Journal of Insect Biodiversity and Systematics 08 (2), 219–227 *https://jibs.modares.ac.ir*

OPEN ACCESS

Tarbiat Modares University Press **Short Paper** https://doi.org/10.52547/jibs.8.2.219 **ISSN**: 2423-8112

Entomological Society of Iran *http://zoobank.org/urn:lsid:zoobank.org:E7420CF0-D5F7-46F0-9B54-1BC6A11A362C*

Stenomesius japonicus (Ashmead) (Hymenoptera: Eulophidae): a new parasitoid of *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) in Syria

Rawa Muhsen Youssef
Department of Plant Protection, Faculty of Agriculture, Tishreen University, Latakia, Syria.
✉*rawayoussef@hotmail.com*; https://orcid.org/0000-0001-6729-1963

Nabil Hasan Abo Kaf
Department of Plant Protection, Faculty of Agriculture, Tishreen University, Latakia, Syria.
✉*nabil.abokaf@tishreen.edu.sy*; https://orcid.org/0000-0001-8484-0813

Rafeek Abboud
Scientific Agricultural Research Centre, Latakia, Syria.
✉*abboud.rafeek@hotmail.com*; https://orcid.org/0000-0002-2863-6348

Received:
21 November, 2021

Accepted:
06 March, 2022

Published:
11 April, 2022

Subject Editor:
Hossein Lotfalizadeh

ABSTRACT. *Stenomesius japonicus* (Ashmead, 1904) (Hymenoptera: Eulophidae) was collected for the first time from larvae of the tomato leaf-miner, *Tuta absoluta* (Meyrick, 1917) (Lepidoptera: Gelechiidae) infesting *Lycopersicon esculentum* Mill. in Syria. Diagnostic morphological characters, biology and distribution of the newly recorded species are provided. Its role in the biological or integrated control of *T. absoluta* remains to be evaluated. A list of all eulophid wasps recorded from Syria is also provided.

Key words: Eulophidae, parasitoid, *Tuta absoluta*, Syria

Citation: Youssef, R.M., Abo Kaf, N.H. & Abboud, R. (2022) *Stenomesius japonicus* Ashmead (Hymenoptera: Eulophidae): a new parasitoid of *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) in Syria. *Journal of Insect Biodiversity and Systematics*, 8 (2), 219–227.

INTRODUCTION

The tomato leaf-miner, *Tuta absoluta* (Meyrick, 1917) (Lepidoptera: Gelechiidae) is a Neotropical oligophagous pest of cultivated and wild plants with a high preference for Solanaceae, especially tomato (Nurul Huda et al., 2020). This pest also attacks other cultivated plants including potato (*Solanum tuberosum* L.), eggplant (*Solanum melongena* L.), sweet pepper (*Solanum muricatum* Aiton), tobacco (*Nicotiana tabacum* L.), bean (*Phaseolus vulgaris* L.) and cape gooseberry (*Physalis peruviana* L.) (Desneux et al., 2010). On wild plant species, the larvae of *T. absoluta* was found on *Datura stramonium* L., *Datura ferox* L., *Lycium chilense* Bertero, *Lycopersicum hirsutum* L., *Nicotiana glauca* (Graham), *Solanum lyratum* Thumberg, *Solanum puberulum* Nuttal ex Seemann, and *Solanum nigrum* L. (EPPO, 2009).

Tuta absoluta is originated from South America, but it was introduced to Spain in 2006 (Urbaneja et al., 2007), then spread throughout the Mediterranean Basin, Central Europe and the Middle East (Devetak et al., 2015). The subsequent invasion into the Middle East have been recorded from Syria (Almatni, 2010; Ibrahim et al., 2012; Mofleh et al., 2014), Iraq (Abdul Razzak et al., 2010), Iran (Banamieri & Cheraghian, 2011), and Jordan (Al Antary & Al Shaalan, 2013). It caused serious damages

Corresponding author: Youssef, Y.M., E-mail: *rawayoussef@hotmail.com*

to tomato cultivations in invaded areas (Ferracini et al., 2019), may be responsible for the losses of up to 80–100% in tomato crops (Desneux et al., 2010). All aerial parts of the host plant including leaves, stems and fruits may be attacked by the pest. *Tuta absoluta* is a difficult pest to manage because of the larval feeding habits in the mines and its ability to build up insecticide resistance (Abdelmaksoud et al., 2020).

