

SHORT COMMUNICATION

# Parasitism of *Automeris liberia* (Lepidoptera: Saturniidae) by tachinids (Diptera: Tachinidae) in oil palm in the Brazilian Amazon

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## ABSTRACT

*Automeris liberia* (Lepidoptera: Saturniidae) caterpillars are important defoliators of the African oil palm, *Elaeis guineensis* (Arecaceae) in Central and South America. The family Tachinidae (Diptera) comprises flies that are parasitoids of many insect pests, mainly from the order Lepidoptera. However, host records for tachinids are still relatively scarce. In the present work, we report the occurrence of *Belvosia* sp. aff. *williamsi* (Diptera: Tachinidae: Exoristinae: Goniini) and *Leptostylum oligothrix* (Diptera: Tachinidae: Exoristinae: Blondeliini) parasitizing caterpillars of *A. liberia* in *E. guineensis* in the municipality of Tailândia, state of Pará, Brazil. This is the first record of the parasitism of *A. liberia* by *Leptostylum* in Brazil, as well as by *Belvosia* in the world.

**KEYWORDS:** *Belvosia*, *Leptostylum*, Exoristinae, Blondeliini, Goniini

## Parasitismo de *Automeris liberia* (Lepidoptera: Saturniidae) por taquinídeos (Diptera: Tachinidae) em palma de óleo na Amazônia brasileira

## RESUMO

Lagartas de *Automeris liberia* (Lepidoptera: Saturniidae) são importantes desfolhadoras da palma de óleo, *Elaeis guineensis* (Arecaceae) nas Américas Central e do Sul. A família Tachinidae (Diptera) compreende moscas parasitóides de muitos insetos-praga, principalmente da ordem Lepidoptera. Contudo, o registro de hospedeiros de taquinídeos ainda é relativamente escasso. No presente trabalho, relatamos a ocorrência de *Belvosia* sp. aff. *williamsi* (Diptera: Tachinidae: Exoristinae: Goniini) e *Leptostylum oligothrix* (Diptera: Tachinidae: Exoristinae: Blondeliini) parasitando lagartas de *A. liberia* em *E. guineensis* no município de Tailândia, Pará, Brasil. Trata-se do primeiro registro do parasitismo de *A. liberia* por *Leptostylum* no Brasil, bem como o primeiro por *Belvosia* no mundo.

**PALAVRAS-CHAVE:** *Belvosia*, *Leptostylum*, Exoristinae, Blondeliini, Goniini

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*Automeris liberia* (Cramer, 1780) (Lepidoptera: Saturniidae) is a moth with caterpillars that infest oil palm, *Elaeis guineensis* Jacq. (Arecaceae), with records of infestation of palm plantations in Colombia, Peru, Venezuela and the Brazilian Amazon (Genty et al. 1978; Aldana de La Torre et al. 2010). The northern region of Brazil is the largest producer of oil palm in the country, and the state of Pará has approximately 88% of the area devoted to palm oil production in the country (Brandão et al. 2019). Considerable outbreaks of *A. liberia* caterpillars in the field cause defoliation that makes production unfeasible and, in addition, the caterpillars are dangerous to humans because their bodies are covered with urticating setae (Genty et al. 1978; Aldana de La Torre et al. 2010).

The Tachinidae (Diptera) family comprises more than 8,500 species distributed in all geographic regions of the planet, with the exception of Antarctica (O'Hara 2013; O'Hara et al. 2020; Stireman et al. 2019). The Neotropical region has 3,032 species (O'Hara et al. 2020), with about 785 recorded for Brazil (Nihei et al. 2021). All known species are endoparasitoids of insects and other arthropods and, although they attack hosts of 15 different orders of Arthropoda, the vast majority of tachinids parasitize holometabolic insect larvae (Stireman et al. 2019; 2021). The order Lepidoptera represents 70% of known host species (Dindo and Grenier 2014; Dindo and Nakamura 2018). As natural enemies of these primarily phytophagous groups, tachinids have been considered one of the most important groups of biological control agents (Gudin and Messas 2018; Weber et al. 2021), both in natural environments and in managed ecosystems (Stireman et al. 2019). However, when compared to the diversity of tachinid species, host records for them are still scarce (Scaramozzino et al. 2020).

