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Notes and Comments

Egg characterization and laying pattern of *Oncideres saga* (Coleoptera: Cerambycidae) in *Inga edulis* (Fabaceae)

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The egg laying choices by insects affect the number of eggs deposited (Minkenberg et al., 1992; Barbosa-Andrade et al., 2018) and their specializations, throughout evolution, determine the egg morphology (Forister et al., 2006; Church et al., 2019). Understand the laying pattern is fundamental for integrated pest management programs (Shaw et al., 2018) and the egg morphology for taxonomy (Suman et al., 2011). Different factors, such as adult oviposition strategies (Church et al., 2019) and biogeographic regions (Forister et al., 2006), affect egg morphology and its dimensions. Therefore, insect eggs should be studied in different regions and host plants.

Females from a group of cerambycid beetles (Coleoptera: Cerambycidae), known as "true twig girdlers", cut branches and tree trunks, where they make scars on the bark as oviposition sites (Paro et al., 2014). The girdling process interrupts the sap flow and increases nitrogen concentration (Forcella, 1982), making the branch more nutritious for the development of these insects. After oviposition, the immature stages of this insect develops inside the branches until the adult emergence (Paulino-Neto et al., 2006; Corrêa et al., 2019).

Oncideres saga (Dalman, 1823) (Coleoptera: Cerambycidae), a neotropical and common twig girdler (Paro et al., 2014), occurs in Argentina, Brazil and Paraguay (Corrêa et al., 2019; Monné, 2020). This insect has economic importance due to damages caused to trees used in urban afforestation (Coutinho, 1997; Soares et al., 2021) and commercial plantations (Cordeiro, 2008). The control of this insect group depends, exclusively, on periodic inspections to remove and burn infested branches in tree crops (Ouali-N'Goran et al., 2020). Therefore, it is necessary to study aspects related to eggs and oviposition of *O. saga*.

Inga edulis Mart. (Fabaceae) occurs, naturally, in humid tropical forests of South America (Argentina, Bolivia, Brazil, Colombia, Ecuador, and Peru) (Lojka et al., 2010; Lim, 2012), where it is abundant in secondary forests and reaches up to 30 m high (Lim, 2012). This tree was introduced in Central America and has several economic uses, including shading in urban afforestation and agroforestry systems, production of firewood and fruit, and medicinal uses (Lojka et al., 2010; Lim, 2012). Insects can damage parts of this tree (eg leaf chewers) (Menezes et al., 2018), but few studies have explored the twig girdler beetles biology in this tree (Paro et al., 2014).

The objective was to describe the laying pattern of *O. saga* and the morphology of its eggs on a girdled branch of *Inga edulis* Mart. (Fabaceae).

A *I. edulis* branch, girdled by a twig girdler beetle, was found on July 3, 2018 on a tree used for landscaping (Figure 1A) in the rural zone of Coimbra, Minas Gerais, Brazil (20º50'27"S e 42º52'22"O). This tree had only one branch girdled by the insect, in the middle-lower part of the crown. The branch had 3.06 cm in diameter and 2.58 m long and was hang from a tree, with a cerambycid adult, identified as *O. saga* female, gnawing the bark at the end of the branch. This branch was removed from the tree (Figure 1B) and transported to the laboratory at the "Universidade Federal de Viçosa" in Viçosa, Minas Gerais, Brazil.

The oviposition scars, made in the bark by the *O. saga* female, was counted on the branch, in the laboratory. Thirty oviposition scars (Figure 1C-I) were opened to quantify the eggs and to check their position in relation to the branch. After that, the branch was discarded. The color, shape and maximum length and width of the best preserved eggs (n= 10) were analyzed under a stereomicroscope, equipped with a ocular micrometer.

