Notes on Economic Plants

Ethnobotany of *Mauritia flexuosa* (Arecaceae) in a Maroon Community in Central Brazil[1]

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Buriti *(Mauritia flexuosa* L.f.), a Brazilian native palm, is widely used by many ethnic groups. In central Brazil, a traditional community of African descendants (maroons), known as the Kalunga, utilize all the native palm species of the region. Buriti is the most important palm species for the Engenho II community of Kalungas, localized in the municipality of Cavalcante, state of Goiás. Leaves are used for construction, household utensils, fodder, and medicine. Forests and wetlands of the Brazilian Cerrado are rapidly being converted to pastures and agriculture. Ethnobotanical studies of plant resources may aid in their conservation and also improve the lives of the local inhabitants.

The genus *Mauritia* is comprised of solitary palms, with tall, robust, erect stems and palmate leaves. Two species are recognized, one of which is widely distributed throughout wet areas in northern South America, east of the Andes and just reaching Trinidad (*Mauritia flexuosa* L.f.) (Henderson et al. 1995). The other is more narrowly distributed in the Amazon region (*Mauritia carana* Wallace) (Henderson et al. 1995).

The common name buriti is derived from *dembyriti,* a word from the native Indian language Tupi-Guarani, and signifies "a palm tree that oozes liquid." Other common names for this majestic palm include aeta, aguaje, bariti, boriti, buriti palm, canaguche, carandá-guaçú, carandaí-guaçú, carandai-guazu, chomiya, coqueiro-buriti, ideui, ite, mariti, meriti, miriti, morete, moriche, moriti, muriti, palma real, palmeira-buriti, palmeira-dos-brejos (Cymerys et al. 2005; Lorenzi et al. 2010; Martins et al. 2010a).

Buriti frequently occurs at low elevations, forming large populations on river banks and lake margins, around water sources, and in inundated or humid areas. These buriti populations are known in Brazil as "veredas" (Ribeiro and Walter 2008) and are ecological indicators of the presence of surface water. In Brazil, buriti is the most widespread of all palm trees, occurring in the Amazon region, Cerrado, Caatinga, and Pantanal (Henderson et al. 1995; Lorenzi et al. 2010).

In the Cerrado biome, the buriti palms grow spontaneously in the veredas, surrounded by shrubby and herbaceous plant communities. They also commonly inhabit inundated gallery forest habitats (Ribeiro and Walter 2008). These palms thrive in flat terrain with humid soils that permit surface water to accumulate (Reatto et al. 2008).

Brazilian ethnobotanical studies of palms have focused mostly on indigenous, ribeirinhos (river-margin dwellers of mixed ethnicity), and seringueiros (itinerant rubber collectors) (e.g., Campos and Ehringhaus 2003; Kahn 1988). A few ethnobotanical studies have been conducted in maroon communities in Brazil (Barroso et al. 2010; Crepaldi and Peixoto 2010; Silva and Freitas 2008).

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This note presents a preliminary qualitative/quantitative account of the myriad subsistence uses by a maroon community of the buriti palm *Mauritia flexuosa*.

Material and Methods

Kalunga are Cerrado inhabitants who live in the state of Goiás, in central Brazil. They live in the municipalities of Cavalcanti, Teresina de Goiás, and Monte Alegre, grouped in different communities. They are descendants from enslaved Africans that escaped bondage and reached the northern part the state of Goiás in the eighteenth century (Velloso 2007). Most Kalungas now live near rivers or creeks and their households are built from adobe with buriti thatched roofs (Martins et al. 2010b) (Fig. 1).

This study was conducted in the Kalunga maroon community Engenho II, Cavalcanti (13° 47′51.4″ S, 47°27′19.8″ W). After obtaining consent of the local Kalunga community, we applied for an authorization from the Conselho de Gestão do Patrimônio Genético, a bureau from the Brazilian Ministry of the Environment, to access the traditional knowledge of that community. An official authorization was issued ("Deliberation number 250, authorization number 48/2009") and published in the federal government daily paper (Diário Oficial da União) on 16 April 2010.

