FLORAL DAMAGE IN *Psidium guajava* L. (MYRTACEAE) CAUSED BY SOCIAL WASPS (VESPIDAE)

DANO FLORAL EM Psidium guajava *L. (MYRTACEAE) CAUSADO POR VESPAS SOCIAIS (VESPIDAE)*

[1]Glauco Cássio de Sousa Oliveira, [2]Laura Tereza Inácio Borges, [2]Marcos Magalhães de Souza

[1]Programa de Pós-Graduação em Botânica Aplicada, Universidade Federal de Lavras glaucomlds@hotmail.com. [2]Instituto Federal de Educação, Ciência e Tecnologia, do Sul de Minas Gerais *Campus* Inconfidentes

ABSTRACT

Social wasps are frequent visitors to flowers in search of food resources and can thus play an important role in the ecosystem service of pollination in natural environments and crops. However, in some cases, they may become harmful by damaging the reproductive structures of plants. The aim of this study was to report floral damage in *Psidium guajava* L. caused by the social wasp *Synoeca cyanea* (Fabricius, 1775) in southeastern Brazil. Despite the evident damage to guava flowers, it is unclear whether this behavior will result in significant losses to guava production. Furthermore, it is likely that these losses are offset by the benefits provided by the presence of social wasps. Therefore, further studies are needed to better evaluate this interaction.

KEYWORDS: herbivory; guava; *Synoeca*.

RESUMO

As vespas sociais são visitantes recorrentes de flores para obtenção de recursos alimentares e, portanto, podem realizar um importante serviço ecossistêmico de polinização em ambientes naturais e culturas. Em alguns casos, porém, podem ser prejudiciais ao danificar as estruturas reprodutivas das plantas. Assim, o objetivo deste trabalho foi relatar danos florais em *Psidium guajava* L. pela vespa social *Synoeca cyanea* (Fabricius, 1775) no sudeste do Brasil. Apesar dos evidentes danos às flores da goiabeira, não está claro se este comportamento resultará em perdas significativas à produção desta fruticultura. Além disso, é provável que as perdas sejam compensadas pelos benefícios da presença de vespas sociais, desta forma, novos estudos são necessários para avaliar melhor esta interação.

PALAVRAS-CHAVE: herbivoria; goiaba; *Synoeca*.

INTRODUCTION

Social wasps (Hymenoptera: Vespidae) have diverse feeding habits, as they feed on a wide variety of animals and different products of plant origin, and therefore can perform different ecosystem services[1]. Pollination is one of the potential services provided by these insects, as they frequently visit flowers of different species to collect pollen and nectar, which are used as food resources[1-5]. Thus, in general, floral visitation by these insects is considered beneficial and is therefore valuable for both natural ecosystems and various crops[6,7].

Although Myrtaceae is one of the largest families of angiosperms and includes several species of commercial interest[8,9], few studies have assessed the floral visitation of social wasps in this family[3-5]. Moreover, in certain cases, some floral-visiting insects may act as floral herbivores or pollen thieves, potentially harming these plants[10,11]. Thus, the aim of this study was to report floral damage in *Psidium guajava* L. (Myrtaceae) caused by the social wasp *Synoeca cyanea* (Fabricius, 1775) (Vespidae: Polistinae) in southeastern Brazil.

MATERIAL AND METHODS

The records were made occasionally on 3 November 2024, on a *P. guajava* tree at a residence in the municipality of Ritápolis (21°01'24.17" S / 44°19'11.81" W), state of Minas Gerais, southeastern Brazil. Approximately 90 minutes of observation were conducted, followed by the collection of specimens for species confirmation. The specimens were euthanized and preserved in 70% ethanol, then sent to the Zoology Laboratory of the Federal Institute of Education, Science, and Technology of Southern Minas Gerais, Inconfidentes Campus, for identification and incorporation into the Social Wasps Biological Collection (CBVS) of the same institution.

RESULTS AND DISCUSSION

Three individuals of *S. cyanea* were recorded causing damage to five flowers of *P. guajava* (Figures 1 and 2).

