Brazilian Journal of Biology®

ISSN 1519-6984 (Print)
ISSN 1678-4375 (Online)

Original Article

Diversity of *Anastrepha* spp. (Diptera: Tephritidae) in the Chaco Biome

Diversidade de *Anastrepha* spp. no Bioma Chaco

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Abstract

Species of the genus *Anastrepha* cause injuries to several fruits and vegetables in the Nearctic and Neotropical regions. Among these species, many are present in Brazil. In this study, we surveyed the existing *Anastrepha* species in the Brazilian Chaco Biome. We evaluated possible influences of climate and vegetation on the occurrence of *Anastrepha* spp. For this, we used traps and hydrolyzed protein as bait. Collections were carried out in three distinct floristic compositions in the Chaco biome, from permanently dry areas to flooded sites. We identified *Anastrepha fraterculus* (Wiedemann, 1830), *A. sororcula* Zucchi 1979, *A. undosa* Stone 1942, and *A. daciformis* Bezzi 1909. The dry and flooded environment did not influence the occurrence of *Anastrepha* species. The presence of multiple hosts increases the number of species. The richness and abundance of *Anastrepha* species are lower in the Brazilian Chaco than in other native environments.

Keywords: insecta, fruit flies, biome, dispersion, pantanal.

Resumo

Espécies do gênero *Anastrepha* causam prejuízos em diversas frutas e hortaliças nas regiões Neártica e Neotropical. Dentre essas espécies, muitas estão presentes no Brasil. Neste estudo, pesquisamos as espécies de *Anastrepha* existentes no Bioma Chaco brasileiro. Avaliamos possíveis influências do clima e da vegetação na ocorrência de *Anastrepha* spp. Para isso foram utilizadas armadilhas e proteína de milho hidrolisada como isca. As coletas foram realizadas em três composições florísticas distintas no bioma Chaco, desde áreas permanentemente secas até áreas inundadas. Identificamos *Anastrepha fraterculus* (Wiedemann, 1830), *A. sororcula* Zucchi 1979, *A. undosa* Stone 1942 e *A. daciformis* Bezzi 1909. O ambiente seco e inundado não influenciou a ocorrência de espécies de *Anastrepha*. A presença de múltiplos hospedeiros aumenta o número de espécies. A riqueza e abundância de espécies de *Anastrepha* são baixas no Chaco brasileiro quando comparadas a outros ambientes nativos.

Palavras-chave: insecta, moscas-das-frutas, bioma, dispersão, pantanal.

1. Introduction

Fruit flies (Diptera: Tephritidae) have significant ecological and economic importance in fruit growing. In the Americas, there are 29 species of fruit flies with economic importance belonging to the genera *Anastrepha, Bactrocera*, *Ceratitis*, *Rhagoletis,* and *Zeugodacus* (Garcia et al., 2020), of which 12 species are present in Brazil, which causes quarantine restrictions between commercial cooperation countries in the fruit growing market. In their larval stage, all of them feed in the endocarp of the fruits of their host plants until they complete the third instar (Taira et al., 2013).

The Chaco is the second largest biome in South America, covering 800,000 km^2, second only to the Amazon, and is present in northern Argentina (Bachmann et al., 2007), in Western Paraguay (Navarro et al., 2006; Vinke and Vinke, 2001) and Southwest Bolivia (Dias and Jemmio, 2008). The Brazilan Chaco is restricted to the municipality of Porto Murtinho, located in the south of the Pantanal state of Mato Grosso do Sul, where it is characterized as the humid Chaco (20º14' and 22º09'S, 56º37' and 57º59'W) (Uchoa et al., 2021). This area of the Chaco biome in Brazil is restricted to four distinct floristic formations: Wooded Steppic Savanna (WSS), Park Steppic Savanna (PSS), and Forested Steppic Savanna (FSS). The latter was not included in this study, as its vegetation is predominantly pasture composed of thorny vegetation and undergoes the natural phenomenon of adequate, originating from the Pantanal (Pott et al., 2011).