At the beginning of the research, we conducted open interviews with tour guides and local leaders in Engenho II. We asked what palms species they knew in the region. We wrote down all names, collected herbarium specimens of all the species mentioned, with a total of 16 ethnospecies, belonging to 16 botanical species, identified by the senior author (Martins et al. 2010b; Martins and Filgueiras 2006).

Fig. 1. Kalunga home built with abode walls using buriti and indaiá leaves for roofing. Engenho II community, Cavalcante-GO.

Ethnobotanical data were collected in 88 homes using checklist interviews (Albuquerque et al. 2010; Alexiades and Sheldon 1996; Martin 1994). There are 102 homes in Engenho II, but some owners were living in cultivated field areas. A catalogue with color photographs of 16 native palm species occurring in the area was shown to the community members being interviewed (Martins et al. 2010b). The interview was divided into three stages: 1) Photographs were shown to the respondents one by one. We asked the following questions: Do you know this plant? What is its name? Have you ever used or known uses for this plant? For what? How do you use it? 2) We asked the respondent to order the 16 plants according to their preference. This ordination technique is quite useful for detecting local preferences (Albuquerque et al. 2010). Data analysis was done using the program Anthropac (Borgatti 1992). Buriti was recognized by all respondents, listed in the first position by 88% of them. Given the cultural importance of this palm, we present only the results on it. 3) We visited each household ($n=88$) and asked if they had any articles made from palms. The names of species, artifacts, and the forms of utilization were annotated. If the craftsman who made the article was present, we asked its perceived economic value.

As a feedback to the Kalunga community, the authors and local guides (Mr. João S. Rosa, Mrs. Januária M. de Sena, and Mr. Jorge M. da Silva) are preparing a field guide of the local palm species as part of the Brazilian law of access to genetic heritage and associated traditional knowledge (Medida Provisória nº 2.186–16). The field guide will be written taking into consideration input from the community members who will have the opportunity to incorporate their traditional knowledge of the local palm flora.

Results and Discussion

The uses of the different palm species were classified into the following categories: food, handicraft, construction, medicine/cosmetics, fertilizer, and direct use (Table 1). Buriti leads the list of the native palm species utilized by the Kalungas at the Engenho II community. The

TABLE 1. BURITI (*MAURITIA FLEXUOSA)* USES BY THE ENGENHO II KALUNGA COMMUNITY: CATEGORY, PLANT PART USED, AND DESCRIPTION OF THE USE.

Category	Part used	Use description
Food	Stipe	A unfermented liquid (called locally "wine") is extracted from the pith and consumed. Also pancake-like food is made from the pith starch.
	Fruit	The mesocarp is eaten *in natura* or is used to make juices, ice-cream, sweets, molasses, and "sambereba" (a dish made with buriti pulp, cassava flour, and sugar).
	Seed	Seeds from immature fruits are eaten *in natura;* seeds from mature fruits are used to make coffee powder.
Construction	Stipe	Old stipes are used to build chicken nests and "jirau," a type of rustic bench used as support for home utensils in general; the "bark" of the stipe is used to build rustic beds.
	Leaf ("straw")	Roofs, walls, chicken house, and assorted useful items (e.g., hand fans).
Medicine/cosmetic	Stipe	The liquid ("wine") extracted from the pith is used against diabetes.
	Roots	Against rheumatism (associated or not with the roots of buritirana, *Mauritiella armata*), back-aches.
	Petiole ("braço")	Squeezed petiole juice is used against snake bites.
	Fruits	The oil extracted from the mesocarp is utilized to cure respiratory problems, pneumonia, asthma, coughs, influenza, fever, snake bite and heart problems.(to "unclog the arteries"); mesocarp oil to treat dry hair.
	Seeds	The powder made of roasted seeds helps women during childbirth.
Handicraft	Fiber (leaf) immature (leaf-bud or growing point)	Ropes, brooms, "quibano" (a type of special sieve), sieves, mats, hats, purses, "caroca" (an old-fashioned, raincoat); "imbira" (a strong type of fiber) to tie logs and other assorted small objects (e.g., key-holders, necklaces, bracelets, etc.).
	Petiole ("braço")	To make doors, couches, benches, beds, book-stands, folders, bird cages, small carts, children's play items, canoes, country guitars; from the epidermis of the petiole many utensils are made, e.g., "quibano," "tapiti" (a cylindrical, flexible artifact used to extract the juices from the cassava dough), sieve; bottle tops (from the pith).
	Seeds	Curtains
Direct use	Leaf ("straw")	Broom, mattress, "uru" (used to transport produce from the plantations to the homes.
	Sheath ("camborona" or "capemba")	Trash collector; as an aid to help hatch chicken eggs; ash collected for the process of soap making.
Feed	Fruit	The scales of the epicarp are used as feed for chickens and pigs.
	Seeds	Pigs
Fertilizer	Stipe	The pith of old stipes is used as mulching material.

