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SCIENTIFIC ARTICLE

Foraging behavior of social wasps on jaboticaba (*Plinia cauliflora*) in urban Southeast Brazil

Comportamiento forrajeo de avispas sociales en jaboticaba (*Plinia cauliflora*) en área urbana del sureste de Brasil

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ABSTRACT

Although frequently observed, the use of fruit as a food source by social wasps in fruit crops requires further study, as some of these insects can act as pests by damaging fruit. To investigate this interaction, we monitored the foraging behavior of social wasps on a jaboticaba tree (*Plinia cauliflora* (Mart.)) throughout a complete reproductive cycle. We recorded 13 wasp species feeding on the fruit; however, despite the potential for damage, we recommend deterring wasps only during fruit ripening. Further studies should assess whether jaboticaba fruit consumption by wasps causes significant economic damage.

Keywords: Fruits, Herbivory, Myrtaceae, Vespidae.

RESUMEN

Es común observar que las avispas sociales utilizan ciertos cultivos frutales como fuente de alimento. Sin embargo, este comportamiento debe ser evaluado para evitar que estos insectos se constituyan en plagas como consecuencia del daño a los frutos. Para investigar esta interacción, este estudio monitoreó el forrajeo de avispas sociales en un árbol de jaboticaba (*Plinia cauliflora* (Mart.)) durante un ciclo reproductivo completo. Registramos 13 especies de avispas alimentándose de los frutos; sin embargo, a pesar de los posibles daños, se recomienda ahuyentarlas solo cuando los frutos estén madurando. Estudios futuros deberían evaluar si el consumo de frutos de jaboticaba por parte de las avispas causa daños económicos significativos.

Palabras clave: Frutas, Herbivoria, Myrtaceae, Vespidae.

INTRODUCTION

Social wasps (Hymenoptera: Vespidae) exhibit a diversified diet that includes plant-derived products, such as the pulp of Myrtaceae fruits (Souza, Venâncio y Prezoto et al., 2010; Souza et al., 2013; Brügger, Castro, Prezoto, Serrão y Zanuncio, 2017; Nucci & Alves-Junior, 2017; Lourido, Somavilla, Barbosa y De Vasconcelos, 2024; Renne, Costa, Jacques y Souza, 2024). This plant family has significant ecological and economic importance worldwide. However, few studies have investigated the potential damage caused by social wasps during fruit development in economically important species, such as jaboticaba *Plinia cauliflora* (Mart.) (e.g., Souza et al., 2010). Consequently, our understanding of the interactions between these insects and Myrtaceae species may be incomplete.

Plinia cauliflora typically produces fruit twice annually and can suffer significant losses from various insects that feed on fruit pulp, rendering the fruit unsuitable for consumption and commercialization (Sanábio y Franco Júnior, 2023). Therefore, this study aimed to inventory and monitor social wasp activity during a reproductive period of *P. cauliflora* in an urban area of southeastern Brazil.

MATERIALS AND METHODS

The study was conducted between September and November 2024 on an adult *P. cauliflora* tree located at a private residence (21°01'24"S, 44°19'12"W) in the urban area of Ritápolis municipality, Minas Gerais, Brazil.

Observations were conducted during four distinct phenological phases: (1) flowering, during the last week of September; (2) fruit maturation stage I, when the first fruits began to ripen while most remained immature (November 1-3); (3) fruit maturation stage II, when nearly all fruits had ripened (November 9-11); and (4) post-maturation, when few fruits remained and these were partially desiccated (November 15-17).

Approximately 25 non-consecutive hours of behavioral observations were conducted using ad libitum sampling between morning and afternoon periods. Social wasps were identified by MMS using taxonomic keys (Richards, 1978; Andena, Carpenter y Noll, 2009; Andena & Carpenter, 2012; Brito, Oliveira, Carpenter y Somavilla, 2024). Voucher specimens were collected for taxonomic confirmation.

RESULTS AND DISCUSSION

Thirteen species of social wasps were recorded feeding on jaboticaba fruit pulp, but no species was observed visiting flowers (Table 1, Figure 1).

During maturation stage I, two social wasp species were observed: *S. cyanea* and P*. platycephala*, with only individuals of the former species able to penetrate the fruit skin. Maturation stage II exhibited the highest wasp species richness, with 11 species recorded. Notably, *P. fastidiosuscula* and *P. chrysothorax* were also capable of breaking through the jaboticaba fruit peel.

Five species were recorded during the post-maturation stage, particularly *P. scutellaris*, which was exclusively observed during this phase. Additionally, only *S. cyanea* and *P. ignobilis* foraged on fallen fruit; all other species consumed fruit that remained attached to the tree.

Jaboticaba fruits can serve as a significant nutritional resource for social wasps in anthropically altered environments with limited food availability. Beyond their high sugar content (Fortes et al., 2011), jaboticaba fruits provide vitamin C, fiber, various minerals, and polyphenols (Destro et al., 2019).

