

Emergence of *Palmistichus elaeisis* (Hymenoptera: Eulophidae) from Pupae of *Thagona tibialis* (Lepidoptera: Lymantriidae) Collected in the Medicinal Plant *Terminalia catappa* (Combretaceae)

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Source: Entomological News, 122(3):250-256.

Published By: The American Entomological Society

<https://doi.org/10.3157/021.122.0306>

URL: <http://www.bioone.org/doi/full/10.3157/021.122.0306>

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**EMERGENCE OF *PALMISTICHUS ELAEISIS*
(HYMENOPTERA: EULOPHIDAE) FROM PUPAE OF
THAGONA TIBIALIS (LEPIDOPTERA: LYMANTRIIDAE)
COLLECTED IN THE MEDICINAL PLANT
TERMINALIA CATAPPA (COMBRETACEAE)¹**

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ABSTRACT: The biological control of pests is an alternative to chemical control in plant crops used in folk medicine. The bark and the roots of tropical almond *Terminalia catappa* L. (Combretaceae) are indicated for dysentery, bile and gastric fevers and intestinal parasites; the leaves are used to treat colic and hemorrhoids; the unripe fruit is an astringent, the ripe fruit is a laxative, and its oil is used as an emulsifier for soothing the chest. *Palmistichus* spp. (Hymenoptera: Eulophidae), gregarious endoparasitoids, were little known until the publication of the first revision of this group in 1993. Fifty-four individuals of *Palmistichus elaeisis* Delvare and LaSalle, 1993 (Hymenoptera: Eulophidae) were collected after emerging from a pupa of *Thagona tibialis* Walker, 1855 (Lepidoptera: Lymantriidae) when their caterpillars defoliated a tree of *T. catappa* at the campus of the Federal University of Viçosa (UFV) in Viçosa, Minas Gerais State, Brazil. The parasitoid individuals were identified by the Department of Biology of the Lund University in Sölvegatan, Lund, Sweden. The present study includes a new host, pupae of *T. tibialis* associated to *T. catappa*, for *P. elaeisis* in Brazil.

KEY WORDS: Biological control, Combretaceae, Eulophidae, host, Lymantriidae, *Palmistichus elaeisis*, parasitism, pupae, *Terminalia catappa*, *Thagona tibialis*

INTRODUCTION

The medicinal plant *Terminalia catappa* L., (tropical almond), of Combretaceae family has astringent, aphrodisiac, antibiotic, anticarcinogenic, anticlastogenic, antispasmodic, antioxidant, antiseptic, laxative and vermifuge properties (Swamy et al., 2006; Chen et al., 2010; Hnawia et al., 2011). The bark and root of this plant are indicated for dysentery, bile and gastric fevers and intestinal parasites; its leaves are used to treat colic and hemorrhoids; its unripe fruit is astringent, while the mature, fresh fruit is a laxative, and its oil is used as an emulsifying agent for soothing the chest (Attarpour, 2009; Chikezie and Uwakwe, 2011; Polesna et al., 2011). This plant can also be useful in the treatment of disorders of the liver and gallbladder, cancer, abdominal pain, premature ejaculation and parasites (Lin et al., 2001; Chu et al., 2007; Yang et al., 2010).

¹ Received on September 30, 2011. Accepted on February 20, 2012.

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Products made from the leaves of *T. catappa* are used in fish farms to fight parasites (Chansue, 2007; Tavechio et al., 2009). Humic acid, tannic acid and some flavonoids, especially quercetin and kaempferol, are found in leaves of *T. catappa* (Chen et al., 2000; Braga et al., 2007; Anam et al., 2009). Humic acid has powerful antiviral properties and stimulates the production of human macrophages. Tannic acid is used as an anticarcinogenic, antioxidant and antibacterial agent, being effective against herpes simplex (lip sore) and vaginal herpes. Quercetin is used as an anti-inflammatory agent and kaempferol has anti-allergic, anticoagulant, anti-inflammatory, antiviral and diuretic properties (Goun et al., 2003; Eloff et al., 2008; Yoshida et al., 2010).

The caterpillars of *Thagona tibialis* Walker, 1855 (Lepidoptera: Lymantriidae) are 40 mm long, blue and white, with subdorsal spots and orange and black dots; bristles of varying length and white-colored verrucas. Pupae of this species are slightly hairy, green, with black dots and visible black cremaster (Forbes, 1939). This insect occurs in Central and South America. In Brazil it is relatively abundant in the Cerrado and Atlantic Rainforest biomes (Diniz et al., 2001, 2011). The biology of *T. tibialis* was studied in Argentina (Jørgensen, 1928) where this species defoliates plants of the Euphorbiaceae, Lauraceae, Piperaceae, Sapindaceae and Vitaceae families (D'Araújo e Silva et al., 1968; Biezanko et al., 1974; Zenker et al., 2010).