Although this biome is scientifically recognized in Brazil, the responsible Brazilian bodies have not yet included it in its nomenclature. This would reinforce a service by

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Received: October 5, 2023 – Accepted: February 9, 2024

including a policy of conservation and preservation of the environment. Without these management procedures, biodiversity loss may occur due to anthropogenic habitat fragmentation (Aguilar et al., 2018).

Despite the considerable species diversity of some plant families in the Brazilian Chaco (Sartori et al., 2018), a survey of fruit fly species and their hosts had not yet been carried out in this area. This survey is of fundamental importance for studies in different areas of knowledge, such as ecology, biology, and pest control (Araújo et al., 2000). In addition to helping to monitor the distribution of species considered pests (Kovaleski et al., 2000).

Therefore, studies on the diversity, hosts, and distribution of *Anastrepha* species have been developed for a little over a decade in regions of Cerrado, Amazon, Caatinga, Pantanal, and Atlantic Biome, as well as ecotones and fragments of native biome (Uchoa and Nicácio, 2010; Trindade and Uchoa, 2011). However, the scarcity of knowledge about the dynamics of these flies and their host plants aroused interest in evaluating the association of these species, in addition to their hosts, as well as seasonality and local phytophysiognomy, providing future monitoring management and control actions for some pest species.

2 Material and Methods

2.1. Study area

Anastrepha species were collected in native biome areas of the Chaco, municipality of Porto Murtinho, state of Mato Grosso do Sul, Brazil. According to Prado et al. (1992), the floristic composition of this area is similar to that found in regions with this same biome with four types of phytophysiognomy in other countries. This biome in Brazil is part of the Pantanal biome, also limited to small areas, representing some fragments of the Cerrado biome in Mato Grosso do Sul.

Samplings were conducted in three types of physiognomy: Wooded Steppic Savanna (WSS), Park Steppic Savanna (PSS), and Forested Steppic Savanna (FSS) (Pott et al., 2011).

The WSS (21°42’21.18”S; 57°47’32.52”W, 87m altitude) is characterized by entangled cacti, shrubs, and thorny trees, about 4m high, mainly composed of *Acacia farnesiana* Willd., *A. paniculata* (Fabaceae), *Capparis retusa* Griseb., *C. speciosa* Griseb., *C. tweediana* Eichl. (Capparaceae), *Celtis iguaneae* (Cannabaceae) Kunth, *Zizyphus* spp. (Rhamnaceae), *Selaginella sellowii* Hieron (Selaginellaceae). The same authors characterize this phytophysiognomy as Chaco.

The PSS (21°50’38.03”S; 57°49’18.80”W, 77m altitude) is predominantly composed of palm *Copernicia alba* Morong (Arecaceae), with 8-20 m in height and *Capparis* spp. Griseb (Capparaceae), *Cereus bicolor* Rizzini and Mattos (Cactaceae), *Diplokeleba floribunda* Brown, N. E (Sapindaceae) (Vell.) Stellf., *Mimosa* spp. (Mimoseae), *Prosopis ruscifolia* Griseb (Fabaceae), *Tabebuia nodosa* (Griseb.) Griseb (Bignoniaceae), among others. The soil is covered with grasses and woody plants.

The FSS is located in the Environmental Protection area of the Municipal Environmental Reserve Cachoeira do APA (22°10’20.35”S; 57°30’56.45”W, 107m altitude). Plants cover this environment with a typical appearance of the dry biome and the Chaco biome, similar to a deciduous biome. The trees usually reach between 5 and 7m in height. The following arboreal species occur white quebracho (*Aspidosperma quebracho-Blanco* Schltdl., Apocynaceae) and red quebracho (*Spinopsis balancae* Engl, Anacardiaceae) (Pott et al., 2011).