Together with the chemical control of this pest, and mating disruption technique has given encouraging results (Filho et al., 2000). Many species of natural enemies are attacking this insect, some of them are considered as important biological control agents. A list of new recorded enemies for Europe is summarized by Desneux et al. (2010). Several braconid species including, *Pseudoapanteles dignus* (Muesebeck) (Cardona & Oatman, 1971; Sanchez et al., 2009) and *Agathis fuscipennis* (Zetterstedt) (Loni et al., 2011) were found attacking the tomato leaf-miner in its original distribution area. Many eulophid species were also reared in association with this insect, including *Neochrysocharis formosa* (Sohrabi et al., 2014) and genus *Elachertus* spp. (Yarahmadi et al., 2016) in Iran, *Closterocerus clara* (Szelenyi), *Ratzeburgiola christatus* (Ratzeburg), *R. incompleta* Bouček, *Baryscapus bruchophagi* (Gahan) in Turkey (Doğanlar & Yiğit, 2011). Other parasitoids belonging to Chalcididae (*Brachymeria secundaria* (Ruschka) and *Hockeria unicolor* (Walker)), Pteromalidae (*Pteromalus intermedius* (Walker)), and Braconidae (*Bracon hebetor* Say and *Bracon didemie* Beyarslan) were also recorded from Turkey (Doğanlar & Yiğit, 2011).

The family Eulophidae with over 4500 species and 332 genera have been known as parasitoids of many insect families, including several species the leaf-miners both in Lepidoptera and Diptera (Noyes, 2021). Eulophidae are either ectoparasitoids or endoparasitoids and mostly parasitize the larvae of other insects, specifically those belonging to the orders Lepidoptera, Coleoptera, Diptera and Hymenoptera. They are environmentally and economically important (Yefremova et al., 2007), and some species are considered as biological control agents for a wide spectrum of pest insects. Little is known about Eulophidae of Syria (only 26 species on different hosts) (Noyes, 2021), with no records as parasitoids of the tomato leaf-miner. This survey revealed the existence of an active eulophid parasitoid that heavily attacks the population of *T. absoluta*.

MATERIAL AND METHODS

The samples of infested tomato plants by tomato leaf-miner, *T. absoluta* were collected from a greenhouse and fields from March to October of the years 2019 to 2021. Collections were done from four localities in Latakia (Jableh-Bet Yashowt, Alaamronie, Jableh-Snouber Jableh) and Tartus provinces (Baniyas-Hrison) (Fig. 1). All the collected samples were transferred to the laboratory (Agricultural Research Centre in Latakia) for rearing and further studies. The parasitized larvae of *T. absoluta* were placed in glass tubes and closed with cotton until the emergence of adult parasitoids. Obtained parasitoids were identified using the available keys (Askew, 1968; Bouček, 1988; Khan et al., 2005). The identification was confirmed by Alex Gumovsky (National Academy of Sciences of Ukraine, I. Schmalhausen Institute of Zoology). The percentage of parasitism was calculated using the following formula (Qureshi et al., 2009).

$$\textit{Parasitism rate (\%)} = \frac{\textit{no of Emerged parasitoids}}{\textit{no of Emerged host + no of Emerged parasitoids}} \times 100$$

The voucher specimens are deposited in the collection of the General Commission of Scientific Agricultural Research (GCSAR), Damascus, Syria. Twenty specimens were dissected and mounted in Canada balsam on slides following the method of Noyes (1982). Images were taken with a stereomicroscope equipped with a computer-attached camera, and a Nikon-Eclipse 80i Digital microscope (40X) equipped with Camera Nikon E8800.

