Biodiversity of Parasitoids Present in Agroforestry in Brazil

Carlos Henrique Marchiori

ABSTRACT

The aim of this study is to report the parasitoids collected on many substrates in the agroforestry area in Brazil. The experimental study was carried out in an agroforestry area in the south of Goiás, Brazil. Traps made of metal containers. They served as baits to attract flies: fish, bovine kidneys, human feces and chicken viscera deposited inside metal containers, on a layer of sand. This sand was sieved after the pupae were extracted and subsequently placed individually in small glass containers to obtain flies and parasitoids. From 745 pupae of dipteran collected 684 parasitoids emerged from 111 pupae. The most frequent species in this study was *Aphaereta* sp. (Hymenoptera: Braconidae: Alysiniinae) 52.6%. The total percentage of parasitism obtained at work was 14.9%. *Brachymeria podagrica* Fabricius (Hymenoptera: Chalcididae) was the species that presented the highest percentage of parasitism with 55.0%, parasitizing *Ophyra aenescens* L. (Diptera: Muscidae) on human feces substrate.

Keywords: Baits, Insect, *Ophyra aenescens*, *Pachycrepoideus vindemmiae*, Pests, Trap.

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I. INTRODUCTION

Flies (Diptera) are accused of having strong potential as mechanical vectors of pathogens that cause carbuncle, mastitis, keratoconjunctivitis and other diseases, which can cause not only economic damage, but also lead animals to death. As these insects, management possibilities, besides the chemical control by means of insecticides may be used natural regulators of various pest species known both in agriculture and in animal breeding [1].

Among the natural regulators, we find parasitoids that are agents responsible for the reduction of flies that proliferate in bovine manure [2]. Parasitoids are essential for maintaining ecological balance and contribute to the diversity of other organisms.

Parasitoids, in addition to their importance in the biological control of insect pests, are important in Forensic Entomology (the study of insects and other arthropods associated with various criminal issues – serves as an auxiliary tool, for example, in the investigation of crimes against victims of violent death) [3].

The aim of this study is to report the parasitoids collected on many substrates in the agroforestry area in Brazil.

II. MATERIAL AND METHODS

The experimental study was carried out in an agroforestry area in the south of Goiás, Brazil. Traps made of metal containers (Fig. 1). They are traps that are built with a metal container, painted externally with black matte paint, measuring about 20 cm in height and 9 cm in diameter, with

two venetian openings, made in the lower third to allow the entry of insects [4].

Fig. 1. General appearance of the trap.

They served as baits to attract flies: fish, bovine kidneys, human feces, and chicken viscera deposited inside metal containers, on a layer of sand. Fortnightly, four traps were used, hanging from trees one meter from the ground, two meters from each other. To obtain parasitoids, the content of the traps was placed in plastic containers containing a layer of sand to serve as a substrate for the larvae pupation. This sand was sieved after the pupae were extracted and subsequently placed individually in small glass containers to obtain flies and / or parasitoids [5]. The experiment was carried out from January to December 2006.

From 745 pupae of dipteran collected 684 parasitoids emerged from 111 pupae (Table I).

The percentage of species collected in this study was: *Pachycrepoideus vindemmiae* (Rondani) (Hymenoptera: Pteromalidae) (25/684) with 3.7%, *Brachymeria podagrica* Fabricius (Hymenoptera: Chalcididae) (68/684) with 10.0%,

Nasonia vitripennis (Walker) (Hymenoptera: Pteromalidae) (231/684) with 33.8% and *Aphaereta* sp. (Hymenoptera: Braconidae: Alysiinae) (360/684) 52.6%. The most frequent species in this study was *Aphaereta* sp. Probably due to his polyphagous, gregarious and generalist habit.

Alysiinae are cenobiont endoparasitoids of brachycous dipterans; the Alysiini occur associated with more than 20 Diptera families. Many of their hosts occur associated with decomposing manure, fungi or plant and animal matter; few parasitize Tephritidae larvae. The pupation of the parasitoid occurs inside the pupae of the host. Most are solitary parasitoids; some species of *Aphaereta* are gregarious. In Brazil, studies on Alysiinae parasitoids of muscoid dipterans refer mainly to species of the *Aphaereta* genera [6].