2.2. Sampling

Samples of fly species were collected monthly for 12 months (March 2017 to February 2018) using McPhail traps distributed in three environments, totaling 96 samples (n) per phytophysiognomy. The food attractant used in the traps was the hydrolyzed protein (BioAnastrepha®), dissolved in drinking water (10% vol.). Traps were 200 meters spaced apart in each environment, in transects following the edges of the biome fragments. Each line transect was 2 km, passing through permanently dry areas and flooded sites. Traps were exposed for 72 hours, and the captured insects were placed in vials with 92% ethanol. Along the transects, a density of floristic composition was observed, making it difficult to move into the biome in the first 50 m of the trailing edge. For the cover, the tree canopy heightens over the points of each trap. As for density characterization, it was classified as easy access, intermediate, and difficult. Three categories were defined for vegetation cover: low, medium, and high (Pott et al., 2011). The categories of these variables were evaluated in percentage according to the number of restrictions observed in each site with the trap. For the first trap, the percentage of displacement restriction was 0-33%=1=easy access; 34 to 66% = 2 = intermediate, and 67 to 100 = 3 = difficult to access. Thus, it was possible to measure each phytophysiognomy in terms of density in percentage. For the cover, the same criteria were followed.

Therefore, vegetation cover in the WSS mainly was, on average, represented by 55% vegetation (5-7 m), 35% high (8-20 m), and 10% low (below 4m). For density, displacement with intermediate restriction was 50%, easy 35%, and difficult 15%. PSS comprises 50% tall vegetation, 35% low, and 15% medium. As for its density is composed of about 60% difficult displacement, 25% intermediate, and 15% easy access. FSS, on the other hand, has 55% medium vegetation, 35% high, and 10% low. In addition, it has easy access of 50%, 35% intermediate, and 15% difficult to access.

2.3. Statistical analysis

The results were subjected to statistical analysis using the Bayesian method to corroborate the assessment of the degree of uncertainty of the propositions. They were represented by a posterior probability distribution, inferring the plausibility relative to the effects of the characteristics of the environment obtained in the results of the parameter of interest. These methods followed the R modeling indicated by Kinas and Andrade (2010).

Flies were identified using taxonomic keys (Stone, 1942; Zucchi, 2000; Norrbom, 1997; Norrbom and Korytkowski, 2009). The voucher specimens are deposited in the Museum of Biodiversity (MuBio), Federal University of Grande Dourados (UFGD), Dourados, Mato Grosso do Sul state, Brazil.

3. Results

We register a single genus and four species: *Anastrepha fraterculus* (Wiedemann, 1830), *A. sororcula* Zucchi 1979, *A. undosa* Stone 1942, and *A. daciformis* Bezzi 1909. These species were obtained from three localities in the Brazilian Chaco, belonging to three infrageneric groups: *fraterculus*, *mucronota*, and *daciformis*.

The compositions of these species had different plausible probabilities among the evaluated environments. In the Wooded Steppic Savanna (WSS), no occurrence of *A. fraterculus* was found, and in the Forested Steppic Savanna (FSS), no *A. daciformis*. However, the proportion of flies in the Park Steppic Savanna (PSS) was higher than in the biome and wooded environments (Table 1).

The species caught in the WSS were 3♀ of *A. undosa*, 1♀ of *A. daciformis*, and 1♀ of *A. sororcula* (Table 1). We caught 20 specimens in the PSS (12♀), represented by 1♀ *A. undosa*, 1♀ *A. fraterculus*, and 10♀ *A. sororcula*, the latter being significantly associated with the phytophysiognomy (Table 1). In the municipal reserve, Cachoeira do APA, with the dominance of Forested Steppic Savana (FSS), 14 adults of *A. undosa* (Table 1).

The highest probability of richness was in the WSS, followed by the FSS environment, where there was a lower abundance of individuals. For PSS, the abundance was high, with lower species richness. *A. undosa* was the most present in this study and was associated with FSS. This phytophysiognomy showed a significant difference in the number of adults of *Anastrepha* spp. They were collected, although with the richness of only one species. While the other two phytophysiognomies had similar richness, three species. When evaluating the probability of the accumulated average, a low occurrence of flies is observed for Chaco (Figure 1).

The a priori and posterior probabilities of the occurrence of *Anastrepha* in the Chaco are evaluated in the result of (Figure 2A - A.1). The proportion of a likelihood occurrence on the x-axis was: *A. daciformis*=0.1; *A. fraterculus*=0.22; *A. sororcula*=0.34; and *A. undosa*=0.46. Evidence of a higher probability of occurrence for *A. undosa* and *A. sororcula,* with a lower probability of occurrence for *A. daciformis* and *A. fraterculus*. Therefore, *A. undosa* and *A. sororcula* are highlighted for the Chaco region (Figure 2A - A.1).

