

Express – PRA for *Tuta absoluta*

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Review of 29 August, 2013 (replaces version of 26 March, 2010) (*amendments highlighted red in italics*)

Initiation: *originally: Notification of finding in packing station for tomatoes in the Netherlands (important tomato supplier for Germany)*

Initiation for revised version: rapid spread within the EU and decision on EU level that phytosanitary regulations are no longer appropriate

Express - PRA	<i>Tuta absoluta</i> (Meyrick, 1917)
Phytosanitary risk	high <input checked="" type="checkbox"/> medium <input type="checkbox"/> low <input type="checkbox"/>
Certainty of assessment	high <input checked="" type="checkbox"/> medium <input type="checkbox"/> low <input type="checkbox"/>
	<p><i>Assessment is no longer applicable, as <i>T. absoluta</i> does no longer fulfil the EU requirements as a quarantine pest.</i></p> <p><i>Nevertheless, <i>T. absoluta</i> has a considerable damage potential for the tomato production and it is not yet spread throughout the country.</i></p>
Conclusion	<p>The risk of introduction of <i>T. absoluta</i> into German tomato cultivation sites is estimated as high because large quantities of tomatoes are imported from the infested countries Spain and the Netherlands. Furthermore, numerous leaf-miner moths have already been found in Dutch tomato production sites under glass in close vicinity to tomato production sites at the Lower Rhine in Germany. Extensive damage caused by yield loss or additional costs for plant protection for the tomato cultivation as well as for the production of bedding and balcony plants of <i>Petunia</i> must be expected in Germany. Due to the broad presence of host plants, the spread in the open field during the summer months is possible, whereby overwintering is limited to the glasshouse because of climatic conditions.</p> <p><i>T. absoluta</i> meets the basic characteristics for a quarantine pest.</p> <p><i>Tuta absoluta</i> has already been found in Germany and other EU Member States and is partly already wide spread (Italy, Spain, Cyprus). Furthermore, there are effective pathways that can hardly be influenced. On EU level, it was clarified that phytosanitary regulations are no longer meaningful.</p> <p><i>Hence § 4a of the Plant Inspection Order is no longer applicable i.e. there is no longer the obligation for notification, control or clearance.</i></p>
Taxonomy	<i>Lepidoptera, Gelechiidae</i>
Trivial name	Tomato leaf miner, tomato borer, South American tomato moth, South American tomato pinworm; polilla del tomate, polilla perforadora, cogollero del tomate, gusano minador del tomate, minador de hojas y tallos de la papa (Spanish); traça-do-tomateiro (Portuguese); Tomatenminiermotte (German)

