DOI: 10.3969/j.issn.2095-1787.2019.03.007

中国新发现外来入侵害虫——南美番茄潜叶蛾(鳞翅目:麦蛾科)

张桂芬[1,2*], 马德英[3], 刘万学[1,2*], 王玉生[1], 付文君[4], 王 俊[5], 高有华[3], 万方浩[1,2*]

[1]中国农业科学院植物保护研究所,植物病虫害生物学国家重点实验室/农业农村部作物有害生物综合治理重点实验室,北京 100193; [2]农业农村部外来入侵生物预防与控制研究中心,北京 100193; [3]新疆农业大学,新疆 乌鲁木齐 830052; [4]伊犁哈萨克自治州农业技术推广总站,新疆 伊宁 835000; [5]新疆维吾尔自治区植物保护站,新疆 乌鲁木齐 830006

摘要: 2017 年 8 月,在新疆维吾尔自治区伊犁哈萨克自治州露地鲜食番茄上发现一种鳞翅目害虫,以幼虫潜食叶肉、蛀食果实,经鉴定为南美番茄潜叶蛾。该害虫原产南美洲的秘鲁,2006 年入侵欧洲的西班牙,截至 2017 年 5 月,已在南美洲、欧洲、非洲、中美洲和亚洲的 80 多个国家和地区发生,严重危害鲜食番茄、加工番茄和樱桃番茄/圣女果,产量损失最高可达 80%~100%。本文提供了南美番茄潜叶蛾的危害情况及主要形态鉴定特征,提出了防范其进一步扩散危害的措施建议以及今后应开展的主要研究方向,包括植物检疫、发生分布调查、生物学生态学特性研究、天敌资源挖掘利用等,以为积极应对南美番茄潜叶蛾对我国农业生产安全的威胁提供参考。

关键词: 入侵害虫; 南美番茄潜叶蛾; 番茄; 中国; 麦蛾科

The arrival of *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae), in China

ZHANG Guifen[1,2*], MA Deying[3], LIU Wanxue[1,2*], WANG Yusheng[1], FU Wenjun[4], WANG Jun[5], GAO Youhua[3], WAN Fanghao[1,2*]

[1]*State Key Laboratory for Biology of Plant Diseases and Insect Pests/Key Laboratory of Integrated Pest Management of Crop, Ministry of Agriculture and Rural Affairs of the People's Republic of China, Institute of Plant Protection, Chinese Academy of Agricultural Sciences, Beijing* 100193, *China*; [2]*Center for Management of Invasive Alien Species, Ministry of Agriculture and Rural Affairs, Beijing* 100193, *China*; [3]*Xinjiang Agricultural University, Urumqi, Xinjiang* 830052, *China*; [4]*Agricultural Technology Extension Master Station of Yili Kazakg Autonomous Prefecture, Yining, Xinjiang* 835000, *China*; [5]*Plant Protection Station of Xinjiang Uygur Autonomous Region, Urumqi, Xinjiang* 830006, *China*

Abstract: In August 2017, during field surveillance in Yili, Xinjiang, China, we found an infestation of lepidopteran larvae on field-grown tomato plants. The plants displayed serious infestation, mined leaves and attacked fruits. This lepidopteran was identified as *Tuta absoluta* (Meyrick), a species native to South America. This species had been introduced to Spain in 2006. By May of 2017, it has appeared in more than 80 countries in South America, Europe, Africa, Central America and Asia and has caused serious damage to tomato production world-wide. The maximum yield losses caused by this species can reach 80%-100%. It is the first record of *T. absoluta* in China. In this paper, the morphological characteristics of *T. absoluta* and its damage is described. In order to prevent further spread of this new invasive insect pest in China, prevention measures, including plant quarantine, nation wide investigation of its distribution, studies of its biological and ecological performance, natural enemies and their control efficacy, detection and monitoring techniques, are proposed. The information provided in this paper should be useful in facing up to the pressures from the South American tomato leafminer on the safety of Chinese agriculture.

