

# South American tomato moth

## *Tuta absoluta*



Figure 1. Tomato fruit showing holes created by *Tuta absoluta* larvae

### Background

*Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) is a pest of tomatoes in South America, mining the leaves and burrowing into the fruit (fig. 1). Since the first detection of this pest in Europe, in Spain in 2006, it has been spreading rapidly through Southern Europe causing very high levels of damage to tomato crops in some regions. *Tuta absoluta* was added to the European and Mediterranean Plant Protection Organisation A1 pest list in 2004.

### Geographical Distribution

*Tuta absoluta* is native to Central America, and has spread to South America. It has been recorded from Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Uruguay and Venezuela; it is found in regions less than 1000 m above sea level. The moth was introduced into Spain and first detected in 2006. It is now present in several provinces, including Castellón, Valencia and the island of Ibiza, and appears to be spreading. Algeria and Morocco reported outbreaks in 2008, both of which are under official control measures. *Tuta absoluta* was also found in four regions of Italy in 2008 (Calabria, Campania, Sardegna and Sicily), and in 2009 outbreaks were reported for the first time in France (in Corsica and Provence-Alpes-Côte d'Azur) and Tunisia. All the European records to date have been on tomato crops, with no evidence of damage to other plants. The Netherlands and the UK have found *Tuta absoluta* infesting imports of Spanish tomatoes, but these are incidental findings and there is no evidence in either country of an outbreak to date.



Figure 2. *Tuta absoluta* larva showing the patterned prothoracic shield just behind the head. Final instar larvae reach a maximum length of 8 mm, and can also be pink in colour



Figure 3. Adult *Tuta absoluta* on a sticky trap, viewed from the side and showing the narrow brown speckled wings folded close around the body. It is up to 7 mm long



Figure 4. Leaf mines created by *Tuta absoluta* on a tomato plant. Dark specks of frass can be seen in the lower, largest, mine



Figure 5. Tomato cut open to show the internal feeding damage and secondary rot caused by *Tuta absoluta* larvae

## Host Plants

Tomato (*Lycopersicon esculentum*) is the preferred host with leaves, stems and fruit attacked by the larvae. They will also eat potato (*Solanum tuberosum*) leaves, but not the tubers. *Tuta absoluta* feeds on the leaves of several species of plants in the Solanaceae; however there are no records of fruit being attacked in species other than tomato. There are host records on many Solanum species, including aubergine (*S. melongena*), pepino (*S. muricatum*) and black nightshade (*S. nigrum*). Hosts in other genera in the Solanaceae include peppers (*Capsicum* spp.), devil's apple (*Datura stramonium*), and tree tobacco (*Nicotina glauca*).

## Description

Eggs are oval-cylindrical, usually laid on the underside of leaves, on buds, or on the calyxes of green fruit. They are cream-coloured and very small, being about 0.2 mm in diameter and less than 0.4 mm on the longest axis.

Larvae are white or cream in early instars, with a black head. As they grow older, they turn pink or green with a brown head (fig. 2). The prothoracic shield just behind the head has paler patches in later instars, though the exact markings are variable. There are no other distinctive markings. Larval identification to species can be made from leaf mines, as there are only a few Gelechiidae larvae that mine tomato leaves, all of which are well described. Larvae tunnelling in fruit cannot definitely be identified to species, as there are a number of Gelechiidae that have been recorded feeding in tomato fruit and not all have been adequately described. Hence, larvae found in fruit will have to be reared to adulthood and examined by an expert for confirmation of the species.

Pupae are brown, and less than 6 mm long. The adult moths are small, with a body length of around 7 mm. They are a brown or silver colour with black spots on the narrow wings (fig. 3). The antennae are long, and the legs and palps are ringed with black and brown.

## Pest Biology, Dispersal and Detection

Full development from egg to pupa has been recorded at mean temperatures varying from 14°C to 30°C. Generations overlap, and there may be over 10 generations in a year if conditions are favourable in Europe, although only 5 generations per year have been observed in Argentina. Larvae are unlikely to enter diapause if a food source is available. In South America, it is thought that the absence of the pest in the Andes at heights of over 1000 m is due to the low temperatures associated with those heights. *Tuta absoluta* can overwinter as eggs, pupae or adults. The exact details of its biology outside South America are not well known, as it is a recent introduction to Europe.

