

Brazilian Peppertree Thrips *Pseudophilothrips ichini* (Hood) (Insecta: Thysanoptera: Phlaeothripidae)¹

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Introduction

The Brazilian peppertree thrips, *Pseudophilothrips ichini* (Hood) (Thysanoptera: Phlaeothripidae), is an insect native to Brazil (Figure 1). This species has been studied for the last 20+ years as a potential biological control agent of Brazilian peppertree, *Schinus terebinthifolia* Raddi (Sapindales: Anacardiaceae), in Florida (Cuda et al. 2008; Cuda et al. 2008; Manrique et al. 2014; Wheeler et al. 2016a, b). Host specificity experiments demonstrated that *Pseudophilothrips ichini* has a limited host range (Cuda et al. 2008; Cuda et al. 2009; Wheeler et al. 2017) and can cause a severe reduction of Brazilian peppertree biomass in the laboratory (Manrique et al. 2014).

Distribution

Pseudophilothrips ichini currently is concentrated in eastern Brazil, overlapping some of the areas of distribution of Brazilian peppertree as documented by Wheeler et al. (2016b, 2017) (Figure 2). In July 2019, *Pseudophilothrips ichini* was first released into Florida and the insects have been found persisting in the environment (Wheeler et al., 2022). At time of publication over 5 million *Pseudophilothrips ichini* have been released in the state (Figure 3). *Pseudophilothrips ichini* has also been released into southern Texas.



Figure 1. *Pseudophilothrips ichini* Hood adults on *Schinus terebinthifolia* Raddi.

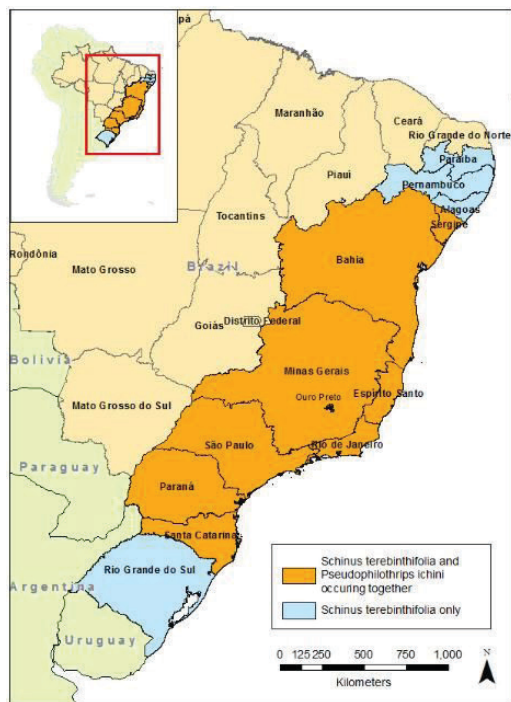
Credits: Carey R. Minter, UF/IFAS

Description

Eggs

Pseudophilothrips ichini adults lay eggs on leaflet blades and pedicels of new growth tissues of Brazilian peppertree. Eggs are 0.02 inches (0.4 mm) in length, ovoid, and golden in color (Figure 4) (Cuda et al. 2008).

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inches (1.0 mm) in length (Figure 5B). Besides body size, the second larval instar can be differentiated from the first by the presence of two horizontal lines on the last few segments of the body (Cuda et al. 2008; Wheeler et al. 2016b).

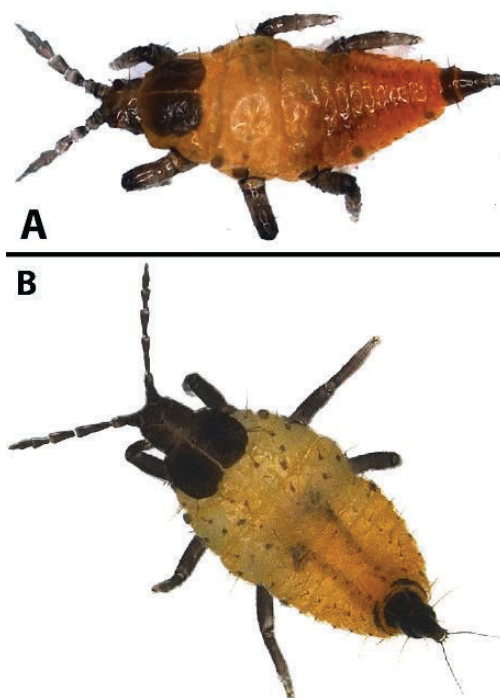
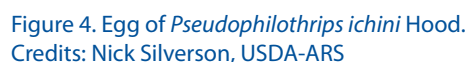
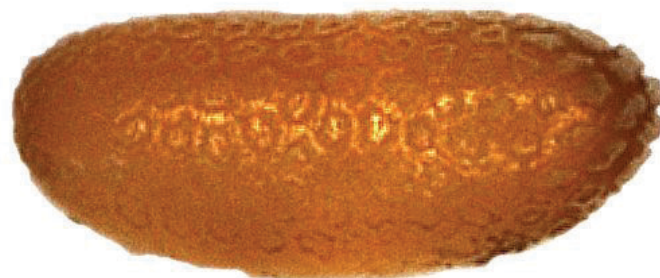