Palmistichus elaeisis Delvare and LaSalle, 1993 (Hymenoptera: Eulophidae) is a polyphagous gregarious pupal endoparasitoid of native and introduced Lepidoptera, including the soybean defoliators *Anticarsia gemmatalis* Hübner, 1818 (Noctuidae) (Pereira et al., 2010a, 2010b); eucalyptus, *Thyrinteina arnobia* Stoll, 1782 and *Thyrinteina leucoceraea* Rindge, 1961 (Geometridae) and *Dirphia moderata* Bouvier, 1929 (Saturniidae) (Pereira et al., 2008, 2011); wheat, *Pseudaletia sequax* Franclemont, 1951 (Noctuidae); cotton, *Alabama argillacea* Hübner, 1818 (Noctuidae); blackberry, *Halysidota pearsoni* Watson, 1980 (Arctiidae) (Pereira et al., 2008); passion fruit, *Dione juno juno* Cramer, 1779 (Nymphalidae) (Gil-Santana and Tavares, 2006); silkworm, *Bombyx mori* L., 1758 (Bombycidae) (Pereira et al., 2009a, 2009b, 2010c) and the stored grain pest *Tenebrio molitor* L., 1785 (Coleoptera: Tenebrionidae) (Zanuncio et al., 2008).

The aim of this study was to report pupal parasitism of *T. tibialis* by *P. elaeisis*, after caterpillars of this Lepidopteran fed on a plant of *T. catappa* in the field.

METHODS

Forty-nine pupae of *T. tibialis* were collected on May 4, 2011, in a *T. catappa* tree grown next to the parking lot of the Chemistry Department on the campus of the Federal University of Viçosa (UFV), in Viçosa, Minas Gerais State, Brazil (20°45'S, 42°51'W, 651 m) (Tavares, et al., 2011b). These pupae were placed in plastic cups, brought to the Laboratory of Biological Control of Insects (LCBI) of UFV and kept in test tubes (14cm length x 2.2cm dia.) sealed with cotton wool

until the emergence of adult moths or of parasitoids. Samples of this plant were deposited in the herbarium of the UFV. *Palmistichus elaeisis* which emerged from pupae of *T. tibialis* were counted.

Parasitoids which emerged from a pupa of *T. tibialis* were killed and sent for identification to the Department of Biology, Lund University, Sölvegatan, Lund, Sweden. Samples of these insects are deposited in the collections of Lund University and of the UFV.

RESULTS

Fifty-four individuals of *P. elaeisis* (Figs. 1A and 1B) emerged on May 9, 2011. This is the first record of parasitism of this natural enemy in a pupa of *T. tibialis* after its caterpillars defoliated the medicinal plant *T. catappa* (Figs. 2A, 2B, 2C and 2D) in the urban area of Viçosa, Minas Gerais State, Brazil (Fig. 3).



Fig. 1. Females of *Palmistichus elaeisis* (Hymenoptera: Eulophidae) parasitizing pupae of (A) *Tenebrio molitor* (Coleoptera: Tenebrionidae) and (B) *Anticarsia gemmatalis* (Lepidoptera: Noctuidae).

DISCUSSION

The defoliation by caterpillars of *T. tibialis* can reduce the amount of foliage of *T. catappa*, which are used as raw material for manufacturing drugs. This demonstrates that *T. tibialis* feeds on *T. catappa*, but the polyoxygenated longipinane derivatives from this plant were toxic to *Spodoptera littoralis* Boisduval, 1833 (Noctuidae) and *Rhopalosiphum padi* L., 1758 and *Myzus persicae* Sulzer, 1776 (Hemiptera: Aphididae) (Cerda-Garcia-Rojas et al., 2010). As *T. catappa* is used in the treatment of diseases (see Introduction), reduced leaf area due to feeding by *T. tibialis* reduces the rate of photosynthesis, which leads to reduction in the amount and quality of its fruits, whose oil is used as an emulsifying agent for soothing the chest. The unripe fruit is astringent and the mature fruit is laxative (Attarpour, 2009; Chikezie and Uwakwe, 2011; Polesna et al., 2011).

