Brief communication

Natural Sciences

First records of *Theobroma speciosum* fruits dispersion

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Abstract

Numerous Amazonian species that produce economically useful fruits have been intensively exploited, which is why wild populations were drastically reduced. *Theobroma speciosum* is an important species for humans and wildlife because it provides fruits for rodents and primates. This plant species is also of great economical potential because it can serve as a source of genetic variation for related species that are economically exploited as *T. cacao.* Here we report for the first time the seed dispersal by *Sapajus apella*, *Mico argentatus,* and *Guerlinguetus aestuans*. The information is useful to develop conservation strategies for this wild cocoa in remnant fragments of the forests of the eastern Amazon.

Key words: Seed dispersal; Volta grande do Xingu; Camera trap; *Saimiri scireus;* Primates.

Primer registro de la dispersión de frutos de *Theobroma speciosum*

Resumen

Numerosas especies amazónicas productoras de frutos de utilidad económica han sido explotadas intensamente por lo cual las poblaciones silvestres se redujeron drásticamente. *Theobroma speciosum* es una especie importante, ya que proporciona frutos para roedores y primates y también tiene un gran potencial económico pues puede servir como fuente de variedad genética para especies relacionadas que se explotan económicamente como *T. cacao*. Se presenta aquí por primera vez la dispersión de semillas de *T. speciosum* por *S. apella*, *Mico argentatus* (Primates) y *G. aestuans* (Rodentia). La información es útil para desarrollar estrategias de conservación de este cacao silvestre en fragmentos remanentes de los bosques de la Amazonia oriental.

Palabras clave: Estrátegias de conservación; Volta grande do Xingu; Cámera trampa; *Saimiri scireus;* Primates.

The species of the genus *Theobroma* L. have special importance for their conventional or potential uses and they represent possible sources of genetic resistance for other more economically important species such as *T. cacao* L. (**Silva, *et al.*,** 2011; **Dardengo, *et al.,*** 2016).

All Amazonian cacao species are found in the "terra firme" rainforest sub-type or areas periodically flooded by rivers and lakes, the so-called "várzea"; in the latter, they preferably occupy the sections that are rarely or little flooded. On the "terra fime", most of these species prefer banks of streams and other humid places, but *T. speciosum* Willd. ex Spreng inhabits relatively dry land (**Ducke,** 1953).

The bark of *T. speciosum* fruits is associated with the wood fawn generates a deodorant used by Amazonian populations (**Dardengo, *et al.*,** 2016; **Di Stasi and Hiruma-Lima,** 2002). **Balée** (1994) and **Dewalt, *et al.*** (1999) indicated that the fruit is also a source of nutrients for the Ka'apor indigenous people in the Amazon region of Brazil and the Tacana region of Bolivia.

Among the plants of the genus *Theobroma* present in Brazil, we find a species commonly known as "cacauí" (*T. speciosum*). This species grows in an area extending from the states of Maranhao to Cururupu in Acre and Madre de Dios in western Bolivia and the Ucayali River in Perú (**Cuatrecasas,** 1964). **Silva and Martins** (2009) indicated that the dispersing agents of *T. speciosum* are unknown. According to **Bates** (1979), the aggregate distribution of *T. cacao* is due to the dispersion by monkey species. The monkey *Sapajus paella* (Linnaeus, 1758), which transports more fruits than it eats, promotes colonization in other habitats, as well as *Saimiri scireus* (Linnaeus, 1758), which feeds on the tree that produces the fruits. In this context, our aim was to report the first records of dispersing species of *T. speciosum*.

Our study took place in a one-hectare fragment of forest in east Amazonia (3°24'42.7' S, 51° 51'50.7' W) during March 2017 (Figure 1). The study area is part of the Amazon forest biome and is mainly covered by a mosaic of: 1) Dense

Figure 1. Fragment of Sub-forest of the rainforest "terra fime" with *T. speciosum*

ombrophilous forest fragments where species such as the Brazil nuts (*Bertolletia excelsa* Humn. & Bonpl.) and the jatobá (*Himenea courbaril* L.) dominate in the upper canopy and a mosaic between the dense and open forest where the woody lianas (*Schnella* sp.) predominate. The medium stratum is dominated by *T. speciosum* and *Inga* sp. 2, cacao plantations, and herbaceous vegetation with *Brachiaria* grass. According to the Köppen classification, the climate is type Am with an average temperature of 26°C, annual rainfall of 2,289 mm, and relative humidity between 78 and 88% (**Sousa Jr., *et al*.,** 2006).

To establish the identity of the fruit disperses, we placed a Sony®Cyber-shot camera in front of a fructifying tree fixed to another different tree at a height of 1.6 m from the ground for five days totaling an effort of 50 camera-trap nights.

During the observation period, we observed dispersion in larger spaces by *S. paella* and by *Mico argentatus* (Linnaeus 1766) and *G. aestuans* in short distances (https://youtu.be/xK7p99rwi0A, https://youtu.be/VWjiaPy2EbQ, https://youtu.be/QoGcQyhpH44). It is worth noting that it was not possible to follow the opening of the fruit. According to residents, the fruit is gnawed at night by the South American spiny rats (*Proechimys* sp. Allen 1899). In recent observations in the Forest Manajement Unit Fazenda Uberlândia (near 3˚0´41´´ S; 50˚5´19´´W), we observed intense movement of *Proechimys* in a fructifying tree of *T. speciosum* during the night.

We found that in the region of the Volta grade do Xingu, *T. speciosum* is dispersed by *S. apella*. This monkey species carries more fruits than it eats. We also observed the small monkey *M. argentatus* and the rodent *G. aestuans* feeding on the site but at different times as indicated by **Bates** (1979) for *Saimiri sciureus*.

Theobroma speciosum is an important species for humans (**Di Stasi & Hiruma-Lima,** 2002; **Dardengo, *et al.*,** 2016; **Balée,** 1994; **Dewalt, *et al.*,** 1999) and wildlife because it provides fruits to rodents and primates. It is also of great potential as it can serve as a source of genetic variability for related species such as *T. cacao* that are exploited economically (**Dardengo, *et al.*,** 2016).

Considering that it has been reported that *T. cacao* seeds are dispersed by *S. apella* and *S. sciureus* (**Cuatrecasas,** 1964), **Silva and Martins** (2009) have suggested that the very similar seeds of the domesticated congeneric species *T. speciosum* could be dispersed by the same animal species generating a typically aggregated spatial pattern of plants distribution. Besides, these authors argue that this type of distribution allowed the pollination by *Drosophila*. On the other hand, the study by **Dardengo, *et al.*** (2016) with microsatellite markers indicated inbreeding and genetic substructure in a population of *T. speciosum* in southern Amazonia. The latter was evidenced partially by the distribution pattern of individuals given that *T. speciosum* is considered a self-incompatible species (**Souza & Venturieri,** 2010).

Thus, our data reinforced those in scattered records and showed the importance of understanding the dispersion, pollination, and genetic structure of this tree species for the planning conservation strategies of wild species with potential for the industry, biotechnology, and forest people's maintenance.

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Authors' Contributions

LB performed field work; IF collaborated in the writing and translation of the document; EJHR participated in the preparation of the design, analysis and writing of the document.

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