International Journal of Botany Studies
ISSN: 2455-541X, Impact Factor: RJIF 5.12
www.botanyjournals.com
Volume 2; Issue 1; January 2017; Page No. 89-99

Ethnobotany in the Amazon floodplain ecosystem: a case study, Quilombo Saracura, Pará, Brazil

[1] Patricia Chaves de Oliveira, [2] Suellen Cavalcante

[1] Federal University of Western Pará- Ufopa, Biodiversity and Forest Institute, Santarém, Pará, cep, Brazil

[2] Federal University of Western Pará- Ufopa, Post graduate student – Program of Natural resources of the Amazon, Santarém, Pará, cep, Brazil

Abstract

In the Amazon Biome, ethnobotany is a fundamental tool for the study of interrelations between man and vegetation in contexts of conquest of territories. In order to value the traditional knowledge of afro-descendent peoples regarding the use of local flora, this research aimed to do an ethnobotanical diagnosis in the quilombola community of Saracura, a lowland ecosystem in the Amazon River, State of Pará, Brazil. Thirty-two families interviewed through semi-structured questionnaires. The results revealed thirty-three species that fit into seven different categories of use. The catauarizeiro (*Crataeva tapia* L.) was the most cited species (56%) and the Brazil nut (*Lecythis pisonis* Cambess) the species with the highest Value of Use (1.0). The plants for food use, represented the majority of all diagnosed plants, being the fruit, the most used part. There was greater diversity (H '= 1.43) of food use plants and higher Equitability (J' = 0.97) in plants used for shading and medicinal use (J '= 0.96). The ethnobotanical knowledge of the quilombo Saracura is rich, diverse and passive of protection for the future generations in the processes of conquest of quilombola identity.

Keywords: ethnobotany, várzea, amazon, quilombo

Introduction

Ethnobotany is the branch of science that allows studying and analyzing the mutual relationship between human population and plant component (Carniello *et al.*, 2010) [12]. The *human-vegetable* interrelation can shaped in the daily life of populations and their respective places of origin or by migratory processes, by the history of the community, by local physical and social aspects or even by peculiar characteristics of each plant or ecosystem (Prance, 2000, Carniello *et al.*, 2010) [27, 12]. This occurs from the knowledge of the historical and social context of how traditional populations use and perceive the disponible vegetal resources around them (Alcorn, 1997) [4]. These interrelationships been studied among the diverse cultural and social organizations, distributed in the most varied units of landscapes and regions of the planet (Albuquerque *et al.*, 2007) [3].

In the Amazon, floodplains have been the focus of these studies, since they cover a wide range and the diversified use of their resources, which allows an economic potential of multiple use with agriculture, fishing, extractivism of forest products and small-scale livestock farming (McGrath, 1991) [25]. According to Santos and Coelho-Ferreira (2012) [32], people living in lowland forests have a vast knowledge accumulated over many generations regarding the use of plant species found in these environments.

The floodplains of the Lower Amazon, where several quilombola communities inserted, are areas of flood plains that extend along the banks of rivers of white or muddy water, such as the Amazon River (Sioli, 1984) [36]. When compared to other forests, this ecosystem presents a lower species diversity due to flooding caused by the annual rainfall cycle characteristic of the region, subjecting its rivers to a regular flood pulse (Almeida, 1996; Junk *et al.*, 1989) [5, 18]. This phenomenon allows the floodplain soils considered highly fertile, since the flow and reflux of its rivers bring with it a nutrient supply necessary for its renewal each year (Sioli and Soares, 2006). The entire productive potential of this ecosystem can maintained or even increased since managed by ecologically sustainable and culturally appropriate manner. In this way, ethnobotanical research becomes fundamental from the moment it generates information that can subsidize the improvement forms of sustainable plant management extracted by traditional community, besides guaranteeing their conservation (Carneiro *et al.*, 2010 [11]; Lima *et al.*

In the Lower Amazon, several of these areas found, for example, the quilombola community of Saracura. This area is a remnant area of quilombo where the rural community descends from slaves, racial ethnic groups that define themselves from the historical oppression suffered by their ancestors, their relations with the land, their own traditions and cultural practices that depend on the forest Flooded (várzea) to guarantee their subsistence. This interdependence between man-quilombola and local flora repeated in other quilombos. According to Santana et al (2016) [33], the Salamina maroon community maintains considerable knowledge of the medicinal value of the local flora. However, little of this knowledge derived from the surrounding old-growth tropical forests. Their pharmacopoeia is a hybrid mix of wild and cultivated species, natives and exotics.

The importance of traditional quilombola knowledge in the Amazon to combat diseases such as malaria also observed in Oriximiná city in the region of Low Amazonas as reported for Oliveira *et al.* (2015) [26]. The results showed a strong correlation between the consensus of quilombola communities living in the malaria endemic area and the salience index indicating antiplasmodial activity, where the ethno species mostly cited to be effective against malaria produced the most active plant extracts *in vitro*. The authors said that it was also evident from the data that these social groups approached the malaria's treatment with a holistic view, making use of purgative, depurative and emetic plants.

In this context, this research aimed to record and analyze the relationships established between the quilombola community of Saracura and the native plant species of floodplain (várzea) ecosystem, based on an ethnobotanical survey and quantitative analysis, in order to characterize and value useful flora for these peoples and, thus, passive of management and conservation.

Material and methods

Study area

The study area was a floodplain region located in the basin of the Amazon River in a fluvial plain belonging to Santarém city, State of Pará, Brazil. The Quilombola Community of Saracura, located between coordinates 02 ° 22' 01.5 " S and 54 ° 36' 40.3" W (Figure 1). The community has 130 families, most of whom have a low level of schooling. The main sources of income are agricultural activities and fishing. There is no health post only the presence of a Community agent.

