# Polybia occidentalis (Hymenoptera: Vespidae) nesting on a Lafoensia glyptocarpa (Lythraceae) plant in the Cerrado biome

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**Short Report**

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# Abstract

*Polybia occidentalis* (Olivier) (Hymenoptera: Vespidae) is an important predator of soft-bodied arthropods, and its association with plant species can provide information about the preference of this wasp for plant substrate and the mechanisms for this choice. The objective was to report the first occurrence of *P. occidentalis* nesting on a *Lafoensia glyptocarpa* (Koehne) (Lythraceae) plant in the Cerrado biome of Brazil. Individuals of the Vespidae were collected and identified using a dichotomous key and by comparison with individuals deposited in the Biological Collection of Social Vespas (CBVS) of the Instituto Federal de Educação, Ciências e Tecnologia do Sul de Minas Gerais (IFSULDEMINAS), Campus Inconfidentes, Minas Gerais state, Brazil. The foliage density and perennially of the plant *L. glyotocarpa* can reduce temperature and increase humidity within its canopy, and the shade of the branches can contribute to camouflage, which can favor the choice of this plant as a nesting site for *P. occidentalis*. Due to the climatic conditions of the region, the plant species can be important to conserve this Vespidae species.


# INTRODUCTION

Studies on the distribution, behaviour, ecology, habitats, and nesting of species of the family Vespidae, especially those of Polistinae in the Neotropical region are important due to reduced information on this subfamily (Clemente et al., 2020). The distribution of Polistinae species in Brazil was studied in the Amazon (Somavilla et al., 2014) and Atlantic Forest (Clemente et al., 2020) biomes, but information on these insects in the Cerrado (Clemente et al., 2020) and Caatinga (Somavilla et al., 2017) are scarce. *Polybia occidentalis* (Oliver) (Hymenoptera: Vespidae) has been reported in phytophysiognomies of the Atlantic Forest (Locher et al., 2014), Amazon (Somavilla et al., 2012), Cerrado (Clemente et al., 2020; Lima et al., 2024), Pantanal (Auko et al., 2017), and Caatinga (Steppe) (Santos et al., 2007) biomes in Brazil.

The successful establishment of social wasps depends on factors such as the choice of nesting site, number of founders, temperature, plant characteristics, including thorns and height increasing protection against predators, besides water and prey availability (López et al., 2012; Pérez-Bote et al., 2020). In addition, foliage density, distribution, and abundance of arthropods affect Vespidae nesting, and these insects prefer plants with similar colors to that of their nests (Pérez-Bote et al., 2020; Silva et al., 2023), increasing defense by camouflage (Milani et al., 2021). In Colombia urban areas, *Polybia occidentalis* Olivier (Hymenoptera: Vespidae) builds nests on plants taller than two meters to reduce predation (López et al., 2012). However, this wasp nested on *Astrocarium* sp. (Arecales: Arecaceae), *Carapa guianensis* Aublet (Sapindales: Meliaceae), and *Eugenia malaccensis* L. (Myrtales: Myrtaceae) plants at approximately one meter and seventy, two meters and four meters high, respectively (Somavilla et al., 2012).

*Polybia occidentalis* nested on *Cereus jamacaru* DC. and *Pilosocereus catingicola* (Gurke) Byles & Rowley (Caryophyllales: Cactaceae) plants, increasing the protection of their nests due to the thorns,

reducing attacks by predators and foraged on flowers of these plants in the Caatinga (Santos et al., 2007). The number of flower buds of *Turnera ulmifolia* L. (Malpighiales: Turneraceae) was greater on plants with *P. occidentalis* nests. Extrafloral nectaries, in leaves or in plant reproductive structures, attract ants and wasps, in addition to bees, beetles, flies, mites, and spiders (Cuautle & Rico-Gray, 2003) due to sugary substances. This shows important relationships with *P. occidentalis* and the places it nests; however, the mechanisms of nesting site choice by this wasp are poorly understood, highlighting the need for more studies on the relationships between wasps and plants (Souza et al., 2014).

The ecological importance of *P. occidentalis* is high and therefore, the community structure (Cabral et al., 2024), prey and nectar stock (Karsai & Runciman, 2012), and plant associations (Cuautle & Rico-Gray, 2003) should be studied for this wasp. Studies on the preference of social wasps for plant substrate and the mechanisms for this choice in a semi-arid region is important for the conservation of these natural enemies (Souza et al., 2014). Social insects are also found in the Southeast USA where the identification of their nesting choice for plants will help to preserve them for the biological control of pests (Smith-Pardo et al., 2020). The objective is to report the first occurrence of *P. occidentalis* nesting on a *Lafoensia glyptocarpa* Koehne (Lythraceae) plant in the Cerrado region.

