

Possible dispersion of *Garcinia brasiliensis* Mart. (1943) (Clusiaceae) by *Callicebus nigrifrons* (Spix, 1823) (Primates: Pitheciidae) in semideciduous montane seasonal forest in southern Minas Gerais, southeastern Brazil.

Possível dispersão de *Garcinia brasiliensis* Mart. (1943) (Clusiaceae), por *Callicebus nigrifrons* (Spix, 1823) (Primates: Pitheciidae), em floresta estacional semidecídua montana, no sul de Minas Gerais, sudeste brasileiro.

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Abstract This study aims to record fruit consumption and the possible dispersal of *Garcinia brasiliensis* seeds by the *Callicebus nigrifrons* (Spix, 1823) primate in the southern Brazilian state of Minas Gerais. It also provides for the confirmation of the occurrence of *G. brasiliensis* for the region and also to include a new confirmed food item in the diet of *C. nigrifrons*.

Keywords: Dispersal, *Garcinia brasiliensis*, occurrence, *Callicebus nigrifrons*.

Resumo Este estudo objetiva em registrar o consumo dos frutos, e a possível dispersão das sementes de *G. brasiliensis* pelo primata *Callicebus nigrifrons* (Spix, 1823), no sul do estado de Minas Gerais, sudeste brasileiro. Presta-lhe também para a confirmação da ocorrência de *G. brasiliensis* para a região e também para incluir um novo item alimentar confirmado na dieta de *C. nigrifrons*.

Palavras-chave: Dispersão, *Garcinia brasiliensis*, ocorrência, *Callicebus nigrifrons*.

Introduction

Howe and Smallwood (1982) estimated that the great majority of tropical trees that produce fruits, from 50% to 90%, have their seeds dispersed by animals, making the Zoocoria dispersion an important plant reproduction act (Herrera, 1994). Coates-Estrada and Estrada (1988) define these interactions between plants and animals as a mutualism way due to the mutual benefit among the involved elements, characterizing a symbiotic act in which the plant has its seeds dispersed (endocarp) and the dispersers receive a nutritious reward (pericarp), which possibly occurs in this case presented here.

Among the great floristic diversity existing in

Brazil, stands the arboreal species popularly known as “Bacupari” *Garcinia brasiliensis* Mart. (1943), this plant is distributed from the Guianas to Argentina and Bolivia (Pott & Pott 1994), being considered in Brazil an Amazon native species (Corrêa 1978). Its fruits are used in folk medicine, as well as being a fauna resource (Pott & Pott, 1994).

In this study we hypothesized a possible positive relation (dispersion) of the plant *Garcinia brasiliensis* with an element of the regional fauna, the primate *Callicebus nigrifrons*.

The objective of this study was to record the fruit consumption and the possible dispersal of *G. brasiliensis* seeds by *Callicebus nigrifrons* (Spix, 1823) in the south of Minas Gerais state, Southeastern Brazil. It also provides the occurrence confirmation of *G. brasiliensis* for the region and also include a new confirmed food item in *C. nigrifrons* diet.

Material and Method

The present record was obtained during a bird taxocenosis study, using the “focal animal” method (Altmann, 1974), with the aid of Nikon 08X40 binoculars, and the photographic record with Canon Power Shot SX50 HS digital camera, in the high areas of the São Thomé das Letras municipality, southern Minas Gerais State, southeastern Brazil, in a semideciduous high montane forest fragment (44°56'06.13”W/21°43'06.51”S, 1246m), in a region locally known as “field of Cruzeiro of the Valley of Canta Galo” (Figure 1). The observations of the present record lasted approximately 27 minutes, in a single day.

The São Thomé das Letras landscape is composed of fragments of semideciduous seasonal forests, ciliary forests, high montane seasonal forests, nebular forests, rupestrian fields, anthropic areas (pastures, cultivation areas, *Eucalyptus* sp. plantations mining areas) and Candeais (places with dominance of *Eremanthus* genus plant popularly known as “Candeia”). However, areas of rupestrian fields are predominant in the landscape. The climate in the area is classified as Köppen CWA, with average annual temperatures of 19.3 C ° and average annual rainfall of 1,529.8 mm. In the higher areas (mountainous regions tops), the climate probably fits as CWB for mountain tops, with temperatures in the warmer mon-

ths below 22 ° C (Alvares et al., 2013). The latter is the same climatic type found in an ornithological study conducted previously in Carrancas mountain tops (Moura & Corrêa, 2012), in an area that is located at approximately 51.05 km of linear distance from São Thomé das Letras.

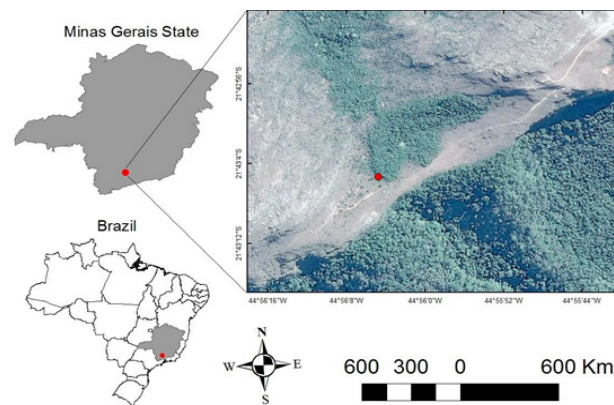


Figure 1. In red the record point, region of Cruzeiro do Vale do Canta Galo, São Thomé das Letras, south of Minas Gerais State, Brazil).

