hoja del tomate, gusano aguja gusano alfiler, quemao, cogollero del tomate, minador del tomate, minador gigante, polilla de tomate (Spanish)

STAGE 2: PEST RISK ASSESSMENT

PROBABILITY OF INTRODUCTION

Entry

Geographical distribution:

(see PRA record for references)

EPPO region: Absent (1 incursion in Italy in 2008).

North America:

-Canada: Ontario (under glasshouses)

-Mexico

-USA: Alabama, Arkansas, Arizona, California **, Delaware, Florida **, Georgia, Hawaii, Maryland, Mississippi, Missouri , New Jersey, New Mexico , North Carolina**, Ohio*, Pennsylvania*, South Carolina, Tennessee*, Texas**, Virginia.

*probably transient populations , **Overwintering outdoors

Central America: Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. It is generally considered that *K. lycopersicella* originates from Central America.

Caribbean: Bermuda, Cuba, Dominican Republic, Haiti, Jamaica, Trinidad and Tobago (Trinidad).

South America: Bolivia, Colombia, Ecuador, Guyana, Peru, and Venezuela.

Major host plants or habitats:

(see PRA record for references)

Major hosts are:

- tomato (*Solanum lycopersicum*),
- eggplant (*Solanum melongena*)

Potato (*Solanum tuberosum*) is also reported as a host but is only occasionally reported as attacked by the pest in the field.

Several weeds are also reported as hosts: *Solanum americanum* var. *nodiflorum*, *S. bahamense*, *S. carolinense*, *S. viarum*, *S. dulcamara* and *S. elaeagnifolium*.

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

• **Fruits of tomato and eggplant from where *K. lycopersicella* occurs**

All life stages may be associated with fruits of tomato and eggplant or with green parts attached.

• **Packaging (i.e. crates, boxes used for picking and packing tomato and eggplant fruits) from where *K. lycopersicella* occurs**

The pest may become associated with packaging that has been used to transport tomato or eggplant fruit. Ferguson & Shipp (2009) mention that crates that have been used to transport tomatoes could carry adults, infested leaves or fruits. Only third and fourth larval instars that are inside the fruit are not likely to become associated with packing material. The life stage which is most likely to be associated with packaging is pupae. Adults may be attracted to packaging carrying the fruit.

This pathway has been shown as important for the related pest *T. absoluta*.

• **Plants for planting (except seeds) of tomato and eggplant from where *K. lycopersicella* occurs**

The foliage of the plants may carry eggs, larvae and pupae of *K. lycopersicella*. If soil or growing medium is associated with the plants, it may contain pupae. In the USA, tomato seedlings are consistently mentioned as the means by which the pest reaches northern parts of its distribution, from its range in the southern part of the country (e.g. Elmore & Howland, 1943; USDA, 2002). It should be noted that this pathway is subject to prohibition in many countries of the PRA area (e.g. the EU).

Other pathways identified but not studied further:

- **Soil (as such; or associated with seed and ware potatoes) from where *K. lycopersicella* occurs.**

Pupae might be associated with soil as they are formed in the shallow part of the soil. Even if potato is considered as a minor host, pupae might become associated with potatoes accompanied by soil at harvest. Entry on this pathway was considered as very unlikely, mostly due to the very low trade of soil (associated with potatoes or as such) into the PRA area from countries where *K. lycopersicella* occurs, the stringent phytosanitary import requirements applying to such commodities in most countries of the PRA area and the low likelihood of transfer to a host plant.

- **Hitch-hiking of adults on containers, machinery and conveyances) from where *K. lycopersicella* occurs**

This pathway was discussed by the EWG in comparison with the related pest *T. absoluta*. *T. absoluta* has shown to be attracted by light and by the smell of tomato, and adults can therefore become associated as hitch-hikers in containers, machinery or conveyances. This seems less probable for *K. lycopersicella* and it was considered a very minor pathway for entry compared to packaging.

- **Plants for planting (except seeds and tubers) of ornamental Solanaceae from where *K. lycopersicella* occurs**

It was considered that *K. lycopersicella* may be associated with other Solanaceae that are ornamental plants. Nevertheless, it is not clear which host plants are relevant and the import of Solanaceae plants for planting is already prohibited in many EPPO countries (e.g. the EU).

Pathways considered not likely

Potato tubers. *K. lycopersicella* may occasionally damage potato plants, but none of its life stages attack potato tubers. However pupae might be associated with soil, which might in turn be associated with potato tubers.

Natural spread. *K. lycopersicella* is reported only in the Americas and Caribbean. It is recorded to move with storm fronts within the Americas. This would not be a mean of transmission from the Americas to the PRA area.

