

(RESEARCH ARTICLE)



Synanthropy of dipterans collected in cattle feces in Brazil

Carlos Henrique Marchiori *

Instituto Federal, Biological Science, Goiânia 74230-120, Goiás, Brazil.

Open Access Research Journal of Biology and Pharmacy, 2021, 02(02), 050–053

Publication history: Received on 20 July 2021; revised on 29 August 2021; accepted on 31 August 2021

Article DOI: <https://doi.org/10.53022/oarjbp.2021.2.2.0040>

Abstract

Cattle feces accumulated in pastures and stables constitute an especially favorable microhabitat for the development of a rich and heterogeneous arthropod fauna. This study determined the species of Diptera of Medical, Veterinary and Agricultural importance present in forest, rural and urban areas in the municipality of Monte Alegre, state Minas Gerais Southeast region, Brazil in the period from March to November 2006. The dipterans pupae were individually placed in glass jars until the emergence of the dipterans. A total of 372 dipteran pupae were collected, 107 in the forest area, 194 in the rural area and 71 in the urban area. Percentage of dipterans in forest, rural and urban areas were 28.7%, 52.2% and 19.1%, respectively. *Sarcophagula occidua* (Fabricius, 1794) (Diptera: Sarcophagidae) was the most frequent species with 42.2%. Regarding the synanthropy index of the species *Archiseptis scabra* (Loew, 1861) (Diptera: Sepsidae) *Palaeosepsis pusio* (Schiner, 1868) (Diptera: Sepsidae), *Brontaea quadrastigma* (Thomson, 1869) (Diptera: Muscidae) and *S. occidua* presented an index of 16.0%, - 64%, +18.4% and +7.7%, respectively. Dipterans constitute the adequate model for the study of synanthropy, not only for their ecological importance, but also for their medical-sanitary aspect.

Keywords: Insect; Diptera; Area rural; Area urban; Forest area

1. Introduction

Cattle feces accumulated in pastures and stables constitute an especially favorable microhabitat for the development of a rich and heterogeneous arthropod fauna. Among these insects are the flies that are of medical and veterinary importance, as they can act in the transmission of pathogens to humans and animals. The association occurs because the flies are explorers of substances and organic residues, which are produced by human and animal activity, especially feces and plant residues [1,2,3].

The term simbovine distinguishes the dipterous groups that are associated with the excrement of domestic ruminants. On the other hand, these dipterans are blamed for having strong potential as mechanical vectors of pathogens that cause anthrax, mastitis, keratoconjunctivitis and other diseases, which can cause not only economic losses, but also lead to death [4,5,6].

The aim of this study was to calculate the synanthropy index of dipterans collected in bovine feces in Brazil.

2. Material and methods

The experiment was carried out in forest (cerrado with eight hectares – legal reserve), rural (brachiara grass pastures with eight hectares) and was carried out at Fazenda do Igarapé, municipality of Monte Alegre, state of Minas Gerais, Southeast region of Brazil and in the area urban (pasture of two hectares of brachiara grass) located 3 km from the center of Monte Alegre, Minas Gerais, from March to November 2006.

* Corresponding author: Carlos Henrique Marchiori
Instituto Federa, Biological Science, Goiânia 74230-120, Goiás, Brazil.

Artificial plates of fresh bovine feces of approximately 2 liters each were produced and placed inside 15 plastic basins (Figure 1) containing, inside, a 5 cm layer of soil from the site itself. The basins were divided into three groups of five placed in three locations proposed in the study (forest, rural and urban areas). The plates were kept at ground level for insect visitation, along with 5 cm of substrate and remained exposed for 15 days, the pupae were then removed with the aid of a sieve, counted and individualized in small glass jars until the emergence of the dipteran. The synanthropy index was calculated from the formula [7]:

$$IS = \frac{2a + b - 2c}{2},$$

Where: a= percentage of a certain species captured in the urban area in relation to this same species, captured in the rural and forested areas; b= percentage of the same species caught in the countryside; c= percentage of the same species caught in the forested area.

3. Results and discussion

A total of 372 dipteran puparia were collected, 107 in the forest area, 194 in the rural area and 71 in the urban area (Table 1). Totaling 270 artificial faeces basins, 90 for each of the studied areas.

The percentages in the forest, rural and urn areas were: (107/372) 28.8%, (194/372) 52.2% and (71/372)19.0%, respectively.

The percentage of species were: *Archiseopsis scabra* (Loew, 1861) (Diptera: Sepsidae) (66/372) 17.7%, *Palaeosepsis pusio* (Schiner, 1868) (130/372) 3.5%, *Brontaea quadristigma* (Thomson, 1869) (Diptera: Muscidae) (19/372) 5.1% and *Sarcophagula occidua* (Fabricius, 1794) (Diptera: Sarcophagidae) (157/372) 42.2% (Table 1).

Percentage of dipterans in forest, rural and urban areas was 28.7%, 52.2% e 19.1%. In relation to the synanthropy index of the species *A. scabra*, *P. pusio*, *B. quadristigma* and *S. occidua* presented index of -16.0%, -654%, +18.4% and +7.7%, respectively.