Parasitism of *P. elaeisis* in pupa of *T. tibialis* collected from *T. catappa* indicated that biological control may reduce the population of this defoliator. This lepidopteran was also parasitized by *Trichospilus pupivorus* Ferrière (Hymenoptera: Eulophidae) in a tree of *T. catappa* in Viçosa, Minas Gerais State, Brazil (Tavares et al., 2011a). *Palmistichus elaeisis* was effective in the control of lepidopteran defoliators of *Eucalyptus* when released at a density of 25 females/host pupa (Pereira et al., 2008, 2011). Moreover, it is readily reared in the laboratory on pupae of Lepidoptera and Coleoptera (Gil-Santana and Tavares, 2006; Pereira et al., 2010a, 2010b, 2008; Zanuncio et al., 2008). Pupae of *B. mori* stored for 15 days at 10°C can be used as hosts for this parasitoid (Pereira et al., 2009a, 2009b, 2010c). Biological control exercised by *P. elaeisis* on pupae of *T. tibialis* is an alternative to chemical pesticides in plants used in folk medicine.

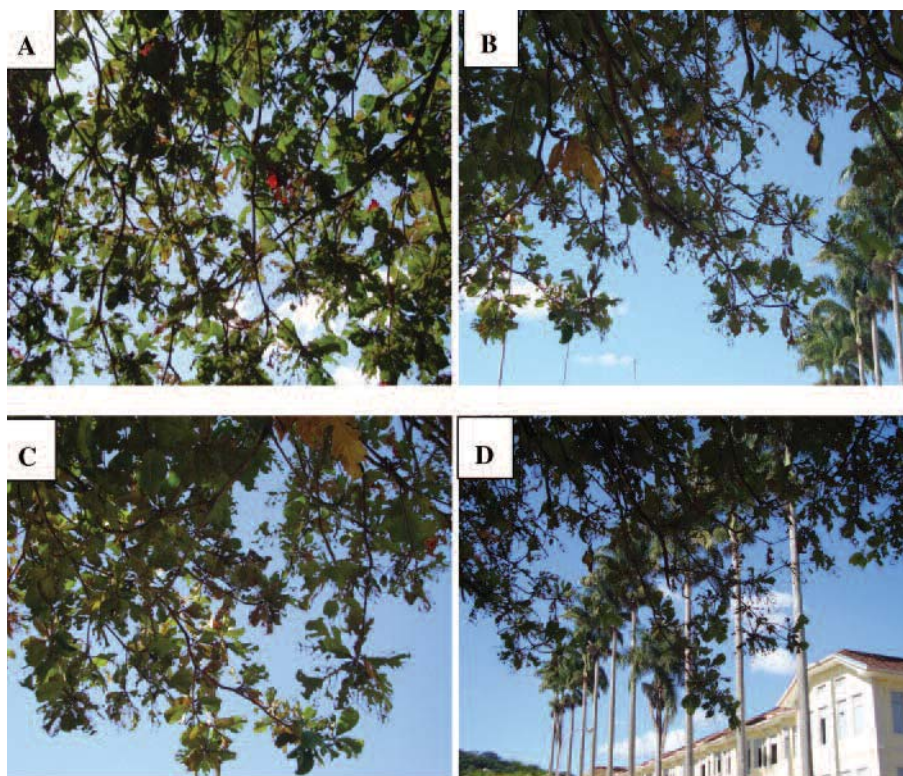


Fig. 2. Four views of defoliation by larvae of *Thagonia tibialis* (Lepidoptera: Lymantriidae) of the medicinal tree *Terminalia catappa* (Combretaceae) in Viçosa, Minas Gerais State, Brazil.



Fig. 3. Location of Viçosa, Minas Gerais State, Brazil, and the area where pupa of *Thagonia tibialis* (Lepidoptera: Lymantriidae) parasitized by *Palmistichus elaeisis* (Hymenoptera: Eulophidae) was collected in a tree of the medicinal plant *Terminalia catappa* (Combretaceae).

ACKNOWLEDGMENTS

The authors thank Dr. Vitor Osmar Becker of the Uiraçu Institute in Camacan, Bahia State, Brazil, for identifying *Thagonia tibialis* Walker, 1855 (Lepidoptera: Lymantriidae). Thanks go to Dr. Rosenilson Pinto of the Department of Animal Biology of Federal University of Viçosa in Viçosa, Minas Gerais State, Brazil, for providing Figs. 1A and 1B; to Dr. Alexandre Igor de Azevedo Pereira of the Goiano Federal Institute in Urutai, Goiás State, Brazil, for providing Fig. 3; and to Dra. Mônica Ruediger de Britto Velho for English corrections. Thanks also go to “Conselho Nacional de Desenvolvimento Científico e Tecnológico” (CNPq), “Coordenação de Aperfeiçoamento de Pessoal de Nível Superior” (CAPES) and “Fundação de Amparo a Pesquisa do Estado de Minas Gerais” (FAPEMIG) for supporting this research.

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