Tuta absoluta

Subjects: Zoology

Contributor: Casper Nyamukondiwa , Vimbai Lisa Tarusikirwa , Honest Machekano

The South American tomato pinworm *Tuta absoluta* (Meyrick) has aggressively invaded the African continent. Since its first detection in North Africa in Morocco and Tunisia in 2008, it has successfully invaded the entire southern, eastern and western Africa, where it has been on the offensive, causing significant damage to Solanaceous food crops.

botanicals invasive species liabilities pest management tomato pinworm natural substances

1. Economic Impact of *Tuta absoluta* in Africa

Tomatoes are an important component of horticulture and a major pillar of sustainable development, with significant contribution to household and national food and nutritional security [1][2]. They are a cash crop grown for home consumption in the backyards of the majority homesteads across SSA and are an important source of vitamins [3]. Tomato production also significantly contributes to economic development ascribed to its high economic returns and ability to create employment (~60% of total labour force) and along the value chain [4][5]. About 170 million tonnes of tomatoes are produced worldwide [6][7]. Of this figure, Africa accounts for ~37.8 million tonnes annually. However, this figure is threatened by increased *T. absoluta* damage [8], with downstream consequences on African socio-economic value chains and household livelihoods [9].

Tuta absoluta larvae attack almost all aerial parts of tomato plants, resulting in ~80–100% yield losses if left uncontrolled [10]. Larval feeding also reduces fruit quality through creating pin holes prone to secondary attack by pathogens, rendering them unmarketable [11]. Increased cost of production has been reportedly experienced by small- and large-scale farmers in Africa due to increased costs for pesticides [12]. For example, recent evidence suggests decreased tomato yields and increased production costs [9]. Highest losses are mostly experienced during early invasion owing to inadequate mitigation measures related to lack of preparedness [13]. Nigeria experienced up to 80% losses in tomato produce in 2016 due to unfamiliarity with the pest and management strategies [5]. This reduced supply and catapulted an estimated 10-fold increase in tomato prices due to the laws of demand and supply [14]. Similarly, following *T. absoluta* invasion in South Africa (2016), pest-free countries banned importation of tomato and other Solanaceae crops from that country [15], resulting in significant economic losses. Similar losses have also been reported in South-western Angola [16]. Thus, *T. absoluta* pest pressure has negatively affected agricultural enterprises in Africa through direct losses (crop damage) and indirect losses through increased costs in pest management [8]. *Tuta absoluta* remains a pest of quarantine importance in

countries under the Inter-African Phytosanitary Council (IAPSC) and has been reported on the European and Mediterranean Plant Protection Organization's (EPPO's) A2 list as a regulated insect pest [17].

2. *Tuta absoluta* Invasion Pathways and Distribution in Africa

Long-distance transmission and short-distance dispersal are the key drivers of *T. absoluta* invasion [18]. International agricultural trade is a key long-distance transmission mode that may have contributed to a larger extent in the introduction of *T. absoluta* into Africa, e.g., importation of fruits (e.g., tomatoes and egg plants) from pest-infested areas [8][19]. Other possible pathways for long-distance dissemination include production facilities and packaging materials (e.g., boxes, crates and pallets) from infested countries [20][21]. Hence, production facilities repack and distribute infested fruits, resulting in long-distance dissemination, reviewed in [22]. In addition, propagule material (e.g., seedlings), farm equipment and transportation vehicles from pest-infested areas are also possible pathways for long-distance transmission [18][19][23]. From the foregoing, the rapid spread across Africa may have been exacerbated by porous port of entries, weak phytosanitary regulations and ineffective early surveillance in the region [13]. Furthermore, natural factors (e.g., wind and water), larval crawling and adult flight are possible key short-distance dispersal pathways [18]. To date, *T. absoluta* has been reported in 41 of the 54 African countries (see [8]). The pest has not yet been officially reported in a few central and south-western African countries [15][6]. However, cognisant of its widespread presence in Africa, this absence may be a consequence of lack of surveillance and pest detection mechanisms.

References

1. Machekano, H.; Mutamiswa, R.; Nyamukondiwa, C. Evidence of rapid spread and establishment of Tuta absoluta (Meyrick) (Lepidoptera: Gelechiidae) in semi-arid Botswana. Agric. Food Secur. 2018, 7, 48.
2. FAO. The State of Food Insecurity in the World: Economic Growth Is Necessary But Not Sufficient to Accelerate Reduction of Hunger and Malnutrition; FAO: Rome, Italy, 2012.
3. Ndor, D.C. Incidence of Tomato leaf miner (Tuta absoluta: Meyrick) damage on Tomato fields in Pankshin and Kanke Local Government Areas of Plateau State. Agric. Sci. Res. J. 2018, 8, 15–19.
4. Weinberger, K.; Lumpkin, T.A. Diversification into horticulture and poverty reduction: A research agenda. World Dev. 2007, 35, 1464–1480.
5. Bala, I.; Mukhtar, M.; Saka, H.; Abdullahi, N.; Ibrahim, S. Determination of insecticide susceptibility of field populations of tomato leaf miner (Tuta absoluta) in Northern Nigeria. Agriculture 2019, 9, 7.

