

## Scientific Note

# From my Backyard to the World: *Phenacoccus solenopsis* Tinsley, 1898 (Hemiptera: Pseudococcidae) on a Medicinal Plant in Brazil

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Edited by: Vitor C. P. Silva<sup>1</sup>

Received: November 24, 2025. Accepted: December 30, 2025. Published: February 27, 2026.

**Abstract.** The solenopsis mealybug, *Phenacoccus solenopsis* Tinsley, 1898 (Hemiptera: Pseudococcidae), is widely distributed globally and is a significant polyphagous pest affecting a variety of plants of agricultural, medicinal, and ornamental value, including certain weeds. In this study, we present, for the first time, the occurrence and damage caused by *P. solenopsis* on false lemon balm, *Lippia alba* (Mill.) N.E. Br. ex Britton & P. Wilson (Verbenaceae) in Brazil. Specimens of the solenopsis mealybug were collected and examined on *L. alba* in a residential area of Floriano city, Piauí state, Brazil, from July to November 2025. The damage caused by the mealybug primarily manifests on the branches of false lemon balm, resulting in yellowing and desiccation, with a comparatively lesser impact on the host's leaves. Throughout our observations, the solenopsis mealybug population on the host declined by November 2025. This represents the first documented instance of *P. solenopsis* in Piauí, thereby increasing the total number of Brazilian states reporting occurrences of this pest to eleven. Additionally, we noted the mutualistic relationship between *P. solenopsis* and *Dorymyrmex* sp. (Hymenoptera: Formicidae: Dolichoderinae). This study also updates information regarding the distribution and host plants of *P. solenopsis* in Brazil.

**Keywords:** *Dorymyrmex*, *Lippia alba*, Mutualistic interaction, New host plant, Verbenaceae.

*Phenacoccus* Cockerell, 1893 (Hemiptera: Pseudococcidae) is one of the most species' rich genera of Pseudococcidae (Ben-Dov 1994; García Morales et al. 2016; Santos & Peronti 2017) with 178 described species (García Morales et al. 2016).

The solenopsis mealybug, *Phenacoccus solenopsis* Tinsley, 1898, probably originated somewhere between south-west USA and South America (Kondo & Watson 2022), has spread to 78 countries. In South America, it has been recorded in Argentina, Brazil, Chile, Colombia, Ecuador, Suriname, and Uruguay (Larraín 2002; Granara de Willink 2003; Culik & Gullan 2005; García Morales et al. 2016; Pacheco da Silva et al. 2020; Kondo & Watson 2022). In Brazil, this pest has been reported in 10 states: Acre, Amazonas, Bahia, Ceará, Espírito Santo, Goiás, Mato Grosso, Paraíba, Pernambuco, and São Paulo (García Morales et al. 2016; Santos & Peronti 2017; Kondo & Watson 2022).

*Phenacoccus solenopsis* is a polyphagous pest, affecting over 250 species across 67 botanical families, with a notable prevalence in Amaranthaceae, Asteraceae, Solanaceae, and Malvaceae (García Morales et al. 2016; Kondo & Watson 2022). This pest targets several economically significant species, including vegetables, ornamental plants, annual crops, fruit trees, and various weeds (Ibrahim et al. 2015; García Morales et al. 2016; Santos & Peronti 2017; Waqas et al. 2021).

The false lemon balm, *Lippia alba* (Mill.) N.E.Br. ex. Britton & P. Wilson (Verbenaceae), is native to South America (Biasi & Costa 2003). However, it has become widely distributed throughout the Americas, as well as in parts of Asia and Oceania (Mirra et al. 2024; Silva et al. 2025; WFO 2025). *Lippia alba* is an erect perennial herb that can reach up to 2 m in height, often exhibiting a shrubby or subshrubby appearance (Lorenzi & Matos 2002). Its leaves and roots are commonly used in infusions and syrups to treat a variety of ailments, including hypertension, digestive issues, nausea, restlessness, and colds (Lorenzi & Matos 2002; Hennebelle et al. 2008; WFO 2025). This herb is among the most widely utilized in traditional medicine (Silva et al. 2025) and is

frequently found in the backyards of both rural and urban residences in Piauí state, Brazil (Aguar & Barros 2012; Baptistel et al. 2014).