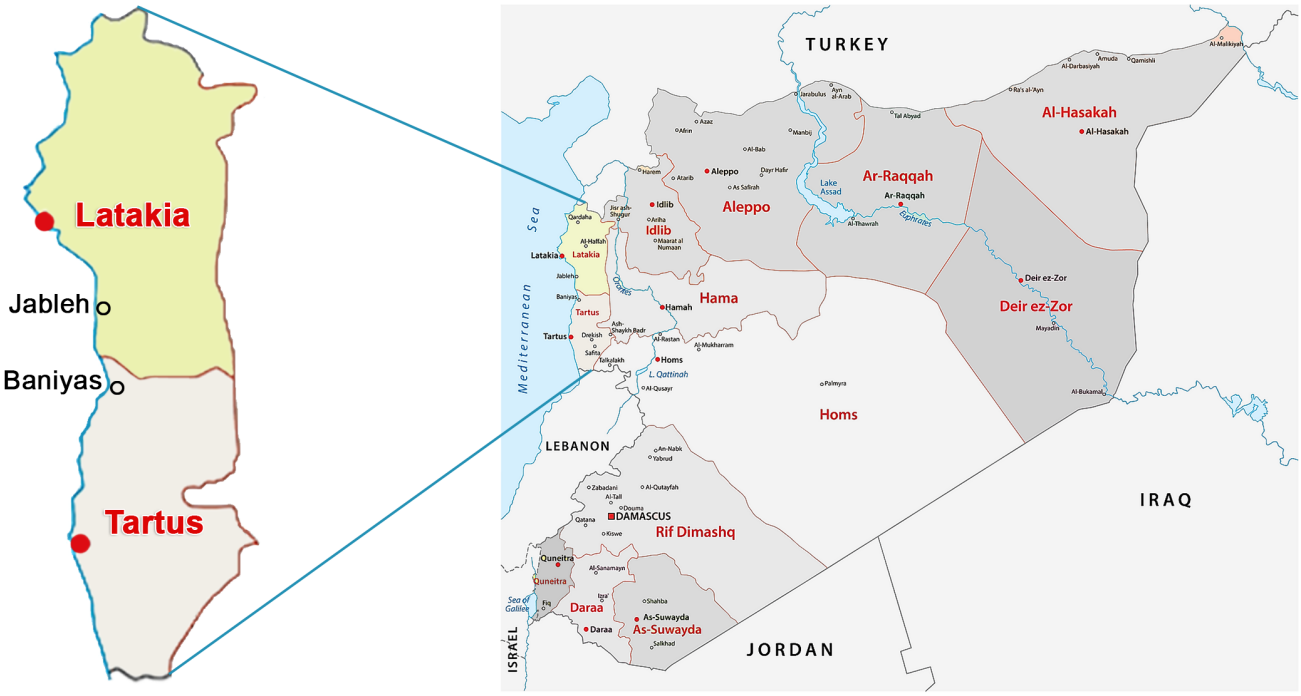

Figure 1. Collection localities for Eulophid specimens in Syria: Latakia and Tartus provinces.

RESULTS

Order Hymenoptera

Family Eulophidae

Subfamily Eulophinae

Genus *Stenomesius* Westwood, 1833

Diagnosis (Female). Funicle 4-segmented, club 2 or 3-segmented; mandible developed; pronotum without transverse carina; mesoscutellum with sublateral grooves; propodeum medially with X- or H-shaped carinae; hind tibial spurs normal; petiole shorter than hind coxa, gaster usually elongate.

Stenomesius japonicus (Ashmead, 1904)

Sympiesomorpha japonica Ashmead, 1904:163, Holotype ♀, USNM, Japan.

Material examined: 200♀♀, 200♂♂, Syria, Latakia province, 20♀♀, 10♂♂, Bet Yashowt (35°19′01″N, 36°07′49″E), 50♀♀, 10♂♂, Alaamronie (35°47′N, 35°31′E), 150♀♀, 75♂♂, Snouber Jableh (35°53′12″N, 35°28′31″E); Tartus province, 50♀♀, 35♂♂, Hrison (35°55′N, 35°08′E), in May to August of the years 2019 to 2021, ex *Tuta absoluta* on Tomato, leg.: R. Muhsen Youssef.

Diagnostic morphological characters. **Female**, Body length 1–1.5 mm.

Colour: Face yellow; vertex black; scape yellow, pedicel and flagellum dark brown; antenna 9-segmented with two anelli, four funiculars, and three clavomeres; funiculars subequal in length; mandibles, gena, pronotum, mesoscutum, and axillae yellow, mesoscutellum black; propodeum yellow, with carina blackish brown (Fig. 2); wings hyaline, legs yellow, gaster yellowish with apex, lateral margins, lateral sides dark brown, and with dark brown spot on median part, ovipositor dark brown (Fig. 2).

Head. Frons and vertex smooth and shiny, malar sulcus present and straight, fronto-facial suture absent, antenna inserted at above the lower eye margins and on the middle distance between anterior ocellus and lower clypeus margin, scape exceeding level of vertex**.**

Figure 2. *Stenomesius japonicus* (Ashmead, 1904). **A.** Pupa; **B.** Larve of *S. japonicus* on larve of Tomato leaf-miner, *T. absoluta*; **C.** Adult, general habitus, dorsal view; **D.** Propodeum, dorsal view (Slide mounted in Canada Balsam), indicating a double X- or H-shaped carinae.