The source of the findings in the UK to date has been tomato fruit from infested areas of Spain. There are a number of vegetable packing houses attached to greenhouses that grow tomatoes, or other crops from the Solanaceae, and this is thought to be the major potential pathway for introduction and establishment in the UK. There is also the potential for transport of *T. absoluta* on imported tomato plants and other foliage from plants in the Solanaceae. The flight capacity of the adults is unknown.

*Tuta absoluta* larvae are commonly associated with leaves, creating blotch leaf mines that are visible on both sides of the leaf (fig. 4). There can be several mines on a single leaf. The mines have dark frass (excrement) visible inside, and over time the mined areas will turn brown and die. The larvae also mine apical buds and stems, and at high densities the larvae will attack both green and red fruit. The larvae can tunnel into the fruit and leave only a surface hole visible (fig. 1), and/or may mine just below the surface, creating a yellow-coloured fruit mine. Pupation may take place on the surface of the leaf, within the mine or tunnel, or the final instar larva may exit the plant and pupate in the soil, where detection is very difficult. Adult moths are nocturnal, spending the day resting between leaves, and are unlikely to be seen. Pheromone traps will catch male moths.

## Economic Importance and Damage

Most feeding damage is done to the leaves and stems of tomatoes. Larvae preferentially feed in new growth, e.g., apical shoots, thus affecting the overall growth and yield of the plant, even if the fruit is not attacked. Up to 100% losses have been reported in tomato crops, and even where programmes of control are implemented, losses can still exceed 5%. Fruit are usually only attacked if the infestation of *T. absoluta* is heavy, but even small amounts of damage means that the fruit will not be suitable for market. Secondary rot can occur in the wounds, rendering the fruit unfit for consumption (fig. 5). In the UK, about 150 ha of tomatoes are grown commercially, all under protected cultivation, and this includes many premium crops, e.g., vine tomatoes, where blemished fruit is unacceptable.

## **Control measures**

Three insecticidal active ingredients have exhibited satisfactory efficacy against *T. absoluta* larval infestations in Spanish outbreaks; *Bacillus thuringiensis* var. *kurstaki* (Dipel DF), indoxacarb (Steward) and spinosad (Conserve\*/Tracer\*\*). All three insecticides are approved for use in the UK, on protected tomato\*, pepper\* and aubergine\*, as well as ornamental plant production\*\*. Deltamethrin has provided effective 'knock-down' of adult populations in Spanish outbreaks. There are various products containing deltamethrin that are approved for use in the UK on protected tomato, pepper and aubergine crops, as well as for ornamental plant production. Where low population densities (1-3 moths caught per week) are present, mass trapping of the pest with pheromone baited water traps has also proved to be an effective control measure in Spanish outbreaks. Specific sex pheromone attractants for *T. absoluta* are available and these are currently used in *T. absoluta* monitoring traps in UK tomato packing houses where Spanish or Italian tomatoes are packed.

There are a number of cultural control measures that aid the eradication of this pest. Crop rotation, crop removal and the selective removal and destruction of infested plant material are important cultural control practices that would help eradication of this pest in UK glasshouses. Wild host plants in the vicinity of infested areas should also be removed and destroyed, to prevent the build up of a potential population reservoir. All infested plant material should be removed and disposed of in a phytosanitary secure manner.

## **Advisory Information**

Suspected outbreaks of *T. absoluta* or any other non-native plant pest should be reported to your local Fera Plant Health and Seeds Inspector, or  
Tel: 01904 465625  
Email: [planthealth.info@fera.gsi.gov.uk](mailto:planthealth.info@fera.gsi.gov.uk)  
Web: [www.defra.gov.uk/fera/plants/plantHealth](http://www.defra.gov.uk/fera/plants/plantHealth)

## **Authors**

**A. Korycinska and H. Moran**

The Food and Environment Research Agency (Fera). April 2009  
© Crown copyright 2009