6. Biondi, A.; Guedes, R.N.C.; Wan, F.-H.; Desneux, N. Ecology, Worldwide Spread, and Management of the Invasive South American Tomato Pinworm, Tuta absoluta: Past, Present, and Future. Annu. Rev. Entomol. 2018, 63, 239–258.
7. FAOSTAT (Food Agric. Org. U. N.). FAOSTAT Statistics Database; FAOSTAT: Rome, Italy, 17 May 2017; Available online: (accessed on 24 April 2017).
8. CABI. Tomato Leafminer (Tuta absoluta): IMPACTS and Coping Strategies for Africa; CABI: Wallingford, UK, 2019.
9. Aigbedion-Atalor, P.O.; Mohameda, A.S.; Hill, M.P.; Zaluckic, M.P.; Azrag, A.G.A.; Srinivasan, R.; Ekesi, S. Host stage preference and performance of Dolichogenidea gelechiidivoris (Hymenoptera: Braconidae), a candidate for classical Biol. Cntrol of Tuta absoluta in Africa. Biol. Control 2020, 144, 104215.
10. Shahbaz, M.; Nouri-Ganbalani, G.; Naseri, B. Comparative damage and digestive enzyme activity of Tuta absoluta (Meyrick) (Lepidoptera: Gelechiidae) on 12 tomato cultivars. Entomol. Res. 2017, 49, 401–408.
11. Kaoud, H.A. Alternative methods for the control of Tuta absoluta. Glob. J. Multidiscip. Appl. Sci. 2014, 2, 41–46.
12. Kamali, S.; Karimi, J.; Koppenhöfer, A.M. New Insight into the Management of the Tomato Leaf Miner, Tuta absoluta (Lepidoptera: Gelechiidae) with Entomopathogenic Nematodes. J. Econ. Entomol. 2018, 111, 112–119.
13. Han, P.; Zhang, Y.; Lu, Z.; Wang, S.; Ma, D.; Biondi, A.; Desneux, N. Are we ready for the invasion of Tuta absoluta? Unanswered key questions for elaborating an Integrated Pest Management package in Xinjiang, China. Entomol. Gen. 2018, 38, 113–125.
14. Sanda, N.B.; Sunusi, M.; Hamisu, H.S.; Wudil, B.S.; Sule, H.; Abdullahi, A.M. Biological invasion of tomato leafminer, Tuta absoluta (Meyrick) in Nigeria: Problems and management strategies optimization: A Review. Asian J. Agric. Horti. Res. 2018, 1, 1–14.
15. Mansour, R.; Brevault, T.; Chailleux, A.; Cherif, A.; Grissa-Lebdi, K.; Haddi, K.; Mohamed, S.A.; Nofemela, R.S.; Oke, A.; Sylla, S.; et al. Occurrence, biology, natural enemies and management of Tuta absoluta in Africa. Entomol. Gen. 2018, 38, 83–112.
16. Chidege, M.; Abel, J.; Afonso, Z.; Tonini, M.; Fernandez, B. Tomato leaf miner, Tuta absoluta (Meyrick) (Lepidoptera: Gelechiidae) detected in Namibe Province Angola. J. Appl. Life Sci. 2017, 12, 1–5.
17. European and Mediterranean Plant Protection Organization. EPPO A1 and A2 List of Pests Recommended for Regulation as Quarantine Pests. 2014. Available online: (accessed on 1 December 2014).

18. Xian, X. The Potential Invasion Risk of the Tomato Leafminer Tuta absoluta in China; Institute of Plant Protection, Chinese Academy of Agricultural Science: Beijing, China, 2017.
19. Karadjova, O.; Ilieva, Z.; Krumov, V.; Petrova, E.; Ventsislavov, V. Tuta absoluta (Meyrick) (Lepidoptera: Gelechiidae): Potential for entry, establishment and spread in Bulgaria. Bulg. J. Agric. Sci. 2013, 19, 563–571.
20. Tonnang, H.E.Z.; Mohamed, S.A.; Khamis, F.; Ekesi, S. Identification and risk assessment for worldwide invasion and spread of Tuta absoluta with a focus on Sub-Saharan Africa: Implications for phytosanitary measures and management. PLoS ONE 2015, 10, e0138319.
21. Potting, R.P.J.; van der Gaag, D.J.; Loomans, A.; van der Straten, M.; Anderson, H.; MacLeod, A.; Castrillón, J.M.G.; Cambra, G.V. Tuta absoluta, Tomato Leaf Miner Moth or South American Tomato Moth—Pest Risk Analysis for Tuta absoluta; Ministry of Agriculture, Nature and Food Quality, Plant Protection Service of the Netherlands: Utrecht, The Netherlands, 2013.
22. Illakwahhi, D.T.; Srivastava, B.B.L. Control and management of tomato leafminer—Tuta absoluta (Meyrick) (Lepidoptera, Gelechiidae). A Review. IOSR J. Appl. Chem. 2017, 10, 14–22.
23. Retta, A.N.; Berhe, D.H. Tomato leaf miner–Tuta absoluta (Meyrick), a devastating pest of tomatoes in the highlands of Northern Ethiopia: A call for attention and action. Res. J. Agric. Environ. Manag. 2015, 4, 264–269.

Retrieved from https://encyclopedia.pub/entry/history/show/24338