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Trigona Jurine, 1807 Bees (Hymenoptera: Apidae) as Pests of Physic Nut (Euphorbiaceae: *Jatropha curcas*) in Peru

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Abstract

Rasmussen C, Orihuela-Pasquel P, Sánchez-Bocanegra VH. 2009. *Trigona* Jurine, 1807 Bees (Hymenoptera: Apidae) as pests of Physic Nut (Euphorbiaceae: *Jatropha curcas*) in Peru. Entomotropica 24(1): 31-34.

Trigona amalthea and *T. truculenta* collect plant fibers by stripping pieces of bark (average size 3x11 mm) of branches and twigs of the physic nut in San Martín, Peru. They also, as does *T. fuscipennis*, chew and destroy the ribs in the palmate-veined leaves and the petiole. From the leaves they were observed to gather both plant fibers and resins. Most of the *Trigona* species damaging crops belong to a monophyletic group of bees that builds exposed nests, thus requiring both fibers and resin for construction and maintenance of their colony. The control of the damage is best achieved by locating and removing the nest.

Additional key words: Neotropics, stingless bees, agriculture, biofuel.

Resumen

Rasmussen C, Orihuela-Pasquel P, Sánchez-Bocanegra VH. 2009. Abejas del género *Trigona* Jurine, 1807 (Hymenoptera: Apidae) como plaga del Piñón Blanco (Euphorbiaceae: *Jatropha curcas*) en Perú. Entomotropica 24(1): 31-34.

Trigona amaltea y *T. truculenta* colectan fibra vegetal mordiendo pedazos de corteza (tamaño medio 3x11 mm) de ramas y ramitas del piñón blanco en San Martín, Perú. También, al igual que *T. fuscipennis*, mastican y destruyen las nervaduras en las hojas palmeadas-nervadas y el pecíolo. Se observaron a las abejas juntando tanto fibras vegetales como resinas de las hojas. La mayoría de las especies de *Trigona* que dañan a los cultivos son de un grupo monofilético de abejas que construye nidos expuestos, por lo que requieren fibras y resinas para la construcción y el mantenimiento de su colonia. El control de los daños se logra mejor mediante la ubicación y eliminación de los nidos.

Palabras clave adicionales: Neotrópicos, abejas sin aguijón, agricultura, biocombustible.

Physic nut (Euphorbiaceae: *Jatropha curcas*) is a drought-resistant small tree or large shrub widely cultivated in the tropics as a living fence (Heller 1996). Many parts of the plants are used in traditional medicine in Peru under the name "piñón blanco" (Mejia & Rengifo Salgado 2000). The seeds, however, are toxic to most vertebrates and insects. A renewed interest for physic nut in Peru is due to its high content of oil that can be processed to produce a high-quality biodiesel fuel, usable in a standard diesel engine (Heller 1996). Due to drought-resistance, the tree can potentially even be used to produce oil from marginal semi-arid lands, without competing with food production.

Despite the toxicity of the seeds, numerous insect pests have been reported from the Neotropical region (Grimm & Maes 1997; Grimm & Führer 1998; Grimm 1999; Schaefer & Panizzi 2000). We therefore, in anticipation of large-scale cultivation of the physic nut in Peru, evaluated the potential pest insects of the plant in the arid parts of San Martín, Peru, during January-July 2009. The study area encompassed the area between Juan Guerra to Picota, Baranquita and Santa Rosilla along the Huallaga river in the eastern parts of Peru. Damage in this area is limited due to the scattered physic nuts planted in fences, but includes *Pachycoris torridus* (Scopoli, 1772), *Leptoglossus gonagra* (Fabricius, 1775), and *L. concolor* (Walker, 1871) (Heteroptera: Coreidae), two genera of potential severe pests in large-scale productions (Grimm & Führer 1998). Other pests not previously reported from physic nut were also frequently observed in our study area. The perennial and social stingless bees *Trigona amalthea* (Olivier, 1789), *T. truculenta* Almeida, 1984, and *T. fuscipennis* Friese, 1900 (Hymenoptera: Apidae, Meliponini) were all frequently observed on the underside of the deciduous leaves or on the stubby twigs and branches of physic nut. One to five individual bees per tree would engage in chewing on the ribs in the palmate-veined leaf or the petiole. Often we observed that the ribs were completely removed leaving small holes in the leaf. Chewing of the smaller-sized *T. fuscipennis* was mainly between ribs across the whole leaf underside. Chewing of the branches or twigs left hundreds of circular 2-4 mm broad scars, sometimes completely encircling the branch, although more often only partially encircling (average scar width 11 mm, n=50). Only the two large-sized bees, *T. amathea* and *T. truculenta* were able to damage branches and twigs. The plant fibers gathered were carefully packed on the corbiculate scopa (basket on the hind legs of the worker bees) and then presumably transported back to the nest for use there. In particular the lighter chewing by *T. fuscipennis* on the leaves produced small amounts of resin, which might be gathered by the bees along with the plant fibers.