During jaboticaba fruit development, sugar levels increase while acidity decreases (Fortes et al., 2011). Furthermore, enhanced production of essential oils occurs during fruit maturation (Fortes et al., 2011), which wasps may use to locate potential food resources, as these insects rely on olfactory cues during foraging (Yossen, Buteler y Lozada, 2022). These factors may explain the higher number of social wasp species recorded during maturation stage II, similar to patterns reported for guava and other fruit consumption by these insects (Renne et al., 2024).

Only *P. platycephala* was present throughout the entire fruiting period, which may reflect two conditions: first, the colony's proximity to the jaboticaba tree, reducing foraging costs and maximizing energy efficiency; and second, a generalist and opportunistic diet, as this species also feeds on diverse prey in urban areas (Prezoto, Maciel, Detoni, Mayorquin y Barbosa, 2019).

Conversely, *S. cyanea* and *P. scutellaris* occurred exclusively during stages Maturation I and Post-maturation, respectively, which can also be attributed to their foraging

Table 1. Social wasp species recorded foraging on *P. cauliflora* fruits during different phenological phases in southeastern Brazil.

Social wasp	Flowering	Maturation I	Maturation II	Post-maturation
Brachygastra lecheguana (Latreille)	0	0	1	0
Mischocytarus cassununga (R. von Ihering)	0	0	1	0
Mischocytarus drewseni (de Saussure)	0	0	1	0
Mischocytarus sp.	0	0	1	0
Polybia bifasciata (de Saussure)	0	0	1	1
*Polybia chrysothorax** (Lichtenstein)	0	0	1	0
*Polybia fastidiosuscula** (de Saussure)	0	0	1	0
Polybia ignobils (Halliday)	0	0	1	1
Polybia occidentalis (Olivier)	0	0	1	0
Polybia platycephala (Richards)	0	1	1	1
Polybia scutellaris (White)	0	0	0	1
Polybia sericea (Oliver)	0	0	1	1
*Synoeca cyanea** (Fabricius)	0	1	0	0
Total richness	0	2	11	5

*Species that damaged fruit skin. Numbers indicate presence (1) or absence (0).

Figure 1. Social wasp species foraging on *P. cauliflora* fruits. A – *S. cyanea*; B – *P. platycephala*; C – *P. fastidiosuscula*; D – *P. ignobilis*; E – *P. chrysothorax*; F – *P. bifasciata*. Photo credit: G. C. S. Oliveira.

behavior in altered environments, as these species exploit various resources (Prezoto et al., 2019).

Synoeca cyanea has been previously reported feeding on different fruits (Brügger, Souza, Souza y Prezoto, 2011; Rocha et al., 2023). Although recorded only at the beginning of the fruit ripening process (Maturation I), its presence was crucial for resource utilization by other social wasp species and even other insects (Lourido et al., 2024), as it was one of three species capable of penetrating fruit skin.

Of the species recorded in this study, only five had been previously documented feeding on jaboticaba fruit pulp: *B. lecheguana, P. occidentalis, P. ignobilis, P. sericea*, and *S. cyanea* (Souza et al., 2010). The remaining eight species therefore represent novel records for *P. cauliflora* fruit consumption. However, most of these species had been observed foraging on commercial fruits of other Myrtaceae species, including pitanga *Eugenia uniflora* L. (Souza et al., 2013), gabiroba *Campomanesia adamantium* (Cambess.) O. Berg (Nucci & Alves-Junior, 2017), araçá *Psidium sp.* (Brügger et al., 2011), guava *Psidium guajava* L. (Lourido et al., 2024; Renne et al., 2024), and rose apple *Syzygium jambos* (L.) Alston (Brügger et al., 2017).

Previous studies have not documented damage to Myrtaceae fruits: Souza et al. (2013) suggested that social wasp visitation to pitanga likely represented searches for pest larvae, while Nucci & Alves-Junior (2017) recorded some social wasp species visiting gabiroba flowers. Other studies have documented potential damage by social wasps to healthy or ripe fruit. However, Renne et al. (2024) demonstrated that damage occurs only to overripe guava fruit with no commercial value.

Beyond potential damage to Myrtaceae fruits, social wasps, particularly those capable of penetrating fruit skin such as *S. cyanea*, have been observed damaging mangoes (Anacardiaceae) (Rocha et al., 2023) and grapes (Vitaceae) (Hickel & Schuck, 1995). This suggests these insects may be undesirable for certain crops, with colony removal near affected crops recommended (Souza et al., 2010). Conversely, alternative management approaches are suggested in the literature, as social wasps provide valuable biological control of crop pests (Prezoto et al., 2019), supporting colony retention in agricultural areas.

A less impactful alternative involves applying homemade insecticides prepared by farmers using tobacco-based solutions (Solanaceae), according to EMBRAPA Environment guidelines (Watanabe & Melo, 2006). These treatments can repel wasps during specific fruiting stages, thereby reducing fruit damage while preserving their beneficial pest control services.

CONCLUSIONS

This study documented 13 Vespidae species utilizing jaboticaba fruit as a food resource in urban environments. Despite documented fruit damage, we recommend deterring social wasps only during the fruit ripening period, while avoiding colony translocation or destruction in cultivation areas, given the potential value of these insects

for biological pest control. We suggest that future studies should quantify the economic impact of jaboticaba fruit consumption by social wasps to better inform integrated pest management strategies.

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