Prior and posterior distribution of the number of *Anastrepha* individuals in the Brazilian Chaco region (Figure 2B - B.1). The prior and posterior boxplot figures of the number of *Anastrepha* individuals captured in McPhail traps in the Chaco biome (Brazil) show an adjusted prior with median odds above 20%. It starts to differ from the posterior about the most extreme values of the amplitude after the first and third quartiles. That is a lower median than a priori due to a more significant variation between the number of flies of the evaluated species (Figure 2B - B1).

The evaluated phytophysiognomies, composing the Chaco biome, differed in the probability parameters, degree

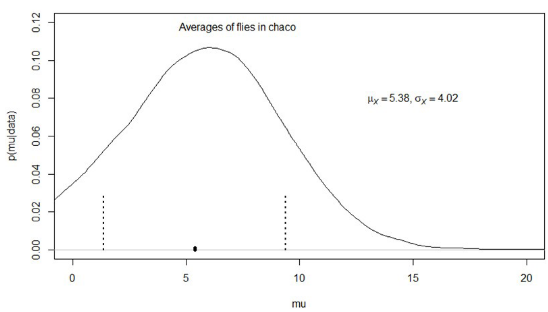

Figure 1. Accumulated average probability of occurrence of *Anastrepha* spp. in the Brazilian Chaco.

Table 1. Mean ± sd of the posterior of species and number of *Anastrepha* spp. (Diptera: Tephridae) caught in McPhail traps with food attractants in the Brazilian Chaco environment.

Infrageneric Groups (♀)/ Species	Wooded Steppic Savanna	Forested Steppic Savana	Park Steppic Savana	Total
Group *fraterculus*				
Anastrepha fraterculus	0	0	1	1
A. sororcula	1	0	10	11
Group *mucronota*				
A. undosa	3	4	1	8
Group *daciformis*				
A. daciformis	1	0	0	1
Richness	¾	¼	¾	**7/4**
Mean±sd(posterior)	2.32±0.96	4.79±0.55	6.69±1.28	**-**
Richness probability	0.95	0.048	0.002	**1**
Probability of the mean (+50%)	0.97	1	1	-

