Systematics, Morphology and Biogeography

New species of Lopesia Rübsaamen (Diptera: Cecidomyiidae) associated with Andira humilis Mart. ex Benth. (Fabaceae)

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A B S T R A C T

A new species of Lopesia Rübsaamen, 1908 induces leaf galls on Andira humilis (Fabaceae) in the Cerrado biome (Brazilian savanna) of Bahia, Mato Grosso and São Paulo states, Brazil. Larva, pupa, female, and male of this new species of gall midge are described and illustrated in this paper.

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Introduction

Lopesia Rübsaamen, 1908 is a genus with 25 described species, mainly distributed in Neotropical region, but also registered in the Neartic, Afrotropical, and Australasia regions (Gagné and Jasnshof, 2014; Urso-Guimarães et al., 2014; Maia and Monteiro, 2017). Lopesia has 20 described species reported to Brazil in Amazonas, Minas Gerais, Rio de Janeiro, Pernambuco, and São Paulo States (Gagné and Jasnshof, 2014; Urso-Guimarães et al., 2014; Maia and Monteiro, 2017).

In Brazil, eleven families of plants are referred as hosts of Lopesia galls: Burseraceae, Clusiaceae, Chrysobalanaceae, Erythroxylaceae, Euphorbiaceae, Fabaceae, Melastomataceae, Nyctaginaceae, Sapotaceae (Gagné and Jasnshof, 2014), Pontederiaceae (Urso-Guimarães et al., 2014), and Dilleniaceae (Maia and Monteiro, 2017). Six described species of Lopesia are known on Fabaceae, Lopesia armata Gagné, 1993 on Acacia tortilis (Forsk.) Hayne; Lopesia niloticae Gagné, 1993 on Acacia nilotica (L.) Willd. ex Del; Lopesia grandis Maia, 2001 on Dalbergia ecastaphyllum (L.) Taub.; Lopesia mimosae Maia, 2010 and Lopesia pernambucensis Maia, 2010 on Mimosa tenuiflora (Willd.) Poir.; and Lopesia aldinae Fernandes and Maia, 2010 on Altina heterophylla Spruce ex Benth. (Gagné and Marohasy, 1993; Maia, 2001; Maia et al., 2010; Fernandes et al., 2010). This is the first report of Lopesia inducing galls on Andira species.

Here, we described a new species of Lopesia, based on material collected in three localities of Cerrado biome (Brazil) from leaf galls on Andira humilis Mart. ex Benth. Andira species are popularly known as “angelim rasteiro”, “angelim-do-campo” or “mata-barata no campo” (roach killer), due to its use as an insecticide. Also, it is a common tree or shrub endemic to Brazil, found in Amazon Forest, Caatinga, and Cerrado biomes. Andira species can reach one meter in height and has demonstrated allelopathic potential (Periott et al., 2004).

Blister-shaped leaf gall on Andira humilis was previously described by Saito and Urso-Guimarães (2012) and Isaias et al. (2014) without association with its inducing. This is the first formal record of a Lopesia species inducing galls on Andira humilis.

Material and methods

Branches with blister-shaped leaf gall of Andira humilis were collected from three localities of the Cerrado biome in Brazil: Parque Nacional da Chapada dos Guimarães (PNGC), Chapada dos Guimarães, Mato Grosso, Brazil (15° 26' 10" S, 055° 47' 23" W), during the Sibbiota-Diptera Program, 14–22.I.2013; Estação Ecológica de Jataí (EEJ), Luiz Antônio, São Paulo State (21° 36' 19.44" S and 47° 47' 28.86" W), 19–21.IV.2010; and Campus Reitor Edgard Santos


of the Universidade Federal do Oeste da Bahia (UFOB), Barreiras, Bahia (12°08′51.4″S and 45°01′17.3″W), June 2015. The galls were kept in plastic pots for rearing of insects. Larvae and pupae were obtained by dissecting the galls. All specimens were preserved in 70% alcohol and posteriorly mounted in slides following the technique and terminology of Gagné (1994).

The types are deposited at the Museu de Zoologia of the Universidade de São Paulo, São Paulo, Brazil (MZSP). Additional material was deposited at Coleção do Laboratório de Zoologia of the Universidade Federal do Oeste da Bahia. Ingrid Koch (IB/UNICAMP) and Ana Carolina Devides Castelo (UNESP/Botucatu) identified the plant species.
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Taxonomy

Cecidomyiidae Macquart, 1838
Cecidomyiinae Rondani, 1840
Lopesia Rübsaamen, 1908

Diagnosis. Rs joining C beyond the wing apex; Rs closer to the end of R3 than to the arculus; palpi three or four-segmented; antennae with binodal and tricircumfilar flagellomeres (in male), or interconnected circumfila (in female); tarsal claws curved near basal third, generally toothed; ovipositor short, barely protrusible and female cerci separate (Maia et al., 2010; Maia, 2015).