Establishment

Plants at risk in the PRA area:

Tomato, eggplants (and potato?). These plants are largely cultivated throughout the PRA area, in field and under protected conditions as well as in gardens.

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

The climate of the pest present distribution is largely similar in the Mediterranean area. Given its current distribution in the Americas, it is thought that the pest would be able to establish and overwinter outdoors predominantly around the Mediterranean Basin. The pest is generally considered to not be able to survive outdoors in winter at low temperatures.

K. lycopersicella seems to be better adapted to high temperatures than *T. absoluta*. The arid areas of the PRA area are more at risk because of the high temperatures which supports a higher number of generations.

The pest can also establish in protected cultivation in the whole PRA area.

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

In some part of the PRA area, solanaceous crops are grown all year round (e.g. in the Mediterranean area); host weeds or volunteers may be found in eggplant, potato or tomato crops. Their presence will favour survival or reproduction of the pest and therefore establishment.

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

The pest could establish in greenhouses throughout the PRA area and outdoors in the Mediterranean Basin. However there is uncertainty as to the northern limit of the area of establishment outdoors, but transient field populations are possible in northern areas.

POTENTIAL ECONOMIC CONSEQUENCES

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

Reports of pest damage in the literature vary depending on whether they were made before the development and implementation of integrated pest management or after. The importance of *K. lycopersicella* as a pest has diminished in places where IPM is implemented (e.g. California, Mexico). The fruit loss is minor but there are still control costs in Mexico. The current situation in Central America, South America and the Caribbean is not known as no recent literature was found for these countries but *K. lycopersicella* was reported as a major pest for tomato (and eggplant). It can cause complete crop losses.

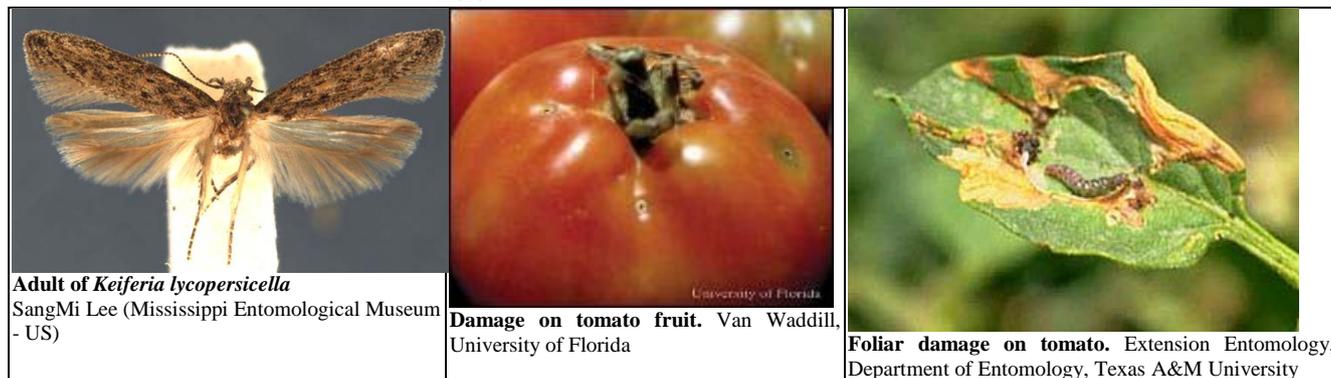
Damage to potatoes can occur, but has been considered relatively minor throughout the current area of distribution

Describe damage to potential hosts in PRA area:

Damage is similar to those of *T. absoluta*. Larvae can damage either foliage or fruit, but most economic losses occur when fruit is attacked. The following damage are reported: loss of yield and quality, rejection of crops (as some markets have a low tolerance for cosmetic damage) and indirect losses by development of secondary rots. Tomatoes attacked when small become leathery and remain green in the centre when mature; the interior of the seed cavity might turn black. In foliage, the first and second instars feed as leafminers, producing a blotch mine. Later instars typically fold leaves or attach pairs of leaves with silk to create sheltered feeding sites, but may enter stems. Fruit contamination occurs when larvae enter the tomato (typically beneath the calyx); infested fruit are unmarketable and must be discarded.

On eggplants, damage is mainly of leaves/stems. Damage on fruit is mainly cosmetic, as larvae rarely enter fruit.

On potato, damage (larval feeding on foliage) is only rarely reported in the field.



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

Establishment of *K. lycopersicella* into area of potential establishment would have a major impact on the production of tomato, and possibly eggplant in areas where *T. absoluta* is not present and a moderate to major impact where *T. absoluta* is present. Although it is likely that non-phytosanitary controls against *K. lycopersicella* can eventually be developed and integrated into current IPM strategies, this would take time and cost money. In particular IPM strategies are based on the use of pheromone for mating disruption but this would need registration before being used in EPPO countries. In the meantime there would be unacceptable damage to crops, increased applications of insecticides and disruption of existing IPM systems. *K. lycopersicella* might also have consequences for exports of tomato and possibly eggplant from countries where it occurs.