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Synonyms	Originally described as <i>Phthorimaea absoluta</i> (Meyrick, 1917); altered in <i>Gnorimoschema</i> (1962) and <i>Scrobipalpula</i> (1964). 1987 transferred in <i>Scrobipalpuloides</i> ; since 1994 altered in <i>Tuta absoluta</i> (Meyrick, 1917)
Biology	Very high reproduction potential: 4-5 generations per annum (maximal 10 to 12); up to 260 eggs per female are positioned; that is why the initial population might augment - despite total mortality of up to 92 % - to the 250-1000fold per annum (estimated by Baufeld); duration of development: 24 (27 °C) to 76 days (14 °C); oviposition preferably on the leaf undersurface of the host (in 97 % of the cases); larvae mine in the leaves, but also in the stem or tomato fruits; 4 larval stages; pupation in the soil, but also partly in the leaf axils, the crinkled leaves or even in the mines; overwintering as egg, pupa and adult; the leaf miner moths are active during the night and hide between the leaves by day.
Is the pest a vector?	No
Is a vector needed?	No
Host plants	The main host plant is tomato (<i>Lycopersicon esculentum</i>). Nevertheless, the pest was also established in haulm (leaves of <i>Solanum tuberosum</i> , it does not infest the tubers!), egg plant (<i>S. melongena</i>), Pepino (<i>S. muricatum</i>), ornamental plants of <i>Solanaceae</i> (f. e. <i>Petunia</i> , <i>Datura</i>) and several wild plants of the family <i>Solanaceae</i> , like <i>S. nigrum</i> (black nightshade), <i>Datura stramonium</i> (common thorn-apple), <i>Lycopersicon hirsutum</i> , <i>L. peruvianum</i> , <i>S. lyratum</i> , <i>S. elaeagnifolium</i> , <i>S. puberulum</i> , <i>Datura ferox</i> and <i>Nicotiana glauca</i> . Furthermore, there was a first notification of an infested host plant in Sicilia that does not belong to the family <i>Solanaceae</i> (<i>Phaseolus vulgaris</i> (bean)). Detailed information is not yet available. <i>Update: This is the only single infestation of P. vulgaris being cited.</i>
Symptoms	Tunnel feeding / tunnels in the leaves and fruits, wherein the caterpillars and dark, granular excrements can be found (see photos).
Presence of the host plants in Germany	In Germany, tomatoes and eggplants are cultivated in glasshouses and under plastic film, potatoes to a great extent in the open field. Some ornamental plant species of the family <i>Solanaceae</i> are cultivated professionally in Germany and are planted in the open field (also as bed and balcony plants). These are in particular <i>Petunia</i> , <i>Schizanthus</i> (butterfly flower), <i>Brugmansia</i> (<i>Datura</i> , angel's trumpet), <i>Solanum jasminoides</i> (potato vine), <i>Physalis</i> (husk-tomato), <i>Brunfelsia</i> , <i>S. pseudocapsicum</i> (coral-tree) as well as further species. Among the wild plants, <i>S. nigrum</i> and <i>D. stramonium</i> are wide-spread in Germany. <i>D. ferox</i> (thorn-apple) and <i>N. glauca</i> may be present as ornamental plants.
Presence of the host plants in the MS	Also in the MS, tomatoes, potatoes and egg-plants as well as ornamental <i>Solanaceae</i> are cultivated professionally; sometimes to a great extent. Only fractional data on the presence of the wild plants are available: <i>D. stramonium</i> and <i>S. nigrum</i> are widely distributed in Europe, <i>D. ferox</i> and

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	<i>N. glauca</i> also as ornamental plants.
Known infested areas	<p>Europe: Spain (Catalonia, Valencia, Murcia, Balearic Islands, Andalusia, Aragon, Navarra, Castilla la Mancha, Extremadura, Madrid, Canary Islands, Castilla y León and Basque region); France (Corsica and Côte d'Azur); notifications of occurrence from the Netherlands (firstly only in one tomato packing station in January 2009, according to an information by R. Potting from the Dutch plant protection service in July 2009, findings in 23 tomato packing stations and in tomato cultivation enterprises, among others in the regions Venlo and Wellerlooi) and from Italy (Sardinia, Sicilia, Campania) as well as further findings in July 2009: in the Abruzzi (field-grown tomatoes!), Umbria (tomato cultivation (open field) for the processing industry in several municipalities), Liguria (glasshouse) and on beans in Sicilia; August 2009: region Puglia on glasshouse tomatoes) as well as on Malta (May 2009), in Greece (Crete, protected tomato cultivation in June 2009), Great Britain (findings in packing stations and in July 2009 in tomato glasshouse cultivation), Portugal (July 2009, tomatoes in glasshouse at the Algarve), Russia (Kaliningrad, April 2009, acc. to www.tutaabsoluta.com) and Switzerland (in the open field in the region Geneva, http://ec.europa.eu/food/fs/rc/scph/sum_17072009_en.pdf);</p> <p>Africa: first findings in Algeria (present under official control) and in Morocco (under eradication);</p> <p>South America: Argentina, Bolivia, Brasilia, Chile, Ecuador, Paraguay, Peru, Uruguay, Venezuela;</p> <p><i>Update: meanwhile, it occurs in 14 EU MS. See EPPO PQR (2013). In Germany, the tomato leaf miner is not permanently established. In case of infestation, control measures are taken locally.</i></p>
Introduction or pathways	<p>The pest is introduced with infested tomato fruits, plants for planting of tomato and eggplants as well as ornamental plants for planting of the family <i>Solanaceae</i>. All stages of development may occur on fruits as well as on plants. In the glasshouse, all stages of development can be found throughout the whole year.</p> <p><u>Importance of pathways for Germany:</u> The self-supporting level in respect to tomatoes only lies at about 8% in Germany (AMI, 2/2009). At the same time, the tomato is the top-selling vegetable, so that tomato imports are very important (total imported quantity 2006: 717,722 t). The main suppliers are the Netherlands, Spain, Belgium and Italy. Import quantity of tomatoes (2006) from the Netherlands app. 350,000 t, from Spain app. 210,000 t, from Italy ca. 46,000 t and from Morocco app. 15,000 t. Small quantities of tomatoes also came from Columbia (246 t) and Chile (61 t). This is why the tomato imports, especially from Spain and the Netherlands, but also from Italy and Morocco, must be regarded as important pathways for <i>T. absoluta</i>. Due to the small quantities in domestic production, the German imports are effectuated throughout the year, i.e. also in spring and summer, when <i>T. absoluta</i> might live in the</p>

