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(REVIEW ARTICLE)

Aleochara notula Erichson, 1839 (Coleoptera: Staphylinidae) as a natural enemy of dipterans in chicken and cattle feces in Brazil

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Abstract

The feces in chicken farms and in cattle raising causes accumulations of manure that are an excellent substrate for the proliferation of Diptera. To control these insects, a management program must integrate cultural, chemical, and biological methods. This study reports the occurrence of *Aleochara notula* Erichson, 1839 (Coleoptera: Staphylinidae) in chicken and cattle feces in Brazil. Manure samples, collected at two-week intervals, were taken to the laboratory and the pupae were extracted by water flotation. Each pupa was placed in colorless gelatin capsules until the appearance of the flies or their parasitoids. Percentages of parasitism in chicken and cattle feces were 0.33% and 0.3%, respectively.

Keywords: Biocontrol; Pathogens; Insects; Natural enemy; Insect

1. Introduction

The feces in chicken farms and in cattle raising causes accumulations of manure that are an excellent substrate for the proliferation of Diptera. To control these insects, a management program must integrate cultural, chemical, and biological methods [1].

Calypterated dipterans are an adequate model for the study of synanthropy, not only for their ecological importance, but also for their medical-sanitary aspect, as mechanical vectors of pathogens such as: amoeba cysts, helminth eggs, enteropathogenic bacteria, viruses, and fungi (Figure 1) [2, 3].

Furthermore, treatment with these substances has had an impact on the natural enemies of these insects, since larvicides not only reach the target fauna, but also end up harming the fauna of parasitoids and synanthropic fly predators. The emergence of resistance to insecticides has highlighted the growing need to implement alternative control programs [2, 3].

Aleochara notula Erichson, 1839 (Coleoptera: Staphylinidae), in the larval stage, behaves as a solitary ectoparasitoid of Diptera Cyclorrhapha pupae from the Muscidae, Anthomyiidae, Coelopidae, Sarcophagidae and Psilidae families. In adulthood, acts as predators of eggs and larvae of these Diptera, and can be used in the biological control of flies (Figure 2) [2, 3]

The objectives of this study are to report the occurrence of *A. notula* in chicken and cattle feces in Brazil

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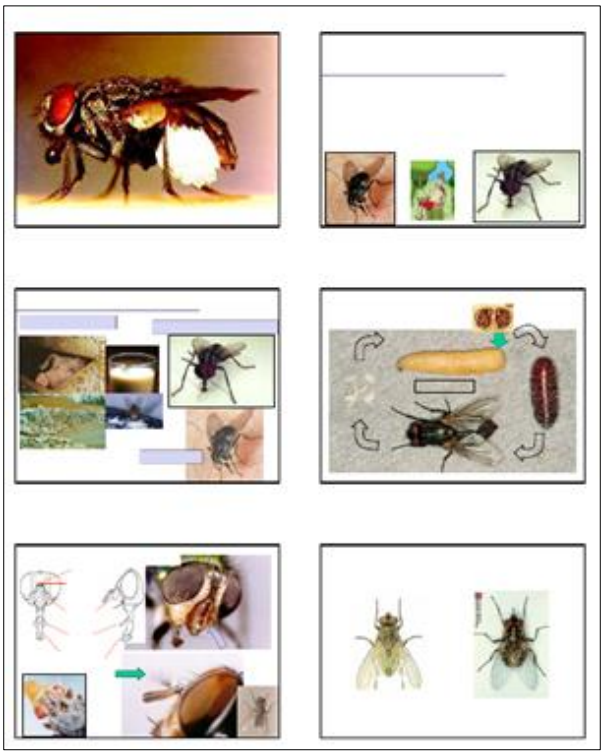

Figure 1 Importation of humans and animals, transmitters of pathogens, intermediate hosts of other parasites and agents of myiasis. Source: https://www.passeidireto.com/arquivo/977094/moscas-grad-2010

Figure 2 *Aleochara notula* Erichson, 1839 (Coleoptera: Staphylinidae)
Source: http://www.coleoptera-neotropical.org/paginas/2_PAISES/Chile/Staphylinoidea/aleocharinae-chile.html

2. Material and methods

2.1. *Aleochara notula* collected in bovine feces

The experiment was carried out at the Federal University of Goiás farm in the central region of Goiás, Brazil. Every fortnight, ten dishes black plastic containers containing bovine feces were exposed for fifteen days in the pastures. After this period, the feces were sent to the laboratory for pupae extraction. Pupae were removed with the aid of a sieve, counted, and stored individually in glass jars. The experiments were carried out from April 2006 to December 2007.