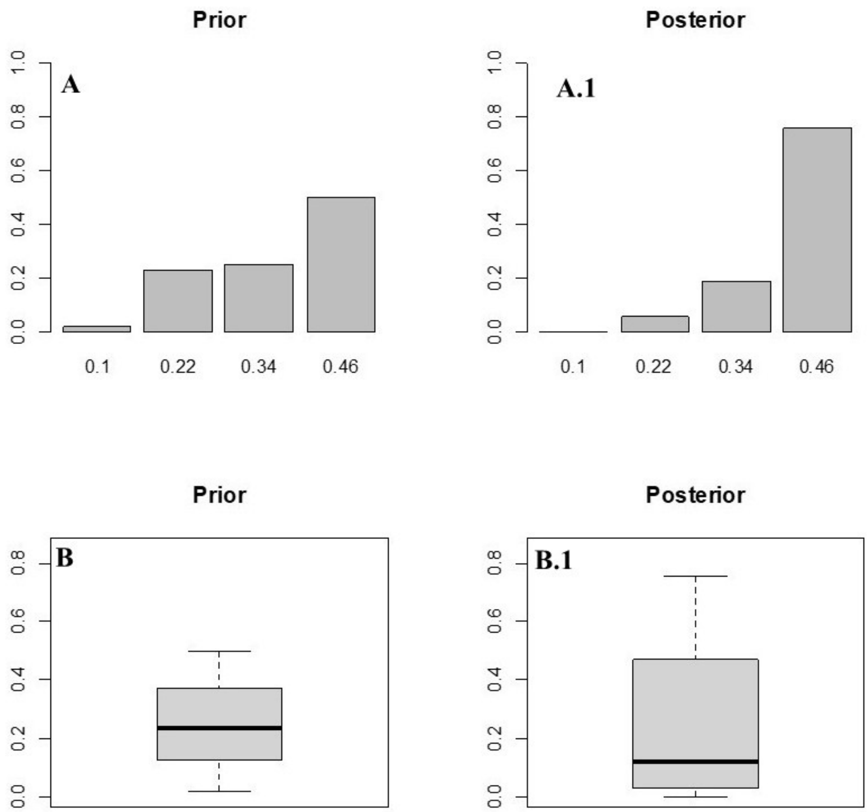

Figure 2. Probabilities and distribution of the occurrence and number of individuals of *Anastrepha* in the Brazilian Chaco region. Legend: (A) Priori probability distribution (y-axis) in relation to the proportion of the number of individuals of *Anastrepha* species (x-axis); (A.1) Posteriori probability distribution (y-axis) in relation to the proportion of the number of individuals of *Anastrepha* species; (B) BoxPlot of Priori probability distribution of central and dispersion measures, and; (B.1) Posteriori probability distribution.

of uncertainty, and several individuals. The Wooded Steppic Savana (WSS) phytophysiognomy had a lower average number of individuals captured, and the parameters of measurement of probability and degree of uncertainty intermediate to the two following phytophysiognomies were also observed. The highest probability of capturing *Anastrepha* individuals with a lower degree of uncertainty of occurrence of these flies was observed for the FSS, with an average number of flies intermediate about the other phytophysiognomies. The Park Steppic Savana (PSS) had the lowest probability of catching flies, with the highest degree of uncertainty regarding the occurrence of this insect, with a higher average number compared to the other environments (Figure 3).

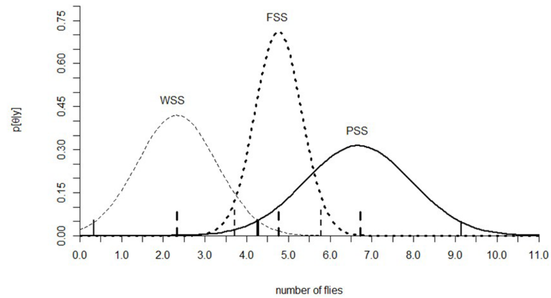

Figure 3. Probability of capture of *Anastrepha* species in each phytophysiognomy. Legend: Steppic Scrub Savanna = WSS; Forested Steppic Savana = FSS; Park Steppic Savanna = PSS. Probability of capture of Tephritoidea species in each phytophysiognomy with a probability of occurrence more significant than 50%: A p(+50% fly) of WSS = 0.97; FSS = 1 and; PSS = 1.

The flooded environment had more significant evidence of occurrence for the *Anastrepha* species. The proportions showed a higher probability of *A. sororcula* and *A. undosa*, with evidence of 70% of both occurring. For the dry environment, the highlight was *A. undosa* and *A. fraterculus*, with approximately 30% occurrence. The probability of occurrence of *Anastrepha* species per environment when observing the posterior distribution was the same for the environments. With time intervals, a particular environment (Table 2) does not influence the odds ratio of occurrence of the number of Anastrepha spp. with emphasis on all species obtained that. Variations in the behavior of flies occur according to different vegetation densities over the first seven years before the distribution settles down to occurrence probabilities. Where the vegetation is highly dense, that is, higher and lower, there were variations in probability in similar periods. There was variation in the probability of occurrence of fruit flies in less dense vegetation; that is, easy movement to the

Table 2. Probability of occurrence of *Anastrepha* species with a priori and posterior on the effect of the flooded and dry environment (March 2017 to March 2018 in the Brazilian Chaco).

Environment		*Anastrepha* species			
		A. daciformis	***A. fraterculus***	***A. sororcula***	***A. undosa***
p(Θ)	flooded = 0.17	0.14	0.00	0.43	0.43
	Dry = 0.83	0.00	0.35	0.24	0.41
p(y|Θ)	Flooded	0.024	0.000	0.073	0.073
	Dry	0.000	0.293	0.195	0.341
TPT	–	**0.024**	**0.293**	**0.268**	**0.415**
p(Θ|y)	Flooded	0.170	0.000	0.109	0.087
	Dry	0.000	0.830	0.297	0.405
Odds Ratio	Flooded	17/100	0	731/6700	731/8400
	Dry	0	83/100	498/6700	3403/8400

p(Θ) = Probabilities of the Distribution a Priori; p(y|Θ) = Probabilities of the Likelihood; TPT = sum of total probability theory; p(Θ|y) = Probabilities of the Distribution a posteriori; Odds Ratio = Probabilities.

interior has a short time to settle the distribution, with a difference occurring up to a maximum of 6 years. Native biome vegetation with intermediate restrictions had more significant variations in the probability of occurrence of flies, suggesting a more extended evaluation time if implemented in research (Figure 4).