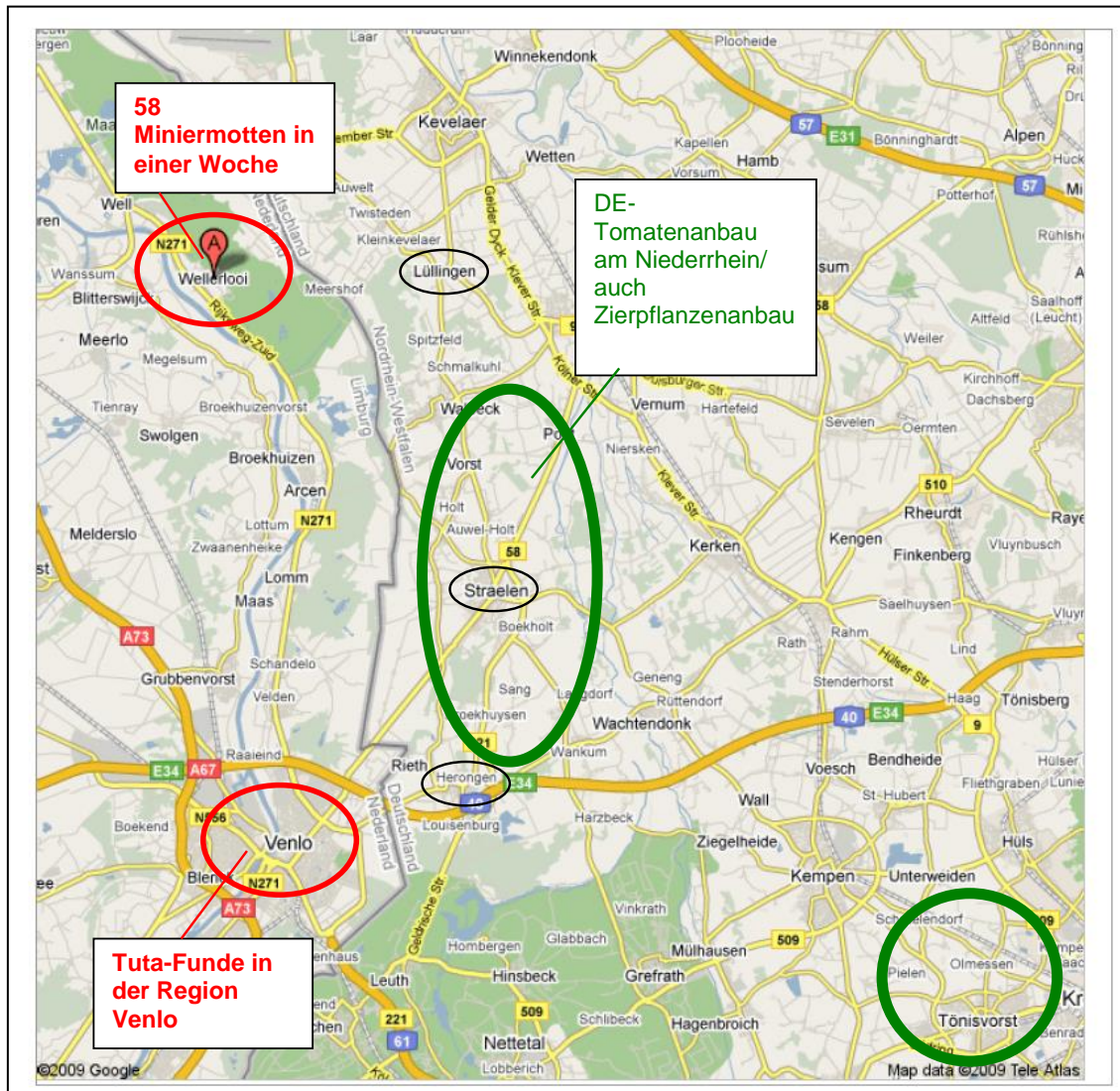
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	<p>open field.</p> <p>In the Netherlands as well as in Great Britain, <i>T. absoluta</i> was found in tomato packing stations that are partly incorporated into production enterprises. From these they got introduced into the tomato crops.</p> <p>There are no detailed data on the import of plants of tomatoes/eggplants as well as on ornamentals of <i>Solanacea</i>.</p>
Natural spread	<p>Information on natural spread is rare. In Spain, moths were found in distances up to 10 km from tomato production sites in the open field (also forest). It is assumed that they are able to cover some km actively or by anemochory under favourable conditions. In Algeria, a rapid distribution of the tomato leaf miner moth was noticed in several municipalities.</p>
Expected establishment and spread in Germany	<p>In the glasshouse: if host plants (tomatoes, eggplants, <i>Solanaceae</i>) are present; in the open field: presumably only during the summer months (areas of origin, need for higher temperatures); establishing in glasshouses with escape into the open field during the summer months and from there immigration back into the glasshouses possible; importance of climate change?</p> <p>In July 2009, <i>T. absoluta</i> (58 leaf miner moths in one week) was found in the Netherlands in the region Venlo and in Wellerlooi (pers. information by R. Potting, Dutch plant protection service, Wageningen). This Dutch cultivation region is situated vis-à-vis the main tomato cultivation region in Germany at the Lower Rhine, in a distance of app. 10-15 km (see map)</p>
Expected establishment and spread in the Member States	<p>In the Southern MS, presumably establishment in the open field if host plants are present (see Spain, Corse (there established on wild <i>Solanaceae</i>); in the Northern MS establishing in glasshouses with passage into the open field during the summer months and from there immigration back into the glasshouses possible.</p>
Known damage in infested areas	<p><i>T. absoluta</i> infests all parts of the plant above ground. Tomato leaves as well as their fruits are damaged by tunnel feeding. Thus, the fruits lose their market value (Fig. 1 to 3).</p> <p>Extensive damage in Spain: in tomato cultivations in Valencia planted in winter, losses up to 100% were noticed.</p> <p><i>T. absoluta</i> is the most important pest on tomato in South America in the open field as well as in protected cultivation (under plastic or in glasshouse). The yield as well as the fruit quality may be reduced significantly, on the one hand by direct (feeding) damage by <i>T. absoluta</i>, on the other hand by secondary infestation of wounded plant organs with pathogens. Yield losses of 50-100% might occur, especially at low rainfall. In Peru, <i>T. absoluta</i> is regarded as a significant pest on potato leaves that occurs in warm regions below 1000 m above sea level.</p>