2.2. Aleochara notula collected in chicken feces

Fresh feces were collected immediately after emission and placed in four basins measuring 30 cm in diameter and 12 cm in height, which were left in the environment, in a dry place. The feces remained in the shed for 15 days, later, the basins were removed and taken to the laboratory for the extraction of pupae by the flotation method. Pupae were

removed with the aid of a sieve, counted, and individualized in glass jars until the emergence of the dipterans and/or their parasitoids.

The percentage of parasitism was calculated by the number of parasitized pupae/total number of collected pupae x 100.

3. Results and discussion

In cattle feces, 905 pupae of *Palaeosepsis* sp. (Diptera: Sepsidae) (Figure 3) in the period November 2003, from which three specimens of *A. notula* emerged, presenting a percentage of parasitism of 0.33%

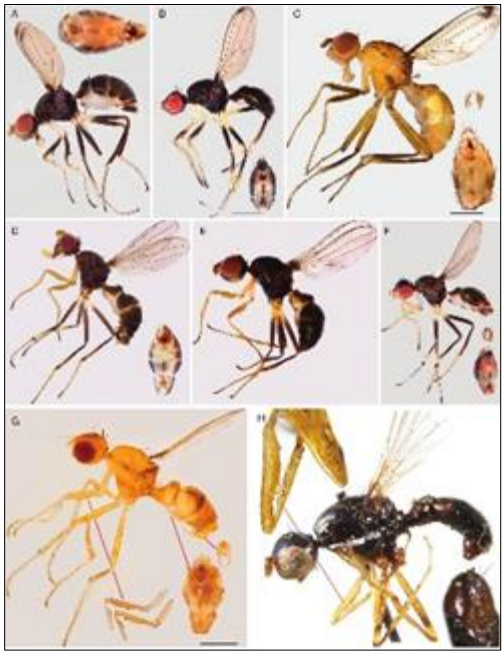

Figure 3 *Archisepsis armata* (Schiner, 1868), *Archisepsis diversiformis* (Ozerov, 1993), *Peruvian Archisepsis* (Ozerov, 1994), *Meropliosepsis sexsetosa* Duda, 1926, *Microsepsis armillata* (Melander & Spuler, 1917), *Microsepsis furcata* (Melander & Spuler, 1917), *Microsepsis mitis* (Curran, 1927), *Palaeosepsioides erythromyrmus* (Silva, 1991), *Palaeosepsioides mitarakensis* Silva, n. sp., described herein, *Palaeosepsis* Duda, 1926 and *Pseudopalaeosepsis* Ozerov, 1992
Source: https://bioone.org/journals/zoosystema/volume-42/issue-14/zoosystema2020v42a14/The-Sepsidae-of-the-Mitaraka-expedition-French-Guiana-Diptera/10.5252/zoosystema2020v42a14.short

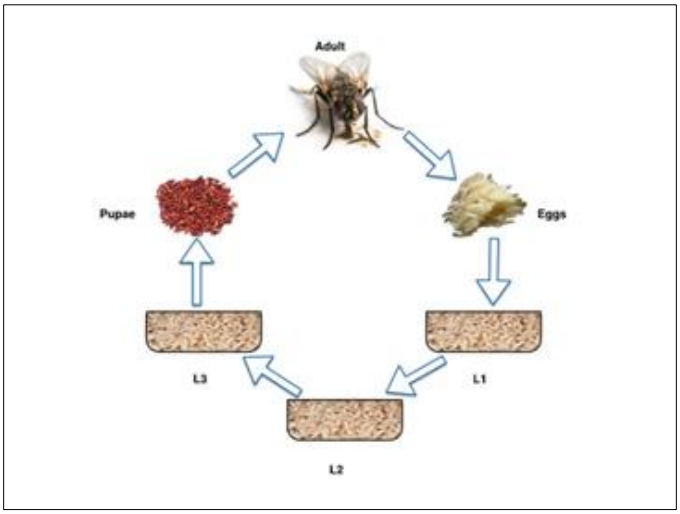

Figure 4 Life cycle of *Musca domestica* L., 1758 (Diptera: Muscidae) (larvae L1, L2 and L3)

In chicken feces during the period of August 2007, 600 pupae of *Musca domestica* L. 1758 (Diptera: Muscidae) were collected from which two specimens of *A. notula* emerged, presenting a percentage of parasitism of 0.3% (Figura 4).