Table 1 Frequency and percentage of dipterans collected in the forest, rural and urban areas in Monte Alegre Minas Gerais Southeast region, Brazil in the period from March to November 2006

Taxonomic group	Forest area	Area rural	Area urban	Total
Sepsidae:				
<i>Archiseopsis scabra</i>	51	15	0	66
%	77.3	22.7	0	100
<i>Palaeosepsis pusio</i>	26	101	3	130
%	20.0	77.7	2.3	100
Muscidae:				
<i>Brontaea quadristigma</i>	0	13	6	19
%	0	68.4	31.6	100
Sarcophagidae				
<i>Sarcophagula occidua</i>	30	65	62	157
Total	107	194	71	372

The synanthropy index ranges from +100 to -100, the first value represents the highest degree of association with man and the negative values indicate aversion to anthropodized environments [7].

Sarcophagula occidua was the most frequent species, probably the larvae of possess coprophagous habits (Figure 1). The adults of this species showed higher abundance during the summer, and exhibit strong preferences for grasslands and attraction to feces [8].



Figure 1 (a) General appearance of plastic basins with feces; (b) *Sarcophagula occidua* Fabricius (Diptera: Sarcophagidae); Source: <http://cookislands.bishopmuseum.org/species.asp?id=13976>

Probably, this difference in the number of dipterans collected in the three areas can be explained by the greater offer of bovine feces in the pastures, due to the greater number of fecal plates naturally placed by cattle, in relation to the number of insects per fecal plate in other areas.

Among the Diptera, *Palaeosepsis* sp. (Diptera: Sepsidae) were the most abundant, comprising 50.3% of sampled insects, followed by *S. occidua* with 39.1%.

Sarcophagula occidua is found in regions Nearctic and Neotropical. In Argentina (Buenos Aires and Entre Ríos), Brazil (Amazonas, Ceará, Goiás, Maranhão, Mato Grosso, Pará, Rio de Janeiro, São Paulo), Chile (Tarapacá), Colombia, Cuba, Dominican Republic, Ecuador, El Salvador, Is. Galápagos, Guyana, Haití, Mexico (Guerrero, Jalisco, Nayarit, Sinaloa, Tamaulipas, Veracruz), Panamá, Paraguay, Perú, Puerto Rico and Venezuela and Australasian (Oceanian) [9].

The synanthropy indices indicated that *B. quadristigma* is the most synanthropic species with a small degree of association with man. Probably due to a mechanism used to survive in areas modified by man. The definition of synanthropic insects those that take advantage of the conditions created by man for their development. Most of the species collected in this work showed synanthropy indexes that indicate aversion to anthropodized environments, possibly due to the forest areas and the rural areas in this substrate being places of origin of dipterans [10].

Over the years, the muscoid dipterans have always were associated with man and domestic animals, due to the food resources found in the breeding stables. With the decrease of the number of stables in urban areas, it was believed that the number of flies would decrease. However, this has not been observed, as in consequence of population growth, man maintained conditions for the development of flies, whether in the household waste produced daily, or also in the feces of pets, which serve as breeding substrates for muscoid dipterans [11].

4. Conclusion

The identification of synanthropic and synanthropic species of dipterans can be used as an efficient indicator of the level of environmental degradation caused by human activities. Dipterans constitute the adequate model for the study of synanthropy, not only for their ecological importance, but also for their medical-sanitary aspect.

Compliance with ethical standards

Acknowledgments

Thanks to the Managing Editor and his working group at Open Access Research Journal of Biology and Pharmacy (OARJBP) for its promptness, efficiency, education, service and for the beautiful layout of the journal.

References

- [1] Marchiori CH, Caldas ER, Almeida KGS, Linhares AX. Muscoid dipterans collected from cattle feces in pastures in Itumbiara, Goiás. *Arquivo Brasileira de Medicina Veterinária e Zootecnia*. 2003; 55(1): 123-125.
- [2] Marchiori CH, Oliveira AT, Linhares AX. Arthropods associated with bovine fecal masses in southern Goiás State. *Neotropical Entomology*. 2001; 30(1): 19-24.
- [3] Marchiori CH, Linhares AX. Constancy, dominance and monthly frequency of muscoid dipterans, and their parasitoids (Hymenoptera and Coleoptera), associated with fresh bovine feces in Uberlândia, MG. *Anais da Sociedade Entomológica do Brasil*. 1999; 28(3): 375-87.
- [4] Axtell RC. Fly management in poultry production cultural, biological and chemical. *Poultry Science*. 1986; 65(4): 657-667.
- [5] Harwood RF, James MT. *Entomology in human and animal health*. 6th ed. New York: Macmillan. 1979.
- [6] Marchiori CH, Linhares AX. Muscoid Diptera associated with fresh cattle feces and their parasitoids. *Brazilian Journal of Ecology*. 1999; 28: 26-31.
- [7] Greenberg B. Flies and Disease: Ecology, Classification, and Associations. In: Ed (1). Polvony D. *Synantropy*. Princeton: Princeton University Press; 1971; 17-54.
- [8] Nuorteva P. Synanthropy of blowflies (Diptera: Calliphoridae) in Finland. *Annales Entomologica Fennicae*. 1963; 29(1): 1-49.
- [9] Marchiori CH. Muscoid Diptera associated with fresh cattle feces and their parasitoids. *Pesquisa Agropecuária Tropical*. 2007; 30(1): 17-21.
- [10] Mulieiri PR, Mariluis JC, Patitucci LD. Review of the Sarcophaginae (Diptera: Sarcophagidae) of Buenos Aires Province (Argentina), with a key and description of a new species. *Zootaxa*. 2010; 2575: 1-37.
- [11] Oliveira VC, Mello RP, D'Almeida JM. Muscoid dipterans as mechanical vectors of helminth eggs in a zoo, Brazil. *Journal of Public Health*. 2002; 36(5): 614-20.