Description. Adult – Body: 1.4 mm long (male, n = 14), 1.9 mm long (female, n = 18). Head [Fig. 1]: eyes black, holoptic, facets circular, closely adjacent. Occipital process present. Frontoclypeus with 10 setae; labrum triangular with three pairs of setae; hypopharynx of the same shape as labrum; labela elongate-convex, each with several long lateral setae; palp terminal length, 0.1 mm, palp 4-segmented. Antennae total length, 0.8 mm (female); scape and pedicel long and maximum wide, 0.05 mm; scape broader distally; 12 binodal tricircumfilar flagellomeres; circumfilar whorls irregular in length in males, medial whorls shorter than distal and basal whorls (Fig. 2); cylindrical flagellomeres with interconnected circumfila in females (Fig. 3), apical process present (Fig. 4), setulose necks in both sexes. Thorax: scutum and scutellum brown. Scutum with two rows of dorsocentral and one row of notopleural setae; anepimeron with 16 setae; laterotergite with two long trichoid sensilla, other sclerites bare. Legs: tarsal claws bend near midlength and 2-toothed (Fig. 5); empodia shorter than claws. Wing 1.25 mm long and 0.5 mm wide (male, n = 14), 1.7 mm long and 0.6 mm wide (male, n = 14); venation as in Fig. 6. Abdomen. Male (Fig. 7): Tergites 1–7 rectangular with a complete row of posterior setae; irregular mesal rows of setae; Tergite 8 setose, weakly sclerotized. Sternites 1–7 as tergites 1–7. Sternite 8 rectangular and setose. Trichoid sensilla absent in tergites and sternites. Female (Fig. 8): Tergites 1–7 rectangular with a complete row of posterior setae; irregular mesal rows of setae; Tergite 8 setose and not sclerotized. Sternites 1–7 as tergites 1–7. Sternite 8 as tergite 8. Trichoid sensilla absent in tergites and sternites. Male terminalia (Fig. 9): gonocoxites splayed; wide and rounded with mesobasal lobe discrete; setae placed only on external surface; gonostylus elongated, wider at base and apically narrow; shorter than gonocoxite, sparsely covered with setae and microsetulae, teeth entire and strong; cercus setose and bilobed (outer lobe little longer than the inner), irregular margin; hypoproct deeply bilobed, setose, and longer than cerci; aedeagus large, elongate, tapering gradually to the apex, and 1.5 longer than hypoproct. Ovipositor (Fig. 10): 0.18 mm long; slightly protrusible, female cerci separate, ovoid and setose; hypoproc short and setose.

Pupa. Yellowish. Body 2.18 mm long (n = 31). Head (Fig. 11): antennal horns, 0.12 mm long, triangular, sclerotized, three lateral papilae present, two with setae and one asetose, two pairs of facial papilae present, one pair setose and one asetose. Cephalic setae 0.06 mm long. Thorax: wing reaching third abdominal segment; first pair of legs reaching the posterior margin of fifth abdominal segment, second pair reaching the 1/3 of sixth abdominal segment, and third pair reaching the posterior margin of sixth abdominal segment. Prothoracic spiracular setiform, 0.16 mm long. Abdomen: abdominal tergites with dorsal spines absent, spinules present. Terminal segment as 0.15 mm long as wide (n = 31). Pupation in gall.

Larva 3rd instar. Yellowish. Body 1.5 mm long (n = 2). Integument rough. Sppula 2-toothed with long stalk (0.1 mm long), pointed teeth far apart from each other (Fig. 12). Two groups of three papilae per side, two of each group setose and one asetose. Terminal segment convex with three pairs of corniform papillae, one longer than the other two (Fig. 13).


Etymology. The species name refers to the generic name of the host plant.

Gall and biology (Fig. 14). Blister-shaped, green, and bare leaf gall occurs only on the upper surface of leaf in Andira humilis (Fabaceae). Pupation in gall.

Remarks. The new gall midge differs from other known Lopesia in having the larval terminal segment with three pairs of corniform papillae, one longer than the other two in a rounded terminal segment and a wide aedeagus in males.

The key to segregation of Lopesia species of Rodrigues and Maia (2010) indicates that L. andrae sp nov. resembles L. elliptica Maia, 2003, in such characteristics: setulose flagellomere necks, narrow gonocoxites, male binodal flagelomeres, wing with Rs joining R1.
after midlength, and 2-toothed tarsal claws, however, Lopesia elliptica has a narrow aedeagus, while the new species presents a large aedeagus.

The pupae of the new species share with L. similis Maia, 2004 the antennal horn developed, the conspicuous apical setae, dorsal abdominal spines absent, and cephalic spines absent, but the antennal base of the pupae of L. similis has a small denticle, absent in the L. andirae sp. nov.

L. andirae sp. nov. is also closely related to L. singularis Maia, 2001 and L. euchthornia Urso-Guimarães, 2014 by the following characters: prothoracic spatula with two teeth spaced apart and three pairs of corniform papillae, but both species differs from L. andirae sp. nov. in having bilobed terminal segment instead of rounded terminal segment.

It is known that there is a high specificity between gall makers and their host plants. As a result, gall morphotypes associated with host plants are used to distinguish their inducer species. Thus, despite the morphological features shown between L. andirae sp. nov. and the species mentioned above, this species induces blister-shaped galls on the upper leaf surface of Andira humilis (Fabaceae). L. elliptica makes a parenchymatic gall that forms an elliptical distension of the leaf’s epidermis of Calophyllum brasiliense (Clusiaceae). L. similis induces a green leaf with a rolled-margin of Protopium heptaphyllum (Aubl.) (Burseraceae) (Narahara et al., 2004). The galls of L. singularis are induced on Pouteria venosa (Mart.) Bahni (Sapotaceae) and L. euchthornia causes swollen rhizome galls on Eichhornia azurea (Sw.) Kunth (Pontederiaceae).

The association between the host plant Andira humilis (Fabaceae) and the gall maker Lopesia andirae sp. nov. is reported for the first time, as well as the geographical distribution of the Lopesia genus to Mato Grosso and Bahia States.

**Conflicts of interest**

The authors declare no conflicts of interest.

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