Tuta absoluta (Lepidoptera: Gelechiidae), a species of concern to agriculture in Florida

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Abstract

Tuta absoluta (Meyrick) is a small moth from South America that belongs in the Gelechiidae family. It is a primary pest of tomato, causing crop losses up to 100%, but it also feeds on other Solanaceous plants, both native and commercial. It entered Europe in 2006 (reported first in Spain in 2008) and spread to the east and south; it now occurs as far east as Iraq and also in some North African countries. In the Americas, *T. absoluta* has been recently found in northern Panama. Surveys in tomato fields are taking place in Florida in 2011 for this pest leafminer. The Cooperative Agriculture Pest Survey Program (CAPS) is leading in this effort in cooperation with various agencies and personnel. As of June 2011 *Tuta absoluta* has not been found in Florida and has not been reported from any other U.S. state. The purpose of this presentation is to explain why this non-native species, also known as the "South American Tomato Leafminer," is of such concern that early detection surveys were initiated and to present preliminary results of the spring season survey, with a discussion of some findings.

Geographical Distribution

The *Tuta absoluta* moth is originally from South America, where it occurs in many countries, but not in the Andean regions at altitudes about 1,000 meters. It was first detected in Spain in 2006 and spread rapidly in southern Europe and northern Africa, including all the countries in the Mediterranean region. It has also been reported from Iraq, Netherlands, Switzerland, and United Kingdom. Additionally, in 2011 it has been detected in Hungary, Kuwait, and Russia (Krasnodar region). Also in 2011, this species was reported for the first time from Central America, in northern Panama. In the United States, this leafminer has the potential to establish primarily around the Gulf Coast (including Florida) as well as in parts of California and Arizona.

Major Hosts

The primary host of the South American leafminer is tomato. It is considered a key pest of tomato wherever it is present, including South America. However, this leafminer can also feed on other plants, mainly in Solanaceae, including potato, eggplant, pepper, tobacco, black nightshade (*Solanum nigrum*) and beans (*Phaseolus vulgaris*).

Pest Importance

Tuta absoluta can cause reductions in yield and fruit quality and is known as a devastating tomato pest, at times causing losses of 50% to 100% in either greenhouses or fields. Tomato plants are damaged by direct feeding on leaves, stems, buds, calyces, young fruit, or ripe fruit and by the invasion of secondary pests. Tomatoes are grown in all states. Florida is the top producer of fresh-market tomato in the nation. In 2007 in Florida, tomatoes were harvested from more than 40,000 acres (valued at $622 million).

Photos from www.tutaabsoluta.com

Biology

Tuta absoluta adults are nocturnal, hiding between leaves during the day, and able to move for several miles by either flight or drifting with wind. The cylindrical creamy white eggs are laid on the aerial parts of their host plants. A female can lay up to 260 eggs in her lifetime. Upon emergence, caterpillars penetrate into the plant and create mines and galleries. The caterpillars pass through four instar stages, changing from creamy white in color to greenish or pinkish cream; mature larvae have a black transverse line dorsally behind the head, on the thorax. Diapause in larvae occurs only if food becomes unavailable. Development stops as temperature drops between 6 and 9 °C. Pupation takes place either in the soil, in mines, or on leaf surfaces, and may be covered by a silken cocoon. A life cycle can be completed between 29 and 38 days. The leafminers can overwinter as eggs, pupae, or adults. Between 5 and 12 generations can take place in a year depending on conditions.

Detection

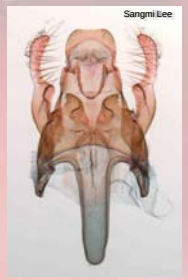
Conspicuous and irregular mines may be visible under the plant's epidermis; black frass may be evident on the surface; irregular growth from damaged stems may be noticeable; and fruit rot can be an indication of a larval infestation. Detection of adults is done by pheromone trapping. A synthetic pheromone for *Tuta absoluta* is available already in the U.S. Sticky traps have been deployed in Florida to survey for this potential pest species.

Management Strategies

Multiple applications of insecticides has been the main control method for this pest, but resistance to several chemicals has been reported. It is likely that if this species enters U.S. it will already be resistant to some insecticides. A combination of cultural practices (crop rotation with non-solanaceous plants, destruction of infested plant material and of post-harvest debris, wild host plant removal, irrigation) is recommended in addition to the use of various botanical insecticides, microbial agents (BT, entomopathogenic fungi), and biological control, all under investigation in Europe and South America. Various mass trapping methods with pheromones are also under field testing and use.

Identification of Adults

Adult *Tuta absoluta* are very small moths with 4.5 to 4.7mm-long narrow wings. The forewings are brown with silvery-grey and black spots. The hind wings have the entire margin fringed with long hairs. The antennae are thin, elongate, and banded with alternate rings of gray and dark brown. For positive identification, males are necessary for genitalic dissection.



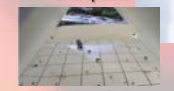
Part of the male genitalia of *Tuta absoluta*

Florida Survey, condensed

An early detection survey for the South American tomato leafminer was started in Florida in late April 2011 in south Miami-Dade Co. and early May 2011 in SW Florida (Collier, Hillsborough, Manatee, Lee counties). The pest survey specialists participating are Andrew Derksen (Florida Deparment of Agriculture and Consumer Services, Division of Plant Industry) and Doug Restom-Gaskill (USDA-APHIS-PPQ). The identifiers are Sarahlynne Guerrero (PPQ, UF Student) and Julieta Brambila (PPQ). More than 100 samples have been submitted. The target has not been detected. The primary non-target gelechiid trapped has been *Keiferia lycopersicella*, the tomato pinworm, native to North America. Another species, trapped in even larger numbers, has not been identified as it appears to be an undescribed species. It is unclear if it is a native or foreign species, but it appears to be new to Florida, according to the specialists, Dr. Richard Brown and Dr. Sangmi Lee, from Mississippi State University.

Male genitalia of *Keiferia lycopersicella*

New species



Inside view of a trap with a sticky insert, a pheromone plug, and the new species.

References (multiple, upon request)

More information can be obtained from www.EPPO.org, NAPPO at www.pestalert.org, www.tutaabsoluta.com, and especially from the linked References section at the following address:
http://www.aphis.usda.gov/import_export/plants/manuals/emergency/downloads/Tuta-absoluta.pdf.

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