Figure 5 Pupa of *Musca domestica* L. 1758 (Diptera: Muscidae) parasitized *Aleochara notula* Erichson, 1839 (Coleoptera: Staphylinidae)

During 2-4 the larvae are fed separately with worthy feed. This feed is also checked on regular viruses, and bacteria under the same regulations that apply for feeding this feed to cows or pigs. In addition, the larvae of the housefly have the unique property of killing bacteria, viruses, and fungi by means of, among other things, anti-microbial protein. The life cycle of a housefly varies depend stongly on outside natural circumstances. It varies between 7 and 49 days. Source: https://www.amusca.com/information-musca-domestica/

Practically the same percentage was found in the two different types of feces, probably this may be due to the experiments having been carried out at almost the same period of time, where the meteorological conditions were the same and, in the quality, and availability of food resources or the densities of the hosts.

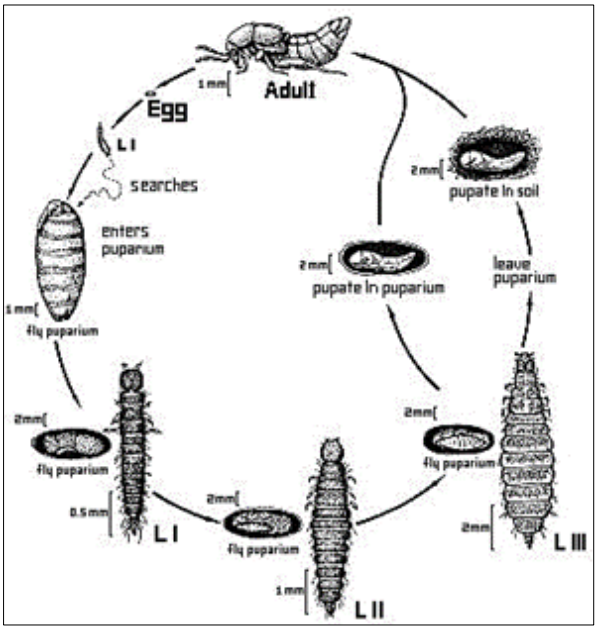

Figure 6 Life cycle of *Aleochara* (Coleoptera: Staphylinidae

Source: http://tolweb.org/Aleochara/9878

In both studies, *M. domestica* was one of the species of greatest health interest, due to its synanthropic character, endophilia, its abundance in the urban region, its ability to develop in various types of substrates, its high reproductive power and to be identified as a carrier of pathogens to man and animals (Figure 5) [4, 5].

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 [6].

Studies have found *A. notula* parasitizing *Sarcophagula occidua* (Fabricius) 1794 (Diptera: Sarcophagidae), in bovine fecal masses [6, 7]. Despite being ideally removed regularlscidy from the raising area, the permanence of accumulation of dung favors the development of a quite diversified arthropod fauna. The most important species of pest flies that breed in this environment are *M. domestica*, *Stomoxys calcitrans* L., 1758 (Diptera: Muscidae) and *Haematobia irritans* (L., 1758) (Diptera: Muscidae) [7, 8].

In a study with bovine feces collected in the State of Goiás, A. notula was the most frequent species with 26.2% of individuals collected. The larval phase of *A. notula* behaves as a solitary ectoparasitoid of pupae of Cyclorrhapha dipterans. In the adult phase, it behaves as a predator of eggs and larvae of these dipterans insects and can be used for biological control of flies (Figure 6) [9]

4. Conclusion

As the use of insecticides used to control flies can damage the environment and human health, the search for effective natural enemies can be a viable alternative for future biological control programs.

Compliance with ethical standards

Acknowledgments

I would like to thank Jéssica da Silva Guimarães for proofreading the English language.

References

[1] Wright EJ, Müller P. Laboratory studies of host finding acceptance and suitability of the dung-breeding fly, *Haematobia thirouxi potans* (Diptera: Muscidae), by *Aleochara* sp. (Col.: Staphylinidae). Entomophaga.1989; 34: 61-71.

[2] Greenberg B. Flies and disease – ecology, classification, and biotic association. New Jersey: Princeton University Press. 1971.

[3] Harwood RF, James MT. Entomology in human and animal health. 6th ed. New York: Macmillan. 1979.

[4] Mariconi FAM, Guimarães JH, Filho EB. House fly. Piracicaba: FEALQ. 1999.

[5] 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.

[6] Polvoný D. Synantropy. Princeton: Princeton University Press. 1971.

[7] Marchiori CH, Oliveira AT, Linhares AX. Arthropods associated with bovine fecal masses in southern Goiás State. Neotropical Entomology. 2001; 30(1): 19-24.

[8] Marchiori CH, Linhares AX. Muscoid Diptera associated with fresh cattle feces and their parasitoids. Brazilian Journal of Ecology. 1999; 28: 26-31.

[9] Marchiori CH, Borges LMF, Ferreira LL. *Parasitoids* of *dipterous collected* in *cattle dung* in the *Regions* Southern and *Central* of *Goiás*, *Brazil*. 2014; 75(9): 408-426.