Figure 5. Larvae of *Pseudophilothrips ichini* Hood. A: first larval stage and B: second larval stage.
Credits: Nick Silversen, USDA-ARS

Pupae

There are three pupal instars. The first stage, called the pre-pupal instar, is 0.6 inches (1.6 mm) in length, has short antennae, and lacks wing buds (Figure 6A). The next stage, called the first pupal instar, is 0.07 inches (1.9 mm) in length and has small wing buds (Figure 6B). The final instar, referred to as the second pupal stage, is 0.8 inches (2.1 mm) in length, has longer antennae, and has wing buds (Figure 6C) (Wheeler et al. 2016b).

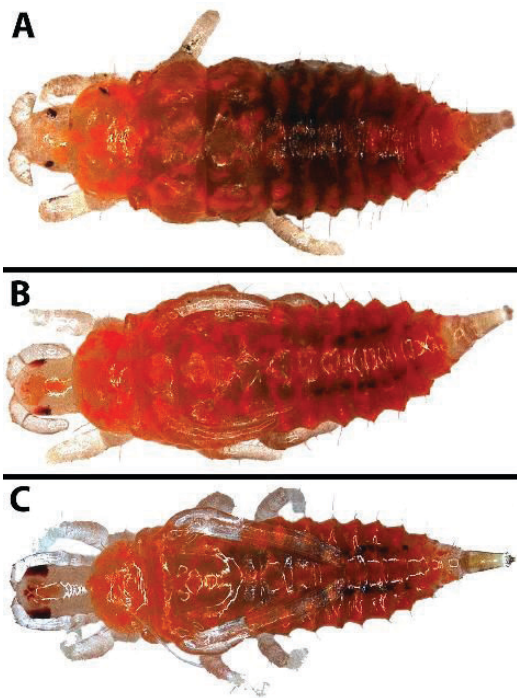


Figure 6. Pupal instars of *Pseudophilothrips ichini* Hood. A: pre-pupal stage, B: first pupal stage, and C: second pupal stage.
Credits: Nick Silversen, USDA-ARS

Adults

Adults are winged, small (0.08 to 0.12 inches) (2 to 3 mm), black, and sexually dimorphic (Figure 7). Sexually dimorphic in this particular species means the adult males are relatively smaller than females (Cuda et al. 2009).



Figure 7. *Pseudophilothrips ichini* Hood adult.
Credits: Nick Silversen, USDA-ARS

Life Cycle

Reproduction can be sexual or by arrhenotoky, which is the production of females from fertilized eggs and males from unfertilized eggs (Bowen and Stern 1966; Cuda et al. 1999; Cuda et al. 2008; Wheeler et al. 2016b). Developmental time from egg to adult ranges from 18 to 34 days and is temperature dependent. Adults and larvae use their rasping sucking mouthparts to make and feed on ruptures in the cells of Brazilian peppertree; pupation occurs in the soil, and all pupae stages do not feed. Adults lay eggs on new growth, and, after 5 to 8 days, the larvae hatch. Larval

stage lasts for 8 to 12 days, and pupal stage for 5 to 14 days (Manrique et al. 2014).

Hosts

Schinus terebinthifolia, the primary host of *Pseudophilothrips ichini*, is a perennial shrub native to Argentina, Brazil, Paraguay, and Uruguay (Barkley 1944) (Figure 8). Introduced into Florida in the mid-1800s, Brazilian peppertree is considered one of the most aggressive invasive weed species in Florida (Morton 1978; Schmitz et al. 1997; Cuda et al. 1999; Cuda et al. 2006; Manrique et al. 2013). Native range observations and host-range tests show that *Pseudophilothrips ichini* is highly specific to Brazilian peppertree (Cuda et al. 1999; Cuda et al. 2009; Wheeler et al. 2016b).