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Endangered area in Germany	Presumably glasshouses with tomatoes, eggplants and ornamentals of <i>Solanaceae</i> ; in spring and summer also in the open field, but differences within Germany (North-South) are probable; presence of host plants generally throughout Germany; main tomato production in Baden-Württemberg, Bavaria and North-Rhine Palatinate.
Expected damage in endangered area in Germany	<p>High: tomato cultivation area in glasshouse (2008): 308 ha; crop 65,100 t; further increase expected, planning of new glasshouse-facilities in different regions in Germany (AMI, 2/2009); eggplant cultivation as well as tomato cultivation area in the open field unimportant; cultivation of ornamental plants of the family <i>Solanaceae</i> in glasshouse: f. e. Petunia (2008): approx. a total of 3,900 enterprises, 260 of them with young plants and semi-finished plants, production quantity approx. 14.7 Mio plants and 3,715 enterprises with finished plants, approx. 41.1 Mio plants; no detailed data available for other species.</p> <p>Additional insecticide treatments necessary with effects on use of beneficial organisms /integrated plant protection and bumble-bees (pollination).</p>
Expected damage in endangered area in MS	<p>Very high: In respect to the quantity, tomatoes are the most important vegetable within the EU.</p> <p>Tomato production EU-27 in 2007 acc. to EUROSTAT 15.3 Mio. t; the main producers are Italy, Spain (more than 60% of the tomatoes derive from Italy and Spain), Greece, Portugal, France and the Netherlands.</p>
Control feasibility and measures	<p>For tomatoes: presumably partly control in line with the conducted controls, but not sufficient to prevent fruit damage. Problem: it is not possible to control larvae in the tunnels by means of contact insecticides; the following agents were indicated as efficient: Indoxacarb and Spinosad as well as <i>Bacillus thuringiensis</i>. Furthermore cultivation measures like crop rotation with non-<i>Solanaceae</i> or adapted fertilisers and irrigation are recommended;</p> <p>infested plant material and plant debris after harvest should be burnt. It was reported from South America that several insecticide treatments within the growing season are inevitable; in some countries resistances have already been noticed (f. e. against Abamectin, Cartap and Permethrin).</p> <p>Biological control: Parasitoids: Trichogramma; 22 brackish wasps (Braconidae) and 13 chalcid wasps (Chalcididae) as parasitoids were detected, natural parasitization rate (0,2 to 4,2 %) low; Predators: Reduviidae (<i>Nesidiocoris tenuis</i>, <i>Macrolophus coliginosus</i>)</p>
Detection and diagnosis	Control of the adults with pheromone traps; the greyish-brown typical moth is 5-7 mm long, has a wing span of 8-10 mm and thread-shaped antennae (antenna links stringed together beadily) (Fig. 7-8); the small cylindrical creamy-white eggs are only 0,35 mm big: eggs can be found on leaf undersurfaces; L1: 0,5 mm; larvae creamy with dark head