A total of 89 oviposition scars were found on the *I. edulis* branch, with only one egg on each of the 30 opened scars, totalizing 30 eggs. One *O. saga* egg per oviposition scar in *I. edulis* confirms the pattern of this twig girdler beetle observed in branches of *Albizia lebbeck* (L.) Benth. (Coutinho, 1997) and *Acacia mangium* Willd. (Fabaceae), although two eggs were deposited in 4% of the oviposition scars in *A. mangium* (Cordeiro, 2008). This would help to determine the reproductive capacity of this insect, allowing a better strategy in integrated pest management

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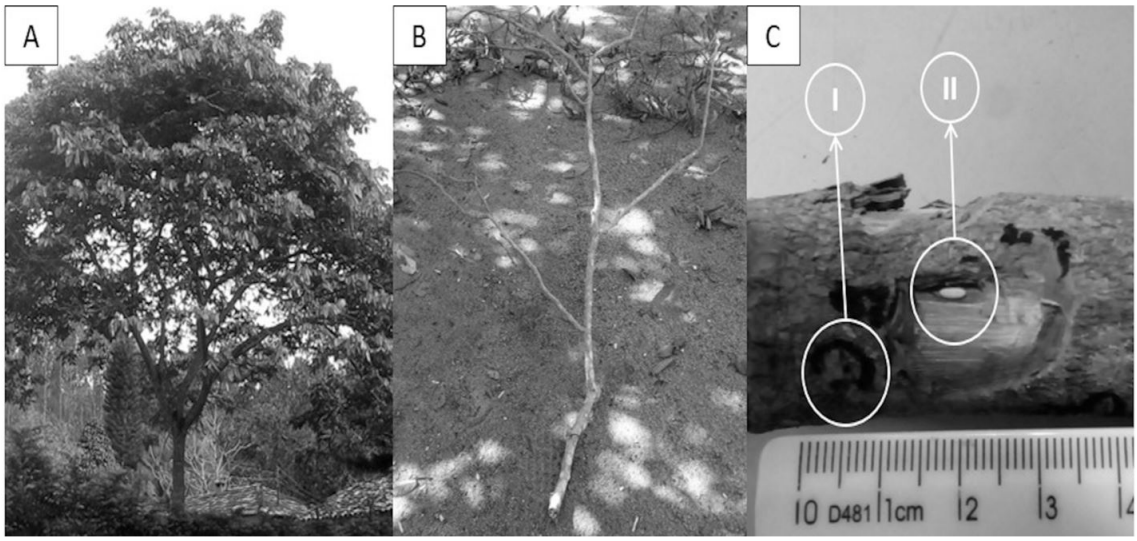

Figure 1. *Inga edulis* Mart. (Fabaceae) tree (A) and a branch girdled by *Oncideres saga* (Dalman, 1823) (Coleoptera: Cerambycidae) (B), with oviposition scars (I) having one egg each (II) (C).

(IPM) programs, such as calculating the level of economic damage (not yet established) and, consequently, controlling this forest pest. This pattern, however, can vary with the girdler beetle, as for *Oncideres humeralis* Thomson, 1868 (Coleoptera: Cerambycidae), registered depositing up to three eggs per oviposition scar in Melastomataceae plants (Paulino-Neto et al., 2006).

The *O. saga* eggs were laid with its length in the longitudinal direction of the *I. edulis* branch (Figure 1C-II). These eggs were white, elliptical in shape and with the length and width (mean ± SE) measuring 3.35 ± 0.04 mm (n = 10; ranging from 3.13 to 3.56 mm) and 0.95 ± 0.01 mm (n = 10; ranging from 0.89 to 1.02 mm), respectively. The color and shape of *O. saga* eggs in *I. edulis* are similar to those of this girdler beetle in *A. mangium* (Cordeiro, 2008) and *A. lebbeck* (Coutinho, 1997). However, the length and width of *O. saga* eggs in *I. edulis* were smaller than in *A. mangium* (3.54 ± 0.03 and 1.05 ± 0.02 mm) (Cordeiro, 2008) and *A. lebbeck* (with 3.70 and 1.20 mm) (Coutinho, 1997). The eggs of *O. saga*, on the other hand, were bigger than those of *O. humeralis* in Melastomataceae plants (3.20 ± 0.03 and 0.70 ± 0.01 mm) (Paulino-Neto et al., 2006) and of *Oncideres ocularis* Thomson, 1868 in *A. mangium* (2.44 ± 0.02 and 0.58 ± 0.12 mm), differing from those of the last species due to the absence of a depression in their center (Lemes et al., 2013). The differences in egg dimensions may be proportional to the size of the adult, since *O. saga* reaches a bigger body size than *O. humeralis* and *O. ocularis* (Dillon and Dillon, 1946). The eggs characterization and the laying pattern of *O. saga* in *I. edulis* expands the knowledge of the life history of this insect. This is the first paper describing the eggs of this beetle.

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