Thrips palmi

Annex to ISPM No. 27
(DIAGNOSTIC PROTOCOLS FOR REGULATED PESTS)

Prepared by: IPPC Secretariat
Overview

1. Pest Information
2. Taxonomic Information
3. Detection
4. Identification
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Pest Information

- *Thrips palmi* Karny is a polyphagous plant pest, especially of species in the Cucurbitaceae and Solanaceae.
- It appears to have originated in Southern Asia
- Now present throughout Asia and is widespread throughout the Pacific and the Caribbean.
- Occurs locally in North, Central and South America, Africa and Oceania.
Pest Information (cont’d)

- The species causes economic damage to plant crops both as a direct result of its feeding activity and from its ability to vector tospoviruses.
- It is extremely polyphagous, and has been recorded from more than 36 plant families.
- The thrips may be carried on plants for planting, cut flowers and fruits of host species, as well as on packing material.
- *Thrips palmi* is almost entirely yellow in coloration; bears similarity to certain other yellow or predominantly yellow species of *Thrips*.
Taxonomic Information

• Name: Thrips palmi Karny, 1925

• Synonyms:
  – Thrips clarus Moulton, 1928
  – Thrips leucadophilus Priesner, 1936
  – Thrips gossypicola Ramakrishna & Margabandhu, 1939
  – Chloethrips aureus Ananthakrishnan & Jagadish, 1967
  – Thrips gracilis Ananthakrishnan & Jagadish, 1968

• Taxonomic position:
  – Insecta, Thysanoptera, Terebrantia, Thripidae

• Common name: melon thrips
Detection

• *T. palmi* may be found in different situations according to the life stages present.
  – Eggs in the leaf, flower and fruit tissue
  – larva on the leaves, flowers and fruits
  – pupa in the soil
Detection

• On plant material, *T. palmi* may potentially be found on most above-ground parts of the plant; varies according to variables such as the host and the characteristics of each separate *T. palmi* population.

• During visual examination of plant material for the presence of *T. palmi*, attention must be paid to silvery feeding scars on the leaf surfaces of host plants, especially alongside the midrib and the veins.

• Heavily infested plants are often characterized by a silvered or bronzed appearance of the leaves, stunted leaves and terminals, or scarred and deformed fruits.
Detection

• Detection may be hampered in the following circumstances:
  – low-level infestation, which may produce little or no detectable symptoms
  – the presence on the plant of the eggs within the plant tissue only (for example after external treatment which may have removed visible life stages).
Detection

• Specimens for morphological examination are best collected in AGA.
• If the specimens are to be stored, they should be transferred to 60% ethanol and kept in the dark, preferably in a freezer to prevent loss of colour.
• For molecular work use 80–95% ethanol as the collecting fluid.
Detection

• Several methods can be used to collect thrips specimens (Mantel and Vierbergen, 1996; modified):
  
  – Thrips may be individually removed from the plant (leaves, flowers or fruit), and transferred into microtubes containing AGA, using a moist, fine brush.
  
  – Thrips may be beaten from plant parts onto a small plastic tray (e.g. a white tray for dark-coloured specimens or a black tray for light-coloured specimens).
Detection

• Several methods can be used to collect thrips specimens (Mantel and Vierbergen, 1996; modified):
  – Plant parts may be sealed in a plastic bag for 24 hours, with a piece of filter paper to absorb condensation. Most thrips will leave the plant parts and can then be collected from the inside of the bag.
  – A Berlese funnel can be used to process plant material such as flowers, turf, leaf litter, moss and even dead branches of trees.
Detection

- Several methods can be used to collect thrips specimens (Mantel and Vierbergen, 1996; modified):
  - Thrips may be monitored (winged adults only) using coloured sticky traps.
  - There are no recognized methods for extracting thrips pupae from the soil.
Identification

- Morphological examination
  - The primary method of identification of adult material is from morphological characters using a high-power microscope.
  - restricted to adult specimens because there are no adequate keys for the identification of eggs, larvae or pupae.
  - Presence of larvae in samples can give important additional information such as confirming their development on the host plants.
- The standard provides figures and photos for recognition of Thrips palmi.
## Combination of characters to recognise *Thrips*

<table>
<thead>
<tr>
<th>Character</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antenna</td>
<td>with seven or eight distinct segments; segments and IV with forked sense cones</td>
</tr>
<tr>
<td>Head</td>
<td>with two pairs of ocellar setae (II and ); pair I missing</td>
</tr>
<tr>
<td>Pronotum</td>
<td>with two pairs of major posteroangular setae</td>
</tr>
<tr>
<td>Forewing</td>
<td>1st vein – setal row on the first vein interrupted (in most species)</td>
</tr>
<tr>
<td>Abdominal tergites V to VIII</td>
<td>with paired ctenidia</td>
</tr>
<tr>
<td>Abdominal tergite VIII</td>
<td>with ctenidia posteromesad to the spiracles</td>
</tr>
</tbody>
</table>
### Thrips palmi characters