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	capsule; L4: 9 mm and rosy coloured (Fig. 9); larvae can be found in the tunnels; pupae: 6 mm and brown coloured; pupae often can be found in the soil but also in crinkled leaves, leaf axils and sometimes also in tunnel ends.
Remarks	USA (APHIS, 4 March, 2009): import restrictions/-regulations for tomatoes from the infested countries (occurrence is known; new: IT); quarantine pest in the Ukraine; EPPO A1 action list.

Map on *Tuta absoluta*—findings in the Netherlands in July, 2009 in direct vicinity to the German tomato cultivation sites at the Lower Rhine

(Findings in the Netherlands: personnel information by R. Potting, Dutch plant protection service, Wageningen)



Tomato cultivation region Lower Rhine:

16 enterprises merged in the society „Tomatengärtner Rheinland e.V.“ and produce tomatoes under glass on an area of about 250,000 m². The panicle tomatoes or also shrub tomatoes are cultivated during the whole season from March to November, as well as tomatoes and cocktail tomatoes and have an essential part in the production (2005: 7,022 t, 49% of the German production).

The marketing is carried out via warehouses, sales and auctions in Lüllingen, Herongen, Straelen and Roisdorf. Purchasers are the specialised wholesale trade and retailers as well as the organised trade (here also contact with imported tomatoes – as the case may be -, f. e. if packaging material is given back to the enterprises).

“Landgard Obst & Gemüse” brings German tomatoes amounting to 10 Million Euro to the specialised wholesale trade and retail trade.