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BRACHYMERIA KOEHLERI (HYMENOPTERA: CHALCIDIDAE) AS A HYPERPARASITOID OF *LESPESIA MELLOI* (DIPTERA: TACHINIDAE) PUPAE IN *THAGONA TIBIALIS* (LEPIDOPTERA: LYMANTRIIDAE) CATERPILLARS IN BRAZIL

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Terminalia catappa L. (Myrtales: Combretaceae), a cosmopolitan ornamental and medicinal plant, probably originated from India or New Guinea, is cultivated for shading in anthropogenic areas (Hayward 1990; Santos & Teixeira 2010). Compounds from the leaves and fruits of this plant are used to treat diseases in humans and against fish parasites (Chansue 2007; Yang et al. 2010). *Thagona tibialis* Walker (Lepidoptera: Lymantriidae) caterpillars defoliate *T. catappa* plants in Brazil with population peaks after the rainy season (Diniz et al. 2001, 2011). Damage by this insect on *T. catappa* crown was reported on TV and in newspapers during an infestation in Belo Horizonte, Minas Gerais, Brazil in 2005. This defoliator is distributed in the Cerrado (Savannah-type) and Atlantic Rainforest biomes in Brazil. The females differ from males in the number of black spots on their hind-wing and their wing color, depending on their geographical region of occurrence (Tavares et al. 2012).

The association of parasitoids with *T. tibialis* suggests that *T. catappa* can be grown along field borders or interspersed with crops as a refuge for parasitoids (Tavares et al. 2011c; Costa et al. 2012). *Thagona tibialis* pupae of various ages were collected from *T. catappa*, and the parasitoids, *Palmistichus elaeisis* Delvare & LaSalle and *Trichospilus pupivorus* Ferrière (Hymenoptera: Eulophidae), emerged from the *T. tibialis* pupae (Tavares et al. 2011b, 2013a, 2013b). *Trichospilus pupivorus* was evaluated in the laboratory showing high parasitism rates on *Anticarsia gemmatalis* Hübner (Lepidoptera: Noctuidae) (Tavares et al. 2011a, 2013c). However, hyperparasitism may reduce the efficiency of such biological control agents.

Hyperparasitism is a rare event in nature, as evidenced by the low number of chalcidid hyperparasitoids of Licomadidae collected between 2004 and 2009 in North America (Gates et al. 2012). Unlike most parasitoids, hyperparasitoids do not make cocoons, but pupate within the already prepared cocoon of the host parasitoid (Harvey et al. 2006). *Lespesia melloi* Gil-Santana, Nunez & Nihei (Diptera: Tachinidae) is a parasitoid of *Xanthopastis timais* Cramer (Lepidoptera: Noctuidae) in Brazil (Gil-Santana et al. 2013). The aim of this study was to evaluate the hyperparasitism by *Brachymeria koehleri* Blanchard (Hymenoptera: Chalcididae) on *L. melloi* pupae parasitizing *T. tibialis* caterpillars in Brazil.

Fifty pupae of various ages of *T. tibialis* were collected during 5 days (10 pupae/day, starting on May 4, 2011) from one *T. catappa* plant grown at the campus of the Federal University of Viçosa (UFV) in Viçosa, Minas Gerais, Brazil (S 20°45′ W 42°51′, 651 m) and placed in 500 mL plastic pots lined with cotton. This material was brought to the Laboratory of Biological Control of Insects (UFV), and each pupa was held individually in a test tube (12 cm H × 2 cm diam) capped with cotton and kept at 25 ± 1 °C, 70 ± 10% RH, and 12:12 h L:D until the emergence of either the

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lepidopteran or the parasitoid. The number and percentage of puparia, adult emergence and sex ratio of *L. melloi*, *B. koehleri* and *T. tibialis*, and the number of unviable *T. tibialis* pupae were recorded. The puparia of *L. melloi* were examined after dissecting the remains of the caterpillars with a scalpel.