Psidium guajava flowers do not have nectar glands, similar to most Myrtaceae species[12]. Therefore, it is likely that *S. cyanea* individuals were foraging to obtain pollen produced by the flower anthers. The damage primarily occurred in flowers that had not yet undergone anthesis (Figure 1). In such cases, the social wasps cut through the sepals and petals to access the interior of the flower, where they consumed the anthers, resulting in the destruction of the flower (Figures 1 and 2). Pollen consumption also occurred in flowers that had already undergone anthesis; in these cases, the social wasps apparently did not cause noticeable damage to the flowers (Figure 1E).

Figure 1. Herbivory of *Synoeca cyanea* on *Psidium guajava* flowers. A, B: sepal cutting process, details of mandibular injuries caused by *S. cyanea* in A; C-E: petal cutting and anther consumption; E: pollen consumption after anthesis.

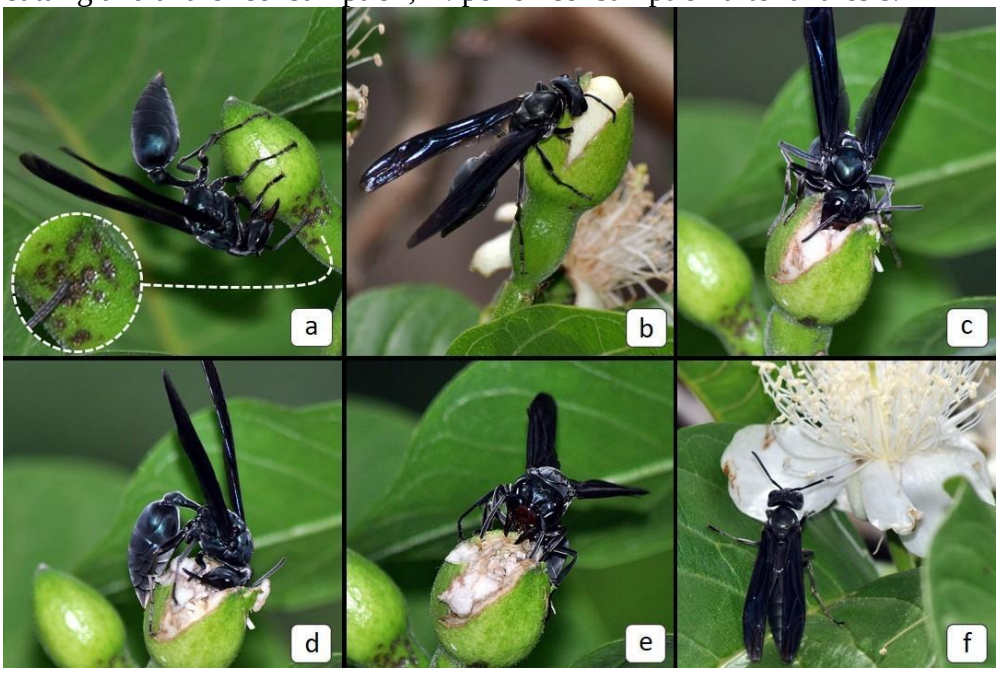

Figure 2. A: General view of the damage caused by *Synoeca cyanea* in *Psidium guajava* flowers; B: Detail of the damaged floral whorls.

Although social wasps are beneficial in various crops due to the pollination and biological control they provide by preying on different pest insects[13], they have also been reported to cause potential damage, particularly by harming fruits, rendering them unsuitable for commercialization[14-17]. Specifically regarding guavas, Lourido et al., (2024)[16] report that only a few large social wasp species, such as *Synoeca* spp., have the ability to break through the fruit's skin. These authors also highlight that the opening of guava skins by wasps creates opportunities for other animals to consume the fruit pulp, further damaging the fruit and making it unfit for consumption. On the other hand, Renne et al., (2024)[18] assessed guava fruit consumption by social wasps and noted that damage occurred mainly when the fruits were already ripe and thus had reduced commercial value. This suggests that economic losses caused by these insects in guava cultivation may be minimal or absent, emphasizing the need for further studies to clarify whether there is significant commercial damage to the crop.