<table>
<thead>
<tr>
<th>Character</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body colour</strong></td>
<td>Clear yellow body with no dark areas on the head, thorax or abdomen; antennal segments I and II are pale</td>
</tr>
<tr>
<td><strong>Antennal segment V</strong></td>
<td>Usually yellowish in basal 1/3 to 1/2</td>
</tr>
<tr>
<td><strong>Antennal segment VI</strong></td>
<td>Length = 42–48 μm</td>
</tr>
<tr>
<td><strong>Head: ocellar setae pair</strong></td>
<td>With their bases sited outside of the ocellar triangle or touching the tangent lines connecting the anterior ocellus to each of the posterior ocelli</td>
</tr>
<tr>
<td><strong>Forewing: 1st vein</strong></td>
<td>With three (occasionally two) distal setae</td>
</tr>
<tr>
<td><strong>Metascutum</strong></td>
<td>With a pair of campaniform sensilla; with striate sculpture converging posteriorly</td>
</tr>
<tr>
<td><strong>Abdominal pleurotergites</strong></td>
<td>Discal setae absent; lines of sculpture without numerous microtrichia</td>
</tr>
<tr>
<td><strong>Abdominal tergite II</strong></td>
<td>With four lateral marginal setae</td>
</tr>
<tr>
<td><strong>Abdominal tergites and IV</strong></td>
<td>S2 almost equal to S3</td>
</tr>
<tr>
<td><strong>Abdominal tergite VIII</strong></td>
<td>With complete posteromarginal comb</td>
</tr>
<tr>
<td><strong>Abdominal tergite IX</strong></td>
<td>With two pairs of pores (anterior and posterior)</td>
</tr>
</tbody>
</table>
| **Male: sternites**        | Transverse glandular areas on sternites to}
Identification

- Molecular assays
  - can be applied to all life stages including the immature stages for which morphological identification to species is not possible.
  - where adult specimens are atypical or damaged, molecular assays may provide further relevant information about their identity.
  - such information needs to be carefully interpreted because the specificity of molecular assays is limited
  - assays have been developed for specific purposes and evaluated against a restricted number of species.

- Four molecular assays have been published that can be used in the discrimination of *T. palmi*.

- A CD-ROM identification system is also available that includes molecular data for a number of thrips species (Moritz *et al.*, 2004).
Molecular assay

- **Requirements for controls**
  - use of appropriate controls is essential
    - a validated *T. palmi*-positive extract must be included as an additional sample
    - negative control
      - PCR amplification on a sample with no DNA.
      - Detection of reagent contamination and false positives.
Molecular assay

• **DNA extraction**
  
  – DNA may be extracted from single eggs, adults, pupae or larvae.
  
  – DNA may be extracted using any DNA extraction methods suitable for insects. For example:
    
    • Sample ground in a lysis buffer in a microtube using a micropestle, and the homogenate taken through a proteinase-K-based DNA extraction kit
    
    • Sample ground in 50 μl nuclease-free water before the addition of 50 μl of a 1:1 (volume to volume) slurry of Chelex 100 resin, and nuclease-free water, heated to 95°C for 5 min and centrifuged at 11,000 g for 5 min. The supernatant is transferred to a new microtube and stored at −20°C.
Assays

• The following 4 assays are described:
  – SCAR marker-generated sequence-based real-time PCR assay for *Thrips palmi*
    • designed as a species-specific assay against *T. palmi* for use by the phytosanitary authorities in England and Wales
    • predominantly, but not exclusively, European species
  – COI sequence-based real-time PCR assay for *Thrips palmi*
    • designed as a species-specific assay against *T. palmi* for use by the phytosanitary authorities in the Netherlands.
    • predominantly, but not exclusively, European species
Assays

• The following 4 assays are described:
  – ITS2 sequence-based PCR-RFLP assay for nine species of thrips including *Thrips palmi*
    • was designed to separate nine species of thrips, including *T. palmi*, that are found in fruit trees in Japan
  – COI sequence-based PCR-RFLP assay for ten species of thrips including *Thrips palmi*
    • designed to separate ten species of thrips, including *T. palmi*, which are mostly, but not exclusively, pest species found in Europe
Records

• Records and evidence should be retained as described in section 2.5 of ISPM 27 (*Diagnostic protocols for regulated pests*).

• Where other contracting parties may be adversely affected by the diagnosis, the records and evidence (in particular, preserved or slide-mounted specimens, photographs of distinctive taxonomic structures, DNA extracts and photographs of gels, as appropriate), should be kept for at least one year.
Acknowledgements

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  – Line drawings for Figure 5 were produced by S. Kobro, Norwegian Crop Protection Institute, Norway.