A few species of stingless bees have frequently been reported to damage crops in South and Central America (Henigman 1975). Damage is from cutting holes in tree bark, defoliation, cutting flower buds and flowers, scarring fruit, and, as a consequence reducing yield and possible also vectoring diseases, although the later part is little studied (Buddenhagen & Elsasser 1962). In particular, stingless bee damage have been reported from but not limited to the following plants of economic importance: avocado (Lauraceae: *Persea americana* by *Trigona silvestriana*); banana (Musaceae: *Musa* by *T. corvina, T. fuscipennis, T. silvestriana* Vachal, 1908, *T. spinipes* (Fabricius, 1793)); citrus (Rutaceae: *Citrus* by *T. amalthea, T. corvina* Cockerell, 1913, *T. fuscipennis, T. nigerrima* Cresson, 1878, *T. silvestriana*); eucalyptus (Myrtaceae: *Eucalyptus* by *Partamona* Schwarz, 1939, *T. corvina, T. ferricauda* Cockerell, 1917); grape (Vitaceae: *Vitis vinifera* by *T. spinipes*); macadamia (Proteaceae: *Macadamia* by *T. corvina, T. fuscipennis, T. silvestriana*); mango (Anacardiaceae: *Mangifera* by *T. spinipes*); passion flower (Passifloraceae: *Passiflora* by *T. spinipes*); and pine (Pinaceae: *Pinus* by *T. hyalinata* (Lepeletier, 1836), *T. spinipes*) (Salt 1929; Myers 1935; Schwarz 1948; Wille 1965; Camacho 1966; Freire & Gara 1970; Henigman 1975; Boiça *et al.* 2004; Azeredo *et al.* 2006). Most of these bees belongs to a monophyletic clade of *Trigona* mostly building exposed nests and utilizing plant fibers for nest construction: the "*amalthea*" species group (*amalthea, silvestriana, truculenta*) and the "*spinipes*" species group (*corvina, hyalinata, nigerrima, spinipes*) (Rasmussen & Camargo 2008). Although *T. fuscipennis* ("*fuscipennis*" species group) may add plant fibers to their nests (Rasmussen & Camargo 2008), these are usually constructed in association with epigeal termites and both *T. fuscipennis* and *T. ferricauda* ("*pallens*" species group) appear to gather mainly resin rather than fiber (C. Rasmussen pers. obs.; Henigman 1975).

We also observed infrequently *T. fuscipennis* with physic nut pollen loaded on the scopa, although pollination was not tested for, it is possible that some individual foragers from the same nest act as pollinators while others are involve in destructive collection of plant materials.

While extensive fields of physic nut are not yet found in San Martín, it is difficult to assess whether *Trigona* will become a significant problem in such crop. They are not typical insect pests with a logistic population growth upon encountering a food resource; rather, they are dependent on multiple different resources and adequate nesting sites. Therefore their population size will likely not be affected by widely available physic nut, although they may allocate more individuals towards gathering physic nut plant fibers and resins, should the tree become widely available. If *Trigona* becomes a problem of economic importance, then the nests of the foragers recruiting to the plantation, should be located. The nests of those species are mostly exposed and within a flight range of about 800m for *T. spinipes* and likely others as well (Araújo *et al.* 2004). As these bees have an aggressive nest defense it is difficult to handle the nest during the day; the whole nest can be removed at night or burned during the day. If a destructive control is preferred, the positive identification of the nest as a main source of the damage should be confirmed, as the colony with many thousand individuals may at the same time be important pollinators to other agricultural crops and native plants in the area (Rasmussen & González 2009). Due to the risk of *Trigona* carrying insecticides to other plants, thus cross-contaminating a field and adversely affecting multiple bee colonies, the chemical control of *Trigona* should be avoided. Manipulations, such as introduction of other competitive bees to the area, like *Apis mellifera* or other stingless bees, is unlikely to deter *Trigona* from visiting the physic nut, as these are capable of out competing most other bees (Johnson & Hubbell 1974). However, in general we recommend prior studies assessing the real impact of *Trigona* stingless bees on a given crop before attempting to destroy or relocate nests near to the affected crop.

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