Thagona tibialis females were identified by Dr. Vitor Osmar Becker and deposited at the Uiraçu Institute in Camacan, Bahia, Brazil. *Lespesia melloi* males were identified by the fourth author and deposited at the Regional Museum of Entomology of the UFV in Viçosa, Minas Gerais, Brazil. *Brachymeria koehleri* was identified by the third author and deposited in the Department of Biological Sciences of the Federal University of Espírito Santo in Vitória, Espírito Santo, Brazil.

A total of 13 *T. tibialis* pupae yielded puparia of *L. melloi*; 8 resulted in the emergence of adults of this tachinid (sex ratio = 0.625); 1 *B. koehleri* female emerged from a single pupa, and 4 pupae were unviable. Lastly, 33 *T. tibialis* adults emerged from the pupae of this insect (sex ratio = 0.758).

Hyperparasitism by *B. koehleri* has been reported in association with species of Sarcophagidae and Tachinidae parasitizing Geometridae, Hesperiidae, Nymphalidae, Noctuidae, and Papilionidae caterpillars (Thompson 1954; De Santis 1967, 1989; Herting 1976, 1978; Tavares et al. 2006; Salgado-Neto et al. 2010; Tinôco et al. 2012; Zaché et al. 2012). *Brachymeria* spp. can occur in various environments: as *Brachymeria vesparum* Bouček (Hymenoptera: Chalcididae) parasitizing *Polistes lanio lanio* F. (Hymenoptera: Vespidae) larvae in Rio de Janeiro, Brazil (Silva-Filho et al. 2007) and *Brachymeria* sp. parasitizing larvae of stored grain pests in Namibia (Stejskal et al. 2006).

In recent reports in Brazil, *B. koehleri* was recorded as a hyperparasitoid of *Lespesia* sp. pupae parasitizing *Paridesa scanius* Cramer (Lepidoptera: Papilionidae) caterpillars, a defoliator of *Aristolochia trilobata* L. (Aristolochiales: Aristolochiaceae) in the Rio de Janeiro, Brazil (Tavares et al. 2006), and also as a hyperparasitoid of *Chetogena scutellaris* Wulp (Diptera: Tachinidae) parasitizing *Opsiphanes invirae* Hübner (Lepidoptera: Nymphalidae) caterpillars, which defoliate *Elaeis guineensis* Jacq (Arecales: Arecaceae) in the Pará, Brazil (Tinôco et al. 2012). Other *Brachymeria* spp. that parasitize Lepidoptera in Brazil include *Brachymeria mnestor* Walker and *Brachymeria nigritibialis* Tavares & Navarro-Tavares (Hymenoptera: Chalcididae) hyperparasitizing *Lespesia* sp. pupae in *Parides ascanius* Cramer (Lepidoptera: Papilionidae) (Tavares et al. 2006); *Brachymeria pandora* Crawford (Hymenoptera: Chalcididae) parasitizing *Historis odius* F. (Lepidoptera: Nymphalidae) in Rio de Janeiro (Gil-Santana & Tavares 2005), *Argon lota* Hewitson (Lepidoptera: Hesperiidae) in Rio Grande do Sul (Salgado-Neto et al. 2010), *Saliana* sp. (Lepidoptera: Hesperidae) in Pará (Tinôco et al. 2012) and *Thyrinteina leucoceraea* Rindge (Lepidoptera: Geometridae) in Minas Gerais (Zaché et al. 2012); and *Brachymeria annulipes* Costa Lima (Hymenoptera: Chalcididae) parasitizing *Opsiphanes invirae* Hübner (Lepidoptera: Nymphalidae) pupae (Tinôco et al. 2012).

This is the first report of hyperparasitism by *B. koeheri* of *L. melloi* pupae parasitizing *T. tibialis* caterpillars defoliating a *T. catappa* plant in Brazil.