收稿日期(Received): 2018-08-21 **接受日期(Accepted)**: 2018-10-15
基金项目: 国家重点研发计划(2017YFC1200600、2016YFC1201200); 中国农业科学院科技创新工程项目(caascx-2017-2021-IAS)
作者简介: 张桂芬, 女, 研究员。研究方向: 入侵生物学
*通信作者(Author for correspondence), 张桂芬: E-mail: guifenzhang3@163.com; 刘万学: E-mail: liuwanxue@caas.cn; 万方浩: E-mail: wanfanghao@caas.cn

Key words: invasive alien species; *Tuta absoluta*; tomato; China; Gelechiidae

麦蛾科是小蛾类中的一个大科,全球约 400 属 4000 种。包括麦蛾 *Sitotroga cerealella* (Olivier)、马铃薯块茎蛾 *Phthorimaea operculella* (Zeller)、棉红铃虫 *Pectinophora gossypiella* (Saunders)等重要害虫。南美番茄潜叶蛾 *Tuta absoluta* (Meyrick),又名番茄潜叶蛾、番茄潜麦蛾、番茄麦蛾(马菲等,2011;张桂芬等,2018),原产于南美洲的秘鲁,以幼虫潜食番茄、马铃薯、茄子等茄科植物叶片,严重发生时还可蛀食果实、顶芽以及嫩梢嫩茎,此前,中国没有其发生危害的报道(CABI, 2019; Desneux *et al.*, 2010; Imenes *et al.*,1990)。棉红铃虫、马铃薯块茎蛾和南美番茄潜叶蛾均为世界性检疫性有害生物,主要通过寄主产品及其种苗的贸易活动/调运进行远距离传播扩散。2017 年 8 月,笔者在新疆吾尔自治区伊犁哈萨克自治州一露地种植的番茄上发现一种鳞翅目昆虫,经鉴定为新入侵中国的外来害虫——南美番茄潜叶蛾。

1　鉴别特征

1.1　成虫

体长 6~7 mm,翅展 8~10 mm,淡灰褐色、灰褐色或棕褐色,鳞片银灰色;触角丝状,足细长,具有灰白色与黑褐色相间的横纹(图 1A);下唇须向上翘弯;腹部纺锤型(雌性尤为明显),第 1~6 节(雌性)或第 1~8 节(雄性)腹面中部两侧具有八字形黑褐色斑纹(图 1B、C)。雄性外生殖器抱器瓣指状,端部多毛;阳茎粗状,具有突出的盲囊(图 1D)。

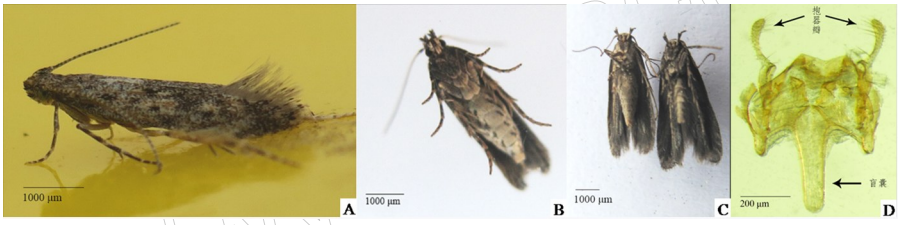

图 1　南美番茄潜叶蛾成虫特征

Fig.1　Photographs of adults of *T. absoluta*

A:雄性成虫,侧面观;B:雌性成虫,腹面观;C:雌性和雄性成虫,腹面观;D:雄性外生殖器,示抱器瓣和阳茎盲囊。

A: Male adult, lateral view; B: Female adult, ventral view; C: Female and male adults, ventral view; D: Male genitalia, valvae and saccus indicated.

1.2　幼虫

4 个龄期。初孵幼虫奶黄色或奶白色,半透明,体长 0.4~0.6 mm,头部黑褐色;前胸背板棕黄色,后缘具一棕褐色锚形斑纹(图 2A);胸足奶白色,半透明(图 2B)。4 龄幼虫绿色、黄绿色,或胴部背面淡玫瑰红色;头部棕黄色;前胸背板淡棕黄色,后缘具有 2 条棕褐色眉形斑纹;胴部各体节隆起明显,胸足和腹足色浅,半透明(图 2C)。