In the Northern part of the PRA area, transient populations may create damage during the summer.

CONCLUSIONS OF PEST RISK ASSESSMENT

Summarize the major factors that influence the acceptability of the risk from this pest: *K. lycopersicella* is a pest of tomato and eggplant which are important crops in the PRA area. It is also reported as a possible pest of potato. Severe damage has been noted in the Americas where outbreaks have occurred.

In the case of introduction of *K. lycopersicella*, they would have a high probability of establishment the Mediterranean Basin, as well as wherever host plants are grown under protected condition. Eradication or containment would be difficult due to fact that they might not be detected before they have already established and caused damage. Producers will have to change their pest management practice to cope with this new pest.

Estimate the probability of entry: The probability of entry is considered **likely with a medium uncertainty**. The pathway Plants for planting of tomato and eggplant is closed for some countries of the PRA area (e.g. the EU and associated countries).

The main pathway of concern is therefore the **Fruit of tomato** from countries where *K. lycopersicella* occurs. As the critical point is transfer of the pest from the imported fruit to host plants, the main risk will be where packaging of imported fruit occurs in close proximity of where solanaceous hosts are grown. Vine tomatoes present a higher risk as they are harvested and marketed with parts of branches which may result in a higher concentration of the pest.

Entry with eggplant fruit has a higher uncertainty because it is not known whether larvae may be present within fruit (in Florida only superficial damage is reported but this may be different in other countries).

Packaging (i.e. crates, boxes) used for picking and packing tomato and eggplant fruits is also a possible pathway, in particular if destined to facilities close to places where tomatoes are grown

Estimate the probability of establishment: The probability of establishment is **high (with a low uncertainty)** outdoors in the Mediterranean Basin and in greenhouses throughout the PRA area. Transient population may occur in the Northern part of the PRA area.

There are uncertainties on the northern limit of the area of potential establishment because of conflicting data on thermal threshold for the pest.

Estimate the probability of spread: The rate of spread of *K. lycopersicella* is likely to be **high (with a low uncertainty)**. The pest can move with fruit, plants for planting, soil and conveyances (especially crates which have carried infested tomatoes). There is a massive movement of tomato and eggplant fruits between countries of the EPPO region (CIRAD, 2009). Crates which have been used to transport tomatoes have been identified as sources of movement of *T. absoluta* in the UK and the Netherlands, and a similar situation could occur for *K. lycopersicella*. In addition, the pest may fly and can also be transported on storm fronts but there is uncertainty on the distances of adult flight and passive flight with wind in the PRA area.

Estimate the potential economic impact: The potential economic impact across the whole area of potential establishment is considered as **moderate with medium uncertainty**. It will be higher in Mediterranean countries with arid areas, and for organic production. Considering the experience with *T. absoluta*, it is considered that the impact in the first years will be greatest before IPM systems are adjusted, especially in places where *T. absoluta* does not occur. Data is lacking on economic impact at origin in recent years.

Degree of uncertainty The main uncertainties are associated with limits of the area of potential establishment (because of conflicting data for thermal thresholds and some uncertainties on the current distribution) and the possible efficacy of pest management already applied in the different countries of the PRA area (e.g. against *T. absoluta*) on *K. lycopersicella*.

OVERALL CONCLUSIONS Entry of the pest in the PRA area is rated as likely. The main risk is associated with imported tomato fruit that are handled in facilities close to places where tomatoes are grown. It should be noted that imports of tomato fruit from countries where *K. lycopersicella* occurs, although limited, have increased over the last 10 years (no import existed before 1999). However, the whole PRA area would be at risk of severe consequences in case of introduction of the pest, either in open field or in protected conditions. It therefore seems important to prevent introduction of *K. lycopersicella*.

STAGE 3: PEST RISK MANAGEMENT

IDENTIFICATION OF THE PATHWAYS

Pathways studied in the pest risk management • **Fruits of tomato and eggplant**

• **Plants for planting (except seeds) of tomato and eggplant**

The risk management section was not carried-out specifically for packaging, but measures regarding packaging were added under the fruit and the plants for planting pathways (only new packaging should be used).

IDENTIFICATION OF POSSIBLE MEASURES

Possible measures for pathways

• **Fruit of tomato and eggplant**

Measures related to the crop or to places of production:

- Pest-free area or pest-free place of production

Pest-free area as described in ISPM 4. It will in particular require the use of pest-free seedlings and the use of pheromone traps to check for absence of the pest. There should be control on movement of tomato fruit and plants, other hosts, equipment and packaging, etc. in and out of the area.