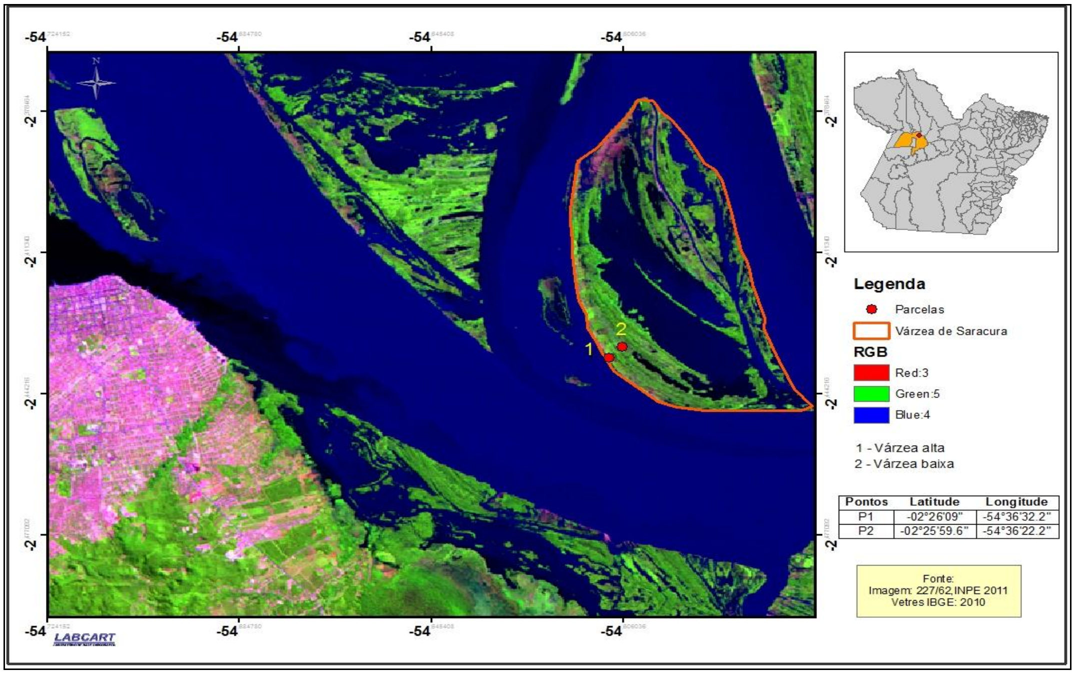

Fig 1: Location of the study area, Saracura Quilombola community, Amazonian lowlands, territory of Low Amazon. Satellite image LANDSAT 5, orbit 227/62, INPE 2011, Vectors IBGE: 2010.

According to Köppen's classification (1948) [19], the area integrates the Ami-type climatic, presents a small variation in average annual temperature, ranging from 25ºC to 28ºC, high relative humidity of the whole year on average of 86.7%. The rainfall pattern, characterized by two very distinct periods: a rainy season, called the "winter" period that runs from December to May, and another less rainy one that extends from June to November, corresponding to the regional summer, with Average annual values around 1.920 mm (Rodrigues *et al*., 2001) [29].

The Amazonian estuarine zone, in which this fluvial plain inserted, influenced by the seasonality of the rainfall, not by the tides; (Almeida *et al.*, 2004) [6]. In this way, its periodically flooded vegetation is subject to the annual cycle of flood (rainy season) and dry (less rainy season).

The soil type varies according to the level of flood and suffers sedimentary and topographic influence, where the flow and reflux of the rivers form two different environments, the "low várzea" with the soil Glei Humic, remaining temporarily flooded, and the "High floodplain" with a more compacted Yellow Latosol with low water influence (Jardim and Vieira, 2001) [16].

Ethnobotanical Survey and Species Identification

The ethnobotanical survey performed through the application of semi-structured form by interview with questions according to Albuquerque *et al.* (2010) [1]. The developed questions sought to list the native plant species of várzea ecosystem of greater importance for the local population, taking into account: the purpose of use (human and animal food, popular medicine, constructions, handicrafts and for fuel) and the parts of plant used (flower, leaves, fruits, bark, seeds and others). For application of questionnaires were selected thirty-two families. The interview made with only the oldest member's family. For taxonomic identification, the botanical samples collected, pressed and dehydrated at 60 ° C. The fertile samples deposited in the herbarium of the National Institute of Amazonian Research (INPA).

Ethnobotanical analysis

The following indices used for ethnobotanical analysis:

1. Relative Frequency of Citations (FRC): aims to identify the plant species considered useful by the community. It can obtained through the formula (Tardío and Pardo-de-Santana, 2008) [37]:
   $FRC = FC / N$, where FC = number of informants who mentioned the use of certain specie;
   N = total number of informants.
2. Value of Use (VU): evaluates the relative importance of a given species cited by the informants, calculated by the

formula adapted by Rossato *et al.* (1999) [30]:
VU = ((ΣU)) / N, where: ΣU = sum of the number of uses mentioned by the informant (U) for a given species; N = total number of informants (N).

3. Fidelity level (FL), index proposed by Friedman *et al.* (1986) [14], used for the medicinal use category in which it evaluates the importance of the species based on the consensus of the informants for a main therapeutic indication among the most varied therapeutic indications informed, calculated by the following formula:
   FL = (Ip / Iu) × 100%; where: Ip = number of informants who cited the main use of the species and Iu = the total number of informants who cited the species for any purpose.
4. Rank Order Priority (ROP): in accordance with Albuquerque *et al.* (2010) [1], calculated by the formula: ROP = FL × RP, where: FL = loyalty level and RP = relative popularity (calculated by the number of informants who quoted a given species, by the number of informants who cited the most cited species).

Statistical analyzes

The statistical analyzes for non-parametric data were: Analysis of Variance by Friedman's test and Descriptive Analysis using the Shannon-Wiener Diversity Index estimating the Diversity and Equitability indices of species cited by category use and for the parts of plants used. The statistical program used was BioEstat. Version 5.0 (Ayres *et al.*, 2007) [9].

Results and discussion

Thirty-three species identified, distributed in thirty-one genera and twenty-one botanical families. The most representative families were *Leguminosae* and *Moraceae* (Table 1). The number of species found in this study was high, compared to Martinez *et al.* (2010) [24], which recorded twenty-one native species of multiple use in lowland Amazonian plains. Although it was low when compared to the study by Almeida and Jardim (2012) [7], which registered fifty-three tree species of várzea and that of Oliveira et al (2015) [26] who identified thirty-five ethno species comprising forty different plants belonging to twenty-three botanical families and thirty-seven genera were listed as antimalarial by the ethno approach.

Table 1: List of native plant species useful to quilombola community of Saracura, in territory of Low Amazon. Popular name, scientific name, botanical family, category of use (A = food, Ar = artisanal, C = fuel, Cm = commercialization, Cs = construction, M = medicinal, S = shading).

	Inicial	Popular name	Scientific name	Botanical Family	Use	Medicinal indication	Parts of plant	Forms of use
1	AC	Açacuzeiro	*Hura creptans* L.	Euphorbiaceae	M	Anti-inflammatory	Leaves	Tea
2	AP	Apuízeiro	*Ficus erratica* Standl.	Moraceae	A, M, S	Anti-inflammatory	Leaves	Tea
3	BA	Bacurizeiro	*Garcinia brasiliensis* Mart.	Clusiaceae	A, Ar, C, Cs	-	-	-
4	BU	Buieira	*Solanum stramoniifolium* Jacq.	Solanaceae	Ar	-	-	-
5	CM	Castanha de macaco	*Couroupita guianenses* Aubl.	Lecythidaceae	A	-	-	-
6	CS	Castanheira sapucaia	*Lecythis pisonis Cambess.*	Lecythidaceae	A, AR, C, Cm, Cs, M	Muscle Pain, rheumatism	Leaves Bark.	Juice, Tea, Bath
7	CT	Catauarizeiro	*Crataeva tapia* L.	Capparidaceae	A, C, M	Diabetes, itchiness, Muscle Pain	Leaves Bark	Alcholic infusion
8	CX	Caxingubeira	*Ficus adhatodifolia Schott*	Moraceae	A	-	-	-
9	CG	Crista de galo	*Heteropterys nervosa* A. Juss.	Malpighiaceae	A	-	-	-
10	CU	Cuieira	*Crescentia Cujete* L.	Bignoniaceae	Ar, M	Itchiness, tosse	Fruits	Bath, Tea Alcholic infusion
11	CR	Curuminzeiro	*Muntingia calabura* L.	Tiliaceae	A, M	Diarrhea	Leaves	Tea,
12	EM	Embaubeira	*Cecropia ficifolia* Warb. ex Snethl.	Urticaceae	A, C, M	Gastritis Hemorrhage, muscle pain, hight pressure	Leaves	Tea
13	IN	Ingazeiro	*Inga sp*	Leguminosae - Mimosaideae	A, C	-	-	-
14	JA	Jauarizeiro	*Astrocaryum jauari* Mart.	Aracaceae	A, Ar	-	-	-

