Thrips palmi

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

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Overview

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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*

Antenna	with seven or eight distinct segments; segments and IV with forked sense cones
Head	with two pairs of ocellar setae (II and); pair I missing
Pronotum	with two pairs of major posteroangular setae
Forewing	1st vein – setal row on the first vein interrupted (in most species)
Abdominal tergites V to VIII	with paired ctenidia
Abdominal tergite VIII	with ctenidia posteromesad to the spiracles

Thrips palmi characters

Body colour	clear yellow body with no dark areas on the head, thorax or abdomen; antennal segments I and II are pale
Antennal segment V	usually yellowish in basal ⅓ to ½
Antennal segment VI	length = 42–48 μm
Head: ocellar setae pair	with their bases sited outside of the ocellar triangle or touching the tangent lines connecting the anterior ocellus to each of the posterior ocelli
Forewing: 1st vein	with three (occasionally two) distal setae
Metascutum	with a pair of campaniform sensilla; with striate sculpture converging posteriorly
Abdominal pleurotergites	discal setae absent; lines of sculpture without numerous microtrichia
Abdominal tergite II	with four lateral marginal setae
Abdominal tergites and IV	S2 almost equal to S3
Abdominal tergite VIII	with complete posteromarginal comb
Abdominal tergite IX	with two pairs of pores (anterior and posterior)
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 th 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 95ºC for 5 min and centrifuged at 11,000 *g* for 5 min. The supernatant is transferred to a new microtube and stored at −20ºC.

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.

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