



First report of *Pachycoris torridus* (Hemiptera: Scutelleridae) in *Carya illinoensis* (Juglandaceae) in Brazil

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Abstract - The cultivation of pecan tree *Carya illinoensis* (Wangenh.) K. Koch (Juglandaceae) is increasing in Brazil for nuts production and reforestation for wood as well as for shading in agrosilvopastoral systems. Here, we report the first occurrence of the stink bug *Pachycoris torridus* (Scopoli, 1772) (Hemiptera: Scutelleridae) associated to pecan fruits in a commercial orchard in the municipality of Galvão, Santa Catarina State, Southern Brazil and its potential as a new pest of this fruit and/or forest species.

Primeiro relato de *Pachycoris torridus* (Hemiptera: Scutelleridae) em *Carya illinoensis* (Juglandaceae) no Brasil

Resumo - A noz-pecã, *Carya illinoensis* (Wangenh.) K. Koch (Juglandaceae), é uma espécie cultivada em franca expansão no Brasil, destinada tanto à produção de castanhas e madeira quanto para sombreamento em sistemas agrossilvipastoris. Aqui, relatamos o primeiro registro do percevejo *Pachycoris torridus* (Scopoli, 1772) (Hemiptera: Scutelleridae) associado a frutos de noz-pecã em um pomar comercial localizado em Galvão, SC, sul do Brasil e, consequentemente, seu potencial como nova praga dessa espécie frutífera e/ou florestal.

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The pecan tree *Carya illinoensis* (Wangenh.) K. Koch (Juglandaceae) is native to the United States and Mexico (Sparks, 2005; McWilliams, 2013). In Brazil, the species was introduced between 1870 and 1900 and its commercial cultivation started around 1960-1970, ranging from the state of Minas Gerais to the state of Rio Grande do Sul (Raseira, 1990). Currently, its cultivation is increasing considerably, mainly for nuts production and wood production for furniture industry, in land areas with steep slopes, and in species integration

in agrosilvopastoral systems (Martins et al., 2017; Fronza et al., 2018), with the largest expansion observed in southern Brazil (Poletto et al., 2016; Boscardin & Costa, 2018), which concentrates the country's largest production (Fronza & Hamann, 2016; Martins et al., 2018).

The expansion of pecan plantations leads to concerns with the occurrence of pest arthropods (Boscardin et al., 2020), since little information is available in the literature for Brazilian environment. The knowledge gap is regarding the identification

of potential pest species and bioecology aspects of species already described that damage this fruit tree in Brazil (Nava et al., 2021). To date, 56 insect pest species have been reported in North America (Thompson & Conner, 2012) and the majority (78.5%) is associated to the aerial part of the plants, damaging thin branches, leaves, and fruits at different stages of formation.

The literature reports several sucking insects attacking pecan trees, including the yellow pecan aphid *Monellia caryella* (Fitch, 1885) (Hemiptera: Aphididae), species of *Phylloxera* spp. (Hemiptera: Phylloxeridae), the Brazilian ground pearl *Eurhizococcus brasiliensis* (Hempel, 1922) (Hemiptera: Margarodidae), and the white cochineal *Pseudaulacaspis pentagona* (Targ.-Tozz, 1855) (Hemiptera: Diaspididae) (Boscardin & Costa, 2018; Entomology and Plant Pathology, 2019; Boscardin et al., 2020). In addition, several species of psyllids (Hemiptera: Psyllidae) have been found on pecans, including *Blastopsylla occidentalis* (Taylor, 1985) (Hemiptera: Aphalaridae), *Ctenarytaina spatulata* (Taylor, 1997) (Hemiptera: Aphalaridae) and *Glycaspis brimblecombei* (Moore, 1964) (Hemiptera: Aphalaridae) (Burckhardt et al., 1999). The black pecan aphid *Melanocallis caryaefoliae* (Davis, 1910) (Hemiptera: Aphididae), which sucks sap from the leaves of pecan trees, is a pest of quarantine importance in Brazil (Nava et al., 2021).

Here, we report the first occurrence of the stink bug *Pachycoris torridus* (Scopoli, 1772) (Hemiptera: Scutelleridae) associated to pecan trees, *C. illinoensis*, in Brazil. *P. torridus* were found infesting pecan trees in March/April 2022 in an orchard (4 ha) with trees aged between 40 and 50 years (height 15 to 20 m) on a commercial farm in the municipality of Galvão (26°29'2.45" S, 52°37'52.81" W) in the western region of the state of Santa Catarina, Brazil. Nymphs and adults were found feeding on fruits in formation in all plants (Figure 1), with consequently premature fruit drop, aesthetic damage, or even a reduction in the growth rate and consequently in the final weight of the nuts.

The collected nymphs and adults (20 specimens) were separated and reared using unripe pecan fruits under controlled laboratorial conditions (26 ± 2 °C, RH: 70 ± 10% and photoperiod: 14L:10D hours).



Fotos: Claudiney Turmina

Figures 1. Adults of *Pachycoris torridus* (Hemiptera: Scutelleridae) associated to pecan fruits, *Carya illinoensis* (Juglandaceae), in a commercial cultivation in Galvão, Santa Catarina State, southern Brazil.