15	JN	Jenipapeiro	*Genipa americana* L.	Rubiaceae	A, Ar, C, Cm, M	Anemia, Itchiness, Anti-inflammatory	Fruits	Juice
16	LI	Limorana	*Maclura tinctoria* (L.) D. Don ex Steud.	Moraceae	A, C	-	-	-
17	LO	Loro	*Nectandra cuspidata* Nees & Mart.	Lauraceae	A, C	-	-	-
18	MA	Marizeiro	*Cassia leiandra* Benth.	Leguminosae - Caesalpinioideae	A, C, Cm	-	-	-
19	MP	Matapasto	*Senna reticulata* (Willd.) H.S.Irwin & Barneby	Leguminosae - Caesalpinioideae	A, C	-	-	-
20	ME	Meracoroeira	*Laetia corymbulosa* Spruce ex Benth.	Salicaceae	A, C	-	-	-
21	MJ	Merajuçara	Identificação em andamento	-	C	-	-	-
22	MG	Mungubeira	*Pseudobombax munguba* (Mart. & Zucc.) Dugand	Bombacaceae	A, Ar, C	-	-	-
23	OI	Oiranera	*Salix humboldtiana* Willd.	Salicaceae	M	Diarrhea	Leaves	Tea, infusion
24	PC	Paricazeiro	*Schizolobium amazonicum* Ducke	Leguminosae - Caesalpinioideae	C	-	-	-
25	PA	Parreira	*Neea macrophylla* Poepp. & Endl.	Nyctaginaceae	A	-	-	-
26	PM	Paumulateiro	*Calycophyllum spruceanum* (Benth.) Hook's. Ex Schum.	Rubiaceae	A, C, Cs, S	-	-	-
27	SP	Sapupieira	*Andira inermis* (Wright) DC.	Leguminosae - Papilionoideae	A, C, S	-	-	-
28	SC	Socorozeiro	*Mouriri cf. ulei Pilg*	Melastomaceae	A, C, Cs	-	-	-
29	TP	Taperebazeiro	*Spondias mombin L.*	Anacardiaceae	A, M	Diarrhea, Anti-inflammatory anemia Wounds infection	Fruits, Leaves Bark	Syrup, Tea, Bath Bark Juice
30	TA	Tarumãzeiro	*Vitex cymosa Bertero ex Spreng.*	Lamiaceae	A, C, S	-	-	-
31	TX	Taxizeiro	*Triplaris surinamensis* Cham.	Polygonaceae	Ar, C, M, S	Diarrhea	Leaves	Alcholic infusion, Tea
32	UR	Uruazeiro	*Cordia tetrandra* Aubl.	Boraginaceae	A, C, S	-	-	-
33	UC	Urucuraneira	*Luehea candicans Mart. & Zucc.*	Tiliaceae	C	-	-	-

The catauarizeiro (CT) was the species that presented the highest relative frequency of citation (56%), followed by Ingá (IN) with 50%, Mungubeira (MG) with 47% and nut of of sapucaia (CS) with 44%. Three different species mentioned by only 3% of the informants (Figure 2). These results suggest that catauarizeiro, ingazeiro, mungubeira and nutmeg of sapucaia are species of high value for the community of Saracura. Martínez *et al.* (2010) [24], in lowland fluvial plains of the Lower Amazon, confirm this result with regard to valorization of the cataurizeiro as a useful species, since it had already been one of the most mentioned in a study.

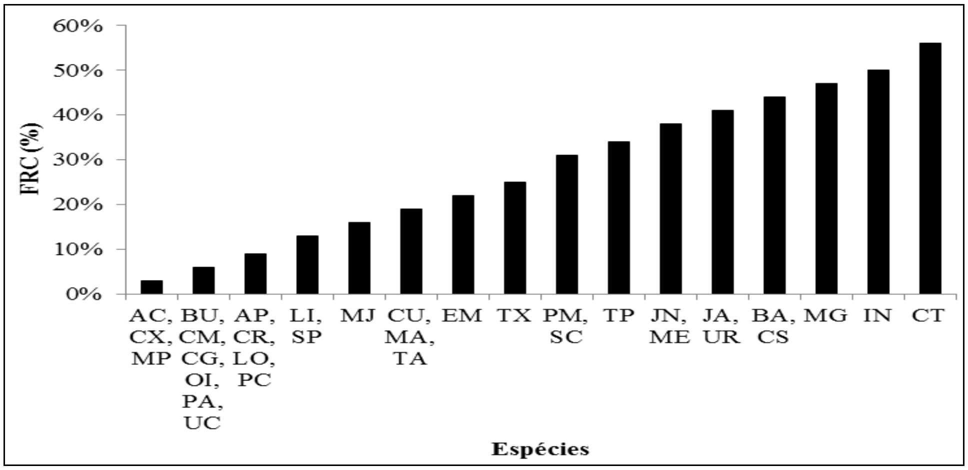

Fig 2: Relative frequency of Citation (FRC %) of native plant species (initials on Table 1) mentioned in ethnobotanical survey carried out with quilombola community of Saracura, várzea region, low Amazon territory.

The values of use (VU) of species ranged from 0.03 to 1.0. The native forest species with the highest VU were Castanheira de sapucaia tree (CS) with 1.0, Ingazeiro (IN) with 0.8, Catauarizeiro (CT) with 0.7, Jenipapeiro (JN) with 0.6 (Figure 3). Our results are similar to those found by Santana et al (2016) [33], who studied an isolated Maroon community of Afro-Brazilians in the Atlantic coastal rainforests of Bahia, Brazil, founded the highest UV for S. cf. Adstringens (1.68), followed by Sida cf. Cordifolia (0.97) and C. citratus (0.93). Fifteen species (13%) of this maroon medicinal flora trace their ancestry to Africa or African-derived healing traditions. If the value of use reveals the importance of each plant species to the community (Vendrusculo and Mentz, 2006) [38], it is suggested that the species with the highest value use are priority in eco-physiological studies that help in its conservation. Once, that the ethnobotanical study is the first step to the multidisciplinary study, involving later the ecophysiological knowledge to assist in the conservation of the species from the importance of their uses (Rodrigues and Carvalho, 2001) [29].

Thus, the forest species of the várzea due to their high value contribute with the improvement of the quality life of these families in diverse aspects and with a diversity of uses.