Studies have explored the use of *L. alba* in the pharmaceutical industry, owing to its compounds that exhibit antibacterial and antifungal properties (Hennebelle et al. 2008; Oliveira et al. 2024). Furthermore, leaf extracts demonstrate insecticidal activity against stored-grain pests (Ringuelet et al. 2014), the fall armyworm (Biswas et al. 2024), and nematodes (Gonçalves et al. 2016).

Information regarding the interactions of *L. alba* with insects is limited in the literature, as this plant is seldom affected by insect infestations. Given the scarcity of information on pest insects impacting this important medicinal plant in Brazil, this study aims to document the record of the mealybug, *P. solenopsis*, on *L. alba* in northeastern Brazil.

Between July and November 2025, mealybugs were observed and manually collected from the branches and leaves of a *L. alba* (Fig. 1A) found in the backyard of a residence in the Ibiapaba neighborhood (6°45'45"S; 43°00'44"W, 114 m a.s.l.) in the city of Floriano, Piauí, Brazil.

Mealybugs were collected and placed in 5.0 mL Eppendorf Tubes<sup>®</sup> containing 99% ethanol. Each tube was duly labeled with collection data and taken to the Insect Taxonomy Laboratory at ESALQ/USP for identification. Twenty-five female mealybugs were prepared on microscope slides following the methods outlined by Granara de Willink (1990). These specimens were labeled, identified, and subsequently deposited in the entomological collection of the “Luiz de Queiroz” Entomology Museum (MELQ – ESALQ/USP, numbers ESALQENT001919 – 001943). The morphological identification was carried out by NSS and ALBPG based on the key of Moghaddam (2013). The identification of the false melissa was carried out by Dr. Fátima Regina Gonçalves Salimena from the Department of Botany: Postgraduate Program in Biodiversity and Nature Conservation at ICB – Universidade Federal de Juiz de Fora, Juiz de Fora, Minas Gerais state, Brazil.

A total of 150 ants associated with mealybugs on *L. alba* branches were collected. The ants were identified to the genus level using the key of Feitosa & Dias (2024). Twenty specimens, prepared in double mount (triangle), were deposited at MELQ (ESALQENT001944 – 001963).

The mealybugs collected from *L. alba* were identified as *P. solenopsis* (Hemiptera: Pseudococcidae) based on morphological characteristics of the females. These characteristics include a grayish-green to black, ovoid-shaped body; dorsum covered by dense greyish white wax (Fig. 1B); dark grey submedian intersegmental bare patches usually present; lateral margins of the body surrounded by short waxy filaments, often with a longer pair of tail-like wax filaments on posterior region (Fig. 1B); nine-segmented antennae; a well-developed anal lobe featuring two lanceolate setae and several trilobular pores; absence of dorsal multilocular disc pores; robust legs; and claws with a denticle.

*Lippia alba* is not listed as a host of *P. solenopsis* in the scale insect database, ScaleNet (García Morales et al. 2016). Therefore, this is the first record of solenopsis mealybug infesting and damaging *L. alba*. Additionally, it is the first record of *P. solenopsis* in Piauí state. Previously it was reported in 10 Brazilian states (Acre, Amazonas, Bahia, Ceará, Espírito Santo, Goiás, Mato Grosso, Paraíba, Pernambuco, and São Paulo) (García Morales et al. 2016; Santos & Peronti 2017; Kondo & Watson 2022). Thus, the distribution of *P. solenopsis* has expanded to 11 states across Brazil, spanning four of the country's five geographic regions. The South region of Brazil is the only one without any record of *P. solenopsis*.

*Phenacoccus solenopsis* has been associated to over 250 host plants (García Morales et al. 2016; Kondo & Watson 2022). Therefore, our record that *L. alba* hosts *P. solenopsis* is a significant finding. Furthermore, with the record of *L. alba*, seven species of Verbenaceae currently host *P. solenopsis* worldwide (Tab. 1).

