Palmistichus elaeisis (Hymenoptera: Eulophidae) Parasitizing Pupae of Citioica anthonilis (Lepidoptera: Saturniidae) Collected on Piptadenia gonoacanther (Fabaceae)

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Source: The Journal of the Lepidopterists' Society, 66(4) : 216-220

Published By: The Lepidopterists' Society

URL: https://doi.org/10.18473/lepi.v66i4.a5
ABSTRACT. The moth *Citioica anthonilis* (Herrich-Schaeffer, [1854]) (Lepidoptera: Saturniidae: Ceratocampinae) occurs in areas of preserved forests, where it is a significant defoliator of *Piptadenia gonoacantha* (Martius) Macbride (Fabaceae) trees. In this study, caterpillars of fourth instar *C. anthonilis* were collected from the ground after falling from a *P. gonoacantha* tree in a herbarium and were reared in the laboratory. Pupae of *C. anthonilis*, the velvetbean caterpillar *Anticarsia gemmatalis* Hübner, 1818 (Lepidoptera: Noctuidae), and the flour beetle *Tenebrio molitor* Linnaeus, 1758 (Coleoptera: Tenebrionidae) were each parasitized by mated parasitoid females wasp *Palmistichus elaeisis* Delvare & LaSalle, 1993 (Hymenoptera: Eulophidae). Data were collected relating to the levels of parasitism and emergence rates of *P. elaeisis* per host pupa, and the size of the host pupae. Our results show that the fecundity of *P. elaeisis* was highest in *C. anthonilis* hosts, probably because of the greater size of these pupae, which supported the development of an increased number of parasitoids. Therefore, *C. anthonilis* is a suitable host for rearing *P. elaeisis* in the laboratory, which could be a means of rearing parasitoids for the biological control of this defoliator of *P. gonoacantha* and other pests in Brazil.

The objective of this study was to assess the suitability of alternatives hosts for rearing *P. elaeisis* in the laboratory. We used pupae of its natural host, *C. anthonilis*, and also of the velvetbean caterpillar *Anticarsia gemmatalis* Hübner, 1818 (Lepidoptera: Noctuidae), and the flour beetle *Tenebrio molitor* Linnaeus, 1758 (Coleoptera: Tenebrionidae). We recorded the rates of parasitism, and emergence of *P. elaeisis* from pupae of these species, as well as the length and width of each host pupa.

**Materials and Methods**

On May 4, 2011, 25 fourth-instar caterpillars of *C. anthonilis* were collected from the ground after falling from a *Piptadenia gonoacantha* (Martius) Machride (Fabaceae) tree in the herbarium of the Federal University of Viçosa (UFV) in Viçosa, Minas Gerais State, Brazil (20°45’S, 42°51’W, 651 m above sea level; Atlantic Forest biome) (Tavares et al. 2011a). The occurrence of *P. gonoacantha* is widespread throughout the Atlantic Forest biome of Brazil (Marques et al. 2009, Braga et al. 2011). The caterpillars were brought to the Laboratory of Biological Control of Insects (LCBI) from UFV and kept at 25 ± 1ºC, under a 12-h photoperiod and 70 ± 10% relative humidity (RH) in 1L plastic cups (UFV and kept at 25 ± 1ºC, under a 12-h photoperiod and 70 ± 10% relative humidity (RH) in 1L plastic cups and 70 ± 10% relative humidity (RH) in 1L plastic cups). Five pupae of *P. elaeisis* were photographed in the plastic cups until adult emergence. Four adult females were sent to the Department of Zoology of Federal University of Viçosa (UFV) for identification by Dr. Christer Hansson. Five pupae of *C. anthonilis* were kept in plastic cups until adult emergence. Four adult females were sent to the Department of Zoology of Federal University of Paraná in Curitiba, Paraná State, Brazil for identification by Dr. Olaf Hermann Hendrik Mielke. Second (Fig. 1), fourth (Fig. 2) and fifth instar (Fig. 3) caterpillars, and adult (Fig. 4) *C. anthonilis* were photographed by Leroy Simon and these pictures are available at http://www.silkmoths.bizland.com/phlsimon.htm.

**Results**

Pupae of *C. anthonilis* were longer (3.82 ± 0.28 cm) and wider (0.8 ± 0.04 cm) than those of *A. gemmatalis* (1.68 ± 0.19 cm and 0.67 ± 0.02 cm, respectively), which, in turn, were longer and wider than those of *T. molitor* (1.47 ± 0.12 cm and 0.59 ± 0.01 cm, respectively) (F<sub>2,57</sub>; P<0.05 in both cases).

In total, *P. elaeisis* parasitized 100% of *C. anthonilis* pupae, 90% of *T. molitor* pupae and 70.0% of *A. gemmatalis* pupae.
gemmatalis pupae. The same values applied to the emergence of P. elaeisis from the pupae of each species (i.e. parasitoids emerged from each of the pupae that had been parasitized).

More P. elaeisis emerged per C. anthonilis pupa (286 ± 29 insects) than from A. gemmatalis pupae (108 ± 17 insects), totals that were both higher than from T. molitor pupae (69 ± 7 insects) (F²,57; P<0.05).

**DISCUSSION**

This is the first report of the parasitism of C. anthonilis pupae by P. elaeisis in the laboratory. The parasitism of C. anthonilis by progeny of P. elaeisis collected from T. tibialis pupa sampled from T. catappa trees in Viçosa confirms the ability of a wild strain of P. elaeisis to parasitize C. anthonilis pupae in the laboratory. However, wild strains of parasitoids might require several generations in the laboratory to develop an adequate parasitic ability on alternative hosts, including P. elaeisis collected in the field in Viçosa on pupae of A. gemmatalis, Bombyx mori Linnaeus, 1758 (Lepidoptera: Bombycidae) and Thyrinteina arnobia (Stoll, 1782) (Lepidoptera: Geometridae) (Pereira et al. 2010b, 2011).

Parasitism of C. anthonilis pupae by P. elaeisis suggests that this host is suitable for rearing this parasitoid in the laboratory. The occurrence of C. anthonilis in preserved areas of native forests in several
States and in the Federal District of Brazil and the adaptation of *P. elaeisis* and other hymenopteran parasitoids in urban areas to *T. catappa* and to plantations of crop species from the Areaceae, Myrtaceae and Passifloraceae suggests the need to maintain areas of original vegetation near agricultural and forest crops to increase natural biological control (Woodcock & Vanbergen 2008, Pickett et al. 2009), particularly by eulophid parasitoids on pupae of arctiid, geometrid, lymantriid, noctuid and saturniid defoliators (Murakami & Hirao 2010). This was shown by fewer geometrid, lymantriid, noctuid and saturniid defoliators particularly by eulophid parasitoids on pupae of arctiid, and forest crops to increase natural biological control and to maintain areas of original vegetation near agricultural plantations of crop species from the Arecaceae, parasitoids in urban areas to *Pesquisa do Estado de Minas Gerais (FAPEMIG)* “provided fi-

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