species appeared in all the categories, occupying the first position in 88 % of the cases. The different parts of the buriti utilized by the Kalungas include roots, stems (stipes), leaves, both mature and immature, entire or as parts (sheath, petiole, blade), fruits, and seeds.

During the interviews, 268 use citations of the plant parts were recorded: mesocarp (125), leaf (78), petiole (22), stipe (22), sheath (22), immature leaves (6), seed (6), epicarp (5), and roots (3). Among the use categories, the number of citations was distributed as follows: food/cooking/direct use (124), construction (68), crafts (46), medicine/cosmetics (23), feed (4), and fertilizer (3).

The use citation of buriti fruits is intense by the Kalunga people. The second most important use is that of the leaves. The roofs of houses and shacks are covered with buriti leaves together with the leaves of another local palm, indaiá (*Attalea brasiliensis* Glassman) (Fig. 2). In 83 of the sampled homes several distinct forms of leaf use were recorded. These items were categorized in the following manner: home utensils ("tapiti," "quibano," broom, sieves) fashion accessories (earrings, hat, purse), furniture/decoration (beds, book stands, couches, tables, etc.), home construction material (doors, roofs, walls), other constructions (pig house, chicken house, doll house), direct use (sheath, complete leaf) (Fig. 3). Other items such as coarse strings, purses, hats, and other small, diverse decoration items were seen inside the homes. It is quite common to see doors, walls, roofs, and small constructions (chicken house, pig house, etc.) made with parts of buriti leaves. The quibano or a sieve is prepared from three petioles about 3 m long (Figs. 4 and 5).

Fig. 3. Mr. Benedito (Kalunga artisan); at the top, petioles without the epidermis; in his right hand he holds a "quibano," in the left hand a "tapiti." Engenho II, Cavalcante-GO.

There are about 30 water sources near the Engenho II Kalunga community. Since buriti palms inhabit all of these sites, the informants estimate the occurrence of about 100,000 individual buriti palm trees in their land. They further report that buriti palms can reach 100 individuals per hectare. In Tocantins state, Sampaio et al. (2008) found around 300 to 667 reproductive individuals of buriti per hectare.

The utilization of the buriti leaf as broom material occurs normally without any improvement. For the construction of a chicken house of

Fig. 2. Roofing of a Kalunga home; the right side is covered with indaiá leaves, the left side with buriti leaves. Engenho II, Cavalcante-GO.

Fig. 4. Scraping of the internal fibers of the epidermis of the buriti petiole to make the "tapiti." Engenho II, Cavalcante-GO.

Fig. 5. An artisan working on the interlacing of the fibers of the epidemis of the buriti petiole to make a "tapiti." Engenho II, Cavalcante-GO.

Fig. 7. A young Kalunga artisan (Mr. Marcelino Santos Rosa) working on a couch and a table using buriti petioles. Engenho II, Cavalcante-GO.

approximately 2 m^2, 20 leaves are necessary (Fig. 6). To make a couch, 20–25 petioles taken from fallen leaves are needed (Fig. 7). To build a roof of about 6×4 m, ca. 120–200 leaves are necessary. The most common products made by the community, as well as some details on how to make them and their average commercial value, are presented in Table 2.

