

Parasitoids of flies collected on human faeces in Itumbiara County, Goiás State, Brazil

Carlos Henrique Marchiori*
Luiz Alex Pereira
Otacílio Moreira Silva Filho
Lalyne Cristhine Silva Ribeiro
Vanessa Rodrigues Borges

Instituto Luterano de Ensino Superior de Itumbiara-ILES-ULBRA
Caixa Postal 23-T, 75.500-000, Itumbiara – GO
E-mail: pesquisa.itb@ulbra.br
*Autor para correspondência

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Resumo

Diferentes espécies de parasitóides associados com moscas coletadas em fezes humanas em Itumbiara, Estado de Goiás, Brasil. Foram utilizadas armadilhas de lata com coloração preta, com iscas e areia. As pupas obtidas foram extraídas por peneiração e individualizadas em cápsulas de gelatina até a emergência das moscas adultas e/ou parasitóides. A preferência das espécies de parasitóides por seus hospedeiros foi testada pelo teste do Qui-quadrado, a 5.0% de probabilidade. No período de março de 2001 a abril de 2002 foram coletados 180 espécimens de parasitóides em 823 pupas de dípteros. Número variáveis de espécimes de 6 espécies de parasitóides foram obtidos de pupas de moscas infestadas: 22 espécimens de *Gnathopleura*

quadridentata Wharton (Braconidae), 21 espécimens de *Brachymeria podagrica* (Fabricius) (Chalcididae), 23 espécimens de *Hemencyrtus herbertii* Asmead (Encyrtidae), 1 espécimen de *Paraganaspis egeria* Díaz and Gallardo (Eucoilidae), 13 espécimens de *Nasonia vitripennis* (Walker) and 100 espécimens de *Pachycrepoideus vindemiae* (Rondani) (Pteromalidae). A percentagem total de parasitismo foi de 21.9%. A percentagem total de parasitismo em *Gnathopleura quadridentata*, *Brachymeria podagrica*, *Hemencyrtus herbertii*, *Paraganaspis egeria*, *Nasonia vitripennis* e *Pachycrepoideus vindemiae* foi de 2.7%, 2.5%, 2.8%, 0.1%, 1.5% e 12.1%, respectivamente. Este é o primeiro relato da ocorrência de *Brachymeria podagrica* (Hymenoptera: Chalcididae) parasitando pupas de *Ophyra* sp. (Diptera: Muscidae) no Brasil

Unitermos: Insecta, Diptera, Hymenoptera, inimigo natural, controle biológico

Abstract

Different species of parasitoids associated with flies collected on human faeces in Itumbiara County, Goiás State, Brazil, were identified. Traps of black tin can with baits and sand were used. Fly pupae were obtained, sifted for extraction, and placed individually into gelatin capsules until emergence of adult flies and/or parasitoids. The preference of species for their host was evaluated by the Chi-square test, at 5.0% probability. The total percentage of parasitism was 21.9%. From March 2001 to April 2002, 180 specimens of parasitoids were collected in 823 pupae of dipterans. Variable numbers of specimens of 6 different species of parasitoids were obtained from pupae of infested flies: 22 specimens of *Gnathopleura quadridentata* Wharton (Braconidae), 21 specimens of *Brachymeria podagrica* (Fabricius) (Chalcididae), 23 specimens of *Hemencyrtus herbertii* Asmead (Encyrtidae), 1

specimen of *Paraganaspis egeria* Díaz and Gallardo (Eucoilidae), 13 specimens of *Nasonia vitripennis* (Walker) and 100 specimens of *Pachycrepoideus vindemiae* (Rondani) (Pteromalidae). The total percentages of parasitism for *Gnathopleura quadridentata*, *Brachymeria podagrica*, *Hemencyrtus herbertii*, *Paraganaspis egeria*, *Nasonia vitripennis* and *Pachycrepoideus vindemiae* were 2.7%, 2.5%, 2.8%, 0.1%, 1.5% and 12.1%, respectively. This is the first report on the occurrence of *Brachymeria podagrica* (Fabricius) parasitizing pupae of *Ophyra* sp. in Brazil.