Summary

Hyperparasitoids use the immature offspring of other parasitoids for their development, which may reduce the efficiency of biological control. The aim of this study was to evaluate the hyperparasitoidism by *Brachymeria koehleri* Blanchard (Hymenoptera: Chalcididae) in *Lespesia melloi* Gil-Santana, Nunez & Nihei (Diptera: Tachinidae) pupae parasitizing *Thagona tibialis* Walker (Lepidoptera: Lymantriidae) caterpillars in Brazil. Fifty pupae of various ages of *T. tibialis* were collected after the caterpillars had defoliated a *Terminalia catappa* L. (Combretaceae) plant on the campus of the Federal University of Viçosa (Viçosa, Minas Gerais, Brazil). Each pupae was held individually under controlled conditions until the emergence of either the lepidopteran or the parasitoid. Thirteen *T. tibialis* pupae yielded *L. melloi* puparia, which resulted in the emergence of 8 *L. melloi* individuals, 1 *B. koehleri* female, and 4 unviable pupae. This is the first report of hyperparasitism by *B. koehleri* of *L. melloi* pupae parasitizing *T. tibialis* caterpillars in Brazil.

Resumo

Hiperparasitóides usam a prole de outros parasitóides para seu desenvolvimento, o que pode reduzir a eficiência do controle biológico. O objetivo deste estudo foi avaliar o hiperparasitoidismo por *Brachymeria koehleri* Blanchard (Hymenoptera: Chalcididae) em pupas de *Lespesia melloi* Gil-Santana, Nunez & Nihei (Diptera: Tachinidae) parasitando lagartas de *Thagona tibialis* Walker (Lepidoptera: Lymantriidae) no Brasil. Cinqüenta pupas de várias idades de *T. tibialis* foram coletadas após suas lagartas terem desfolhado uma planta de *Terminalia catappa* L. (Combretaceae) no *campus* da Universidade Federal de Viçosa (Viçosa, Minas Gerais, Brasil). Estas pupas foram individualizadas e mantidas em condições controladas até a emergência de lepidópteros ou parasitoides. Treze pupas de *T. tibialis* apresentaram pupários, resultando na emergência de oito

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indivíduos de *L. melloi*, uma fêmea de *B. koehleri* e quatro pupas foram inviáveis. Este é o primeiro relato de hiperparasitoidismo por *B. koehleri* em pupas de *L. melloi* parasitando lagartas de *T. tibialis* no Brasil.

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References Cited

Chansue, N. 2007. Effects of dried Indian almond leaf (*Terminalia catappa* L.) extract on monogenean parasites in goldfish (*Carassius auratus*). Wien Tierärztl. Monat 94(11/12): 269-273.

Costa, M. A., Tavares, W. S., Pereira, A. I. A., Cruz, I., Serrão, J. E., and Zanuncio, J. C. 2012. *Chrysoperla externa* (Neuroptera: Chrysopidae) and *Utetheisa ornatrix* (Lepidoptera: Arctiidae) on organically grown *Crotalaria juncea* (Fabaceae). Planta Daninha 30(3): 459-468.

De Santis, L. 1967. Catálogo de los himenópteros argentinos de la serie parasítica, incluyendo Bethyloidea. 337pp. La Plata: Provincia de Buenos Aires, Comisión de Investigación Científica.

De Santis, L. 1989. Catalogo de los Himenópteros Calcidoides (Hymenoptera) al sur de los Estados Unidos, Segundo Suplemento. Acta Entomol. Chilena 15(1): 1-12.

Diniz, I. R., Morais, H. C., and Camargo, A. J. A. 2001. Host plants of lepidopteran caterpillars in the cerrado of the Distrito Federal, Brazil. Rev. Brasileira Entomol. 45(1): 107-122.

Diniz, I. R., Lepesqueur, C., Milhomen, M. S., Bandeira, F. C. S., and Morais, H. C. 2011. *Eloria subapicalis* (Lepidoptera: Noctuidae: Lymantriidae): rare and specialist species on *Erythroxylum* (Erythroxylaceae) in the cerrado. Zoologia 28(1): 58-62.