Boti, Madalon and Haddade (2016)[19] also reported potential floral damage caused by social wasps on *P. guajava* flowers. These authors observed that *Polistes*

sp. and *Polybia paulista* H. von Ihering, 1896 (Vespidae: Polistinae) scraped the sepals of the flowers, hypothesizing that the material obtained might be used for building their colonies. In the same study, the authors also recorded the presence of *Thrips* sp., as observed by Hickel and Ducroquet (1993)[20], causing damage to leaves and flowers. More recently, Oliveira et al. (2024)[21] observed the predation of these insects by *Polybia scutellaris* (White, 1841) (Vespidae: Polistinae). Therefore, the presence of social wasps on guava plants could be beneficial from the perspective of biological control of these pests.

Synoeca cyanea has previously been recorded causing damage to fruits, such as jabuticabas[22], mangoes[17], and grapes[14], as it is capable of breaking the skin of these fruits, thereby reducing their commercial value. Therefore, in such cases, it is recommended to relocate the colonies of species with the potential to cause such damage away from fruit orchards[22,23].

Although this study highlights potential damage caused by social wasps, the records made here were occasional and isolated. New studies, especially in commercial guava crops, may confirm whether floral damage caused by *S. cyanea* results in significant losses in guava production. It is important to note that only individuals of this species were observed with this undesirable behavior. Therefore, the benefits offered by social wasps in the biological control of pests in different crops are substantially greater than the potential damage caused by some species.

REFERENCES

1. Brock RE, Cini A, Sumner S. Ecosystem services provided by aculeate wasps. Biological Reviews. 2021; 96(4): 1645-1675. https://doi.org/10.1111/brv.12719.

2. Hermes MG, Köhler A. The flower-visiting social wasps (Hymenoptera, Vespidae, Polistinae) in two areas of Rio Grande do Sul State, southern Brazil. Revista Brasileira de Entomologia. 2006; 50(2): 268-274. https://doi.org/10.1590/S0085-56262006000200008.

3. Mello MA, Santos GMM, Mechi MR, Hermes MG. High generalization in flower-visiting networks of social wasps. Acta Oecologica. 2011; 37(1): 37-42. https://doi.org/10.1016/j.actao.2010.11.004.

4. Clemente MA, Lange D, Del-Claro K, Prezoto F, Campos NR, Barbosa BC. Flower-visiting social wasps and plants interaction: network pattern and environmental complexity. Psyche: A Journal of Entomology. 2012; 2012(1): 1-10.

5. Clemente MA, Campos NR, Vieira KM, Del-Claro K, Prezoto F. Social wasp guild (Hymenoptera: Vespidae) visiting flowers in two of the phytophysiognomic formations: Riparian Forest and campos rupestres. Sociobiology. 2017; 64(2): 217-224. https://doi.org/10.13102/sociobiology.v64i2.1364.

6. Akhter F, Khanday AL, Ahmad ST. Pollination potential: A comparative study of various hymenopteran insects pollinating some economically important crops in Kashmir. International Journal of Advanced Research in Biological Sciences. 2016; 3(9): 50-59. https://doi.org/10.22192/ijarbs.2016.03.09.007.

7. Ish-Am G, Barrientos-Priego A, Castañeda-Vildózola A, Gazit S. Avocado (*Persea Americana* Mill.) pollinators in its region of origin. Revista Chapingo Serie Horticultura. 1999; 5: 137-143.

8. Conceição GM, Aragão JG. Diversidade e importância econômica das Myrtaceae do Cerrado, Parque Estadual do Mirador, Maranhão. Scientia Plena. 2010; 6(7):1-.

9. Kurtz BC, Araújo DSD. Composição florística e estrutura do componente arbóreo de um trecho de Mata Atlântica na Estação Ecológica Estadual do Paraíso, Cachoeiras de Macacu, Rio de Janeiro, Brasil. Rodriguésia. 2000; 71: 69-112. https://doi.org/10.1590/2175-7860200051787903.

10. Hargreaves AL, Harder LD, Johnson SD. Consumptive emasculation: the ecological and evolutionary consequences of pollen theft. Biological Reviews. 2009; 84(2): 259-276. https://doi.org/10.1111/j.1469-185X.2008.00074.x.