Mesosoma. Axillae and scutellum shiny, pronotum without transverse carina; mesoscutellum with sublateral grooves; propodeum smooth with a double X- or H-shaped carinae; mesoscutellum with one pair of setae; sublateral grooves meeting each other medially on posterior margin; forewing hyaline and speculum absent; stigma hyaline, with three setae or more on submarginal vein, cubital vein straight, length of postmarginal vein very long, more than two times the length of stigmal vein.

Legs. Yellow, tibial spurs short, with tarsus 4 tarsomeres, claws yellow.

Metasoma. Petiole short, gaster elongate and longer than mesosoma; ovipositor black brown, and exserted beyond apex of gaster.

Male. Body length is 0.5 mm, head black; antenna 9-segmented with two anelli, four funiculars, and two clavomeres; mesosoma 2.5× as long as gaster.

Note on biology: Host-parasitoid association between *T. absoluta* (Fig. 2) and *S. japonicus*, is recorded for the first time from Syria. Adults of *T. absoluta* and *S. japonicus* started to emerge from the infested leaves during 2019, 2020 and 2021. 300 specimens of *T. absoluta* and 119 specimens of *S. japonicus* have been obtained in 2019; 350 adults of *T. absoluta* and 116 specimens of *S. japonicus* emerged in 2020 and finally, 400 adults of *T. absoluta* and 165 specimens of *S. japonicus* emerged in 2021. The larval parasitism rate was determined to be 35% of the larval population. *Stenomesius japonicus* was the only parasitoid emerged from our samples.

DISCUSSION

The discovery of *Stenomesius japonicus* in Syria represents a new generic and species record for Syria. It was reared from larvae of the tomato leaf-miner, *Tuta absoluta* (Meyrick, 1917) (Lepidoptera: Gelechiidae). So far 26 species of eulophid wasps are recorded from Syria (Table 1). *Stenomesius japonicus* was already recorded from some other countries in the Middle East including Egypt (Urbaneja et al., 2012), and Iran (Hesami et al., 2010; Yefremova et al., 2007), but widely distributed in the eastern Palaearctic region to the Oceanic and Australasian regions (Noyes, 2021). It has also occurred in *T. absoluta*-infested tomato crops in various European Mediterranean basin countries (Desneux et al., 2010; Urbaneja et al., 2012; Zappalà et al., 2012, 2013). *Stenomesius japonicus* is a solitary idiobiont ectoparasitoids of the larva of leaf-mining lepidoptera of the families Gracillariidae, Gelechiidae, Pyralidae, Tortricidae and Noctuidae (Askew & Bouček, 1968; Bouček, 1988). Further research is needed to determine its potential and efficiency as a biocontrol agent of *T. absoluta*.

Table 1. The known eulophid species (Hymenoptera, Eulophidae) from Syria and their host associations.