The number of parasitized pupae obtained the total percentage of parasitism / total number of pupae collected x 100. According to the formula, the total percentage of parasitism obtained at work was (111/745) 14.9%. The total percentage of parasitism obtained by the species in this study was *P. vindemmiae* (25/745) with 3.4%, *B. podagrica* (68/745) with 9.1%, *N. vitripennis* (10/745) with 0.9% and *Aphaereta* sp. (8/745) 1.1%. *Brachymeria podagrica* presented the highest total percentage of parasitism obtained by the species in this study. Probably due to the competitive ability of the young forms.

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The Chalcididae are cosmopolitan insects with a high diversity in the tropics including approximately 1.500 species. They are predominantly solitary endoparasitoids. Species of the genus *Brachymeria* are important primary parasitoid of muscoid Diptera, such as species of the Sarcophagidae and Calliphoridae families. Some species are of economic importance, for they attack insect pests. The species *B. podagrica* occurs almost everywhere in the world and lives associated with synanthropic and other Diptera flies emerging from their pupae [7].

Percentage of parasitism for each species of parasitoid was calculated according to the formula: number of parasitized puparium/by the number of host puparium x hundred. According to this formula *B. podagrica* was the species that presented the highest percentage of parasitism (11/20) with 55.0%, parasitizing *Ophyra aenescens* (Diptera: Muscidae) on human feces substrate. This fact may be influenced by variations in the quality and availability of resources, in the ability to search for parasitoids and by the density of the hosts (Table I).

Pachycrepoideus vindemmiae generalist wasp that attacks pupae of several species cyclorrhaphous dipteran as a primary parasitoid. *P. vindemmiae* pupae remain concealed under the soil or manure until they are ready to emerge as adults.

Due to the controlling action of the parasitoids, there would be an explosion in the populations of herbivores, which would lead to the destruction of the plant species they consume. This makes them essential for maintaining ecological balance and a force that contributes to the diversity of other organisms [9].

Fig. 2. *Ophyra aenescens* (Diptera: Muscidae)
Source: https://www.flickr.com/photos/hans_smid/10931538014.

TABLE I. PARASITIDS AND THEIR DIPTERANS HOSTS COLLECTED IN THE STATE OF GOIÁS, MIDWEST REGION OF BRAZIL

Species of Diptera	Number of pupae	Baits	Species of Hymenoptera	Number de specimens	Pupae parasitized	%
<i>Chrysomya albiceps</i>	120	Bovine kidneys	<i>Pachycrepoideus vindemmiae</i>	2	2	1.6
<i>Fannia pusio</i>	40		<i>Nasonia vitripennis</i>	143	4	10.0
<i>Chrysomya megacephala</i>	40	Chicken	<i>Brachymeria podagrica</i>	6	6	15.0
<i>Oxysarcodexia thornax</i>	33		<i>Brachymeria podagrica</i>	10	10	30.3
			<i>Nasonia vitripennis</i>	25	2	6.1
<i>Peckia chrysostoma</i>	104		<i>Brachymeria podagrica</i>	34	34	32.7
			<i>Nasonia vitripennis</i>	23	1	1.0
<i>Musca domestica</i>	236	Human feces	<i>Pachycrepoideus vindemmiae</i>	18	18	7.6
<i>Ophyra aenescens</i>	20		<i>Brachymeria podagrica</i>	11	11	55.0
<i>Sarcophagula</i> sp.	47		<i>Pachycrepoideus vindemmiae</i>	5	5	10.6
<i>Chrysomya albiceps</i>	43	Fish viscera	<i>Nasonia vitripennis</i>	40	3	7.0
<i>Peckia chrysostoma</i>	42		<i>Aphaereta</i> sp.	360	8	19.4
			<i>Brachymeria podagrica</i>	7	7	16.6
Total	745	--		684	111	--

III. CONCLUSION

The most frequent species in this study was *Aphaereta* sp. 52.6%. The total percentage of parasitism obtained at work was 14.9%. *B. podagrica* was the species that presented the highest percentage of parasitism with 55.0%, parasitizing *Ophyra* sp. (Diptera: Muscidae) on human feces substrate.

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