*Phenacoccus solenopsis* shows a preference for infesting the branches of *L. alba* rather than its leaves (Fig. 1B–D). Symptoms such as yellowing and drying of the plant structure were predominantly observed on branches with a higher concentration of specimens. On the branches, it was common to find several adults grouped with nymphs, all covered in a white, powdery secretion. Only a few specimens (fewer than five) were noted on the leaves, specifically on the abaxial surface (Fig. 1D).



**Figure 1.** *Phenacoccus solenopsis* Tinsley, 1898 (Hemiptera: Pseudococcidae) on *Lippia alba* (Mill.). N.E. Br. ex Britton & P. Wilson. A) host plant in the backyard; B) *P. solenopsis* (adults and nymphs) on branches and interaction of with *Dorymyrmex* sp. (red arrow); C) leaf bud and branch damaged (red arrows); D) Solenopsis mealybug on the abaxial surface of leaves.

The solenopsis mealybug primarily infests the branches of *L. alba*, particularly between the points where leaves are inserted, and it also targets tender shoots. Initially, the most heavily infested branches turn yellow and subsequently dry out, progressing from the tips to the base (Fig. 1C). Despite a significant infestation occurring between July and August, the presence of numerous dry branches did not lead

to the plant's death during the observation period. In November 2025, a decrease in the population of the solenopsis mealybug on the host was noted, likely due to seasonal climate changes (winter to spring). The extended period of spring dryness appears to have affected plant development and, in turn, the pest population.

The infestation of *P. solenopsis* on the upper and more tender branches has been observed in cotton (*Gossypium* L.) and *Hibiscus rosa-sinensis* L. (Malvaceae) (Maruthadurai & Singh 2015; Waqas et al. 2021). In the case of cashew (*Anacardium occidentale* L., Anacardiaceae), damage was predominantly observed in the upper regions, where the pest feeds on the sap of young tender leaves, shoots, inflorescences, branches, and fruit peduncles (Maruthadurai & Singh 2015). Furthermore, the abaxial leaf surface are commonly infested in attacks by this mealybug (Akintola & Ande 2008). However, in this study, few individuals were found on the lower portions of *L. alba* leaves (Fig. 1D).

The attack and distribution of *P. solenopsis* can vary depending on the type and age of its host (Kumar et al. 2014; Waqas et al. 2021). This variation may enhance the pest's remarkable adaptability to a diverse array of hosts across various geographic regions.

We observed the mutualistic relationship between *Dorymyrmex* sp. (Dolichoderinae) (Figs. 1B; 2A–B) and *P. solenopsis*. The ants traversed the branches and leaves where the solenopsis mealybugs were grouped (Fig. 1B). They performed tactile recognition of the mealybugs using their antennae. They actively repelled other insects, such as whiteflies (Aleyrodidae) and parasitoids (Hymenoptera) that landed on leaves infested with mealybugs.



**Figure 2.** *Dorymyrmex* sp. A) head in anterior view; B) habitus in lateral view (Scale bars = 1 mm).

Mutualistic interactions between the solenopsis mealybug and ants (Hymenoptera: Formicidae) have been documented for several species. Notable examples include *Solenopsis* sp. (Myrmicinae) in Acre state, Brazil (Santos & Peronti 2017), *S. invicta* Buren, 1972, *Tapinoma melanocephalum* (Fabricius, 1793) (Dolichoderinae) in China, and *Lasius niger* (L., 1758) (Formicidae) in Canada (Zhou et al. 2012; García Morales et al. 2016; Santos & Peronti 2017).

Among the ant species known to interact with *P. solenopsis*, as compiled by García Morales et al. (2016), *Dorymyrmex bicolor* Wheeler, W.M., 1906 (Dolichoderinae) has been observed in a vineyard within the lower-middle São Francisco Valley region (Petrolina, Pernambuco State, and Juazeiro, Bahia state, Brazil) (Guindani et al. 2017). However, the reliable identification of *Dorymyrmex* species remains challenging due to unclear species boundaries and the absence of a taxonomic revision for the genus (Rodrigo dos Santos Machado Feitosa, personal communication, August 18, 2025).