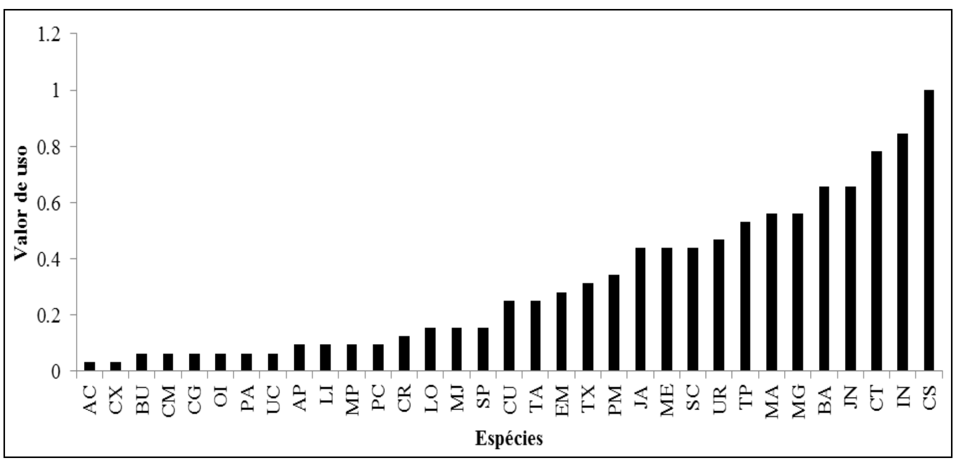

Fig 3: Value of use (axis Y) of native species (axis X) of Amazonian floodplain mentioned in the ethnobotanical survey in the community of Saracura, according to Rossato *et al.* (1999) [30].

Categories of use

The predominant habit among useful species is arboreal (31 spp.). Among the uses were identified seven different categories: medicinal, food, energy (fuel), commercialization, construction and shading. Its main uses were concentrated in the food category with a greater number of species (25), followed by fuel (21), medicinal (12) and artisanal (8) categories (Figure 4). These uses are usually the most common ones, and observed in others works about the knowledge of forest species in Amazonia (Sanchez *et al.*, 2005; Martinez *et al.*, 2010) [31, 24]. These results show that the quilombola community has a wide knowledge, which makes it sustainable, regarding the use of native vegetation species of várzea, from its relations and cultural practices that it has with forest, removing basic resources like food, fuel and remedies to live and resist in these ecosystems with high edaphoclimatic variability.

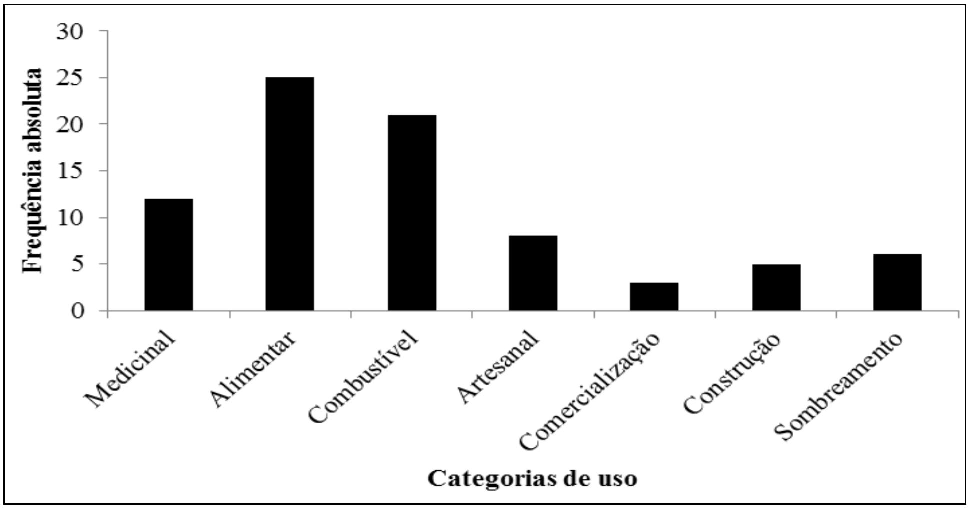

Fig 4: Absolute frequency (axis Y) of native species of várzea by category of use (axis X) mentioned in the ethnobotanical survey carried out with the quilombola community of Saracura, Territory of Low.

The valorization that quilombola riverine communities give to vegetable species is due to several factors: the low purchasing power of these populations (Semedo and Barbosa, 2007) [34], distance from the urban area, inefficiency and cost of river transportation and productivity of other food sources such as fish and wild animals (Mcgrath, 1991) [25]. In this context, the native species of food use mentioned by the local population are fundamental for subsistence in the Amazonian varzeiras communities.

In the fuel category, the trunks and / or branches of the trees used to make firewood or charcoal, still the main source of energy in the community. The most cited species were Meracoroeira, Brazil nut and Pau-mulatto. Ferraz *et al.* (2006) [13], Carneiro *et al.* (2010) [11] and Lima *et al.* (2012) [22] also reported the use of wood for this purpose in other ethnobotanical studies.

Among the most cited species with medicinal use are Taperabazeiro, Jenipapeiro and Cuieira. The medicinal category is among the most cited based on other studies conducted in Brazil (Ferraz *et al.* 2006, Rodrigues *et al.*, 2006; Brito and Senna-Vale, 2012) [13, 28, 10]. This indicates the importance that medicinal plants play for traditional populations (Brito and Senna-Vale, 2012) [10].

In the category of handcraft use, include the species used completely or in pieces for making artifacts, ornaments or decorations. Earrings and adornments of dresses made with the taxidermy flower mentioned; wooden spoon produced from the branches and trunks of the mungubeira.

Commercialization was the least mentioned category of use with only three species (the Sapucaia Nut, the Jenipapeiro and the Marizeiro) used for this purpose. This indicates that the community is not in the habit of marketing the native forest products, but using them for their own consumption. However, the fruits of the few species mentioned marked in open fairs in urban area of city.

For the construction category, five different species stood out: Bacurizeiro, Sapucaia, Catauarizeiro, Paumulateiro and Socorozeiro. The wood extracted from these trees is widely used in constructions, be it houses, fences, corrals, tools, among others. The paumulateiro indicated as the best wood because it is harder and resistant to decomposition (Martínez *et al.*, 2010) [24]. For shading, the species that stood out the most was the Sapupieira for being a leafy tree and softening the temperatures inside the houses.

The Friedman test revealed that there are significant differences in the knowledge of the interviewees as to the quantity of species cited within their respective utilities ($p < 0.0001$) (Table 2). For example, there is greater knowledge of food useful species, as there are more species used for construction than for shading ($p < 0.05$) (Figure 5). Once again, we observe the variability in the knowledge that the population has about the ecosystem in which they live, potentially exploiting forest resources as a viable alternative to subsidize food conditions. According to Jardim *et al.* (2008) [17], the alternatives of use of plants vary from one place to another and are due to the needs of the local population, the diversity of knowledge about the uses and management by the community or even the specific characteristics of each plant.

Table 2: Friedman test for comparison of categories of useful vegetable species for the quilombola community of the Saracura floodplain, in the Lower Amazon. *

	M	A	C	Ar	Cm	Cs	S
Sum of Ranks	142.0	216.5	171.0	112.5	81.0	81.5	91.5
Average of Ranks	4.4375	6.7656	5.3438	3.5156	2.5313	2.5469	2.8594
Average of Value	1.2813	5.0938	2.4063	0.6563	0.1250	0.1563	0.2500
Standard deviation	1.1140	3.0938	1.8467	1.1248	0.4212	0.5741	0.5080
Friedman Test (Fr)	105.9442						
(p) =	< 0.0001						

* Category of use (M = medicinal, E = feed, C= fuel, Ar = handmade, Cm = commercialization, Cs = construction,, S = shading).

