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First report of *Agathis fuscipennis* in Europe as parasitoid of the tomato leafminer *Tuta absoluta*

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Abstract

Agathis fuscipennis (Zetterstedt) (Hymenoptera Braconidae) was collected for the first time from larvae of the tomato leafminer *Tuta absoluta* (Meyrick) (Lepidoptera Gelechiidae) infesting *Solanum nigrum* (L.) plants in Tuscany (Central Italy). The knowledge about this parasitoid is still scarce. Its role in the biological or integrated control of *T. absoluta* remains to be evaluated.

Key words: Braconid, new host, *Tuta absoluta*.

Introduction

Tuta absoluta (Meyrick) (Lepidoptera Gelechiidae) is a moth native from South America, where it is an important pest of tomato crops (Filho *et al*., 2000; Gomide *et al*., 2001). In 2006 it was accidentally introduced in Spain (Urbaneja *et al*., 2007) from where it spread very quickly in many other countries of the western Paleartic Region (Desneux *et al*., 2010; EPPO, 2009a; 2009b; 2010; Ostrauskas and Ivinskis, 2010).

The tomato leafminer larvae feed inside the mesophyll tissue, hollowing it out. They can also penetrate young stems and fruits. Its damages are heavy both in greenhouse and in field crops. Although tomato (*Lycopersicon esculentum* Mill.) is the preferred host plant, larvae of *T. absoluta* can live also on other cultivated plants such as *Solanum tuberosum* L. (potato), *Solanum melongena* L. (aubergine), *Solanum muricatum* Aiton (sweet pepper), *Nicotiana tabacum* L. (tobacco), *Phaseolus vulgaris* L. (bean) and *Physalis peruviana* L. (cape gooseberry) (Desneux *et al*., 2010). On wild species, the larvae can be found on *Datura stramonium* L., *Datura ferox* L., *Lycium chilense* (Coralillo), *Lycopersicum hirsutum* L., *Nicotiana glauca* (Graham), *Solanum lyratum* Thumberg, *Solanum puberulum* Nuttal ex Seemann, *Solanum nigrum* L. (EPPO, 2007).

Chemical insecticides are still the main tool used for *T. absoluta* control both in South America and in Europe, although the mating disruption technique has given encouraging results (Filho *et al*., 2000). Furthermore there is an increasing interest in assessing the potential role of both native natural enemies and European endemic enemies in reducing the pest populations (Vivan *et al*., 2003; Arnó *et al*., 2010; Desneux *et al*., 2010).

Materials and methods

Observations were carried out in September - October of the years 2009 and 2010, at Capezzano Pianore (Lucca - Italy). In order to avoid the negative effects of insecticides sprays on entomophagous survival, leaves infested with *T. absoluta* were collected from plants of the wild host *S. nigrum* nearby of a tomato greenhouse heavily infested with the tomato leafminer. Both in 2009 and 2010, about 1000 leaves with mines, were cut and isolated from *S. nigrum* plants. This material was divided inside three plastic cages and maintained in the lab under standard conditions (23 ± 1 °C and 55 ± 10% RH) to allow the emergence of adults of both *T. absoluta* and eventual parasitoids. The leaves were left inside the cages until no more adults emerged and then they were counted.

Agathis fuscipennis (Zetterstedt) (Hymenoptera Braconidae) was identified using the key of Simbolotti and van Achterberg (1999) in the laboratory of the Department of Terrestrial Zoology, Netherlands Centre for Biodiversity Naturalis at Leiden (The Netherlands). *T. absoluta* adults were identified according to the keys and descriptions presented by Povolny (1994). The specimens of both species are conserved in the Department of Tree Science, Entomology and Plant Pathology "G. Scaramuzzi" of Pisa (Italy).

