

Food preference of insects in capoeira area in east of state of Maranhão, Brazil

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ABSTRACT. In the relation between plants and herbivores, both organisms developed along their evolutionary histories mediating mechanisms for these relationships. Considering that the present work had the objective to evaluate the herbivory food preference of plants by insects in an area of capoeira phytophysionomy and the hypothesis tested was that insects prefer plants with lower leaf tenacity. The study was carried out in Caxias, Maranhão, Brazil, in November 2016, in which 600 leaves were analyzed with half of tenacious leaves and one of soft leaves. The chi-square test indicated an association between the variables tested pointing an occurrence of herbivory preference for plants with tenacious leaves.

Keywords: Brazilian Cerrado, Herbivory, Ecological interaction

Preferência alimentar de insetos em área de capoeira no leste do estado do Maranhão, Brasil

RESUMO. Na relação entre plantas e herbívoros ambos os organismos desenvolveram ao longo de suas histórias evolutivas mecanismos mediadores dessas relações, considerando isso o presente trabalho teve por objetivo avaliar a preferência alimentar em herbivoria de plantas por insetos em uma área de fitofisionomia de capoeira e a hipótese testada foi de que os insetos preferem as plantas com menor tenacidade foliar. O estudo foi realizado em Caxias, Maranhão no mês de novembro de 2016, no qual analisou-se 600 folhas sendo a metade de folhas tenazes e a outra de folhas macias, o teste de qui-quadrado indicou associação entre as variáveis testadas, apontando a ocorrência de preferência de herbivoria para plantas com folhas tenazes.

Palavras chave: Cerrado, Herbivoria, Interação ecológica

Introduction

Brazilian Cerrado domain presents a diversity of phytophysionomies (Sano and Almeida, 1998). This characteristic gives it great heterogeneity and this can provide a great wealth for species of herbivorous insects (PRICE, 2002). Plants and insects evolved interdependently and this coevolution can be expressed as a mutual

interspecific improvement, with the main purpose of supplying nutritional urgency, procreation and refuge, as well as continuity of species and purpose of survival (PRICE, 2002).

In herbivorous insects there is a high degree of food specialization providing one of the most significant characteristics of insect-plant relationships (NICOLE, 2002). Then, to minimize

the action of phytophagous insects, plants have chemical and physical defenses. Therefore, several studies point to the mechanical (physical) strength of the leaf, or leaf hardness as one of the main defenses against herbivorous (WALTERS, 2011; ONODA et al., 2011, GRAÇA; ZIMMER, 2005, SCHOONHOVEN et al., 2005). The leaf hardness of plants can make them resistant to mechanical lesions, also to the penetration of mouthpieces, tearing action of jaws and ovipositors of phytophagous insects (SCHOONHOVEN et al., 2005).

As presented so far, the present work had the objective of evaluating the herbivory food preference of plants by insects in an area of phytophysiology of Capoeira. The hypothesis tested is that insects prefer plants with lower leaf tenacity, in order to give less mechanical resistance to the action of the insects mouthparts.

Materials and Methods

The present research was developed at the Federal Institute of Maranhão Campus Caxias, in the State of Maranhão, Brazil (Figure 1). The municipality of Caxias is inserted in a transition area between the Brazilian Cerrado and the Caatinga, the climate is dry subhumid, with an annual temperature around 27°C and rainfall between 1,600 and 2,000mm, with two well defined seasons, a rainy season from December to June and a drought from July to November. The predominant phytophysiology in the municipality is the Semidecidual Seasonal Forest, with predominance of the plant species *Attalea speciosa*, in some stretches the *Attalea speciosa* ceases to exist and in these stretches, it is observed Cerrado and Cerradão are highlighted (CONCEIÇÃO et al., 2010).

The data were collected in November 2016. The sampling was carried out along a transect of 500 meters, in which every 25 meters a perpendicular transect of five meters was established. At every perpendicular transect, 30 leaves of plant species were randomly selected. Its hardness was checked and whether there were signs of herbivory.

The measure of hardness was examined by foliar texture, malleability and strength required to make a 1.0mm diameter metal rod completely cross the leaf blade. The data collected in the field were organized in a spreadsheet. For statistical analysis, the association test (chi-square

test) was used to carry out the test. The test's assumptions were taken into account. The analysis was performed with a range of confidence in the statistical environment R (R Development Core Team, 2016).

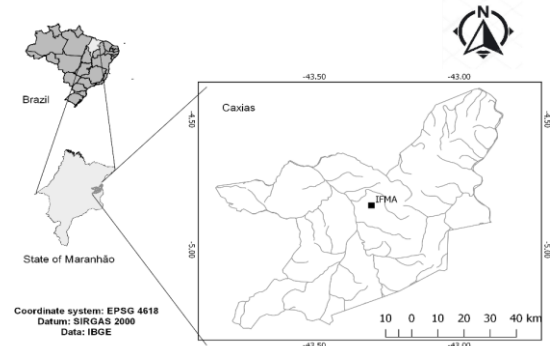


Figure 1. Location of the Federal Institute of Maranhão Campus Caxias, Maranhão, Brazil.

Results and discussion

The number of leaves sampled was 600, being 300 leaves (50.00%) hard and 300 leaves (50.00%) soft, there was a predominance of hard leaves with herbivorous presence. About 48.83% of the samples had herbivorous, being 29.50% hard and 19.33% soft, while 51.17% of them had no herbivore, being 20.50% hard and 30.67% soft. There was an association between the variables analyzed ($\chi^2 = 24.013$, $df = 1$, $p < 0.01$). As observed herbivory values for tenacious leaves were higher than expected, we conclude that there is a greater herbivory in plants with hard leaves when compared with soft leaves.

Although leaf tenacity is a fundamental property of anti-herbivore defense (KITAJIMA; POORTER, 2010), in our study leaves with these characteristics were the most consumed by herbivores, which indicates the existence of adaptive mechanisms that allow the consumption of these leaves. Especially when we consider that several species of insects have developed behaviors and physiological changes that increase their capacity to consume plants with secondary polymers that make their intake difficult (Nicole, 2002). In addition, other defense mechanisms such as the production of secondary metabolites (VIZZOTTO et al., 2010) or the presence of trichomes (RIGUETE et al., 2011; BARBOSA et al., 2010) may be more effective against the action of herbivorous insects on plants of this type of phytophysiology.

Conclusion

Our results indicated that in the capoeira area, herbivorous insects showed a preference for leaves with greater tenacity, a fact that indicates the need to carry out studies about other defense mechanisms to verify which has been most effective in the defense against the action of herbivores.

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