# METHODS

One *P. occidentalis* nest was found in a Cerrado area in the campus of the Federal University of Uberlândia in the municipality of Monte Carmelo, Minas Gerais state, Brazil (18º45’35.38” S, 47º32’35.07” W, 901 m). Individuals of *P. occidentalis* were collected to measure their size and the nest was not removed from the plant to avoid destroying a colony of this wasp. This region is agricultural with fragments of Cerrado surrounded by coffee plantations. The nest was found at 0.95 m high on a two-year-old *L. glyptocarpa* plant with 1.20 m high, 1.16 m canopy width, trunk diameter at the ground level of 3.96 cm, and 453 m distant from a river (Figs. 1A and B).

*Polybia occidentalis* was identified with a dichotomous key (Richards, 1978) and by comparing its individuals with those of the Biological Collection of Social Wasps (CBVS) of the Federal Institute of Southern Minas Gerais (IFSULDEMINAS), Campus Inconfidentes in Inconfidentes municipality, Minas Gerais state, Brazil where it is deposited. The diagnostic features of *P. occidentalis* are gastral sternites usually with inconspicuous bristles. Variation in color of this wasp, from nearly black specimens to those with gena and clypeus yellow and scutellum, metanotum and propodeum largely yellow were recorded. Pronotal and gastral tergite bands never very wide. Occasionally wasps in one nest are dimorphic with yellow and blacker forms mixed. Nests of *P. occidentalis* differ from those of other wasp species by more than one layer of brood cells, small and medium (around 2mm) envelope with varied color, and usually resistant and dark (Somavilla et al., 2012). *Polybia occidentalis* nests are of the phragmocyttarous type fixed directly to the substrate, and other combs are added on the lower part of the anterior envelope, building modules with younger capsules in the basal part of the old ones (Noll et al., 2020).

*Lafoensia glyptocarpa* was identified based an *in loco* visit and its dendrological characters and collection of botanical material. This identification was confirmed with the aid of a bibliography (Lorenzi, 2008) and its nomenclature updated according to the Brazilian Flora Species List (JBRJ, 2021). This plant with wider range has been registered in Brazil (Reflora, 2020) and planted in the Monte Carmelo campus of the Federal University of Uberlândia.

# RESULTS AND DISCUSSION

The *L. glyptocarpa* growth is fast and this plant is used in the restoration of degraded areas and in urban afforestation with high density of non-deciduous leaves, reducing temperature, pollution and increasing humidity (Abreu-Harbich et al., 2015). However, the morphology of this plant is poorly known.

The *P. occidentalis* nest was rounded with 6.67 and 5.87 cm with and an opening of 1.07 and 1.33 cm in the vertical and horizontal diameters, respectively (Fig. 1A). These values are lower than the 7 to 12 cm in diameter of nests of this wasp on *Astrocaryum* sp. (Arecales) plant (Somavilla et al., 2012), indicating that it was probably harbored for a small colony. The number of individuals in the colony of *P. occidentalis* can be very high, facilitated by the reduced size of this wasp (Somavilla et al., 2012), averaging 0.8 cm. The nest, without pedicel, was fixed on the plant branches, unlike that reported for those of this wasp on the abaxial face of the *Eugenia malaccensis* L. (Myrtales: Myrtaceae) leaves and at a height of four meters (Somavilla et al., 2012). The shape, almost circular, of this nest, is similar to that reported for those of this wasp with a resistant casing, generally not exceeding the width of the leaf that protects it and with a single anterior lateral opening.

The dimensions of the *L. glyptocarpa* with the nest was 0.95 high and 1.16 in width (Fig. 2B). The nesting of *P. occidentalis* on *L. glyptocarpa* tree, lower than two meters high, may be due to the perennially and width of the leaves of this plant, contributing to thermal comfort in the extreme conditions of the Cerrado biome (López et al., 2012). Furthermore, the proximity of an agriculture area and a river increases the foraging areas of this wasp (Pérez-Bote et al., 2020). The structure, degree of conservation and succession stage (Souza et al., 2010) and the area of the forest fragment (Graça & Somavilla, 2018) also influence the establishment of wasp colonies.

# CONSLUSION

The color of the nest of the social wasp *P. occidentalis* resembled that of the branches of *L. glyptocarpa*, because wasps build their nests with plant material taken from the plant where they nest, contributing to camouflaging it (Pérez-Bote et al., 2020). Because of this, it is possible to find some color variation in the *P. occidentalis* nests. The choice of substrate for nesting by *P. occidentalis* varies, but the mechanisms of this preference are poorly studied (Souza et al., 2014). General plant characteristics, such as broad and leathery leaves and deciduousness, affect nesting preference for social wasps (López et al., 2012). In addition, plant can provide the *P. occidentalis* colony with more than a place with ideal physical

conditions and safety, but also compounds that compose the colonial chemical signature of these insects (Sguarizi-Antonio et al., 2022).

This is the first record of *P. occidentalis* nesting on *L. glyptocarpa* plant in the Cerrado region of Minas Gerais state, Brazil. The relationship between the social wasp and the tree where it builds its nest is essential for protection, foraging area, and thermal comfort for these insects. Factors that affect the choice of plant substrate for nesting by social wasps are poorly known, but the shade of the branches and leaves contributes to camouflage and the density and perpetuity of the leaves with thermal comfort. The information presented contributes to the knowledge on substrates and nesting choice by *P. occidentalis*.