Parasitoids	Host	References
Aprostocetus invidus (Domenichini)	*Coccus pseudomagnoliarum* (Kuwana) *Lasioptera berlesiana* Paoli	Mohamed et al. (2012) Viggiani & Sasso (2008)
Baryscapus sp.	*Coccus pseudomagnoliarum* (Kuwana) *Coccus hesperidum* (L.)	Basheer et al. (2014)
Baryscapus servadeii (Domenichini)	*Traumatocampa pityocampa* (Denis & Schiffermüller)	Baur (2005)
Cirrospilus ingenuus Gahan	*Phyllocnistis citrella* Stainton	Schauff et al. (1998)
Cirrospilus nr. *Lyncus* (Walker)	*Phyllocnistis citrella* Stainton	Almatni & Samara (2001)
Cirrospilus quadristriatus (Subba Rao & Ramamani)	*Phyllocnistis citrella* Stainton	Almatni & Samara (2001)
Cirrospilus phyllocnistoides (Narayanan)	*Phyllocnistis citrella* Stainton	Almatni & Samara (2001)
Chrysocharis latifossa Hansson	*Liriomyza trifoliii* (Burgess)	Hansson (1985)
Chrysocharis longitarsus Hansson	*Liriomyza trifolii* (Burgess)	Hansson (1985)
Dicladocerus westwoodii Westwood	*Prays oleae* (Bernald)	Baur (2005)
Diglyphus isaea (Walker)	*Liriomyza cicerina* (Rondani) *Liriomyza trifolii* (Burgess) *Liriomyza huidobrensis* (Blanchard)	Almatni & Samara (2001)
Elasmus steffani Viggiani	*Phyllocnistis citrella* Stainton *Prays oleae* (Bernald)	Almatni & Samara (2001) Baur (2005)
Euplectrus flavipes (Fonscolombe)	*Spodoptera exigua* (Hübner)	Zhu & Huang (2003)
Hemiptarsenus ornatus (Nees)	*Liriomyza huidobrensis* (Blanchard)	Almatni & Samara (2001)
Neochrysocharis sp.	*Phyllocnistis citrella* Stainton	Alkhateeb et al. (1999)
Neochrysocharis formosa (Westwood)	*Liriomyza huidobrensis* (Blanchard) *Phyllocnistis citrella* Stainton	Almatni & Samara (2001)
Oomyzus scaposus (Thomson)	*Coccinella septempunctata* L.	Shahadi et al. (2002)
Pnigalio spp.	*Phyllocnistis citrella* Stainton	Almatni & Samara (2001)
Pnigalio agraules (Walker)	*Batrocera oleae* (Gmelin)	Almatni & Samara (2001)
Pnigalio mediterraneus (Ferriere & Delucchi)	*Batrocera oleae* (Gmelin)	Almatni & Samara (2001)
Pediobius acanthi (Walker)	*Liriomyza huidobrensis* (Blanchard)	Almatni & Samara (2001)
Quadrastichus sajoi (Szelenyi)	*Dasineura oleae* (Loew)	Doğanlar (1992)
Ratzeburgiola incompleta Bouček	*Phyllocnistis citrella* Stainton	Alkhateeb et al. (1999)
Sympiesis sp.	*Phyllocnistis citrella* Stainton	Almatni & Samara (2001)
Semielacher petiolatus (Girault)	*Phyllocnistis citrella* Stainton	Schauff et al. (1998)
Tetrastichus sp.	*Coccus pseudomagnoliarum* (Kuwana) *Coccus hesperidum* (L.) *Ceroplastes rusci* (L.)	Almatni & Samara (2001)
Stenomesius japonicus Ashmead	*Tuta absoluta* (Meyrick)	Current study

AUTHOR'S CONTRIBUTION

The authors confirm contribution in the paper as follows: R.M.Y. performed the work, collecting and slide-mounting the parasitoid specimens, taking the photographs, identification of specimens, and drafting. N.H.A.K. was a major contributor in writing the manuscript, reviewing & editing the paper. R.A. reviewed and edited the paper. All author(s) read and approved the final manuscript.

FUNDING

This study is funded by General Commission of Scientific Agricultural Research GCSAR, Damascus, Syria.

AVAILABILITY OF DATA AND MATERIAL

The mentioned specimens are deposited in the private collection of General Commission of Scientific Agricultural Research, Damascus, Syria.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

ACKNOWLEDGMENTS

This research was supported by General Commission of Scientific Agricultural Research, Damascus, Syria which is greatly appreciated for financial funding the research. Our special thanks are expressed to Prof. Alex Gumovsky (National Academy of Sciences of Ukraine, Schmalhausen Institute of Zoology, Kyiv, Ukraine) for helping us in identification the species.

REFERENCES

Abdelmaksoud, N.M., Abdel-Aziz, N.F., Sammour, E.A., Agamy, E.A., El-Bakry, A.M., Kandil, M.A. (2020) Influence of insect traps and insecticides sequential application as a tactic for management of tomato leafminer, *Tuta absoluta* (Meyrick), (Lepidoptera: Gelechiidae). *Bulletin of the National Research Centre,* 44, 123. https://doi.org/10.1186/s42269-020-00376-y

Abdul Razzak, A.S., Al-Yasiri, I.I. & Fadhil, H.Q. (2010) First record of tomato borer (tomato moth) *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) on tomato crop in Iraq. *Arab Near East Plant Protection,* 51, 31.

Al Antary, T. & Al Shaalan, T. (2013) *The Broad Tomato Leaf miner*; University of Jordan: Amman, Jordan, p. 11.

Almatni, W. (2010) Tomato leaf miner *Tuta absoluta* invades East Mediterranean countries. *Arab Near East Plant Protection*, 50, 29.

Almatni, W. & Samara, H. (2001). Natural enemies of insects recorded in Syria and neighboring countries. Version 2, Dar An-Nokhba, Damascus, Syria.

Alkhateeb, N., Raie, A., Gazal, K., Shamseen, F. & Kattab, S. (1999) A study on population dynamics of citrus leaf miner (*Phyllocnistis citrella* Stainton) and its parasitoids. *Arab Journal of Plant Protection*, 17 (2), 60–65.

Askew, R.R. (1968) *Handbooks for the identification of British insects*. Vol. VIII. Hymenoptera 2. Chalcidoidea section (b). Royal Entomological Society of London, London (UK), 39 p.