Results and discussion

In both 2009 and 2010 adults of *T. absoluta* and *A. fuscipennis* emerged from the infested leaves in the cages. In 2009, 731 adults of *T. absoluta* and 201 specimens of the parasitoid *A. fuscipennis* were obtained while in 2010, 521 adults of *T. absoluta* and 103 specimens of *A. fuscipennis* emerged. The rate adults of *T. absoluta* / adults of *A. fuscipennis* was quite high, suggesting a percentage parasitism of about 20% of the larval population. *A. fuscipennis* was the only parasitoid emerged from our samples. All species of the genus *Agathis* are solitary koinobiont endoparasitoids of many concealed Lepidopteran larvae (Simbolotti and van Achterberg, 1999). *A. fuscipennis* is a polyphagous parasitoid living on many Lepidopteran families such as Coleophoridae, Gelechiidae, Oecophoridae and Tortricidae (Simbolotti and van Achterberg, 1999; Yu and van Achterberg, 2010), thus *T. absoluta* is well fitting in its host pattern (table 1). This is the first record of this species in southern Italy (sensu Check list of the Italian Fauna, 2003; van Achterberg, 2010).

Table 1. Hosts of *A. fuscipennis* (Taxapad.com database, Yu and van Achterberg, 2010).

Host	Host plant
Aproaerema anthyllidella (Hubner)	[on *Anthyllis* sp. L.]
Caryocolum saginella Zeller	
Chrysoesthia hermannella F.	
Chrysoesthia sexguttella (Thunberg)	[on *Chenopodium album* L.]
Coleophora sp. Hubner	
Coleophora albicostella Duponchel	[on *Potentilla* sp. L.]
Coleophora albitarsella Zeller	[on *Origanum vulgare* L.]
Coleophora artemisiae Muhlig	
Coleophora artemisicolella Bruand	
Coleophora chamaedriella Bruand	
Coleophora conspicuella Zeller	[on *Aster linosyris* (L.) Bernhard]
Coleophora conyzae Zeller	[on *Pulicaria dysenterica* (L.) Bernhard]
Coleophora cracella Vallot	
Coleophora dianthi Herrich Schaffer	
Coleophora follicularis Vallot	[on *Pulicaria dysenterica*(L.) Bernhard]
Coleophora granulatella Zeller	
Coleophora inulae Wocke	[on *Pulicaria dysenterica*(L.) Bernhard]
Coleophora laripennella (Zetterstedt)	
Coleophora linosyridella Fuchs	
Coleophora meridionella Rebel	
Coleophora salicorniae Heinemann et Wocke	
Coleophora salinella Stainton	
Heliodines roesella (L.)	[on *Atriplex sp*. L.]
Ochromolopis ictella (Hubner)	
Olethreutes arbutella (L.)	
Scrobipalpa atriplicella (Fischer von Roslerstamm)	[on *Chenopodium album* L.]
Scrobipalpa gallicella Constandt	
Scrobipalpa ocellatella Boyd	
Spilonota ocellana (Denis et Schiffermuller)	
Thiotricha subocellea (Stephens)	

From: http://www.taxapad.com/local.php?newwolp=90220224

The entomophagous complex living on *T. absoluta* larvae in its native areas has been assessed while not very much is known about the parasitoids and predators in the new colonized areas. A list of new recorded enemies for Europe is summarized in the paper of Desneux *et al*. (2010). Among these, some undetermined species of Braconidae are reported. Different Braconids were found living on the South America tomato leafminer. *Pseudoapanteles dignus* (Muesebeck) is reported as the main solitary larval parasitoid (about 30% of mean parasitization rate), although it can parasite also other Gelechiidae of economic importance (Cardona and Oatman, 1971; Sanchez *et al*., 2009).

Other Braconids are reported living on *T. absoluta*, belonging to the genus *Bracon*, *Earinus*, *Apanteles*, *Diadegma*, *Orgilus*, *Chelonus*, and also an *Agathis* sp. is mentioned (Desneux *et al*., 2010; Marchiori *et al*., 2004).

The first observation on *A. fuscipennis* refers to a limited period of time and to a restricted geographical area. It will be interesting to extend the survey in space and time for an evaluation of the role played by this parasitoid in the development of integrated and/or biological control protocols for *T. absoluta*.

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