

***Tillandsia tenuifolia* L. (Bromeliaceae) as nesting substrate for social wasps of the genus *Mischocyttarus* (Vespidae, Polistinae) in the cerrado biome**

Tillandsia tenuifolia L. (Bromeliaceae) como substrato de nidificação para vespas sociais do gênero *Mischocyttarus* (Vespidae, Polistinae) no bioma cerrado

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ABSTRACT

The nesting substrate selection by social wasps is related to the protection of colonies, either against predators or adverse weather conditions. Despite the growing number of studies on nesting, there is still limited information on the use of bromeliad species as substrates for social wasps. Therefore, the aim of this study is to report the use of *Tillandsia tenuifolia* L. (Bromeliaceae, Tillandsioideae) as nesting substrate for social wasps of the genus *Mischocyttarus* Saussure, 1853, in a cerrado area in the state of Minas Gerais, southeastern Brazil. Eleven colonies of wasps were recorded, including one of *Mischocyttarus drewseni* Saussure, 1857, three of *Mischocyttarus rotundicollis* (Cameron, 1912), two of *Mischocyttarus mirificus* (Zikán, 1935), two of *Mischocyttarus wagneri* (Buysson 1908), and three of *Mischocyttarus* sp. This genus of social wasps can build their nests in bromeliads, which protect their nests, either through camouflage or concealment, as a form of indirect defense, and these plants offer ideal conditions for this form of shelter.

Keywords: camouflage, indirect defense, nest concealment.

RESUMO

A seleção de substrato de nidificação por vespas sociais está relacionada à proteção das colônias, seja contra predadores ou condições climáticas adversas. Apesar do crescente número de estudos sobre nidificação, ainda há poucas informações sobre o uso de espécies de bromélias como substratos para vespas sociais. Portanto, o objetivo deste estudo é relatar o uso de *Tillandsia tenuifolia* L. (Bromeliaceae, Tillandsioideae) como substrato de nidificação para vespas sociais do gênero *Mischocyttarus* Saussure, 1853, em uma área de cerrado no estado de Minas Gerais, Sudeste do Brasil. Registraram-se 11 colônias de vespas *Mischocyttarus*, incluindo uma de *Mischocyttarus drewseni* Saussure, 1857, três de *Mischocyttarus rotundicollis* (Cameron, 1912), duas de *Mischocyttarus mirificus* (Zikán, 1935), duas de *Mischocyttarus wagneri* (Buysson, 1908) e três de *Mischocyttarus* sp. Esse gênero de vespas sociais pode construir seus ninhos em bromélias, o que os protege, seja por camuflagem ou ocultação, como forma de defesa indireta, e tais plantas oferecem condições ideais para essa forma de abrigo.

Palavras-chave: camuflagem, defesa indireta, ocultação do ninho.

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INTRODUCTION

Social wasps are insects that nest in various substrates such as woodwork, roofs, eaves of houses, metal, embankments, rocks, and different plant species (SOUZA *et al.*, 2014; OLIVEIRA *et al.*, 2017; FRANCISCO *et al.*, 2018). The selection of such substrates is often related to the protection of colonies, whether against predators, based, for example, on camouflage (SILVA *et al.*, 2022), or against weather conditions such as rain, wind, and extreme temperatures (SCHMOLZ *et al.*, 2000; HOZUMI *et al.*, 2008). Therefore, in the case of a plant substrate, the texture and shape of the leaves (DEJEAN *et al.*, 1998), color and shape of the stems (MILANI *et al.*, 2021), and even the chemical composition of the plant (SGUARIZI-ANTONIO *et al.*, 2022) are important factors in the choice of nesting site.

Despite the increasing number of studies on nesting of social wasps, there is still limited information on the use of bromeliad species as substrates (GONZÁLEZ & LATTKE, 1991; BARBOSA *et al.*, 2016; SOUZA *et al.*, 2010, 2014). Bromeliaceae is one of the richest plant families in the Neotropical region, with about 3,503 species (BUTCHER & GOUDA, 2017), with emphasis on those with an epiphytic habit, comprising approximately 1,552 species (WCSP, 2017). They are commonly found in humid tropical forests, such as the atlantic forest (ROCHA-PESSÔA *et al.*, 2008), but can also be found in other biomes, such as the caatinga (PONTES & AGRA, 2006) and cerrado (BATAGHIN *et al.*, 2012).

The objective of this study is to report the use of *Tillandsia tenuifolia* L. (Bromeliaceae, Tillandsioideae) as a nesting substrate for social wasps of the genus *Mischocyttarus* Saussure, 1853, in a cerrado area in the state of Minas Gerais, southeastern Brazil.