11. Nucci M, Alves-Junior AV. Behavior and diversity of floral visitors to *Campomanesia adamantium* (Myrtaceae). Revista Colombiana de Entomología. 2017; 43(1): 106-112.

12. Gressler E, Pizo MA, Morellato LPC. Polinização e dispersão de sementes em Myrtaceae do Brasil. Brazilian Journal of Botany. 2006; 29(4): 509-530. https://doi.org/10.1590/S0100-84042006000400002.

13. Prezoto F, Maciel TT, Detoni M, Mayorquin AZ, Barbosa BC. Pest control potential of social wasps in small farms and urban gardens. Insects. 2019; 10(7): 192. https://doi.org/10.3390/insects10070192.

14. Hickel ER, Schuck E. Vespas e abelhas atacando a uva no Alto Vale do Rio do Peixe. Agropecuária Catarinense. 1995; 8(1): 38-40.

15. Brügger BP, Castro BMC, Prezoto F, Serrão JE, Zanuncio JC. Feeding by the social wasp *Polybia scutellaris* (Hymenoptera: Vespidae) on *Syzygium jambos* (Myrtaceae) fruits in Minas Gerais, Brazil. Florida Entomologist. 2017; 100(1): 172-173. https://doi.org/10.1653/024.100.0125.

16. Lourido GM, Somavilla A, Barbosa BC, Vasconcelos GJN. Damage caused by social wasps (Hymenoptera: Vespidae) to commercial fruits in the Brazilian Amazon region. Revista Chilena de Entomología. 2024; 50(1): 109-114. http://dx.doi.org/10.35249/rche.50.1.24.13.

17. Rocha EAA, Silva LF, Fernandes MES, Macedo AF, Soares CS, Pereira RC, Fernandes FL. First of report of occurrence and damage of *Synoeca cyanea* (Hymenoptera: Vespidae) on *Mangifera indica* L. in Brazil. Brazilian Journal of Biology. 2023; 83: e27512. https://doi.org/10.1590/1519-6984.275126.

18. Renne DGS, Costa MJ, Jacques GC, Souza MM. Avaliação dos danos aos frutos de *Psidium guajava* (Linnaeus, 1753), Myrtaceae var. Kumagai, por vespas sociais (Vespidae: Polistinae). ForScience. 2014; 12(2): e001277. https://doi.org/10.29069/forscience.2024v12n2.e1277.

19. Boti JB, Madalon FZ, Haddade IR. Insetos provocadores de danos em folhas, flores e frutos da goiabeira (*Psidium guajava* L., Myrtaceae) nos pomares conduzidos em sistema de cultivo convencional e orgânico, no município de Santa Teresa-ES. Natureza online. 2016; 14(1): 40-44.

20. Hickel ER, Ducroquet JHJ. Pragas da goiabeira serrana: tripes (*Phrasterothrips* sp. e *Liothrips* sp.) (Thysanoptera: Phlaeothripidae). Anais da Sociedade Entomológica do Brasil. 1993; 22(2): 381-384.

21. Oliveira GCS, Rubim LTG, Vieira L, Alvarenga MJC, Souza MM. First record of *Polybia scutellaris* (White, 1841) (Hymenoptera: Vespidae) predation on *Thrips tabaci*, Lindeman, 1889 (Thysanoptera: Thripidae) in urban kale cultivation in Southeastern Brazil. International Journal of Tropical Insect Science. 2024; 44(5): 3051-3055. https://doi.org/10.1007/s42690-024-01386-3.

22. Souza AD, Venâncio DF, Prezoto F. Social wasps (Hymenoptera: Vespidae: Polistinae) damaging fruits of *Myrciaria* sp. (Myrtaceae). Sociobiology. 2010; 55(1): 297-300.

23. Brügger BP, Souza LSA, Souza AR, Prezoto F. Social wasps (*Synoeca cyanea*) damaging *Psidium* sp. (Myrtaceae) fruits in Minas Gerais State, Brazil. Sociobiology. 2011; 57(3): 533-535.