First Report of Gymnandrosoma aurantianum (Lepidoptera: Tortricidae) in Pecan in Brazil

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First report of *Gymnandrosoma aurantianum* (Lepidoptera: Tortricidae) in pecan in Brazil

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The cultivation of hardy pecan, *Carya illinoinensis* (Wangenh.) K. Koch (Juglandaceae), in Brazil started in the 1870s, but significant expansion occurred only during the 1960s and 1970s due to governmental stimuli aiming to bring in new investments for forestation (Backes & Irgang 2004; Ortiz & Camargo 2005). Economic exploration of pecan cultivation garnered attention in Brazil in the 21st century due to its high revenue, crop nutritional value, use of lands with irregular (sloping) surfaces, and the development of integrated systems with pastures for animal production, or the cultivation of pecan along with other crops (Fronza et al. 2013, 2018; Martins et al. 2017). In 2017, harvested areas were concentrated in the southeastern (21%) and southern (79%) regions of Brazil. The state of Rio Grande do Sul increased its production area to 86% between 2007 and 2017, and is currently the largest producing state, accounting for two-thirds of the total harvest area in Brazil (IBGE 2017). Simultaneously with the increase of pecan orchards in the country, pests seem to be damaging plants; however, information on this problem continues to be limited. This is the first report of the occurrence of *Gymnandrosoma aurantianum* (Lima) (Lepidoptera: Tortricidae) in pecan in Brazil.

Pecan samples were taken from 2 areas in May 2018: 1 in the municipality of Uraí in the state of Paraná (23.315200°S, 50.501339°W) from a pecan orchard of about 80 ha, which was planted in 1965. The second was taken in the municipality of Chapada in the state of Rio Grande do Sul (28.070686°S, 53.155628°W) from an orchard of about 5.2 ha, planted in 2009, which was attached to another area of about 27.6 ha of pecan trees planted between 2013 and 2014. In these 2 areas, plants were sampled randomly. Three nuts infested with lepidopteran caterpillars were found in Uraí and 5 were found in Chapada, respectively. Insects were fed in order to obtain adult moths (Fig. 1), which were identified according to Adamski & Brown (2001).

The damage on fruits occurred by excavation and perforation of the light green with darkish green outer pericarp layer (husk) that encloses the endocarp. The larval feeding resulted in deep galleries, even promoting some grooves in the outer pecan pericarp. Excrement (frass) of the larvae were found between the outer pericarp layer and the endocarp as shown in Fig. 2. On these infested pecans, the damage did not reach the endocarp, but galleries did compromise the pericarp, which might imply risk of contamination by microorganisms, and trouble for transportation and storage because of shorter shelf life.

Twenty phytophagous insects have been identified that feed on pecan plants, 3 of which are common in North America where this species is indigenous: *Phylloxera devastatrix* Pergande and *Phylloxera notabilis* Pergande (both Hemiptera: Phylloxeridae), and *Monellia caryella* (Fitch) (Hemiptera: Aphididae) (Paulsen et al. 2013; Boscardin & Costa 2018). No species recorded in Brazil belongs to the Tortricidae family, although 2 species have been found in pecan nuts and trees in North America: *Cydia caryana* (Fitch) and *Gretchena bolliana* (Slingerland) (both Lepidoptera: Tortricidae) (Ree & Knutson 1997; Thompson & Conner 2012; Boscardin & Costa 2018).

