



Host stage preference and performance of *Dolichogenidea gelechiidivoris* (Hymenoptera: Braconidae), a candidate for classical biological control of *Tuta absoluta* in Africa

Pascal Osa Aigbedion-Atalor^{a,b}, Samira Abuelgasim Mohamed^{a,*}, Martin P. Hill^b, Myron P. Zalucki^c, Abdelmutalab G.A. Azrag^{a,e}, Ramasamy Srinivasan^d, Sunday Ekesi^a

^a International Centre of Insect Physiology and Ecology (icipe), P.O. Box 30772-00100, Nairobi, Kenya

^b Centre for Biological Control, Department of Zoology and Entomology, Rhodes University, P.O. Box 94, Grahamstown 6140, South Africa

^c School of Biological Sciences, The University of Queensland, 4072, Australia

^d World Vegetable Center, 60 Yi Ming Liao, Shanhua, Tainan 74151, Taiwan

^e Department of Crop Protection, Faculty of Agricultural Sciences, University of Gezira, P.O. Box 20, Wad Medani, Sudan

ARTICLE INFO

Keywords:

Larval parasitoid
Apanteles gelechiidivoris
 Parasitoid oviposition
 Classical biological control
 Invasive pest

ABSTRACT

Tuta absoluta (Meyrick) (Lepidoptera: Gelechiidae) is native to South America but has invaded the Afro-Eurasian supercontinent where it is currently the most devastating invasive arthropod pest of tomato. As a part of the first classical biological control programme against *T. absoluta* in Africa, a larval parasitoid, *Dolichogenidea gelechiidivoris* Marsh. (Syn.: *Apanteles gelechiidivoris* Marsh) (Hymenoptera: Braconidae), of *T. absoluta* was imported from Peru into the quarantine facility of the International Centre of Insect Physiology and Ecology, Kenya. We report on the host larval preference of *D. gelechiidivoris* and the host suitability, and the parasitoid's reproductive strategy, including lifetime fecundity and egg maturation dynamics. *Dolichogenidea gelechiidivoris* females preferentially oviposited in early (1st and 2nd) larval instars of *T. absoluta* but parasitized and completed development in all four instars of the host. Host instar did not affect *D. gelechiidivoris* sex-ratio but females reared on the first instar had significantly fewer eggs than when reared in late larval instars (3rd and 4th). Females of the parasitoid emerged with a high mature egg load which peaked 2 d post eclosion. The females of *D. gelechiidivoris* survived 8.51 ± 0.65 d and produced 103 ± 8 offspring per female at 26 ± 4 °C (range: 24 to 29 °C) and 50–70% relative humidity (RH) with males present and fed honey-water (80% honey). Increasing maternal age decreased the proportion of female offspring. Under the aforementioned laboratory conditions, the Gross and Net reproductive rates were 72 and 39.5 respectively, while the mean generation time was 20 d. The potential intrinsic rate of natural increase was 0.18. This study shows that *D. gelechiidivoris* is a potential biological control agent of *T. absoluta* and should be considered for release in Kenya and across Africa following host specificity testing and risk assessments.

1. Introduction

The tomato leaf miner, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae), is an oligophagous invasive pest endemic to South America (Desneux et al., 2010). Outside of its native range, the pest was first detected in eastern Spain in 2006 (Urbaneja et al., 2007). Its proliferation in the invaded range over the past 12 years has been rapid and devastating to tomato production across the Afro-Eurasian supercontinent (Biondi et al., 2018; Campos et al., 2017; Han et al., 2019; Mansour et al., 2018). Currently, it is a serious threat to two major worldwide tomato producers, China and USA (Han et al., 2019; Tabuloc

et al., 2019; Verheggen and Fontus 2019). Following its first detection in the Maghreb area of Africa in 2008, *T. absoluta* rapidly spread into the African continent with devastating effects, notably, on small-scale tomato farming (Mansour et al., 2018). In Kenya, its impact typifies the ecological and socio-economic impacts of Invasive Alien Species (IAS) in novel environments (Aigbedion-Atalor et al., 2019). There is evidence showing that its countrywide proliferation has indeed decreased tomato yield, with increases both in production costs and vulnerability of human and environmental well-being as a result of a three-fold increase in pesticides use for controlling this pest (Aigbedion-Atalor et al., 2019).

* Corresponding author.

E-mail address: sfaris@icipe.org (S.A. Mohamed).

<https://doi.org/10.1016/j.biocontrol.2020.104215>

Received 16 April 2019; Received in revised form 13 January 2020; Accepted 31 January 2020

Available online 01 February 2020

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