The studied plant species

Popularly known as “Bacupari” the species *Garcinia brasiliensis* Mart. (1943) (Clusiaceae) is distributed from the Guianas to Argentina and Bolivia (Pott & Pott 1994), being considered in Brazil an Amazon native species (Corrêa 1978), and also attributed to Mato Grosso do Sul state, in the Pantanal region (Oliveira et al. 2011). However, forestry studies conducted in Brazil southeastern region presented their occurrence even in Minas Gerais state (Assis et al. 2004, Scolforo et al. 2008, Pifano et al. 2010, Junior et al. 2011, Oliveira et al. 2011, Leal et al. 2013, Correia et al. 2013, Barros et al. 2015, REFLORA 2017).

Garcinia brasiliensis is a perennial tree species (Schöngart et al., 2002), occurring in the middle stratum of lowland and Cerrado forests. The wood is relatively heavy and has a density ranging from 0.58 to 0.64 g cm³. It presents yellow latex, dark red phloem, white sapwood, dark brown to gray rhytidoma, densely lenticellate and rough (Wittmann et al., 2010). The leaves of *G. brasiliensis* are simple and opposite and the flowers are axillary and white in color. They have edible fleshy fruits rounded to

ovoid, containing from one to three seeds. The fruits are used in the manufacture of jams and juices, as well as being a fauna resource. They are also used in popular medicine (Pott & Pott 1994) as an antimicrobial agent (Murataet et al. Pereira et al., 2010) and anti-proliferative for cancer cells (Murata et al., 2010). Its seeds have anti-inflammatory and anticancer properties (Wittmann et al., 2010).

Results and Discussion

On March 16, 2015, around 1:25 pm, five ‘Sauás’ (*C. nigrifrons*) were visualized and later photographed (Figure 2), consuming fruits of *G. brasiliensis* on the edge of a fragment of seasonal forest semideciduous high montana (44°56'06.13''W/21°43'06.51''S, 1246m). The group remained in the tree for approximately 27 minutes, during which time they manipulated the *G. brasiliensis* fruits, opening them and throwing the leftovers around in an almost human act. Possibly the leftovers and seeds released by *C. nigrifrons* contribute to the *G. brasiliensis* dispersal, however they have dispersed them near the mother plant, they may be contributing with secondary dispersers, benefiting actions by terrestrial birds, Mimercocoria, and even Saurocoria.



Figure 2. *Callicebus nigrifrons*, monkey-sauá foraging fruits of *G. brasiliensis*, region of Cruzeiro do Vale do Canta Galo, São Thomé das Letras, south of Minas Gerais, southeastern Brazil. (Photo: Aloysio Souza de Moura)

After the stay and foraging of fruits in the *G. brasiliensis* plant, many mature fruits fell on the soil (Figure 3), indicating possible contribution with dispersion by Hydrocoria, if we take into account the location (top of saw), its slope ($> 45^\circ$) and its proximity of the plant to a watercourse. This course is approximately 3 m from this plant and acts as a drainage channel for rainwater from this mountain range during rainy periods, ending in the lower reaches of the Canta Galo valley, becoming a tributary of the popularly known “Moon waterfall”.



Figure 3. Fruits of *G. brasiliensis* fallen to the ground after group visit of *C. nigrifrons* tree, region of Cruzeiro do Canta Galo, São Thomé das Letras, south of Minas Gerais, southeastern Brazil. (Photo: Aloysio Souza de Moura).

Corrêa (1978), considers *G. brasiliensis* in Brazil as a native species of the Amazon, and is also attributed to the state of Mato Grosso do Sul, in the Pantanal region by Oliveira et al. (2011). However, in addition to these confirmations of this species for the northern and central-western regions of Brazil, it has also been mentioned in scientific studies for the southeastern region of the country (Assis et al., 2004, Pifano et al., 2010, Junior et al., 2011, Oliveira et al., 2011, Leal et al., 2013, Correia et al., 2013, Barros et al., 2015, REFLORA, 2017). Although there are no scientific publications confirming the presence of this plant in the south of the state of Minas Gerais, several exsicates of origin of this region were deposited in the “Herbarium of ESAL”, Federal University of Lavras (UFLA), with confirmation to neighboring

municipalities: (Mata do Galego) (16454 ESAL), Carrancas (Mata Triste) (16237 ESAL), and Lavras (Eucalyptus of Rio Bonito) (12843 ESAL), (Mata da Subestação, UFLA campus) (18052 ESAL), confirming the presence of *G. brasiliensis* in the southern state of Minas Gerais. In addition, studies of Forest Dynamics currently conducted by the Forest Ecology Laboratory of the DCF-UFLA in forest areas of the region present *G. brasiliensis* as quite present, where this species will be briefly mentioned in the scientific publications of the results of these studies (personal observation).

In a *C. nigrifrons* diet study conducted by Caselli (2008), in the Serra do Japi, in the state of São Paulo, with nine months of data collection in the field, 28 families of plants included in the diet of these primates were detected. However, the Clusiaceae family was not mentioned, thus confirming another family and consecutively another plant species used in the *C. nigrifrons* diet, thus corroborating with Caselli (2008).

We present here new contributions to the areas of Ecology, Zoology and Botany. For Ecology we present the interaction and a possible dispersion of *G. brasiliensis* by *C. nigrifrons*. For zoology we include a new food item in the *C. nigrifrons* diet and for Botany we confirm the *G. brasiliensis* presence to the south of Minas Gerais state. Thus, from the mentioned facts *C. nigrifrons* contributes directly or indirectly to *G. brasiliensis* dispersion in the region and in other areas that coexist. However, new studies are suggested for a better understanding of this interaction between these two elements.

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