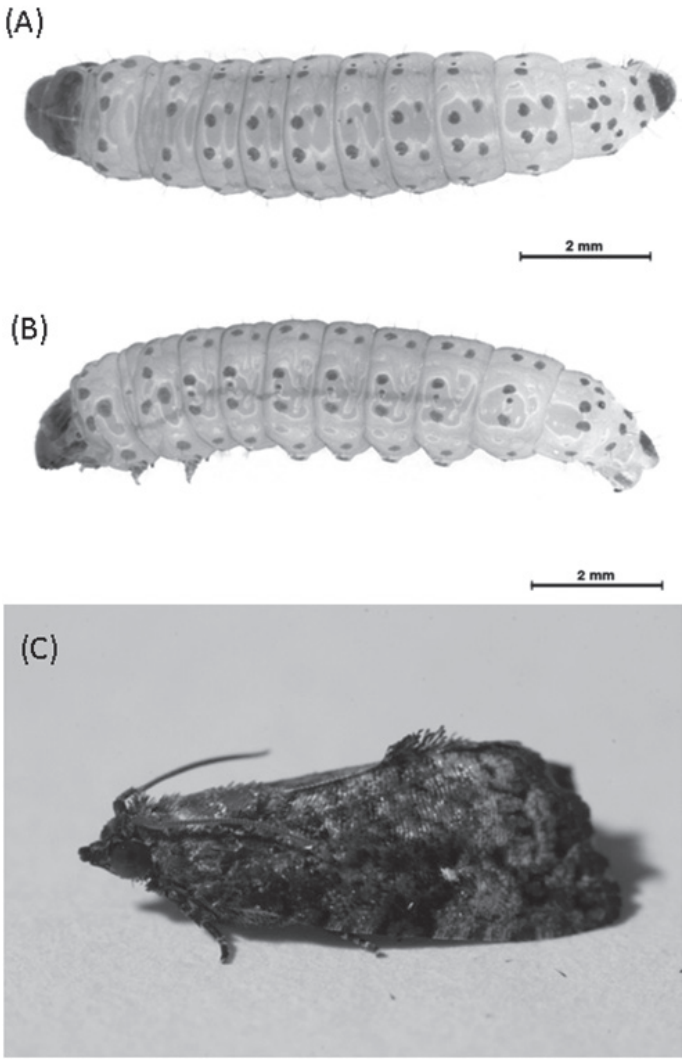

Fig. 1. *Gymnandrosoma aurantianum*: dorsal (A) and lateral (B) view of fifth instar larvae, and adult moth (C).

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Fig. 2. Larva of *Gymnandrosoma aurantianum* and injury to pecan pericarp.

Gymnandrosoma aurantiana is known in Brazil as the citrus fruit borer, and became a key pest by the end of the 1980s, when larval injuries on fruits became serious damage, and compromised the use of fruits for industry or for consumption in natura, resulting in loss of production up to 50% (Prates 1992; Parra et al. 2004; Carvalho et al. 2015). This led to research efforts aimed at lowering losses, and basic studies on biology, rearing techniques, monitoring, and use of egg parasitoids, which resulted in parameters for *G. aurantiana* pest management, particularly in the state of São Paulo, the largest citrus producer in Brazil (Garcia & Parra 1999; Vilela et al. 2001; Parra et al. 2004; Bento et al. 2006; Molina & Parra 2006). In Mexico, the egg parasitoid *Trichogramma platneri* Nagarkatti (Hymenoptera: Trichogrammatidae) was effective in pecan orchards when the abundance of tortricidae *C. caryana* was low or moderate (García-Nevárez & Tarango-Rivero 2013).

In the southern states, particularly in Rio Grande do Sul, pest management is not common in small orchards with citrus plants, which is why the pest status of *G. aurantiana* is unknown. Moreover, the increase of pecan harvest areas, as well as the existence of abandoned orchards from the last century, may pose a threat to pecan production (Ortiz & Camargo 2005). These zones may serve as additional reproduction sites, and become sources of infestation for commercial pecan areas. Considering that other tortricid species already are recorded in pecan, and that *G. aurantianum* is a key pest in citrus plants and is hosted by other plant species (Silva et al. 1968; Molina & Parra 2006), it is reasonable to presume that the incidence of this pest in pecan could increase and eventually reach economic injury levels.

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Summary

The cultivation of hardy pecan, *Carya illinoinensis* (Wangenh.) K. Koch (Juglandaceae), has increased in Brazil in the current century; however, the knowledge about insect pests is limited. This report deals with the occurrence of *Gymnandrosoma aurantianum* (Lima) (Lepidoptera: Tortricidae) in pecan trees for the first time in Brazil, discussing symptoms and possible risks.

Key Words: *Carya illinoinensis*; Juglandaceae; Olethreutinae; Graphotilini; citrus fruit borer

Sumario

O cultivo de nogueira-pecã *Carya illinoinensis* (Wangenh.) K. Koch (Juglandaceae), aumentou no Brasil no presente século, apesar disso informações sobre insetos praga são limitadas. Esse registro trata da ocorrência de *Gymnandrosoma aurantianum* (Lima) (Lepidoptera: Tortricidae) em nogueira-pecã no Brasil, relatando sintomas e possíveis riscos à cultura.

Palavras Chave: *Carya illinoinensis*; Juglandaceae; Olethreutinae; Graphotilini; bicho furão dos citros.

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