Askew, R.R. & Boućek, Z. (1968) Index of Palaeactic Eulophidae (excl. Tetrastichinae). In: Delucchi, V. & Remaudiére, G. (eds.) Index of entomophagous insects, Paris, pp. 1–44.

Basheer, A., Asslan, L., Rachhed, A., Abd Alrazaq, F., Saleh, A., Alshadidi, B. & Assad, R. (2014) Primary and secondary hymenopteran parasitoids of scale insects (Homoptera: Coccoidea) in fruit orchards in Syria. *Bulletin OEPP/EPPO Bulletin*, 44 (1), 47–56. https://doi.org/10.1111/epp.12095

Banamieri, V. & Cheraghian, A. (2011) First report of *Tuta absoluta* in Iran and initial control strategies. EPPO/IOBC/FAO/NEPPO Joint International Symposium on management of *Tuta absoluta* (Tomato borer), Agadir, Morocco, November 16–18.

Baur, H. (2005) Determination list of entomophagous insects nr 14. *Bulletin. Section Regionale Ouest Palaearctique, Organisation Internationale de Lutte Biologique*, 28 (11), 1–71

Bouček, Z. (1988) *Australasian Chalcidoidea (Hymenoptera). A biosystematic revision of genera of fourteen families, with a reclassification of species*. CAB International, Wallingford, Oxon. 832 p.

Cardona, C. & Oatman, E.R. (1971) Biology of *Apanteles dignus* (Hymenoptera: Braconidae), a primary parasite of the Tomato Pinworm. *Annals of Entomological Society of America*, 64 (5), 996–1007. https://doi.org/10.1093/aesa/64.5.996

Desneux, N., Wajnberg, E., Wyckhuys, K.A.G., Burgio, G., Arpaia, S., Vasques, C.A.N., Cabrera, J.G., Ruescas, D.C., Tabone, E., Pizzol, J., Poncet, G., Cabullo, 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. https://doi.org/10.1007/s10340-010-0321-6

Devetak, M., Bohinc, T., Kač, M. & Trdan, S. (2015) Seasonal dynamics of the cabbage armyworm (*Mamestra brassicae* L.) and the bright line brown-eyes moth (*Mamestra oleraceae* L.) in Slovania. *Horticultural Science,* 41, 80–88. https://doi.org/10.17221/209/2013-HORTSCI

Doğanlar, M. & Yiğit, A. (2011) Parasitoid complex of the tomato leaf miner, *Tuta absoluta* (Meyrick 1917) (Lepidoptera: Gelechiidae) in Hatay, Turkey. *KSÜ Doğa Bilimleri Dergisi*, 14 (4), 28–37.

Doğanlar, M. (1992) Notes on the species of the some genera of Tetrastichinae in Zoologische Staatssamlung München (Hymenoptera: Eulophidae). *Zeitschrift für Entomologie*, 13, 523–527.

Filho, M.M., Vilela. E.F., Jham, N.G., Attygalle, A., Svatoš, A. & Meinwald, J. (2000) Initial studies of mating disruption of the tomato moth, *Tuta absoluta* (Lepidoptera: Gelechiidae) using synthetic sex pheromon. *Journal of the Brazilian Chemical Society* 11 (6), 621–628. https://doi.org/10.1590/S0103-50532000000600011

EPPO. (2009) First report of *Tuta absoluta* in Italy. *EPPO Reporting Service*, 2 (023), 6.

Ferracini, C., Bueno, V.H.P., Dindo, M.L., Ingegno, B.L., Luna, M.G., Salas Gervassio, N.G., Sánchez, N.E., Siscaro, G., van Lenteren, J.C., Zappalà, L. & Tavella, L. (2019) Natural enemies of *Tuta absoluta* in the Mediterranean basin, Europe and South America. *Biocontrol Science and Technology*, 29, 578–609. https://doi.org/10.1080/09583157.2019.1572711

Hansson, C. (1985) Taxonomy and biology of the Palaearctic species of *Chrysocharis* Forster 1856 (Hymenoptera: Eulophidae). *Entomologica Scandinavica* (Supplement), 26, 1–130.

Hesami, S.H., Ebrahimi, E., Ostovan, H. & Yefremova, Z. (2010) Contribution to the study of Eulophidae (Hymenoptera: Chalcidoidea) of Fars province of Iran: II-Subfamilies Entiinae and Eulophinae, with a preliminary checklist of Eulophidae species in Iran. *Plant Protection Journal*, 2 (3), 239–253.