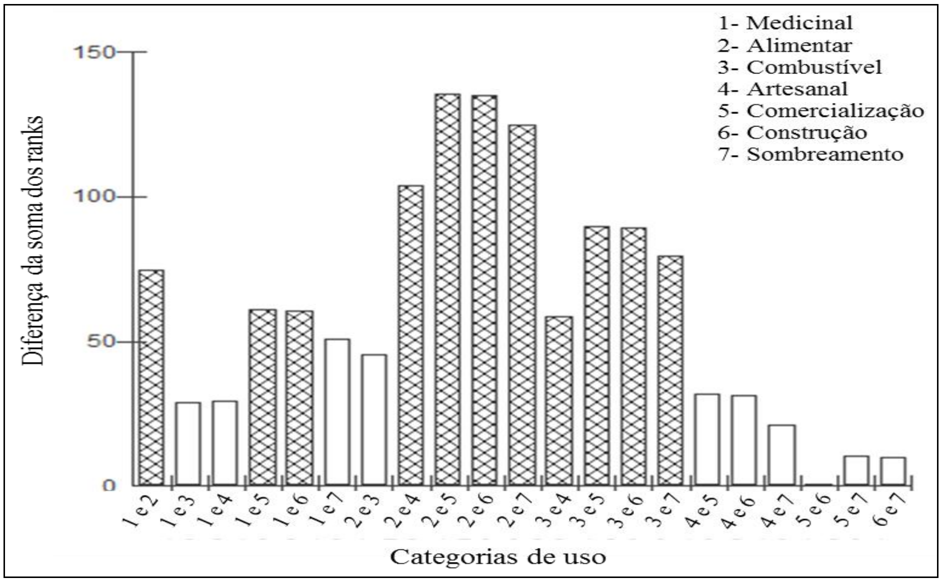

Fig 5: Difference of Sum Ranks (axis Y) by Friedman test between seven categories of use (axis X) of native plant species useful for quilombola community Saracura, Low Amazon Territory.*

*Category of use (1 = medicinal, 2 = feed, 3= fuel, 4 = handmade, 5 = commercialization, 6 = construction, 7 = shading)

As for the diversity of plants used taking into account the relative abundance of citations for all categories of use mentioned, the Shannon Index ranged from H '= 0.41 to 1.43 and the Equability of J' = 0.86 to 0.97. However, these indices are lower those found in other regions for the medicinal categories (Amorozo, 2002) [8], construction (Brito and Senna-Valle 2012, Carneiro *et al.*, 2010) [10, 11]. Even so, it can inferred that although plant diversity has been low among categories of use, such species are very useful for the informants. The number and diversity of plant species cited in the food category were the highest (S '= 165, H' = 1.43) and the shading and medicinal categories revealed a greater homogeneity in the proportions of species cited by each family, therefore a higher equitability of J '= 0.97 and 0.96, respectively (Table 3). Our data are in agreement with Amorozo (2002) [8] who observed that for medicinal plants category, the high Equitability found showed that the knowledge about therapeutic use of plants has a relatively uniform distribution among the individuals.

Table 3: Shannon-Wiener index for determining the diversity of native plant species by category of use mentioned in the ethnobotanical survey conducted with the quilombola community of the Saracura floodplain, in the territory of Low Amazon.

	M	A	C	Ar	Cm	Cs	S
Sample amount (S’)	41	163	77	21	4	5	8
Number of categories (Families)	23	32	27	15	3	3	7
Shannon-Wiener Index (H’)	1.3116	1.4304	1.3669	1.0712	0.4515	0.4127	0.8278
Maximum diversity	1.3617	1.5051	1.4314	1.1761	0.4771	0.4771	0.8451
Homogenity (J’)	0.9632	0.9503	0.9550	0.9108	0.9464	0.8650	0.9796
Heterogenity	0.0368	0.0497	0.0450	0.0892	0.0536	0.1350	0.0204

*Category of use (M = medicinal, E = feed, C = fuel, Ar = handmade, Cm = commercialization, Cs = construction,, S = shading).

According to the interviewees, the knowledge of the use of plants is mainly from father to son (vertical sense), by the exchange of information between neighbors (horizontal sense) mainly when it comes to medicinal species and / or even by simple observation.

When analyzing the contribution of the knowledge of each family to plant diversity, it observed that families of numbers 14th and 31th were those that contributed with a greater number of plants of different uses (Figure 6). Probably, because the interviewed representatives of these families are female, where they perform activities in the social organization of the community that allow them a better understanding of the use of plant species, besides being one of the oldest families and not having the urban habit. This fact corroborating with Laraia (2002) [20], who affirmed that human populations shaped by the cultural environment in which they live.

According to the interviewees' perception, there is a decrease in the occurrence of several native plant species that no longer used due to the increasing deforestation associated with the occupation process in these areas or the small-scale farming activities practiced by them. This fact may directly related to the different contribution of knowledge among families, since knowledge of species influenced by their availability (Amorozo, 2002) [8]. In addition, the contact of traditional populations with urban actors ends up influencing the degradation of knowledge and loss of the cultural identity of these groups (Brito and Senna-Valle, 2012) [10]. Thus, when the use of exotic species increases, it causes the replacement of natural environments with artificial ones (Amorozo, 2002) [8].

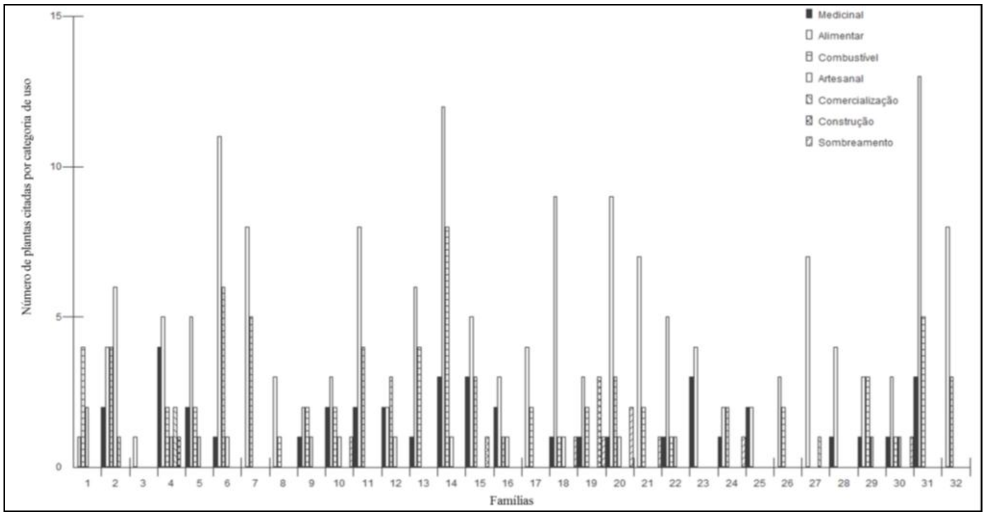

Fig 6: Number of species (axis Y) per family interviewed (axis X) under category of use mentioned in the ethnobotanical survey carried out with the quilombola community of Saracura floodplain, Territory of Low Amazon.*Category of use (1 = medicinal, 2 = feed, 3= fuel, 4 = handmade, 5 = commercialization, 6 = construction, 7 = shading)

Used Plant Parts

The most commonly used plant parts were; fruit, leaf, flower, bark, seed, trunk and latex. Analysis of Variance (Friedman's test) showed that the use of plant parts is different among families (p <0.0001) (Table 4).