As there is no product with permitted use for the control of *A. liberia* in Brazil, the search for management alternatives, including natural enemies, is of great importance. Identifying natural enemies is an essential step in establishing a pest management program. Thus, aiming to contribute to the knowledge about alternatives for the biological pest control, here we report the parasitism of *A. liberia* by two tachinid species in oil palm in the Brazilian Amazon.

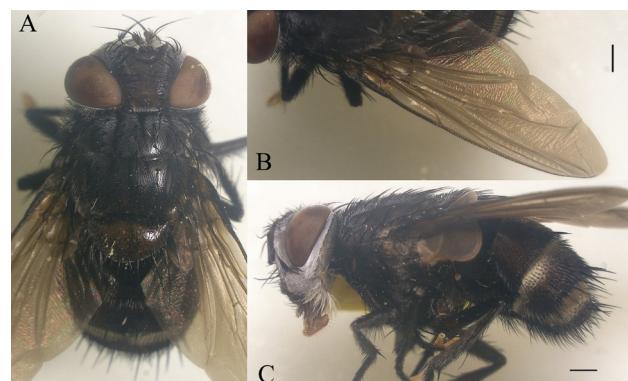
In March 2021, a collection of *A. liberia* caterpillars was carried out in commercial oil palm plantations of Grupo Agropalma S/A, in the municipality of Tailândia, state of Pará, Brazil ( $2^{\circ}31'16''S$ ;  $48^{\circ}46'25''W$ ). The cultivation area has 120 ha and density of 143 palms  $ha^{-1}$ , with ages ranging from three to five years. We found 68 caterpillars of different instars infesting palms in the field. The caterpillars were taken to the laboratory, placed individually in plastic pots (10 cm in diameter  $\times$  6 cm high) and kept in a rearing room at  $25 \pm 2^{\circ}C$ , relative humidity of  $68 \pm 10\%$  and 12L/12D photoperiod, with natural diet (host plant leaflets). The containers were

monitored every 24 hours to check the possible presence of natural enemies.

Parasitism by tachinids was observed in two instances. In 10.3% of the *A. liberia* specimens, tachinid larvae left the body of the caterpillars and pupated inside the plastic containers (the pupae were collected and kept until the emergence of the adult flies). In 4.4% of the *A. liberia* specimens, adult tachinids emerged directly from the host's pupae. In both cases, adult parasitoids were collected and preserved in 70% alcohol. The tachinids were identified based on Aldrich (1928) and Gudin and Messas (2018), and the specimens were deposited in the zoological reference Collection of the Universidade Federal de Mato Grosso do Sul (ZUFMS), in Campo Grande, Mato Grosso do Sul, Brazil.

The emerged tachinids were identified as *Belvosia* sp. aff. *williamsi* Aldrich, 1928 (Exoristinae: Goniini) (Figure 1) (eight individuals, six males and two females) (vouchers ZUFMS-DIP01252 - ZUFMS-DIP01254) and *Leptostylum oligothrix* Gudin & Messas, 2018 (Exoristinae: Blondeliini) (Figure 2) (30 individuals, 12 males and 18 females) (vouchers ZUFMS-DIP01248 - ZUFMS-DIP01251).

Male specimens of *Belvosia* run to *B. williamsi* in the key of Aldrich (1928) and, with the exception of the genal hairs without reddish reflections and the postpedicel a little less than twice the length of the pedicel, agree with the description of this species. However, Aldrich (1928) did not describe the



**Figure 1.** Male of *Belvosia* sp. aff. *williamsi*. A – dorsal view; B – detail of wing; C – lateral view. Scale bars = 1 mm. This figure is in color in the electronic version.



