



First record of South American tomato moth, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) in Tamil Nadu, India

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ABSTRACT: The South American tomato moth (SATM), *Tuta absoluta* is a quarantine pest, native to South America which was detected first time in Maharashtra, India in late 2014 and then in Karnataka. The border district of Tamil Nadu was under vigil to monitor the activity through regular surveillance from March 2015 to know the presence of SATM in Dharmapuri district and the occurrence of *T. absoluta* was first noticed in Karimangalam block in the tomato hybrid Sivam. The widely cultivated tomato hybrids Sivam and Sagar were equally susceptible to the SATM with 20-32 per cent leaf damage and 28 - 53 per cent fruit damage. The sex pheromone traps attracted more number of adults per day. The damage was mostly found in the middle and lower leaves and half ripened and ripened fruits. In a single fruit 8-12 holes were noticed during the survey. This is the first report of this pest in Tamil Nadu. Main characteristics of the species are briefly reviewed, with notes on biology, distribution and damage. © 2016 Association for Advancement of Entomology

KEY WORDS: *Tuta absoluta*; Tomato; Quarantine pest; Tamil Nadu

Non-native invasive insect species are a significant threat to biodiversity and their ecological impacts are difficult to reverse. They also affect economic interests particularly within agriculture, horticulture and forestry (Mace and Kunin, 1994). The South American tomato moth (SATM), *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) is one such pest, originating from South America, that devastates tomato and closely related solanaceous crops in the world since, 1960's (EPPO, 2005). In 2004, *T. Absoluta* was added by the European and Mediterranean Plant Protection Organization (EPPO) to the A1 List of pests recommended for regulation (pests absent from the EPPO region), and in 2009 was transferred to the A2 list (pests locally present in the EPPO region), 3 years after its arrival in Spain (Urbaneja *et al.*, 2007). During

2006–2012, the pest spread rapidly throughout the Mediterranean basin. *Tuta absoluta* is considered a typical invasive species, due to its capacity to develop very quickly in suitable agro-ecological conditions, spreading rapidly in new areas and causing economical damage (Desneux *et al.*, 2010).

In India, it was first reported from Pune, Maharashtra during October 2014 (ICAR, 2014) and has rapidly moved across the states and later detected in Karnataka during the *rabi* (November) season of 2014, where, it has become a serious threat to tomato production in both greenhouse and outdoor crops (Sridhar *et al.*, 2014). Since then alert notice was issued by the Indian Council of Agricultural Research to keep vigil on the incidence of *T. absoluta* in different states. As a district

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adjoining to Karnataka, regular surveillance was conducted by scientists of Tamil Nadu Agricultural University in Dharmapuri district particularly in the border blocks. In Dharmapuri district tomato has been cultivated in 4000 hectares in which 40% area is under precision farming.

Tomato plants can be infested from seedlings to mature plants. *T. absoluta* reduces yield and fruit quality, causing up to 100% yield losses in severely infested crops (Arturo *et al.*, 2012). The main damage is produced on the leaves and fruits, but inflorescences and stems can also be affected. Larvae of *T. absoluta* feed on the mesophyll of the leaf leaving only the epidermis intact. The galleries produced by young larvae may be confused with those produced by leafminers (*Liriomyza* spp.), but the gallery produced by *T. absoluta* subsequently widens and the damaged tissue dries. In the gallery, the larvae of the moth and its black frass can be seen. The economic impact is reflected by an increase in the cost of tomato production (additional costs for crop protection) and yield loss (lower marketable fruits production), as well as potential loss of markets if it were to become established. It is also very challenging to manage and limit the spread of the pest. Hence, there is an urgent need for domestic quarantine measures to curtail the pest from spreading further to other tomato growing regions of Tamil Nadu. The nature of spread, occurrence, damage potential and management options of *T. absoluta* in Tamil Nadu are discussed in this paper.

Explorative surveys were conducted in the border blocks of Dharmapuri district *viz.*, Karimangalam and Palacode where tomato has been grown throughout the year in the district. Subsequently, during June 2015 a survey was conducted in five major tomato growing districts of Tamil Nadu *viz.*, Dharmapuri, Krishnagiri, Salem, Coimbatore and Dindigul to assess the extent of spread and damage. Varieties *viz.*, Sivam and Sagar, US800, US1036 and Ruchi are widely cultivated. The 25-30 days old portray seedlings from shade net nurseries were procured and planted in the main field. Periodical surveys were conducted to monitor the incidence of SATM damage in the leaves and fruits. After

noticing the initial damage in the field, the leaf damage was recorded at weekly intervals in randomly selected 25 plants. The fruit damage was calculated in the selected plants and also during harvest. The pin hole damaged fruits were sorted out during the harvest and percentage of affected fruits calculated to the total harvest during each harvest. To monitor the adult movement sex pheromone lure of *T. absoluta* from Pest control India Ltd., was installed in the field. Ten traps were installed for 0.4 ha. field. The number of adults collected and counted each day in these traps.