Table 4: Friedman test for Comparations the use of plant parts mentioned in the ethnobotanical survey carried out with the quilombola community of Saracura floodplain, Territory of Low Amazon.

	Fruits	Leaf	Flower	Bark	Seed	Trunk	Latex
Sum of Ranks =	216.00	111.00	84.50	118.50	103.50	187.50	75.00
Average of Ranks =	6.75	3.46	2.64	3.70	3.23	5.85	2.34
Average of value =	4.93	0.59	0.25	0.78	0.5	2.84	0.12
Standard Deviation =	2.81	0.66	0.50	0.75	0.56	1.85	0.42
Friedman Test (Fr) =	113.60						
(p) =	<0.0001						

When analyzed by ranks the fruit differed significantly in relation to the other parts of the plant, such as leaves, flower, bark, seed and latex, except compared to the trunk (Figure 7). In this way, the fruit is the part of the plant most used by families.

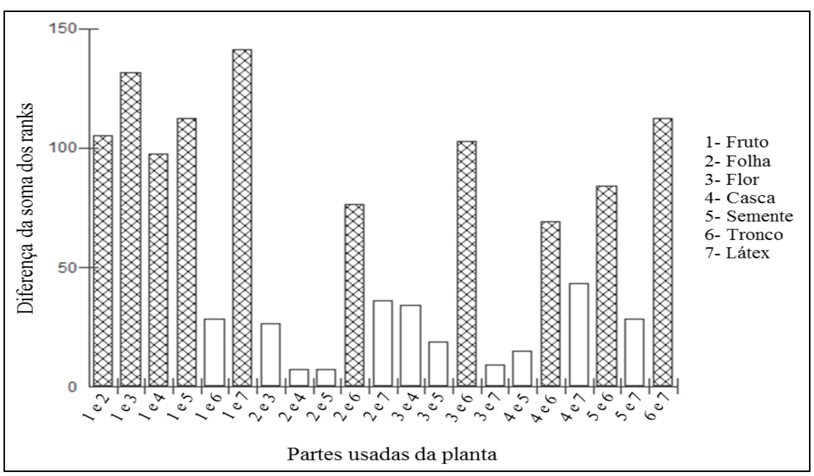

Fig 7: Difference of Sum Ranks (axis Y) by Friedman's test for the plants parts (axis X) mentioned by the community of the Saracura floodplain, in the territory of the Lower Amazon.* Ranks (1= fruit; 2=leaf; 3=flower; 4=bark; 5=seed; 6=trunk; 7=latex)

Of twenty-six species of plants mentioned, the most cited of them are fruit (Figure 8). This result already expected, considering that the fruits of certain plant species considered the main food and socioeconomic extractive product of riparian populations living in the várzea (Jardim *et al.*, 2007) [15]. Their importance is mainly due to essentiality they have in human and animal feeding (Lima, 2005) [21]. The other parts of the plant such as leaves, barks and latex are used in regional medicine; The trunk in the production of firewood and small benefactors; Flowers and seeds for handicrafts; And the tree as a whole, of some species is used for shading in order to ensure more pleasant temperatures.

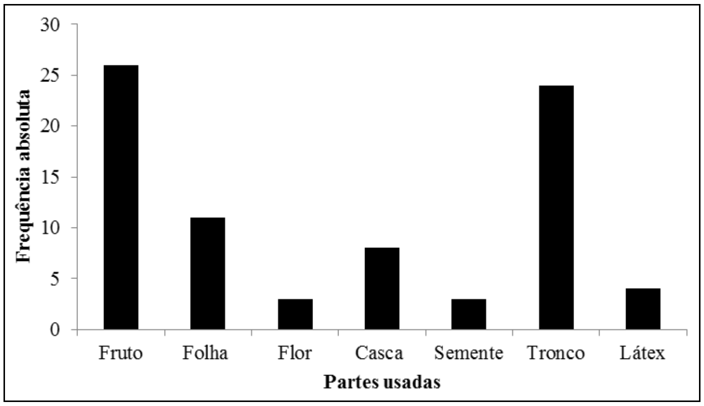

Fig 8: Absolute frequency (axis Y) of native plant species by used part of plant (axis X) mentioned in the ethnobotanical survey conducted with the quilombola community of Saracura, várzea region, territory of low Amazon.

When the Shannon-Wiener Index was applied to know the diversity of used parts of the plants, the fruit presented greater diversity than others did (H '= 1.43) and greater wealth with 32 families citing species where this organ is used, followed by the trunk (H '= 1.41) and the shell (H' = 1.26). The Shannon index ranged from H '= 0.45 to 1.43. In terms of Equitability, that is, the proportion of mentions of used parts of the plant by each family, there was little variation of J '= 0.94 to 0.99. Seed and leaf were the parts of the plant that presented a more homogeneous distribution (Table 5). This indicates that the knowledge about the use of the parts of the plant as the fruit is variable and of the seed and leaf is quite uniform, being used by the majority of the interviewees. Although, families of numbers 6th, 14th, 20th and 31th were the ones that contributed the most to the diversity of used parts of plants of different species (Figure 9).

Table 5: Shannon-Wiener index for determining the diversity of native plant species by used parts of the plant mentioned in the ethnobotanical survey conducted with the quilombola community of the Saracura floodplain, in the territory of the Lower Amazon.

	Fruits	Leaf	Flower	Bark	Seed	Trunk	Látex
Sample amount (S’)	158	19	8	25	16	91	4
Number of categories (Families)	32	16	7	20	15	30	3
Shannon-Wiener Index (H’)	1.4370	1.1837	0.8278	1.2684	1.1665	1.4103	0.4515
Maximum diversity	1.5051	1.2041	0.8451	1.3010	1.1761	1.4771	0.4771
Homogenity (J’)	0.9547	0.9830	0.9796	0.9749	0.9918	0.9548	0.9464
Heterogenity	0.0453	0.0170	0.0204	0.0251	0.0082	0.0452	0.0536

The reproductive phenology of várzea species varies with their geographical location, with climatic conditions such as the seasonality of precipitation, in which many species bloom and fruit throughout the year and others bloom in one period and fruit in the other (Shanley, 2005) [35]. It is suggested that this fruit availability during several periods contributed to the food diversity of the riverine population and present in the várzea environment, being the fruit the most used part, therefore, it is emphasized the importance of the management and protection of such species.