Key words: Insecta, Diptera, Hymenoptera, natural enemy, biocontrol

Introduction

Diptera is one of the largest orders of insects, comprising an abundant number of species as well as of individuals. Also, these muscoid dipterous are of great medical and veterinary importance since they may produce myiasis and may be vectors of microorganisms which are pathogenic to men and animals (Chow, 1940; Greenberg, 1971). Flies have been found to carry diseases caused by bacteria, protozoa and helminthes (Greenberg, 1971). The association occurs because flies are explorers of organic material and/or residues, which are produced by human or animal activities, especially faeces and vegetable residues (Greenberg, 1971). Together with flies there develops a diverse fauna of parasitoids, which are responsible for the natural control of these dipterous insects. Since parasitoids occupy a superior trophic level, they act as determining factors on the population densities of their hosts due to the diversity of their physiological and behavioral adaptations. Also, being natural enemies of pests they may be used in biological control programs. The use of certain insecticides to control this fly may cause damage to the environment and to human health. Thus, the search for effective natural enemies may

be a viable alternative to control this pest in a long-term control program. The objective of this study was to identify species of parasitoids that parasitize flies occurring on human faeces, under field conditions.

Material and Methods

This study was conducted from March 2001 to April 2002 at the College of Agronomy (Faculdade de Agronomia) located in Itumbiara County, Goiás State, Central Brazil (18°25'S;49°13'W). Flies were attracted to traps made of dull black tin cans (19 cm tall and 9 cm in diameter) with two blinder-like openings on the bottom 1/3rd to allow fly entry. On the upper part of each, a nylon funnel with open extremities and base turned down was attached. These traps were then wrapped with plastic bags, which after removal would allow the capture of flies and parasitoids. Human faeces, deposited on top of a soil layer, were placed as baits inside each can. Five of these traps were randomly hung on *Eucalyptus* sp. trees 1 m above the soil level, 2 m apart from each other and 50 m away from a domestic garbage deposit. The specimens of parasitoids and flies collected after remaining 15 days in the field were taken to the laboratory, killed with ethyl ether, and stored in 70% ethanol for further identification. After removal of insects, the contents of each trap were individually placed into plastic containers lined with sand to serve as substrate for the development of larvae and pupae. These substrata were sifted for extraction of pupae obtained from the natural environment. The pupae were then individually transferred to gelatin capsules (number 00) and maintained in the environmental temperature of the laboratory to obtain flies and/or parasitoids.

The percentage of parasitism was computed using the following formula: $P = (\text{parasitized pupae} / \text{total of pupae}) \times 100$ (Margolis et al., 1982; Bush et al., 1997). The preference of species

for their host was evaluated by the Chi-square test, at 5% probability.

Results and Discussion

From March 2001 to April 2002, a total of 823 pupae of dipterans was collected. From these, a total of 180 specimens of parasitoids, representing 6 species from 5 families, was obtained.

The total percentage of parasitism observed was 21.9% (Table 1). From the hosts collected, the importance of the species *Musca domestica* Linnaeus (Diptera: Muscidae) has to be emphasized. This species is of large sanitary importance due to its sinanthropic characteristics, its abundance in urban areas, its capacity of development on several sorts of substrata, its high reproductive power, and the fact that it behaves as a pathogenic mediator between men and animals.

The percentage of parasitism for the species *Gnathopleura quadridentata* Wharton (Braconidae), *Brachymeria podagrica* (Fabricius) (Chalcididae), *Hemencyrtus herbertii* (Encyrtidae), *Paraganaspis egeria* Díaz and Gallardo (Eucoilidae), *Nasonia vitripennis* (Walker) and *Pachycrepoideus vindemiae* (Rondani) (Pteromalidae) were 2.7%, 2.5%, 2.8%, 0.1%, 1.5% and 12.1%, respectively.