In March 2015, *T. absoluta* incidence was first noticed in the Kollupatti village of Karimangalam block in 45 days old crop. Followed by the detection of *T. absoluta*, 100 per cent damage was recorded in Jittandahalli, Palacode (Block), Dharmapuri District (Table 1). The per cent damage was low (43 %) in Velampatti, Nallampalli (Block), Dharmapuri District. As the leaf miner *Liriomyza trifolii* (Burgess) and *T. absoluta* incidence occurred simultaneously in the field the farmers were unable to distinguish between the damage symptoms. The coalescing of mines in the *T. absoluta* damage was different from that of leaf miner *L. trifolii* damage symptom. Initially *T. absoluta* larvae mines the leaves, later the mines coalesce to become necrotic lesions. The damage was noticed in 30-40 days old crop. The young and unripened fruits are not infested by *T. absoluta*. The damage was noticed mostly in the ripened and semi ripened fruits. The adult movement was noticed during the evening hours. In a single fruit a maximum 8 -12 holes were noticed during the survey. In the half ripened fruits the damage was noticed in the inter lobe and soft regions of the fruit. Recent survey on major tomato growing districts of Tamil Nadu also revealed that the pest has spread rapidly into neighbouring districts and the extent of damage ranged from 20-38 and 30-48 per cent on leaf and fruits, respectively. Maximum leaf (38%) and fruit damage (48%) was recorded in Dharmapuri district (Table 2).

In Sivam hybrid, leaf and fruit damage was 20 – 32 and 28 – 50 per cent, respectively whereas in Sagar it was 20 – 24 and 40 – 53 per cent (Table 3) and

Table 1. Incidence of *T. absoluta* in different villages in two Districts

Villages	Per cent damage*
Kollupatti, Karimangalam (Block), Dharmapuri District	70
Jittandahalli, Palacode (Block), Dharmapuri District	100
Mallupatti, Palacode (Block), Dharmapuri Dt	85
Kottur, Palacode (Block), Dharmapuri Dt	56
Kariappanahalli, Nallampalli (Block), Dharmapuri Dt	50
Velampatti, Nallampalli (Block), Dharmapuri Dt	43
Jekkari, Kelamangalam (Block), Krishnagiri Dt.	66
Uthanapalli, Shoolagir (Block), Krishnagiri Dt.	70
Haleseepam, Kelamangalam (Block), Krishnagiri Dt.	72
Mettrai, Kelamangalam (Block), Krishnagiri Dt.	72

* Mean of ten fields

Table 2. Incidence of *T. absoluta* in five major tomato growing districts of Tamil Nadu

Districts	Leaf damage (%)	Fruit damage (%)
Dharmapuri	38	48
Krishnagiri	24	32
Salem	20	30
Coimbatore	30	47
Dindigul	35	48

* Mean of ten fields

the damage was almost equal in all the hybrids (Table 4). As the damage is more than 50% during the survey the further spread of this pest in Tamil Nadu will hamper the tomato cultivation. *T. absoluta*, originating from South America, has become one of the key pests of tomato in many South American countries since the 1960s (Garcia and Espul, 1982). It has been listed in the A2 quarantine list of the European Plant Protection Organization (EPPO, 2010). Feeding of the pest on other host plants of the Solanaceae family was also recorded (Pereyra and Sanchez, 2006). The moth can develop very quickly under suitable agro-ecological conditions and can breed 10 to 12 generations a year depending on environmental

conditions. Control is extremely difficult once the pest is well established because the larvae are internal feeders. Hence, suitable integrated pest management strategies should be developed to manage *T. absoluta* effectively.

The pheromone traps kept in the field are able to trap 40 – 50 adults on the first day itself with the maximum of 102 adults per trap. The adults are silvery grey to brown with brown to black scales on the forewings. Adults are 6 -7 mm long with a wing span of about 8 -10 mm (Kilic, 2010). Taha *et al.*, (2013) revealed that the pheromone baited traps alone recorded 37.44 per cent incidence of *T. absoluta* and concluded that the pheromone traps

Table 3. Damage potential of *T. absoluta* in different tomato hybrids

Tomato hybrids	Leaf damage (%)*				Fruit damage (%)*			
	L1	L2	L3	L4	L1	L2	L3	L4
Sivam	20	22	30	32	33	42	50	28
Sagar	21	24	22	20	40	52	50	53

*Mean of ten replications L – Location

Table 4. Incidence of *T. absoluta* in different tomato hybrids

Tomato hybrids	Per cent damage*
Sivam	82
Sagar	80
US 800	84
US 1036	85
Ruchi	82

* Mean of ten fields

are ideal management option for *T. absoluta* in integrated pest management programmes. In the present survey also the pheromone traps able to trap 40 moths per day. This study also confirms that *T. absoluta* also found in brinjal in Dharmapuri district, Tamil Nadu.

The SATM, *T. absoluta*, is a micro lepidopteran moth recently introduced to India. It has a high reproductive potential. Its main host is tomato, but it also infests other Solanaceae crops. Tomato plants can be attacked from seedlings to mature plants and in severely infested tomato crops it may cause yield losses of up to 100%. To avoid potential damage it is very important to detect symptoms early and especially during the egg to small gallery forming stage. Though the pathway for intensive spreading and dissemination of SATM is not known fully, it is considered that fruit importation might have carried the pest into Tamil Nadu from adjacent states. To manage the pest effectively combine all available control measures including

cultural methods such as summer ploughing, removal and destruction of affected portion and installation of pheromone traps @ 6-10/ha may be encouraged and the correct use of registered/recommended insecticides. As the insect has several other Solanaceae host plants chances are high for its occurrence on other crops, weeds, and wild plants also. Hence, continuous monitoring/surveillance are required to contain the spread and timely adoption of management practices can further reduce the yield loss.

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