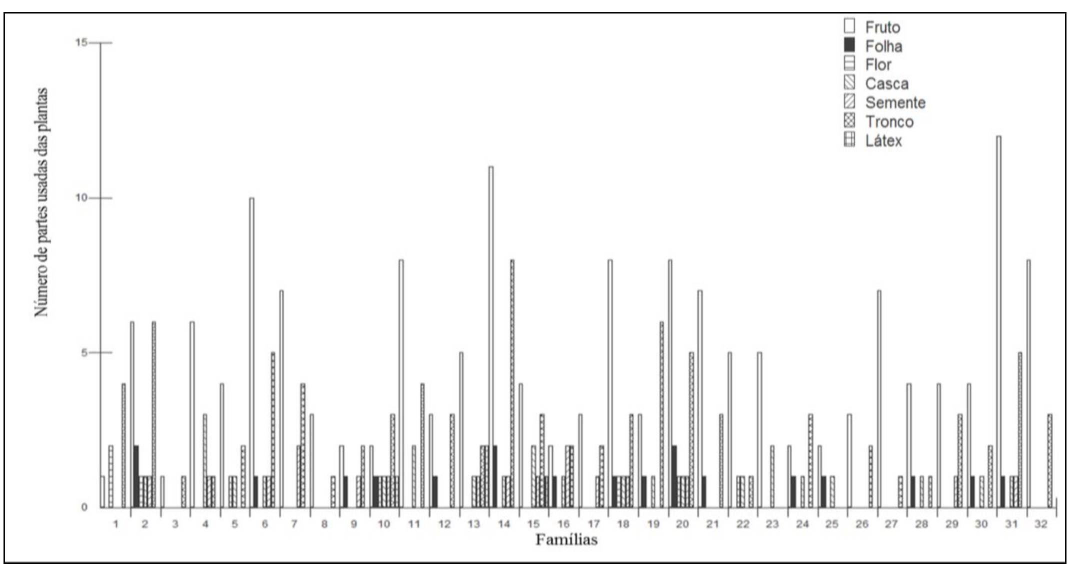

Fig 9: Number of plant parts used/use category (axis Y) per family interviewed (axis X) mentioned in the ethnobotanical survey carried out with the quilombola community of the Saracura floodplain, in the territory of Low Amazon. * (1= fruit; 2=leaf; 3=flower; 4=bark; 5=seed; 6=trunk; 7=latex)

Relative importance indices of medicinally active species

The Loyalty Level (FL) ranged from 0.25 to 1.0 and the Ordering Priority Index (ROP) from 0.05 to 0.75. The highest-ranking priority indexes were concentrated on the species catauarizeiro (ROP = 0.75) indicated in the treatment of rheumatism and muscular pain; Jenipapeiro (ROP = 0.53) indicated mainly in the treatment of anemia and itching; (ROP = 0.46) used by the community to combat mainly itching, diabetes, muscular pain and amoeba. It suggested that this high consensus of observed information could imply in a greater effectiveness of use of these species for that indicated therapeutic treatment.

According to the interviewees, the therapeutic use of plants in the community is an essential alternative for the treatment of health problems, and in many cases is the only immediate resource for this purpose, since there are difficulties in access to medicines and precariousness of public health system (Lima *et al.* (2011) [23].

The forms of preparation also have great importance in an ethnobotanical survey (Vendrusculo and Mentz, 2006) [38]. In this study, the forms of preparation found were syrup, bath, tea, alcohol infusion, topical use of the leaf or bark, in the form of macerated powder or leaf juice and juice of the fruit pulp. The predominant preparation was tea with 37% of the mentions. Tea is prepared from the leaves or the bark of various species such as curuminzeiro, sugarcane, taxizeiro, among others, and there are different ways of obtaining. Of the fruit of the Jenipapeiro is made wine for treatment of anemia; of the sapucaia nut tree the leaves are crushed with the leaf of pasture to combat itching.

Table 7: Main therapeutic indication represented by Loyalty Level (FL) and Ordering Priority (ROP) of native plant species of the Amazonian floodplain, from the quilombola community of Saracura, indicated with medicinal use.

Nome vulgar	Espécie	FL	ROP
Catauarizeiro	*Crataeva tapia*	0.75	0.75
Jenipapeiro	*Genipa americana*	0.8	0.53
Castanheira de sapucaia	*Lecythis pisonis*	0.6	0.46
Taxizeiro	*Triplaris surinamensis*	1	0.44
Taperebazeiro	*Spondias mombin*	0.5	0.30
Cuieira	*Crescentia Cujete*	0.8	0.26
Curuminzeiro	*Muntingia calabura*	1	0.16
Apuizeiro	*Ficus erratica*	1	0.16
Oiraneira	*Salix humboldtiana*	1	0.11
Embaubeira	*Cecropia ficifolia*	0.25	0.09
Açacuzeiro	*Hura creptans*	1	0.05

Given this scenario, it can said that the lowland ecosystem is an important source of forest resources, which the local population has a strong relationship, whose traditional knowledge based on the use of the plants. Deserves greater appreciation, in order to obtain information that can subsidize management practices appropriate to local conditions in order to guarantee the sustainable use and conservation of this ecosystem, as well as the identity of the quilombola people.

Conclusion

There is a high diversity in the traditional quilombola knowledge of Saracura regarding the use of plant species in the floodplain. The cataurizeiro (*Crataeva tapia*) was the most frequently mentioned species and the Brazil nut tree (*Lecythis pisonis*) was the species with the highest value in use, suggesting that these species are a priority in conservation and management processes. The richness and diversity of species useful for food observed is a bio indicator of socioenvironmental sustainability that these riverside quilombola populations have, explaining their dependence relationship with the environment. The knowledge about the use of medicinal species diffused homogeneously in the horizontal sense, or, among quilombola families, indicating a solidary sharing of traditional knowledge.

Acknowledgements

To the Laboratory of Amazonian Ecosystems Studies (LEEA) for the logistic support and to CAPES-Brazil for the grant.