When evaluating vegetation coverage levels below 30%, a lower average probability of flies and a low occurrence are observed, with coverage between 30 and 50% presenting a higher average number of flies but with an intermediate probability of occurrence (Figure 5A). The vegetation with the highest level of cover restriction has an intermediate average, having the highest plausibility of occurrence in the Chaco. Greater plant density provides a lower average number of flies captured (Figure 5B).

The highest probability ratio of *Anastrepha* per host occurs at one to three flies per host (Figure 6A). The probability of the cumulative distribution of *Anastrepha* occurrence is between two and four host plants, reaching the probability above 95% (Figure 6B).

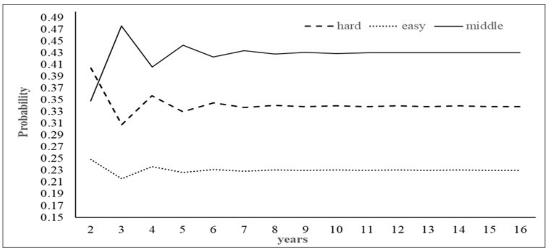

Figure 4. Probability of occurrence of *Anastrepha* at different densities over time in the Brazilian Chaco.

4. Discussion

This is the first survey of frugivorous Tephritidae species in the Brazilian Chaco. Only four species of the genus *Anastrepha* Schiner 1868 were caught, showing the richness of the well-known fruit flies in the Brazilian Chaco, with low richness compared to other surveys carried out in different environments, mainly those in extensive plains that make connections, such as the Pantanal (Taira et al., 2013; Nicácio and Uchoa, 2011; Uchoa and Nicácio, 2010; Minzão and Uchoa, 2008; Uchoa et al., 2002), among others the Cerrado (Uchoa and Bomfim, 2017; Bomfim et al., 2014; Taira et al., 2013; Querino et al., 2014). Regarding endophagous tephritids associated with Asteraceae, species richness is also low (Uchoa et al., 2021).

The species caught have all been cataloged for the Pantanal Biome, such as *A. fraterculus*, *A. sororcula*, *A. undosa,* and *A. daciformis*. Among these are A. fraterculus and A. sororcula, which have high pest status for Brazilian fruit production (Canesin and Uchoa, 2007). In addition to its wide geographic distribution with the generalization of an extensive host range and high infestation rate (Zucchi and Moraes, 2023). Although, it is essential to know the occurrence of fruit flies in their host's fruit at this location. *Anastrepha undosa* has a geographical distribution restricted to Mato Grosso do Sul, Minas Gerais (Nicácio, 2010), and Tocantins (Zucchi and Moraes, 2023), and only one host, *Pouteria glomerata* (Sapotaceae) (Nicácio, 2010) and in Paraguay (Clavijo Rodriguez et al., 2020). However, the host plant has a wider geographic distribution from South America to Mexico (Bortolotto et al., 2021). The Chaco can be considered a repository area for *A. undosa* in Mato Grosso do Sul. The level of richness and abundance represented is low, probably due to the low host frequency with fruiting seasonality (Minzão and Uchoa, 2008).