Our findings reveal, for the first time, the attack of *P. solenopsis* on *L. alba* (new host), and extend the known geographic distribution of this pest within Brazil. We have also updated the host list for the solenopsis mealybug in Brazil and documented the mutualistic interaction between *P. solenopsis* and *Dorymyrmex* sp.

Understanding ecological interactions, infestation patterns, and the damage caused by polyphagous pest species such as *P. solenopsis* is crucial for advancing knowledge across fields that collectively improve integrated pest management strategies in agroecosystems and subsistence crops. This study underscores the importance of monitoring phytosanitary conditions for medicinal plants in both commercial plantations and domestic cultivation, particularly *L. alba*, to prevent the spread of *P. solenopsis* to other regions through infested seedlings.

**Table 1.** Records of *Phenacoccus solenopsis* Tinsley, 1898 (Hemiptera: Pseudococcidae) in Verbenaceae species worldwide\*.

Host plants**	Countries	References
<i>Duranta</i> sp.	Israel	Spodek et al. (2018)
<i>Duranta erecta</i> L.	Pakistan	Arif et al. (2009); Abbas et al. (2010)
<i>Lantana camara</i> L.	Pakistan	Arif et al. (2009); Sahito et al. (2011)
<i>Lantana camara</i> L.	–	Williams & Granara de Willink (1992)
<i>Lantana camara</i> L.	Egypt	Abdel-Razzik et al. (2015); Beshr et al. (2016)
<i>Lantana camara</i> L.	Iran	Fallahzadeh et al. (2013); Fallahzadeh et al. (2014)
<i>Lantana camara</i> L.	Mexico	Ben-Dov (1994)
<i>Lantana camara</i> L.	India	Kedar & Saini (2015)
<i>Lantana camara</i> L.	Israel	Spodek et al. (2018)
<i>Lantana montevidensis</i> (Spreng.) Briq.	Israel	Spodek et al. (2018)
<i>Lippia alba</i> (Mill.) N.E.Br. ex Britton & P.Wilson	Brazil	<b>This study</b>
<i>Verbena × hybrida</i> Groenland & Rümpler	India	Kedar & Saini (2015)
<i>Verbena officinalis</i> L.	–	Watson (2020)

\*Based on García Morales et al. (2016). \*\* Scientific names according to WFO (2025).

## Acknowledgments

The authors wish to thank the Graduate Program in Entomology of the Escola Superior de Agricultura "Luiz de Queiroz", Universidade de São Paulo (ESALQ/USP). The authors thank Dr. Fátima Regina Gonçalves Salimena (Departamento de Botânica: Programa de Pós-Graduação em Biodiversidade e Conservação da Natureza, ICB – UFJF, Juiz de Fora – MG, Brazil) for the identification of *Lippia alba*, and Dr. Rodrigo dos Santos Machado Feitosa (Laboratório de Sistemática e Biologia de Formigas, Departamento de Zoologia, Universidade Federal do Paraná, Brazil), for confirming the identification of *Dorymyrmex* sp. ants in this study. Special thanks to my parents, Wilcimar Soares and Iracema Maria de Sousa Soares, who helped me with observations of the solenopsis mealybug in our backyard. RAZ is a fellow researcher at the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq).

## Authors' Contributions

NSS: Conceptualization, Investigation, Methodology, Writing – original draft; THRP: Conceptualization, Methodology, review & editing; ALBGP: Investigation, Writing – original draft; RAZ: Conceptualization; Writing – original draft; Writing – review & editing; MS: Conceptualization, Investigation, Writing – original draft, Writing – review & editing.

## Conflict of Interest Statement

The authors declare no competing interests.

## Ethical Approval

Not applicable.

## Data Availability

The datasets generated during this study are available from the corresponding author upon reasonable request.

## Generative AI Statement

The authors declare that no generative artificial intelligence tools were used in the preparation of this manuscript.

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