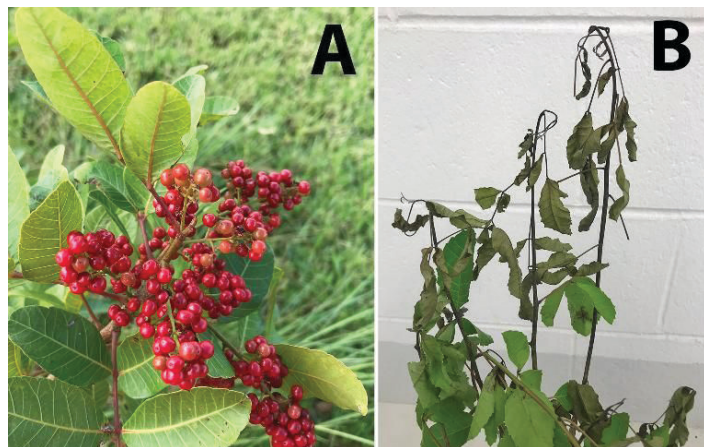


Figure 8. *Schinus terebinthifolia* Raddi plants. A: Plant with fruits, B: Plant damaged by *Pseudophilothrips ichini* Hood.
Credits: Patricia Prade, UF/IFAS

Wheeler et al. (2017) found that during no-choice host specificity experiments, *Pseudophilothrips ichini* was able to complete development and produce offspring on Brazilian peppertree (target species) and 10 other species (non-target species). Reproduction and survival on non-target species were reduced compared to reproduction and survival on Brazilian peppertree. The average number of adults produced on Brazilian peppertree was 124. However, 20.3 adults on average were produced from Peruvian peppertree, *Schinus molle* L. (Sapindales: Anacardiaceae), a non-native invasive ornamental in California, and on average 1.8 adults were produced on each of the other nine species tested. When given a choice between Brazilian peppertree and non-target species, *Pseudophilothrips ichini* was able to produce adult offspring on only four non-target species (*Schinus molle* L., *Pistacia vera* L., *Rhus glabra* L., and *Rhus sandwicensis* A. Gray). However, the number of adult offspring produced on Brazilian peppertree was on average 71, much higher than on non-target species that had an

average of 0.9 adult offspring produced (Wheeler et al. 2017).

Once *Pseudophilothrips ichini* was released into Florida, host range tests in the field were conducted. *Pseudophilothrips ichini* were placed at the base of 7 non-target species and Brazilian peppertree. In plots where Brazilian peppertrees were cut to simulate local eradication of the target weed, a small number of larvae (average of 4.3 larvae/plant) were produced on *Rhus sandwicensis*. None of these larvae survived past the first larval stage. In plots where Brazilian peppertree plants remained intact, larvae were not found on any other plant species (Bowers et al., 2022). These results clearly show that *Pseudophilothrips ichini* will not harm native plants even if local eradication of Brazilian peppertree should occur.

Economic Importance

Feeding by *Pseudophilothrips ichini* reduces Brazilian peppertree growth, reduces plant height, reduces the number of green stems produced, and causes flower abortion. More importantly, plants attacked by *Pseudophilothrips ichini* are slow to recover and less vigorous, with a reduction in the number of leaves and green stems, plant height, and growth rate, as well as limited fruit production when compared with non-attacked plants (Cuda et al. 1999; Manrique et al. 2014).

Brazilian peppertree management costs are high. In fiscal year 2015–2016, the South Florida Water Management District spent \$2.6 million to control Brazilian peppertree (Cuda et al. 2017; Rodgers et al. 2017). *Pseudophilothrips ichini* is expected to reduce the impact of Brazilian peppertree on the environment and potentially reduce the need for other control techniques, although this will take time. Populations of *Pseudophilothrips ichini* have begun to spread to new areas with Brazilian peppertree. Brazilian peppertree plant health has begun to decline in areas with high *Pseudophilothrips ichini* pressure and the insects have been found spreading onto Brazilian peppertree seedlings and killing them (Figure 9).



Figure 9. Brazilian peppertree plants in Hendry County, FL. Top: Plants before establishment of *Pseudophilothrips ichini*. Bottom: Plants after establishment of *Pseudophilothrips ichini*. Credits: Carey Minter, UF/IFAS

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