Ibrahim, M.Y., Mehrez, E.A., Edrees, M.S., Aodie, B.I. & Al-Masrey, A.R. (2012) The first record to tomato leaf miner, *Tuta absoluta* (Povolny) (Lepidoptera: Gelechiidae) at Homs Governorate, Syria. *Persian Gulf Crop Protection*, 1, 53–63.

Khan, M.A., Agnihotri, M. & Sushil, S.N. (2005) Taxonomic studies of eulophid parasitoids (Hymenoptera: Chalcidoidea) of India. *Pantnagar Journal of Research* (Suppl.), 2 (1), 1–79.

Loni, A., Rossi, E. & van Achterberg, C. (2011) First report of *Agathis fuscipennis* in Europe as parasitoid of the tomato leafminer *Tuta absoluta*. *Bulletin of Insectology*, 64, 115–117.

Masi, L. (1917) Chalcididae of the Seychelles Islands. *Novitates Zoologicae*, 24, 121–330. https://doi.org/10.5962/bhl.part.23147

Mofleh, M., Abboud, R., Habaq, H., Hammodi, O., Al-Quem, F., Adra, L. & Ahmed, M. (2014) Population changes and control of *Tuta absoluta* Meyrick along the Syrian coast. *Arab Journal of Plant Protection*, 32, 161–168.

Mohamed, E., Basheer, A., Abo Kaf, N. (2012) Survey of parasitoids species of citricola scale *Coccus pseudomagnoliarum* (Homoptera: Coccidae) and their effect on the scale in citrus orchards at Latakia, Syria. *Egyptian Journal of Biological Pest Control*, 22, 61–65.

Noyes, J.S. (1982) Collecting and preserving chalcid wasps (Hymenoptera: Chalcidoidea). *Journal of Natural History*, 16, 315–334. https://doi.org/10.1080/00222938200770261

Noyes, J.S. (2021) Universal Chalcidoidea Database. World Wide Web electronic publication. http://www.nhm.ac.uk/chalcidoids [Accessed 26th August 2021].

Nurul Huda, M.D., Jahan, T., El Taj, H.F. & Asiry, K.A. (2020) A newly emerged pest of tomato [tomato leaf miner, *Tuta absoluta* Meyrick (Lepidoptera: Gelechiidae)] in Bangladesh. A review of its problems and management strategies. *Journal of Agriculture and Ecology Research International*, 21, 1–16. https://doi.org/10.9734/jaeri/2020/v21i330132

Qureshi, J.A., Rogers, M.E., Hall, D.G. & Stansly, P.A. (2009) Incidence of invasive *Diaphorina citri* (Hemiptera: Psyllidae) and its introduced parasitoid *Tamarixia radiata* (Hymenoptera: Eulophidae) in Florida citrus. *Journal of Economic Entomology*, 102, 247–256. https://doi.org/10.1603/029.102.0134

Sanchez, N.E., Pereyra, P.C. & Luna, G.M. (2009) Spatial patterns of parasitism of the solitary parasitoid *Pseudoapanteles dignus* (Hymenoptera: Braconidae) on *Tuta absoluta* (Lepidoptera: Gelechiidae). *Environmental Entomology*, 38 (2), 365–374. https://doi.org/10.1603/022.038.0208

Schauff, M.E., LaSalle, J. & Wijesekara, G.A. (1998) The genera of chalcid parasites (Hymenoptera: Chalcidoidea) of citrus leafminer (*Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae). *Journal of Natural History*, 32 (7), 1001–1056. https://doi.org/10.1080/00222939800770521

Shahadi, F., El-Bouhssini, M. & Babi, A. (2002) First record of parasitoid on the predator seven spotted coccinellid, *Coccinella septempunctata* L. (Coleoptera: Coccinellidae) in Syria. *Arab Journal of Plant Protection*, 20 (1), 49–51.

Sohrabi, F., Lotfalizadeh, H. & Salehipour, H. (2014) Report of a larval parasitoid of *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) from Iran. *Journal of Plant Protection Research*, 54 (3), 306–307. https://doi.org/10.2478/jppr-2014-0046.

Subba Rao, B.R. & Sharma, A.K. (1996) Two new species of parasites reared from *Stomopteryx nerteria* (Meyrick) (Lepidoptera: Gelechiidae). *Indian Journal of Entomology*, 28, 299–304.