Pachycrepoideus vindemiae was the most frequent species and the species that parasitized the largest diversity of hosts (Table 1). It is probably a polyphagous species and is considered a solitary parasitoid of numerous Diptera from Anthomyiidae, Calliphoridae, Muscidae, Tachinidae and Tephritidae families, among others (Silva, 1991) (Table 1).

TABLE 1 - Number of parasitized pupae, number of specimens of parasitoids, and percentage of parasitism in different species of synanthropic flies collected in humans faeces, in the period from March 2001 to April 2002 in Itumbiara (18°25'S; 49°13'W) County, Goias State, Central Brazil.

Fly species	Number of pupae collected	Parasitoid species	Pupae	Percentage
<i>Fannia pusio</i>	157	<i>Pachycrepoideus vindemiae</i>	7	4.5
		<i>Paraganaspis egeria</i>	1	0.6
<i>Musca domestica</i>	20	<i>Hemencyrtus herbertii</i>	5	25.0
<i>Ophyra</i> sp.	06	<i>Brachymeria podagrica</i>	1	16.7
<i>Oxysarcodexia thornax</i>	109	<i>Brachymeria podagrica</i>	1	0.9
		<i>Gnathopleura quadridentata</i>	22	20.2
		<i>Hemencyrtus herbertii</i>	18	16.5
		<i>Pachycrepoideus vindemiae</i>	11	10.1
<i>Peckia chrysostoma</i>	106	<i>Brachymeria podagrica</i>	19	17.9
		<i>Nasonia vitripennis</i>	5	4.7
<i>Poecilosomella</i> sp.	230	<i>Pachycrepoideus vindemiae</i>	40	17.4
<i>Sarcodexia</i> sp.	34	<i>Nasonia vitripennis</i>	8	23.5
		<i>Pachycrepoideus vindemiae</i>	6	17.6
<i>Sarcophagula</i> sp.	161	<i>Pachycrepoideus vindemiae</i>	36	22.4
Total	823		180	21.9

Hemencyrtus herbertii has shown preference for pupae of *Oxysarcodexia thornax* Walker (Diptera: Sarcophagidae) and *M. domestica*; *N. vitripennis* for pupae of *Peckia chrysostoma* (Wiedemann) and *Sarcodexia* sp. (Diptera: Sarcophagidae); *G. quadridentata* for pupae of *O. thornax*; and *P. vindemiae* for pupae of *Poecilosomella* sp. (Sphaeroceridae), *Sarcophagula* sp. (Sarcophagidae), *O. thornax*, *Fannia pusio* (Wiedemann) (Fanniidae) and *Sarcodexia* sp. ($\chi^2=355.0$; DF=35; P=39.3).

Nasonia vitripennis and *Hemencyrtus* sp. behaved gregarious with four and five individuals emerging from a single host pupa, respectively. According to Rivers and Denlinger (1995), *N. vitripennis* behave as gregarious parasitoids and are an ectoparasitoid on pupae of several species of the Diptera, especially in the families Calliphoridae, Muscidae, Sarcophagidae and Tachinidae. Silva (1991) reported *Hemencyrtus* sp. parasitizing pupae of *Chrysomya albiceps* (Wiedemann) (Calliphoridae), *Phaenicia eximia* (Wiedemann) (Calliphoridae), *Synthesiomyia nudiseta* Wulp (Muscidae), *Ophyra* sp. (Muscidae), *Oxysarcodexia* sp. and *Patonella intermutans* (Walker) (Sarcophagidae), collected on rat carcasses in São Carlos County, São Paulo State, Brazil.

Considering the importance of these flies in relation to public health, as a vector of disease-causing agents, it is essential to conduct surveys on these natural enemies to aid in the adequate control of flies through methods of integrated control. This paper reports the first occurrence of *B. podagrica* parasitizing pupae of *Ophyra* sp.

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