**Figure 2.** Male of *Leptostylum oligothrix*. A – dorsal view; B – lateral view. Scale bars = 1 mm. This figure is in color in the electronic version.

male terminalia of *B. williamsi*, so that it is not currently possible to make a definitive identification.

The specimens identified as *L. oligothrix* can be easily distinguished from other species of the genus by the following combination of features: ocellar triangle and fronto-orbital plate with golden pruinosity, well-developed ocellar setae, eyes sparsely haired with short hairs, palpus yellow, tegula and basicosta black, calyptora white with yellowish margin, basal dorsal surface of tergites 3, 4 and 5 with faint yellowish pruinosity, and postgonite subtrapezoidal (Gudin and Messas 2018). However, our specimens differed slightly from the description by Gudin and Messas (2018) in having the golden pruinosity of the fronto-orbital plate extending below the second anterior frontal seta covering the upper half of the parafacial (instead of having fronto-orbital plate with golden pruinosity to the level of the second anterior seta), antenna brown with the apex of the pedicel and the basal portion of the postpedicel reddish brown (instead of antenna being black), labella yellow (instead of labella being reddish-brown), surstylus in posterior view slightly wider and less straight and in lateral view slightly broader at the base, cercus in posterior view narrowing more evenly from base to apex, postgonite narrowing towards apex but more digitiform, and pregonite with posterior margin straighter. Despite the above differences, our specimens were tentatively identified here as *L. oligothrix* until more material is available for further study.

The genus *Belvosia* Robineau-Desvoidy, 1830 has 71 valid species, some of them with Nearctic distribution, but most described from the Neotropical region, from Mexico to Argentina and Chile (O'Hara et al. 2020). The genus *Leptostylum* Macquart, 1851 is distributed from southern Mexico to southeastern Brazil. Despite being considered a diverse taxon, with many species yet to be described (Wood and Zumbado 2010), the genus currently has nine valid species (Gudin and Messas 2018; O'Hara et al. 2020).

In South America, species of *Belvosia* have been previously reported from hosts from the families Arctiidae, Limacodidae, Megalopygidae, Mimallonidae, Notodontidae, Nymphalidae, Saturniidae and Sphingidae (Lepidoptera) (Guimarães 1977). With respect to the genus *Leptostylum*, most known hosts are lepidopterans from the family Saturniidae (Jacobson 1991; Stireman et al. 2009; Gudin and Messas 2018). However, the record of hosts of Tachinidae, especially in the Neotropical region, is still considered scarce (Gudin and Messas 2018). Additional families of lepidopteran hosts for *Belvosia* and *Leptostylum* were identified in Costa Rica, such as Erebidae, Eupterotidae, Hesperiidae and Noctuidae (Janzen and Hallwachs 2009).

Tachinidae larvae develop inside the host, consuming its tissues and typically killing it, and then pupate inside the host's corpse or in the litter or soil (Stireman et al. 2006). The tachinids identified as *L. oligothrix* in our study abandoned

the host's body when the host was still in the larval stage, leaving the caterpillar corpse flaccid and pupating out of it. In contrast, the larvae of *Belvosia* sp. aff. *williamsi* allowed the host to reach the stage of pupa, from which they emerged, leaving the host's pupa still rigid.

A species of *Leptostylum* has been reported to parasitize *A. liberia* in Peru (Jacobson 1991). However, the present work is the first formal record of *A. liberia* being parasitized by a *Leptostylum* species in Brazil, as well as the first worldwide record of an association between *A. liberia* and *Belvosia*. It should be noted that these genera are well-known to be associated with other species of *Automeris* (Guimarães 1977; Jacobson 1991; Ramírez et al. 2004; Janzen and Hallwachs 2009; Stireman et al. 2009; Gudin and Messas 2018).

Our results open a perspective of potential use of the parasitoids *Belvosia* sp. aff. *williamsi* and *L. oligothrix* in the biological control of *A. liberia* in oil palm and other crops attacked in South America, and potentially bring gains in production without impacting humans and the environment.

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