Gates, M. W., Lill, J. T., Kula, R. R., O'hara, J. E., Wahl, D. B., Smith, D. R., Whitfield, J. B., Murphy, S. M., and Stoepler, T. M. 2012. Review of parasitoid wasps and flies (Hymenoptera: Diptera) associated with Limacodidae (Lepidoptera) in North America, with a key to genera. Proc. Entomol. Soc. Washington 114(1): 24-110.

Gil-Santana, H. R., and Tavares, M. T. 2005. *Brachymeria pandora* (Crawford) (Hymenoptera: Chalcididae): a new parasitoid of *Historisodius* (Fabricius) (Lepidoptera: Nymphalidae). Rev. Brasileira Zool. 22(4): 1211-1212.

Gil-Santana, H. R., Nunez, E., and Nihei, S. S. 2013. *Lespesia melloi* sp. nov. (Diptera: Tachinidae) from Brazil, parasitoid of *Xanthopastis timais* (Lepidoptera: Noctuidae). J. Insect Sci. (in press)

Harvey, J. A., Vet, L. E. M., Witjes, L. M. A., and Bezemer, T. M. 2006. Remarkable similarity in body mass of a secondary hyperparasitoid *Lysibia nana* and its primary parasitoid host *Cotesia glomerata* emerging from cocoons of comparable size. Arch. Insect Biochem. Physiol. 61(3): 170-183.

Hayward, D. F. 1990. The phenology and economic potential of *Terminalia catappa* L in south central Ghana. Vegetation 90(2): 125-131.

Herting, B. 1976. Lepidoptera, Part 2 (Macrolepidoptera). A catalogue of parasites and predators of terrestrial arthropods. Section A. Host or Prey/Enemy 7(1): 83-84. Commonwealth Agric. Bureaux, CIBC.

Herting, B. 1978. Neuroptera, Diptera, Siphonaptera. A catalogue of parasites and predators of terrestrial arthropods. Section A. Host or Prey/Enemy 5(1): 110-111. Commonwealth Agric. Bureaux, CIBC.

Salgado-Neto, G., Di Mare, R. A., and Lopes-Da-Silva, M. 2010. Parasitism of *Argon lota* Hewitson (Lepidoptera: Hesperiidae) by *Brachymeria pandora* (Crawford) (Hymenoptera: Chalcididae) in Rio Grande do Sul, Brazil. Neotropical Entomol. 39(2): 311-312.

Santos, M. N., and Teixeira, M. L. F. 2010. Tropical almond seeds (*Terminalia catappa* L.) (Combretaceae) as a substrate for epiphytic orchid cultivation. Acta Sci. Agron. 32(2): 339-343.

Silva-Filho, R., Cassino, P. C. R., Marques, O. M., Penteado-Dias, A. M., Rodrigues, W. C., and Zanuncio, J. C. 2007. Parasitoids of *Polistes lanio lanio* (Hymenoptera: Vespidae) larvae in the municipality of Seropédica, Rio de Janeiro State, Brazil. Sociobiology 50(3): 1191-1198.

Stejskal, V., Kosina, P., and Kanyomeda, L. 2006. Arthropod pests and their natural enemies in stored crops in northern Namibia. J. Pest Sci. 79(1): 51-55.

Tavares, M. T., Navarro-Tavares, A. B., and Almeida, G. D. S. 2006. The species of Chalcididae (Hymenoptera) parasitoids of *Parides ascanius* (Cramer), an endangered Papilionidae (Lepidoptera) from restingas of southeastern Brazil. Zootaxa 1197(1): 55-63.

Tavares, W. S., Hansson, C., Serrão, J. E., and Zanuncio, J. C. 2011a. First report of *Trichospilus pupivorus* (Hymenoptera: Eulophidae) parasitizing pupae of *Anticarsia gemmatalis* (Lepidoptera: Noctuidae). Entomol. Gen. 33(4): 281-282.