Thus, for these parameters to be at high levels, it may only need to increase the occurrence of their hosts and fruiting biomass. Because, in all other environments connected by some territory to the Chaco (Amazon, Cerrado, and Pantanal), greater richness and abundance

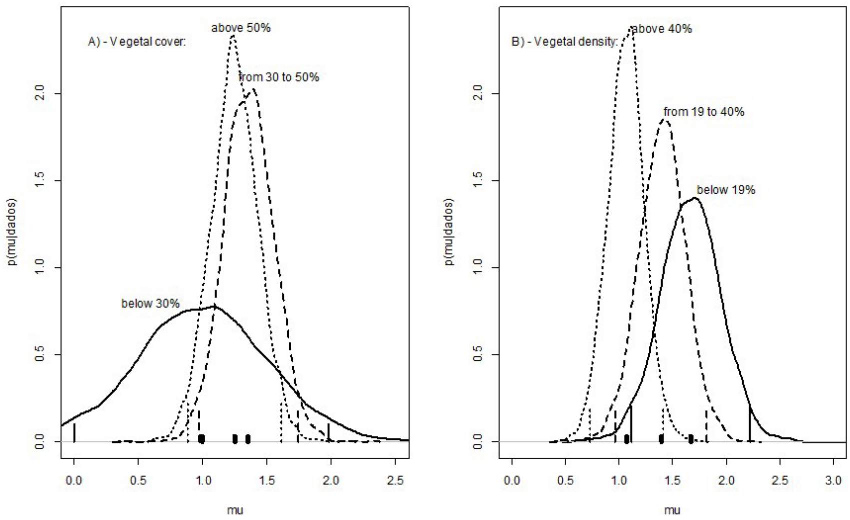

Figure 5. (A) The average probability of occurrence of *Anastrepha* spp. at different levels of vegetation cover; (B) Average probability of occurrence of *Anastrepha* spp. At different levels of plant density in the Brazilian Chaco.

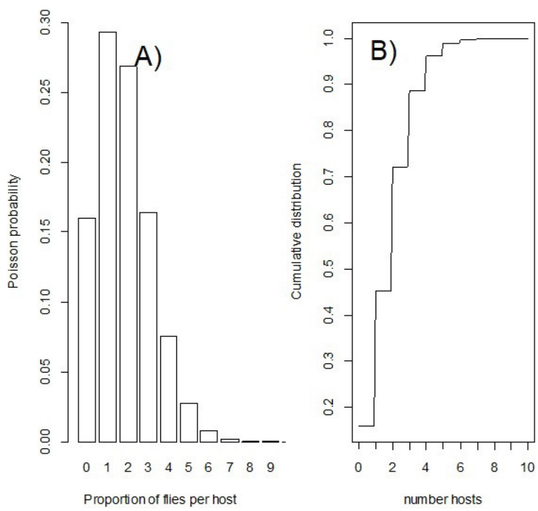

Figure 6. (A). Poisson distribution probability of the proportion of flies per host; (B) Probability of the cumulative distribution of the number of flies per host.

in fruit fly species have been reported (Uchoa et al., 2002; Uchoa and Nicácio, 2010; Trindade and Uchoa, 2011).

Non-impacted native biome environments have greater richness and less abundance compared to areas of orchards formed by mono-crops, as these provide biotic and abiotic resources suitable for the development and ecological balance of the community of these flies (Bomfim et al., 2014; Vargas et al., 2019).

As the diversity of fruit species in ecosystems increases, the diversity of fruit fly species tends to increase. Surveys in the Cerrado showed richness and abundance 87% higher than that found herein (Uchoa et al., 2002; Uchoa and Bomfim, 2017). Higher richness values were also observed in fruit fly surveys in Caatinga-Cerrado transition areas (Querino et al., 2014).

The Chaco has a natural short-term propagation barrier: the Serra da Bodoquena National Park between this environment and the Mato Grosso do Sul plateau (Brasil, 2013). This site is used in many places as a buffer zone for fruit crops (Assunção et al., 2020). Therefore, in biome reserves with preservation levels higher than those of the fragments evaluated in this survey, the richness and abundance of fruit flies were also higher than those in the present study (e.g., Canesin and Uchoa, 2007; Bomfim et al., 2014), in which only four species were found (Table 1).

The Chaco area surrounding these areas, assessed as Forested Steppic Savana, has been impacted by agriculture and livestock production as the main economic activity in Porto Murtinho (Pott et al., 2011). Livestock has contributed to environmental degradation in the Chaco, as increasingly larger areas are needed for grazing, resulting in the decimation of native flora with the consequent reduction in the number of fruit trees that host fruit flies (Pott et al., 2011). This can provide an ease of movement for these insects and reach levels of infestation, causing damage in future orchards of these areas if not monitored with preventive measures with IPM (Integrated pest management) methods.