Viggiani, G. & Sasso, R. (2008) Notizie morfo-biologiche sull' *Aprostocetus invidus* (Domenichini) (Hymenoptera: Eulophidae), parassitoide di *Lasioptera berlesiana* Paoli (Diptera: Cecidomyiidae). *Bollettino del Laboratorio di Entomologia Agraria Filippo Silvestri*, 62, 83–88.

Westwood, J.O. (1833) Descriptions of several new British forms amongst the parasitic hymenopterous insects. *Philosophical Magazine*, 3, 342–344. https://doi.org/10.1080/14786443308648197

Yarahmadi, F., Salehi, Z. & Lotfalizadeh, H. (2016) Two species of the genus *Elachertus* Spinola (Hym.: Eulophidae) new larval ectoparasitoids of *Tuta absoluta* (Meyreck) (Lep.: Gelechidae), *Journal of Crop Protection*, 5 (3), 413–418.

Yefremova, Z., Ebrahimi, E. & Yegorenkova, E. (2007) The Subfamilies Eulophinae, Entedoninae and Tetrastichinae in Iran, with description of new species (Hymenoptera, Eulophidae). *Entomofauna*, 28 (30), 405–440.

Urbaneja, A., Gonzalez Cabrera, J., Arno, J.K. & Gabarra, R. (2012) Prospects for the biological control of *Tuta absoluta* in tomatoes of the Mediterranean basin. *Pest Management Science*, 68, 1215–1222. https://doi.org/10.1002/ps.3344

Urbaneja, A., Vercher, R., Navarro, V., Porcuna, J.L. & Garcia-Marí, F. (2007) La polilla del tomate, *Tuta absoluta*. *Phytoma España*, 194, 16–24.

Zappalà, L., Bernardo, U., Biondi, A., Cocco, A., Deliperi, S., Delrio, G., Giorgini, M., Pedata, P., Rapisarda, C., Tropea Garzia, G. & Siscaro, G. (2012) Recruitment of native parasitoids by the exotic pest *Tuta absoluta* (Meyrick) in southern Italy. *Bulletin of Insectology*, 65, 51–61.

Zappalà, L., Biondi, A., Alma, A., Al-Jboory, I.J., Arnò, J., Bayram, A., Chailleux, A., El-Arnaouty, A., Gerling, D., Guenaoui, Y., Shaltiel-Harpaz, L., Siscaro, G., Stavrinides, M., Tavella, L., Aznar, R.V., Urbaneja, A. & Desneux, N. (2013) Natural enemies of the South American moth, *Tuta absoluta*, in Europe, North Africa and the Middle East, and their potential use in pest control strategies. *Journal of Pest Science*, 86, 635–647. https://doi.org/10.1007/s10340-013-0531-9

Zhu, C.D., Huang, D.W. (2003) A study of the genus *Euplectrus* Westwood (Hymenoptera: Eulophidae) in China. *Zoological Studies*, 42 (1), 140–164.

گونه‌ی *Stenomesius japonicus* (Ashmead) (Hymenoptera: Eulophidae): پارازیتویید جدید *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) در سوریه

روعۀ محسن یوسف[1*]، نبیل حسن ابوکاف[1] و رافیک عبود[2]

۱ گروه گیاهپزشکی، دانشکده کشاورزی، دانشگاه تشرین، لاذقیه، سوریه.
۲ مرکز تحقیقات علمی کشاورزی، لاذقیه، سوریه.
* پست الکترونیکی نویسنده مسئول مکـاتبه: *rawayoussef@hotmail.com*

| **تاریخ دریـافت:** ۳۰ آبان ۱۴۰۰ | **تاریخ پذیرش:** ۱۵ اسفند ۱۴۰۰ | **تاریخ انتشار:** ۲۲ فروردین ۱۴۰۱ |

چکیـده: گونه‌ی *Stenomesius japonicus* (Ashmead, 1904) (Hymenoptera: Eulophidae) برای اولین بار از روی مینوز برگ گوجه فرنگی *Tuta absoluta* (Meyrick, 1917) (Lepidoptera: Gelechiidae) آفت مهم گوجه‌فرنگی (*Lycopersicon esculentum* Mill.) در سوریه، جمع‌آوری شد. صفات مرفولوژیک افتراقی، زیست‌شناسی و انتشار گونه گزارش شده، ارایه گردید. نقش این گونه در کنترل بیولوژیک یا کنترل تلفیقی *T. absoluta* باید ارزیابی شود. لیست زنبورهای Eulophidae گزارش شده از سوریه ارایه شد.

واژگـان کلیدی: Eulophidae، پارازیتویید، *Tuta absoluta*، سوریه