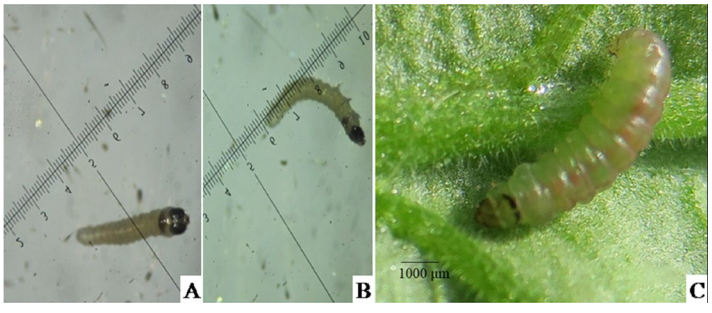

图 2　南美番茄潜叶蛾 1 龄和 4 龄幼虫形态

Fig.2　Photographs of first and forth instar larvae of *T. absoluta*

A:1 龄幼虫整体背面观,示前胸背板;B:1 龄幼虫整体侧面观,示胸足;C:4 龄幼虫,背侧面观。

A: Whole body of 1st instar larva, dorsal view, pronotum indicated; B: Whole body of 1st instar larva, lateral view, thorax feet indicated; C: Whole body of 4th instar larva, dorsal and lateral view.

2 入侵与危害

南美番茄潜叶蛾原产南美洲西部的秘鲁,是南美洲国家番茄上的主要害虫(Desneux *et al.*, 2010),2006 年年底首次入侵西班牙(智利中部可能是其唯一的入侵源头)的东部,之后,向东向南迅速扩散,很快遍布了整个地中海区域(Biondi *et al.*, 2018; Desneux *et al.*,2010)。截至 2017 年 5 月,已在包括南美洲、欧洲、非洲、中美洲、亚洲在内的 85 个国家/地区发生,22 个国家/地区疑似发生(张桂芬等,2018; Biondi *et al.*,2018; CABI,2019; Campos *et al.*,2017; Desneux *et al.*,2011; Uulu *et al.*, 2017)。

南美番茄潜叶蛾可以危害包括茄科、豆科、锦葵科、苋科、旋花科、藜科、菊科、十字花科以及禾本科在内的近 40 种植物,但主要危害茄科植物,尤其嗜食番茄(包括鲜食番茄、加工番茄和樱桃番茄/圣女果)、马铃薯、茄子等(张桂芬等,2018; CABI, 2019)。据观察,南美番茄潜叶蛾可以潜食叶肉,蛀食果实、顶芽、嫩梢和嫩茎,严重危害时造成叶片枯萎、顶芽枯死和果实脱落/腐烂;若防治不及时或未防治,将造成番茄产量损失 80%~100%(Desneux *et al.*,2010)。该虫不仅在入侵地危害严重(Potting *et al.*,2013),在原产地亦严重发生,使防治成本一再飙升(Gontijo *et al.*, 2013; Guedes & Picanço, 2012)。在伊犁,南美番茄潜叶蛾以幼虫在寄主植物叶片内潜食叶肉,潜道/潜斑明显、半透明、窗纸样,但形状不甚规则,受害叶片常皱缩,严重时枯萎(图 3A);同时,幼虫还可蛀食番茄果实,造成果实未熟脱落或腐烂(图 3B);此外,幼虫亦可蛀食幼苗顶芽,造成无效番茄苗,毁种重播。