MATERIAL AND METHODS

The records took place in a gallery forest, a phytophysionomy of the cerrado, in the municipality of Luminárias (21°31' South, 44°52' West), southern Minas Gerais state, between September and December 2023, using the active search method. The bromeliads were photographed, collected, and identified by the botanist Laercio Loures, from the Federal Institute of Education, Science, and Technology of Southern Minas Gerais, Inconfidentes Campus (IFSULDEMINAS). The social wasps were collected, stored in 70% alcohol, identified by the co-author MMS using entomological keys (RICHARDS, 1978), and later incorporated into the entomological collection of IFSULDEMINAS.

RESULTS AND DISCUSSION

Eleven colonies were recorded nesting in *Tillandsia tenuifolia* L.: one colony of *Mischocyttarus drewseni* Saussure, 1857, three of *Mischocyttarus rotundicollis* (Cameron, 1912), two of *Mischocyttarus mirificus* (Zikán, 1935), two of *Mischocyttarus wagneri* (Buysson, 1908) and three of *Mischocyttarus* sp. (figure 1).

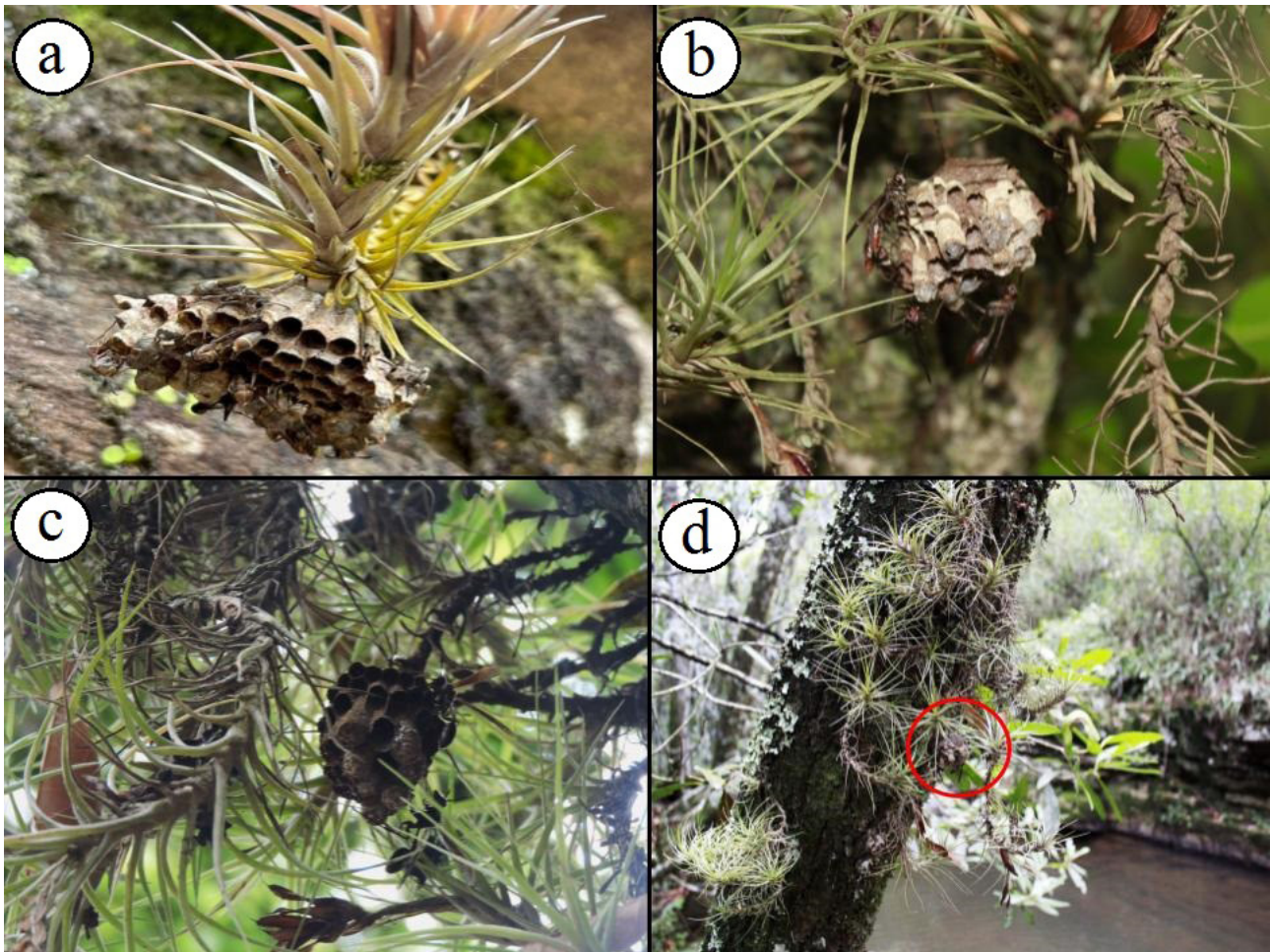


Figure 1 – Nesting of *Mischocyttarus wagneri* (a), *M. drewseni* (b), and *M. rotundicollis* (c and d) in *Tillandsia tenuifolia* L. (Bromeliaceae) in gallery forest, cerrado, municipality of Luminárias, Minas Gerais. Source: primary.

The nesting of *Mischocyttarus* species in *T. tenuifolia* may be related to colony protection, either based on camouflage or nest concealment. Consequently, the colony apparently becomes difficult to visualize for predators such as birds, mammals, and other arthropods, as already recorded for some colonies of *M. mirificus* (MILANI *et al.*, 2021) and *Metapolybia cingulata* (Fabricius, 1804) (SOUZA *et al.*, 2022), as well as for species belonging to other genera such as *Chartergus* (WENZEL, 2020), *Chartergellus* (SILVA *et al.*, 2022), and *Parachartergus* (SOUZA *et al.*, 2020).

Several studies support that camouflage and nest concealment are common behaviors found among *Mischocyttarus* species, representing a type of indirect defense (MONTAGNA *et al.*, 2010). This occurs because these species exhibit non-aggressive behavior and have atrophied stinger muscles (RAPOSO-FILHO & RODRIGUES, 1984; MANZOLI-PALMA, 1993). Therefore, the choice of a nesting site is an evolutionary response to the pressure exerted by predators, being crucial for the success of the social wasp colony (JEANNE, 1975).