Tavares, W. S., Zanuncio, T. V., Hansson, C., Serrão, J. E., and Zanuncio, J. C. 2011b. Emergence of *Palmistichus elaeisis* (Hymenoptera: Eulophidae) from pupae of *Thagona tibialis* (Lepidoptera: Lymantriidae) collected in the medicinal plant *Terminalia catappa* (Combretaceae). Entomol. News 122(3): 250-256.

Tavares, W. S., Cruz, I., Silva, R. B., Figueiredo, M. L. C., Ramalho, F. S., Serrão, J. E., and Zanuncio, J. C. 2011c. Soil organisms associated to the weed suppressant *Crotalaria juncea* (Fabaceae) and its importance as a refuge for natural enemies. Planta Daninha 29(3): 473-479.

Tavares, W. S., Mielke, O. H. H., Wilcken, C. F., Simon, L., Serrão, J. E., and Zanuncio, J. C. 2012. *Palmistichus elaeisis* (Hymenoptera: Eulophidae) parasitizing pupae of *Citioica anthonilis* (Lepidoptera: Saturniidae) collected on *Piptadenia gonoacantha* (Fabaceae). J. Lepid. Soc. 66(4): 216-220.

Tavares, W. S., Hansson, C., Mielke, O. H. H., Serrão, J. E., and Zanuncio, J. C. 2013a. Parasitism of *Palmistichus elaeisis* Delvare & LaSalle, 1993 on pupae of *Methona themisto* (Hübner, [1818]) reared on two hosts (Lepidoptera: Nymphalidae; Hymenoptera: Eulophidae). SHILAP-Rev. Lepidopterol. 41(161): 43-48.

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TAVARES, W. S., SOARES, M. A., MIELKE, O. H. H., PODEROSO, J. C. M., SERRÃO, J. E., AND ZANUNCIO, J. C. 2013b. Emergence of *Palmistichus elaeisis* Delvare & LaSalle, 1993 (Hymenoptera: Eulophidae) from pupae of *Heraclides anchisiades capys* (Hübner, [1809]) (Lepidoptera: Papilionidae) in the laboratory. Folia Biol.-Krakow 61(3/4): 233-237.

TAVARES, W. S., HANSSON, C., SERRÃO, J. E., AND ZANUNCIO, J. C. 2013c. First report of *Trichospilus pupivorus* (Hymenoptera: Eulophidae) to the American continent and its parasitism on *Thagona tibialis* (Lepidoptera: Lymantriidae). Stud. Neotropical Fauna E. 48(2): 1-2.

THOMPSON, W. R. 1954. A catalogue of the parasites and predators of insect pests - Section 2 - Host parasite catalogue, Part 3 - Hosts of the Hymenoptera (Calliceratid to Evaniid). 198 pp. Commonwealth Agric. Bureaux, CIBC.

TINÔCO, R. S., RIBEIRO, R. C., TAVARES, M. T., VILELA, E. F., LEMOS, W. P., AND ZANUNCIO, J. C. 2012. *Brachymeria* spp. (Hymenoptera: Chalcididae) parasitizing pupae of Hersperidae and Nymphalidae (Lepidoptera) pests of oil palm in the Brazilian Amazonian region. Florida Entomol. 95(3): 788-789.

YANG, S. F., CHEN, M. K., HSIEH, Y. S., YANG, J. S., ZAVRAS, A. I., HSIEH, Y. H., SU, S. C., KAO, T. Y., CHEN, P. N., AND CHU, S. C. 2010. Antimetastatic effects of *Terminalia catappa* L. on oral cancer via a down-regulation of metastasis-associated proteases. Food Chem. Toxicology 48(4): 1052-1058.

ZACHÉ, B., ZACHÉ, R. R. C., TAVARES, M. T., AND WILCKEN, C. F. 2012. *Brachymeria pandora* (Crawford) (Hymenoptera: Chalcididae) as a new parasitoid of *Thyrinteina leucocerae* (Rindge) (Lepidoptera: Geometridae) in Brazil. Neotrop. Entomol. 41(4): 343-344.

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