References

1. Albuquerque UP, Lucena R, Cunha LVT. Methods and Techniques in Ethno biological and Ethno ecological Research. 1. ed. Nupeea, Recife. 2010, 558.
2. Albuquerque UP, Lucena RFP, Monteiro JM, Florentino ATN, Almeida CFCBR. Evaluating two quantitative ethnobotanical techniques. Ethnobotany Research & Applications. 2006; 4:51-60.
3. Albuquerque UP, Medeiros PM, Almeida ALS, Monteiro JM, Neto EMF, Melo JG *et al.* Medicinal plants of the caatinga (semi-arid) vegetation of NE Brazil: A quantitative approach. Journal of Ethnopharmacology. 2007; 114(3):325-354.
4. Alcorn JB. The scope and aims of ethnobotany in a developing word. In: Schultes, R.E.; Reis, S.V. (Eds.). *Ethnobotany – Evolution of Discipline*. Dioscorides Press, Portland. 1997, 23-39.
5. Almeida SS. Estrutura e florística em áreas de manguezais paraenses: evidências da influência do estuário amazônico. Bol. Mus. Par. Emílio Goeldi, ser. Ciênc. Terra. 1996; 8:93-100.
6. Almeida SS, Amaral DD, da Silva ASL. Floristic analysis and structure of lowland forests in the Amazonian estuary. *Acta Amazonica*. 2004; 34(4):513-524.
7. Almeida AF, Jardim MAG. The use of tree species in the lowland forest of Sororoca Island, Ananindeua. 2012. ISNN PRESS 1808-4524 / ISSN ON LINE: 2176-9478.
8. Amorozo MCM. Use and diversity of medicinal plants in Santo Antônio do Leverger, MT, Brazil. *Acta Botanica Brasilica*. 2002; 16(2):189-203.
9. Ayres M, Ayres JRM, Ayres DL, dos Santos AAS. Bio Estat 5.0: Statistical Applications in Biological and Medical Sciences. Belém-PA. 2007, 364.
10. Brito MR, Senna-Vale L. Diversity of plant knowledge in a community of Caiçaras of Brazilian Atlantic Forest. Acta Botanica Brasilica. 2012; 26(4):735-742.
11. Carneiro DB, Barboza MSL, Menezes MP. Native plants useful in the Fishermen's Village of the Marine Extractive Reserve Caeté-Taperaçu, Pará, Brazil. Acta Botanica Brasilica. 2010; 24(4):1027-1033.
12. Carniello MA, Silva RS, Cruz MAB, Garim Netto G. Urban backyards of Mirassol D'Oeste-MT, Brazil: an ethnobotanical approach. Acta Amazonica. 2010; 40(3):451-470.
13. Ferraz JSF, Albuquerque UP, Meunier IMJ. Value of use and structure of the woody vegetation along the banks of

Navio's Stream, Floresta, PE, Brazil. Acta Botanica Brasilica. 2006; 20(1):125-134.
14. Friedman J, Yaniv Z, Dafni A, Palewith D. A preliminary classification of the heling potencial of medicinal plants, based on a rational analysis of ethno pharmacological field survey among Bedouins in the Neveg desert, Israel. Journal of Ethnopharmacology. 1986; 16:275-287.
15. Jardim MAG, Santos GC, Medeiros TDS, Francez DC. Diversity and structure of palm trees in lowland forests of Amazonian estuaries. Amazônia: Ciência e Desenvolvimento. 2007; 2(4):67-84.
16. Jardim MAG, Vieira ICG. Floristic composition and structure of a floodplain forest of the Amazonian estuary, Combú Island, Pará state, Brazil. Bol. Mus. Para. Emílio Goeldi, ser. Botânica. 2001; 17(2):333-354.
17. Jardim MAG, Batista FJ, Medeiros TDS, Lopes ILMA. Várzea forest: Tree species and uses. In: Jardim, M. A. G.; Zoghbi, M. G. B. (Org.). The flora of Resex Chocoaré-Mato Grosso (PA): Uses and diversities. Collection Adolph Ducke: MPEG, Belém. 2008, 25-36.
18. Junk WJ, Bayley PB, Sparks RE. The flood pulse concept in river-floodplain systems. In: DODGE, D.P. Proceedings of the International Large River Symposium. Canadian Especial Publication of Fisheries and Aquatic Science. 1989, 110-127.
19. Köppen W. Climatología: con un estudio de los climas de la tierra. Fundo de Cultura Econômica. México. 1948, 479.
20. Laraia RB. Culture: An Anthropological Concept. 15 ª ed, Editora Zahar, Rio de Janeiro. 2002.
21. LIMA D. Socio-environmental development in the floodplains of the Amazonas and Solimões rivers: perspectives for the development of sustainability. Manaus, AM: Ibama, Provárzea. 2005, 416.
22. Lima ILP, Scariot A, MedeiroS MB, Sevilha AC. Diversity and use of Cerrado plants in community of Geraizeiros in the northern Minas Gerais state, Brazil. Acta Botanica Brasilica. 2012; 26(3):675-684.
23. Lima RA, Magalhães SA, Santos MRA. Ethnobotanical survey of medicinal plants used in the city of Vilhena, Rondônia. Revista Pesquisa & Criação. 2011; 10(2):165-179.
24. Martínez GB, Junior MM, Junior SB. Selection of multiple forest species ideotypes in lowland Amazon plains, Pará. Acta Amazonica. 2010; 40(1):65-74.
25. Mcgrath DG. Varzeiros, geleiros e o manejo dos naturais na várzea do baixo amazonas. Belém, Pa: Núcleo de altos estudos Amazônicos-UFPA. 1991, 25.
26. Oliveira DR, Krettli AU, Aguiar ACC, Leitão GG, Vieira MN, Martins KS *et al.* Ethno pharmacological evaluation of medicinal plants used against malaria by quilombola communities from Oriximiná, Brazil, Journal of Ethnopharmacology. 2015; 173:424-434.
27. Prance GT. Ethnobotany and the future of conservation. Biologist. 2000; 47(2):65-68.
28. Rodrigues LMB, Lira AUS, Santos FA, Jardim MAG. Floristic composition and uses of plant species of two environments of lowland forest. Revista Brasileira de Farmacia. 2006; 87(2):45-48.
29. Rodrigues VEG, Carvalho DA. Ethnobotanical survey of medicinal plants in the Cerrado domain in the Alto Rio Grande region, Minas Gerais. Ciência e Agrotecnologia. 2001; 25:102-123.
30. Rossato SC, Leitão Filho H, Begossi A. Ethnobotany of Caiçaras of the Atlantic Forest Coast (Brazil). Economic Botany. 1999; 53:387-395.
31. Sánchez M, Duivenvoorden JF, Duque A, MIRAÑA P, CAVELIER J. A Stem-based Ethnobotanical Quantification of Potential Rain Forest Use by Mirañas in NW Amazonia. Ethnobotany Research & Applications. 2005; 3:215-229.
32. Santos RS, Coelho-Ferreira M. Ethnobotanical study of Mauritia flexuosa L.f. (Arecaceae) in riverside communities of the municipality of Abaetetuba, Pará, Brazil. Acta Amazonica. 2012; 42(1):1-10.
33. Santana BF, Voeks RA, Funch LS. Ethno medicinal survey of a maroon community in Brazil's Atlantic tropical forest Journal of Ethnopharmacology. 2016; 181:37-49.
34. Semedo RJCG, Barbosa RI. Fruit trees in the urban yards of Boa Vista, Roraima, and Brazilian Amazonia. Acta Amazonica. 2007; 37:497-504.
35. Shanley P. Fruit trees and useful plants in the Amazonian life. Belém: CIFOR, Imazon. 2005, 300.
36. Sioli H. (Ed). The Amazon - Limnology and landscape ecology of a mighty tropical river and its basin. Junk, Dordrecht. 1984.
37. Tardío J, Pardo DE, Santana M. Cultural importance indices: a comparative analysis based on useful wild plants of Southern Cantabria (Northern Spain). Economic Botany. 2008; 62:24-39.
38. Vendrusculo GS, Mentz LA. Ethnobotanical survey of plants used as medicinal plants in the Ponta Grossa neighborhood, Porto Alegre, Rio Grande do Sul, Brasil. *Iheringia*, Sér. Bot., Porto Alegre. 2006; 61(1-2):83-103.