Pest free place of production is considered possible for screened glasshouses with use of pest-free seedlings. Pest freedom should be checked using pheromone traps. Handling and packing should be done within the pest-free place of production and only new packaging should be used.

Measures related to consignments:

- Visual inspection is not sufficient as a standalone measure to detect all life stages of the pest.
- Treatment: fumigation of the consignment may be effective but no specific data is currently available. Methyl bromide treatment is reported as effective against the related pest *T. absoluta*). However methyl bromide is no longer registered in most EPPO countries (e.g. the EU) and will be phased out definitely in 2015.
- Import under specific conditions: It is theoretically low risk to import consignments of tomato during winter time (e.g. when the outside temperature is below 5°C) for immediate processing or direct consumption where *K. lycopersicella* cannot survive outdoors and provided no handling or packing is done in or in close proximity of a place producing host plants. However the EWG considered that it was difficult to control, at least within the EU, that this consignment is used in the same area as it is imported. Another option could be immediate processing of the fruit and destruction of the waste (e.g. burning, deep burial), but it is not practical and difficult to control in practice.

Systems approach

Tomato plants should be cultivated under protected conditions excluding *K. lycopersicella* (e.g. use of screened

glasshouses and implementation of a mating disruption programme). Stringent sanitation measures should be applied, including removal of plant debris from earlier crop. Visual inspections should be conducted during the growing season, and the pest monitored with pheromone traps. During handling and packing, careful examination should be conducted to discard infested fruits. For tomato, removal of green parts will allow a better detection of infested fruit. Only new packaging should be used.

Other possible measures in the importing country

In the northern part of the PRA area where the pest cannot survive outdoors in winter, measures could theoretically be taken only in the importing country. It would require the separation of trade and production flows (separate facilities for imported consignments and growing tomato or eggplant) and a good surveillance system (including trapping at packing stations). However the Panel on Phytosanitary Measures considered that it was not a safe option in practice.

• **Plants for planting (except seeds) of tomato and eggplant**

For the EU, import of plants for planting of *Solanaceae* is prohibited (except from European countries and countries in the Mediterranean region) (EU Directive 2000/29/EC). This pathway is also closed for at least Norway, Switzerland and Israel.

Measures related to the crop or to places of production:

- Pest-free area or Pest-free place of production

Pest-free area as described in ISPM 4. It will in particular require the use of pheromone traps to check for absence of the pest. Pest-free seedlings should be used. There should be control on movement of tomato and eggplant fruit and plants, other hosts, equipment and packaging, etc. in and out of the area.

Pest-free place of production for plants for planting is considered possible only under screened glasshouses.

Measures related to consignments:

- Visual inspection is not sufficient to detect all life stages of the pest (eggs in particular).

- Treatment with systemic insecticide prior to export seems a possible option but its efficacy is not fully documented.

- Post-entry quarantine was not considered as a realistic option because the quarantine period would be too long for the intended use of tomato and eggplant seedlings.

- Systems approach

Several measures could be combined in a Systems approach (e.g. use of screened glasshouses, implementation of a mating disruption programme and stringent sanitation measures, visual inspections during the growing season and prior to export, spray with systemic insecticides a few days prior export, use of new packaging). However, the Panel on Phytosanitary Measures considered that would not be sufficient to guarantee pest freedom of the consignment.

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

The trade in the commodities from outside the EPPO region is limited so impact on trade should be minor.

The pest would be difficult to eradicate or contain if introduced. The possible measures have a lower cost than attempting eradication or of bearing the costs of impacts caused by *K. lycopersicella* if it established.

Degree of uncertainty

Uncertainties in the management part are:

- Uncertainty with current distribution of the pest
- Natural spread capacity of the pest
- Efficacy of systemic insecticides for plants for planting
- Practical implementation of import under specific conditions
- Efficacy of other fumigation than methyl bromide for tomato fruit

IDENTIFICATION OF POSSIBLE MEASURES

PC= Phytosanitary certificate, RC=Phytosanitary certificate of re-export

Fruits of tomato and eggplant	PC and, if appropriate, RC - Pest-free Area for <i>K. lycopersicella</i> OR - Pest-free place of production (under screenhouses) for <i>K. lycopersicella</i> OR - Systems approach: combination of measures at the place of production (mating disruption, growing under screenhouse, pheromone traps, visual inspection at the place of production, handling and packing methods, removal of green parts, visual inspection of the consignment).
Plants for planting (except seeds) of tomato and eggplant	PC and, if appropriate, RC - Pest-free Area for <i>K. lycopersicella</i> OR - Pest-free place of production for <i>K. lycopersicella</i> (under screenhouses)

References

See PRA Record (doc 12-17836)