The species was identified as *P. torridus* by Prof. Dr. Sinval Silveira Neto (Department of Entomology and Acarology, "Luiz de Queiroz" College of Agriculture/University of São Paulo). Voucher specimens were deposited at the Entomological Collection of Epagri/Cepaf, in Chapecó, Santa Catarina State, Brazil. No parasitoids were detected in association to the stink bugs collected.

Adults of *P. torridus* have a high phenotypic variability, showing variations in color patterns and body spots (polychromatism) in a non-inheritable way, especially in females (Souza-Firmino et al., 2015a, 2015b; 2016), hindering taxonomic identification. Males, on the other hand, are generally monochromatic. However, the basic form of coloration is usually black or brown predominant color patterns observed in the specimens associated with pecan fruits (Figure 1), with eight spots on the pronotum and 14 on the scutellum, which are yellow or red, totaling 22 spots on the entire body (Monte, 1937). Nevertheless, other color patterns have been observed due to environmental variations

and to the effects of the plant host (Sanchez-Soto et al., 2004; Santos et al., 2005; Pikart et al., 2011; Souza et al., 2012; Souza-Firmino et al., 2015a, 2015b, 2016, 2017). In addition to phenotypic variation, Souza-Firmino et al. (2015a) also verified a large genetic variability in *P. torridus* populations assessed by mitochondrial COI phylogeny, which showed a high capacity of adaptation to different environments and plant hosts.

Pachycoris torridus is widely distributed in the Americas and has been recorded from the United States to Argentina (Froeschner, 1988). It is the only important representative of the Scutelleridae family in Brazil (Monte, 1937; Gallo et al., 2002). This scutellerid is also considered one of the most polyphagous pests worldwide capable of feeding on many hosts and thus its occurrence is verified throughout the year. However, the largest populations are found in association with summer crops (Avelar et al., 2007).

To date, *P. torridus* has been reported in association to 18 plant species in Brazil: rice (*Oryza sativa* L., Poaceae), eucalyptus (*Eucalyptus* spp., Myrtaceae), araçá (*Psidium araçá* Raddi, Myrtaceae), strawberry guava (*Psidium cattleianum* Sabine, Myrtaceae), cashew (*Anacardium occidentale* L., Anacardiaceae), cassava (*Manihot esculenta* Crantz, Euphorbiaceae), orange tree (*Citrus sinensis* (L.) Osbeck, Rutaceae), mango (*Mangifera indica* L., Anacardiaceae), tung (*Aleurites fordii* Hemsl., Euphorbiaceae), jatropha (*Jatropha curcas* L., Euphorbiaceae), acerola (*Malpighia glabra* L., Malpighiaceae), cansanção (*Cnidoscolus pubescens* Pohl., Euphorbiaceae), okra (*Abelmoschus esculentus* (L.) Moench, Malvaceae), bromeliads (*Bromelia* spp., Bromeliaceae), yerba mate (*Ilex paraguariensis* A.St.-Hil., Aquifoliaceae), Brazilian peppertree (*Schinus terebinthifolius* Raddi, Anacardiaceae), spurge-nettle (*Cnidoscolus* sp., Euphorbiaceae), and coffee (*Coffea arabica* L., Rubiaceae) (Lima et al., 1968; Sánchez-Soto & Nakano, 2002; Sánchez-Soto et al., 2004; Santos et al., 2005; Michelotto et al., 2006; Schmidt & Barcellos, 2007; Chiaradia, 2010; Pikart et al., 2011; Marques et al., 2012; Silva et al., 2016; Fregadolli et al., 2020a, 2020b). Thus,

this report expands the spectrum of host plants for this pest species. *P. torridus* has also aposematism as a strategy to anti-predation and to obtain toxic compounds from plants for their defense against predators (Pikart et al., 2011).

The host plant plays a significant role on the biological fitness of *P. torridus* and consequently on its potential to cause damage. For instance, Borges Filho et al. (2013) verified that strawberry guava and jatropha are adequate for the development and reproduction of *P. torridus*, while nymphs did not develop in tung fruits.

Nymphs and adults preferentially suck the sap of new plant parts, while they inject toxins that affect the plant physiological normality and thus fruit formation (Borges Filho et al., 2013). *P. torridus* is traditionally considered a key-pest to jatropha with potential to reduce oil production by 50% (Souza-Firmino et al., 2014; Fregadolli et al., 2020b). In jatropha trees, adults stay on leaves green, ripe fruits and in several different parts of the plant dossel (Avelar et al., 2007). In this study, we report the first occurrence of *P. torridus* in association to pecan trees and its potential as a new pest of this fruit species. However, further studies should be conducted to investigate the impact of *P. torridus* on the production and quality of pecan fruits as well as on the resistance of pecan genotypes.

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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Authors' contributions

Daian Marcos Savaris: Investigation, writing – original draft. **Claudiney Turmina:** Conceptualization, investigation. **Daniel Bernardi:** Conceptualization, investigation, writing – original draft. **Dori Edson Nava:** Conceptualization, investigation, writing – original draft. **Leandro do Prado Ribeiro:** Conceptualization, supervision, writing – original draft, writing – review & editing.

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