## Declarations


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# Author Contribution

All authors contributed to the conception and design of the study. Material preparation, data collection and analysis were carried out by David Lopes Teixeira, Marcos Magalhães de Souza, Jardel Boscardin, José Cola Zanuncio. The first version of the manuscript was written by David Lopes Teixeira and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.


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# Data Availability:

The data supporting the findings of this study are available within the article.

# Competing Interests:

The authors declare that they have no competing interests to disclose.

# Ethics Approval:

Not applicable.

# Informed Consent:

Not applicable.

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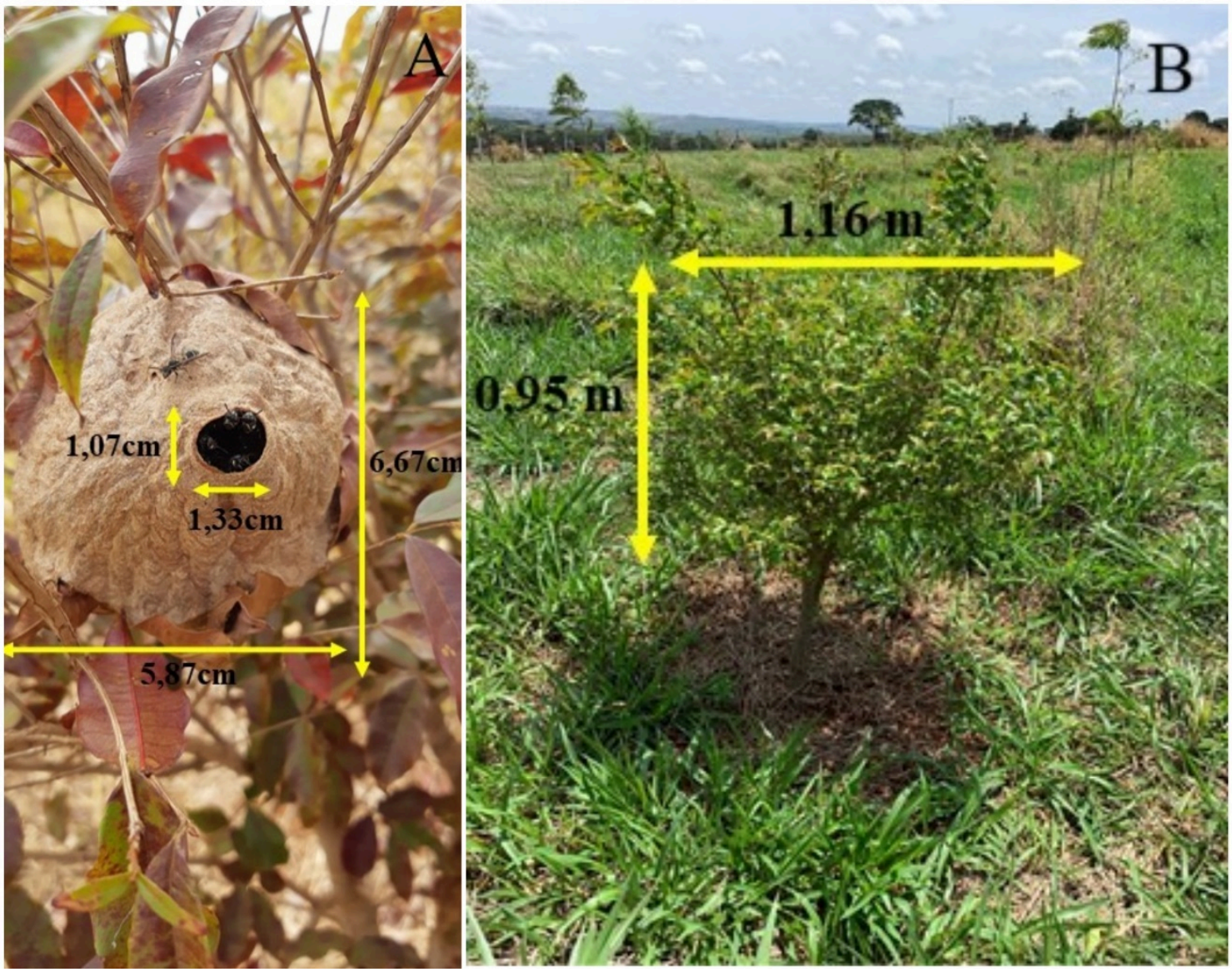
# Figures




## Figure 1

Nest of *Polybia occidentalis*(Hymenoptera: Vespidae) on a *Lafoensia glyptocarpa* plant in the Monte Carmelo municipality, Minas Gerais state, Brazil. Detail of size of the nest and that of its entrance (yellow arrows) (A) and overview of the plant with its height and width (yellow arrows) (B). Abbreviations: cm, centimeters; m., meters.