The traditional use of buriti oil (Fig. 8) to prevent and cure artery clogging ("desentupidor de veia") has been confirmed experimentally by Villachica et al. (1996). According to the authors, the oleic acid content found in the buriti oil is higher than the values found both in olive and soybean oils. In addition, the fruits of certain Cerrado tree palms, such as buriti and macaúba (*Acrocomia aculeata* [Jacq.] Lodd. ex Mart.), are rich in carotenes (Rodriguez-Amaya et al. 2008). The oil extracted from the buriti pulp is rich in monosaturated fatty acids, especially oleic acid. Its orange-yellowish color is indicative of the presence of high levels of carotenes, principally beta-carotene. In a normal meal, this component has sufficient vitamin A to prevent the symptoms of low vitamin levels in the organism (Almeida et al. 2008).

Fig. 6. Roof of a chicken house made with buriti leaves. Engenho II, Cavalcante-GO.

Buriti fruits are normally collected by specialists called "apanhadores," i.e., gatherers (Pallet 2002). Afonso (2008) studied the buriti productive chain and concluded that there are several social segments involved in this chain. The pulp is popular throughout the country. The frozen pulp has been sold at about (USD 0.95) per kilo, whereas the fruits in natura are sold for about 0.50 (USD 0.27) a kilo (Afonso 2008). In 2006, IBGE (the Brazilian Institute for Geography and Statistics) recorded the production of 4.911 tons of buriti fruits in the country. This corresponds to (USD 400,000) (IBGE 2009).

The oil extracted from the mesocarp is used in the cosmetic industry (Afonso 2008). About 50 kilograms of fruits are necessary to obtain 1 liter of oil, which is sold at ca. USD 7.5–31.25 per liter in the national and international markets (Afonso 2008). In 2004, the total value of the buriti fibers commercialized in the country reached ca. USD 518,125. The average price per kilogram was USD 1.05. According to IBGE, in 2005, in the state of Maranhão, buriti fiber reached the highest price per kilo (USD 2.8), followed by Tocantins (USD 1.87) and Bahia (USD 1.62).

TABLE 2. MAIN PRODUCTS, FORM OF UTILIZATION, AND PRICE OF BYPRODUCTS FROM THE BURITI LEAVES IN THE ENGENHO II KALUNGA COMMUNITY IN CAVALCANTE, STATE OF GOIÁS, BRAZIL.

Product	Size of the product	Part used and size	Amount used	Local price (USD)
Tapiti	1.5 m long	Epidermis of three immature petioles, ca. 2.5 m long.	12 pairs of switches 1.5 m×2.5 cm	27.0
Quibano	50 cm diameter	Epidermis of immature petioles	10–12 pairs of switches 60×2.5 cm	32.43
Sieve	50 cm diameter	Epidermis of immature petioles	8 pairs of switches 60×2.5 cm	29.73
Couch	1.5 m long	Mature petioles of fallen leaves	20–25	81.08
Chicken house	2 m^2	Dried leaves	20	–
Roof	6×4 m	Dried or fresh leaves	120–200	–

In the state of Goiás and in the Federal District, a few products made with buriti leaves and with the fruit pulp are found in open fairs, or are sold by ambulant vendors or directly by the artisans and local farmers. These products represent an important source of extra income for the families in rural/traditional communities in the Cerrado region (Sampaio et al. 2008).

We conclude that the fruit and the leaves of the buriti palm are the most important parts of the plant in the daily life of the Kalunga people at Engenho II. Gomez-Beloz (2002) came to a similar conclusion in Venezuela. Given the value and ubiquitous uses of buriti, the need to conserve this natural resource, together with the traditional knowledge concerning management of the natural populations, is a priority. Toward this end, it would be useful to determine the growth rate of individual plants and the dynamics of leaf production. If this is accomplished with the active participation of members of the Kalunga community, the results will contribute to a better understanding of how to manage the buriti populations under increasing anthropic pressure.

Ethnobotanical studies of plants like buriti in traditional communities are scarce in the Cerrado (Sampaio et al. 2008). We believe that the publication of a field guide summarizing the results of this study will increase the awareness of the Kalunga community regarding their traditional knowledge, will eventually improve the quality of the life of this maroon community, and will facilitate public policies regarding vereda and buriti palm conservation in the Cerrado.

Fig. 8. A Kalunga housewife (Mrs. Maria dos Reis) holding a bottle containing buriti oil. Engenho II, Cavalcante-GO.

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