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First Record of *Tuta absoluta* (Lepidoptera: Gelechiidae) from Bangladesh¹

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Tuta absoluta (Meyrick) (Lepidoptera: Gelechiidae), commonly known as the South American tomato leafminer, is a native of South America and is a serious pest of tomato, *Solanum lycopersicum* L. (Solanaceae). To a lesser extent, it also attacks other solanaceous weeds and crops, such as eggplant, potato, pepper, and tobacco (Urbaneja et al. 2013). This pest was detected in Spain in 2006. Since then it has spread to most of Europe, the Mediterranean (Desneux et al. 2011), many countries in north, east and west Africa (Brévault et al. 2014), Uzbekistan (G. Mahmudov, Agricultural Value Chains Project, personal communication), Afghanistan (H. Bottenberg, USAID-OAPA, personal communication), India (Sridhar et al. 2014), and Nepal (Bajracharya et al. 2016) (Table 1). This paper reports the first detection of *T. absoluta* in Bangladesh.

The moth lays about 200 eggs in its lifetime, mostly on the lower leaf surface. Eggs measure 0.4 mm in length and 0.2 mm in diameter (Urbaneja et al. 2013), and the incubation period is three to four days in the tropics (Silva et al. 2015). There are four larval instars, and the larvae mine into the leaves upon hatching. These mines are blotchy (Figure 1), different from the mines caused by *Liriomyza* spp. (Diptera: Agromyzidae), which are narrow and wavy (Figure 2). Some larvae bore into petioles, stalks, young shoots, and fruits (Ferracini et al. 2012) (Figure 3). Pupation takes place mostly in the soil and in some cases in dried leaves and debris. It can complete its life cycle in three weeks in the tropics (Urbaneja et al. 2013). Short distance dispersal within a country is likely accomplished by flight of the adults, whereas long distance dispersal is likely through commercial shipments of infested fruits or seedlings.

Recognizing the hazard of accidental introduction through tomato shipments from *T. absoluta* infested countries, the Animal and Plant Health Inspection Service of the United States Department of Agriculture (USDA-APHIS) has instituted quarantine regulations, which require removal of the calyx and pedicel

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Table 1. Timeline for establishment of *Tuta absoluta* in non-native countries, 2006-2016.

• Spain	2006	• Lithuania	2010
• Italy	2008	• Kosovo	2010
• France	2008	• Israel	2010
• Morocco	2008	• Iran	2010
• Algeria	2008	• Lebanon	2010
• Malta	2009	• Yemen	2010
• Romania	2009	• United Arab Emirates	2010
• The Netherlands	2009	• Qatar	2010
• Russia	2009	• Montenegro	2011
• Albania	2009	• Georgia	2011
• Slovenia	2009	• Oman	2011
• Switzerland	2009	• Senegal	2012
• Canary Islands	2009	• Ethiopia	2012
• Tunisia	2009	• Niger	2012
• Egypt	2009	• Czech Republic	2013
• Libya	2009	• Kenya	2013
• Bahrain	2009	• The Gambia	2013
• Saudi Arabia	2009	• Panama	2013
• Jordan	2009	• Ukraine	2014
• Iraq	2009	• Tanzania	2014
• Kuwait	2009	• India	2014
• Syria	2009	• Costa Rica	2014
• Bulgaria	2010	• Nigeria	2014
• Hungary	2010	• Afghanistan	2015
• Turkey	2010	• Guinea	2015
• Serbia	2010	• Zambia	2015
• Croatia	2010	• Uzbekistan	2015
• Cyprus	2010	• Mali	2015 (reported, not confirmed)
• Germany	2010	• Nepal	2016
• Guernsey	2010	• Bangladesh	2016
• Bosnia-Herzegovina	2010		

from the fruit before placing them in boxes for shipment (USDA-APHIS 2014). When *T. absoluta* invaded India in November 2014 (Sridhar et al. 2014), the Integrated Pest Management Innovation Lab (IPM IL) conducted two workshops to raise awareness of this new invasive pest among agricultural administrators, scientists, extension agents, and staff of the USAID Value Chain Project that addresses crop production and marketing at Dhaka and Jessore in May 2015. Because *T. absoluta* had been detected in southern and southwestern India (Kalleswaraswamy et al. 2015, Shashank et al. 2015), as well as the Kathmandu region of Nepal (Bajracharya et al. 2016), it was recommended that pheromone traps be deployed in the border areas and major ports of entry to detect invasion of *T. absoluta*. Early detection of *T. absoluta* will allow the development of a management program once it is introduced. Tomato is one of the most important and popular vegetables in Bangladesh, with annual production amounted to 255,430 tons in 2012 (Hossain & Abdulla 2015). If the known tomato losses of 80 to 100% (Desneux et al. 2010) are realized after its introduction, the economic impact of *T. absoluta* to Bangladesh will be enormous.

Bangladesh IPM IL coordinator deployed *T. absoluta* pheromone traps at Jessore in the west, Comilla in the east, and Panchogarh in the north. In May 2016, *T. absoluta* was detected in the tomato fields visually and in traps in the village of Chaklarhat (26°19'N, 88°43'E) under the Tunirhat union of Panchagarh Sadar Upazila, Panchagarh District in the northern part of Bangladesh. No *T. absoluta*



Fig. 1. Tomato leaf mined by *Tuta absoluta*. (Photo by Sulav Paudel, Department of Entomology, Pennsylvania State University, University Park, PA).



Fig. 2. Tomato leaves mined by *Liriomyza* spp. (Photo by Md. Shahadath Hossain, IPM IL, Bangladesh).



Fig. 3. Tomato fruit damaged by *Tuta absoluta*. (Photo by Sulav Paudel, Department of Entomology, Pennsylvania State University, University Park, PA).

moths were recorded in the traps set up at Jessore or Comilla, indicating that the invasion had taken place in the north. The pathway of this introduction to northern Bangladesh is yet to be determined.

Tuta absoluta has spread from Spain to Bangladesh, a distance of more than 8,000 km, in 10 years. We believe it will continue to spread east and invade neighboring southeast Asian countries (Myanmar, Thailand, Malaysia, Laos, Cambodia, and Vietnam) and China in the coming years. IPM IL is closely monitoring the spread of *T. absoluta* in India, Nepal, and Bangladesh to identify the pathway of its introduction, either by surface or by air via shipments, or through human mediated introduction by movement of laborers inadvertently carrying *T. absoluta*-infested tomato fruits between Middle Eastern countries and India, Nepal, and Bangladesh. It will be of particular interest to monitor the invasion of the island nations in the Pacific.

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