The PSS area presented the greatest abundance of flies, which may be influenced by fire in grasslands to renew pastures in extensive cattle-raising areas in this region (Cardoso et al., 2003). These factors probably contributed to the significantly greater abundance (n = 20) of fruit flies in that area, Park Steppe Savanna (PSS), and this effect has already been observed in Cerrado areas by Uchoa and Bomfim (2017). The richness of *Anastrepha* species was similar in the two phytophysiognomies: Wooded Steppic Savanna (WSS) and Forested Steppic Savanna (FSS); in both, there were three species. This is because it is in preserved areas.

Therefore, the low diversity of *Anastrepha* species reported here can be explained by the environmental impacts in the surroundings and interior of the evaluated areas, especially in the Cachoeira do Apa Municipal Park, FSS (Table 2). In an environmental assessment, authors pointed out numerous deficiencies of this conservation area, directly linked to a lack of management and poor management.

Anastrepha sororcula and *A. undosa* occurred independently of drought and flood conditions. The specimens *A. daciformis* and *A. fraterculus* occurred in only one of these conditions, the first occurring only in a flooded area and the second in a dry area. According to Ronchi-Teles and Silva (2005), the occurrence of *Anastrepha* species depends on the availability of host fruits and not on climatic factors. The Brazilian Chaco vegetation is composed of more than 50% Leguminosae, Poaceae, Asteraceae, Malvaceae, Euphorbiaceae, Apocynaceae, and Rubiaceae (Sartori et al., 2018). Except for the last three, these are plant species with greater richness of species and not preferred hosts of *Anastrepha* spp., which explains the low occurrence of these flies. The dry and flooded conditions do not influence the probability of occurrence of Anastrepha species present in this study in the environment. Still, the species occur in both conditions due to the availability of host fruits.

A. sororcula and *A. fraterculus* are highly polyphagous, with a wide geographic distribution of their host plants throughout the Brazilian states (Uchoa and Nicácio, 2010). In the state of Mato Grosso do Sul, they are the most frequent and abundant fruit fly species in Pantanal and Cerrado environments. *A. sororcula* and *A. undosa* are associated with the Chaco, in which *A. sororcula* has generalist foraging habits and a high level of infestation, as described by Nicácio and Uchoa (2011). On the other hand, *A. undosa* is characterized as a monophagous species. This species showed restricted occurrence in the environment of areas of the Pantanal.

The dispersion of fruit flies depends on the distribution density of native vegetation plants in biome fragments, serving as maintenance reservoirs for the species, such as alternative hosts, having a favorable climate for reproduction and protection against predators (Vargas et al., 2019). Therefore, vegetation with difficult-to-access density, that is, difficult to enter into the biome, has a higher probability of occurrence of *Anastrepha* spp. Interior areas have a greater diversity of host fruits, providing the predator with constant and alternative food (Nicholls et al., 2001). Environments with greater environmental impact are less likely to occur. The probability of fruit flies occurring is low in the Brazilian Chaco. However, the species collected here are very similar to those found in the Pantanal, such as the monophagous species *A. undosa* registered in *P. glomerata*, with a wide distribution in the Chaco in Brazil, Bolivia, and Paraguay (Pott and Pott, 1993).

5. Conclusion

The richness and abundance of *Anastrepha* species are lower in the Brazilian Chaco than in other native environments.

The dry and flooded environments did not influence the occurrence of *Anastrepha* species.

We identified *Anastrepha fraterculus*, *A. sororcula*, *A. undosa*, and *A. daciformis.*

Anastrepha species occurred in native vegetation with intermediate cover (vegetation cover) and density (displacement restriction).

Acknowledgements

Support Foundation for the Development of Education, Science and Technology of the State of Mato Grosso do Sul (FUNDECT) in partnership with CAPES, FUNDECT-CAPES Notice Call 12/2015 Biota-MS-Science and Biodiversity and FUNDECT-CAPES PAPOS II -MS Notice Call 44/2014. The authors would like to thank the National Council for Scientific and Technological Development (CNPq) for the productivity scholarship provided to FRMG.

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