Camouflage is a mechanism by which living organisms (or their structures) resemble other organisms, plants, or animals, or blend with objects surrounding them or the substrate they are on, to avoid detection by potential predators (OLIVEIRA *et al.*, 2006). This defense strategy has been observed in species such as *Mischocyttarus iheringi* Zikán, 1935, and *M. saussurei* Zikán, 1949, which deposit unprocessed plant fibers in their nests, resembling some plants of the family Metzgeriaceae (*Metzgeria* spp.), thus giving them a similarity to the surrounding substrate (BARBOSA *et al.*, 2016; MILANI *et al.*, 2020). It also occurs in the species *M. mirificus*, which build nests containing a vertical cell with a single comb, assuming a filamentous shape that blends into the vegetation (MILANI *et al.*, 2021).

On the other hand, nest concealment occurs in colonies of *M. drewseni*, which have been observed in embankments, plant substrates, and human constructions, using locations that make their detection difficult by predators (SOUZA *et al.*, 2020). In addition to camouflage, *M. iheringi* also seeks substrates that hinder the location of colonies (BARBOSA *et al.*, 2016). For *M. rotundicollis* and *M. wagneri*, there were no previous records of the use of camouflage and/or nest concealment strategies. Regarding bromeliads as nesting substrates, a nest of *Mischocyttarus commixtus* Richards, 1945 was found attached to a leaf inside the tubular rosette of a *Brocchinia hechtioides* Mez (GONZÁLEZ & LATTKE, 1991), whereas a *M. iheringi* nest was found beneath a leaf of *Portea petropolitana* (Wawra) Mez (BARBOSA *et al.*, 2016). *Mischocyttarus drewseni* and *M. cassununga* von Ihering, 1903 nests were found in *Tillandsia* spp., however there is no information on the nesting site (SOUZA *et al.*, 2014). Additionally, two colonies of *Protopolybia sedula* Saussure, 1854 were recorded inside bromeliads (SOUZA *et al.*, 2010). In this study, the nests were located beneath the bromeliads, hidden among the roots.

The nesting habits of *Mischocyttarus* in plant substrates, such as bromeliads, still lack comprehensive information that may allow the full understanding of the functioning of this ecological relationship and its implications for both wasps and bromeliads. However, it is safe to say that this genus of social wasps seeks safe places for their nests, either through camouflage or by concealing them, as a form of indirect defense, and bromeliads seem to offer ideal conditions for this form of defense.

CONCLUSION

Social wasps of the genus *Mischocyttarus* may utilize bromeliads of the species *Tillandsia tenuifolia* as nesting substrates, possibly because these bromeliads offer conditions for nest concealment and/or camouflage as a defense strategy. However, further studies are needed to fully understand this ecological relationship.

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