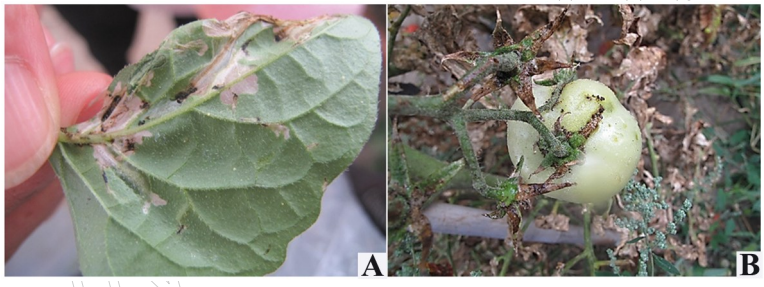

图 3 南美番茄潜叶蛾田间危害叶片(A)和果实(B)状

Fig.1 Tomato leaf (A) and fruit (B) damaged by the *T. absoluta* larvae

3 防控建议

南美番茄潜叶蛾以 1~4 龄幼虫在茄科作物或花卉的组织(包括叶片、果实、嫩梢、嫩茎、果萼等)内潜食/蛀食危害,而农产品(包括果实、观赏型茄科植物及其种苗,以及包装物、填充物、运输工具等)的贸易活动是其远距离传播扩散的主要途径,尤其是鲜食番茄和樱桃番茄/圣女果(特别是带蒂或带蔓番茄)(Campos *et al.*,2017; Desneux *et al.*, 2010)。因此,应严格番茄产地检验检疫,严禁携带有南美番茄潜叶蛾的番茄果实(包括鲜食番茄、加工番茄、樱桃番茄/圣女果)和幼苗从疫区调往非疫区。初步调查显示,南美番茄潜叶蛾目前仅在伊犁河谷的局部区域发生,应及时开展全面普查,摸清该虫的发生分布情况,并参照国外已有的防治方法,对疫区的南美番茄潜叶蛾进行有效防除或严加管控,以防对我国番茄生产造成更大危害。同时,应做好南美番茄潜叶蛾生物学生态学研究、本地天敌资源挖掘利用、检测监测技术、防控措施等研究,积极应对南美番茄潜叶蛾对我国农业生产安全的威胁。

参考文献

马菲, 张俊华, 于艳雪, 曹逸霞, 段胜勇, 2011. 番茄麦蛾. 植物检疫, 25(5): 55-58.

张桂芬, 刘万学, 万方浩, 冼晓青 ,张毅波, 郭建洋, 2018. 世界毁灭性检疫害虫番茄潜叶蛾的生物生态学及危害与控制. 生物安全学报, 27(3): 155-163.

BIONDI A, GUEDES R N C, WAN F H, DESNEUX N, 2018. Ecology, worldwide spread, and management of the invasive South American tomato pinworm, *Tuta absoluta*: past, present, and future. *Annual Review of Entomology*, 63: 239-258.

CABI, 2019. Invasive species Compendium, *Tuta absoluta* (tomato leafminer) datasheet. (2019-01-04)[2019-06-05]. https://www.cabi.org/isc/datasheet/49260#toPictures.

CAMPOS M R, BIONDI A, ADIGA A, GUEDES R N C, DESNEUX N, 2017. From the Western Palaearctic region to

beyond: *Tuta absoluta* ten years after invading Europe. *Journal of Pest Science*, 90: 787-796.

DESNEUX N, WAJNBERG E, WYCKHUYS K A G, BURGIO G, ARPAIA S, NARVÁEZ-VASQUEZ C A, GONZÁLEZ-CABRERA J, RUESCAS D C, TABONE E, FRANDON J, PIZZOL J, PONCET C, CABELLO T, URBANEJA A, 2010. Biological invasion of European tomato crops by *Tuta absoluta*: ecology, geographic expansion and prospects for biological control. *Journal of Pest Science*, 83: 197-215.

DESNEUX N, LUNA M G, GUILLEMAUD T, URBANEJA A, 2011. The invasive South American tomato pinworm, *Tuta absoluta*, continues to spread in Afro-Eurasia and beyond: the new threat to tomato world production. *Journal of Pest Science*, 84: 403-408.

GONTIJO P C, PICANÇO M C, PEREIRA E J G, MARTINS J C, CHEDIAK M, GUEDES R N C, 2013. Spatial and temporal variation in the control failure likelihood of the tomato leaf miner, *Tuta absoluta*. *Annals of Applied Biology*, 162: 50-59.

GUEDES R N C, PICANÇO M C, 2012. The tomato borer *Tuta absoluta* in South America: pest status, management and insecticide resistance. *EPPO Bulletin*, 42: 211-216.

IMENES S D L, UCHÕA-FERNANDES M A, CAMPOS T B, TAKEMATSU A P, 1990. Aspectosbiológicos e comportamentais da trata do tomateiro *Scrobipalpula absoluta* (Meyrick, 1917), (Lepidoptera-Gelechiidae). *Arquivos do Instituto Biológico*, *Sao Paulo*, 57(1/2): 63-68.

POTTING R P J, VAN DER GAAG D J, LOOMANS A, VAN DER STRATEN M, ANDERSON H, MACLEOD A, CASTRILLÓN J M G, CAMBRAG V, 2013. *Tuta absoluta*, *tomato leafminer moth or South American tomato moth*. Utrecht, The Netherlands: Ministry of Agriculture, Nature and Food Quality, Plant Protection Service of the Netherlands.

UULU T E, ULUSOY M R, ÇALIŞKAN A F, 2017. First record of tomato leafminer *Tuta absoluta* Meyrick (Lepidoptera: Gelechiidae) in Kyrgyzstan. *Bulletin OEPP/EPPO Bulletin*, 47(2): 285-287.

(责任编辑:郭堂)