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Ethno-knowledge of medicinal plants in a community in the eastern Amazon

Etnoconhecimento de plantas medicinais em uma comunidade na Amazônia oriental

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ABSTRACT

The Amazon has many plant species with potential for medicinal use and a vast traditional knowledge accumulated over the years by the traditional peoples that inhabit the region. The objective of this work was to document traditional knowledge regarding the use of medicinal plants by São Tomé community residents that had its physical area affected by the reservoir of a hydroelectric plant in the region of the Araguari river valley, Amapá, Brazil. Data were collected from May to October 2014. Non-probabilistic sampling (n = 15) and participant observation were used to select local experts who understood about the use of medicinal plants. Socio-demographic and ethnobotanical data were collected during semi-structured interviews. There were 45 species distributed in 31 botanical families, with indicative of medicinal use by local informants. The main parts used of the plants were bark and leaves.

Keywords: rural communities, ethnospecies, hydroelectric, ethnobotany

RESUMO

A Amazônia possui muitas espécies vegetais com potencial para uso medicinal e um vasto conhecimento tradicional acumulado ao longo dos anos pelos povos tradicionais que habitam a região. O objetivo deste estudo foi documentar as principais espécies de plantas medicinais utilizadas por uma comunidade que teve sua área física afetada pelo reservatório de uma hidrelétrica na região do vale do rio Araguari, Amapá, Brasil. A coleta de dados ocorreu no período de maio a outubro de 2014. Utilizou-se amostragem não probabilística (n = 15) e observação participante para selecionar especialistas locais que entendem sobre o uso de plantas medicinais. Os dados sociodemográficos e etnobotânicos foram coletados durante entrevistas semiestruturadas. Foram relatadas 45 espécies, distribuídas em 31 famílias botânicas, com indicativo de uso medicinal pelos informantes locais. As principais partes utilizadas das plantas foram cascas e folhas.

Palavras-chave: comunidades rurais, etnoespécie, hidrelétricas, etnobotânica

INTRODUCTION

The use of medicinal plants by the world population has been significant in recent years (Ribeiro *et al*., 2017). The elemental role played by trees seems evident by non-timber forest products such as food, medicines, fiber, fuels, animal feed and their cultural and spiritual value (Dawson *et al*., 2014).

The traditional knowledge has been increasingly valued in the search for effective ways to conserve biological diversity (Nardi-Santos *et al*., 2014; McCarter and Gavin, 2014; Casas Reátegui *et al*., 2018). These knowledges are of great importance for the use and conservation of forest species (Pereira *et al*., 2007; Oliveira *et al*., 2015; Jamba and Kumar, 2018).

Ethnobotany studies the relationship between plants and man and its practice is centered on the influence that human beings and plants exert each other (Pieroni *et al*., 2008; Pedrollo *et al*., 2016). Phytotherapy and the use of medicinal plants are part of the practice of popular medicine, constituting a set of knowledge internalized in the diverse users and practitioners. The knowledge of medicinal resources varies according to the characteristics of an individual and the category of plant uses, and may have a strong association between age and traditional knowledge (Laleye *et al*., 2015).

There are many ways to get information from a community about the plants used for therapeutic purposes, but before beginning any research it is necessary to know the people, how they live, their culture and their social organization (Albuquerque and Hanazaki, 2006). Many communities have their own management systems, a result of the experience accumulated during centuries of relationship with the resources that allow meeting their needs with minimal environmental damage (Albuquerque and Andrade, 2002).

The São Tomé community possessed this historical interaction of knowledge and use of plants for the cure and / or prevention of diseases and due to the construction of the hydroelectric plants Cachoeira Caldeirão and Ferreira Gomes Energia, the physical area of the community was flooded and its residents were relocated. Thus, the objective of this work was to document traditional knowledge about the use of medicinal plants by community residents.

The work is important because it represents an opportunity to know the potential and diversity of plant species (ethnospecies) that were lost, due to the installation of hydroelectric plants in the Brazilian Amazon.

MATERIALS AND METHODS

Study area

The study was carried out in the area where the São Tomé community was located, in the municipality of Ferreira Gomes, Amapá, Brazil, on the left bank of the river Araguari, between coordinates N 00º 49'31 and W 051º 18'33 (Figure 1).

Figure 1 - Location of the visited properties. Source: Google Earth (2014).

Regarding precipitation, the Araguari river basin presents a significant spatial variation ranging from slightly less than 2.300 mm/year to 2.900 mm/year. The climate has two well-defined seasons: summer, which extends from June to November and is characterized as the least rainy season; and winter, between December and May and characterized by a higher rainfall volume.

The predominant soils are Oxisols and Gleysols. The vegetation of the area combines terra firme forest and alluvial forest dense. The region is home to three hydroelectric power plants: Coaracy Nunes, Ferreira Gomes Energia and the Caldeirão Waterfall. These three ventures are located in the Araguari River Basin and located in nearby areas, exposing the surrounding communities to various social and environmental impacts.

Data collect

Data collection took place from May to October 2014. Before the data collection, we used approximation strategies, by the "rapport" method, aiming for the involvement and confidence of community residents. The first informants were

randomly selected from the community. We used non-probabilistic sampling (n = 15), such as the snowball technique proposed by Bailey (1994) to select local extraction experts who understood the use of medicinal plants. Ethnobotanical data were collected through semi-structured interviews and participant observation (Albuquerque *et al*., 2008). The sociodemographic and ethnobotanical data (vernacular name, uses, geographical origin, habit and part used) of the medicinal plants were collected during interviews. The informants' age ranged from 29 to 68 years. We applied semi-structured interview because it allows greater flexibility and is an effective tool for collecting descriptive data.

The Terms of Free and Informed Consent were obtained from those who offered to participate in the study, following the legal ethical standards. A survey of the household units was carried out.

The botanical collection was performed according to Pinheiro (2014), that is, the collected samples were processed in the field and each one received a collection number, marked on a previously prepared label, containing its vernacular name.

Photographic registration of the species was carried out to assist in their botanical identification. For the identification of families, the Angiosperm Phylogeny Group IV classification system was used (APG, 2016) and for the species, the identification was performed through dichotomic keys and with comparison of the deposited specimens in the Amapaense Herbarium (HAMAB). To confirm the spelling and synonymy, the database of the "Missouri Botanical Garden" and "The Plant List" were consulted.

Data analysis

The data collected and recorded in the ethnobotanical Form were organized and systematized in tables containing the information on species occurrence, the most used by the informants and their type of use. Tables were originated to contain information on: the relation of forest species used, information of use, collection and availability in the area. We used mean and standard deviation for the variables that could be analyzed in this way, it was also used (simple and percentage rate) and Relative Frequency of Citation.

RESULTS AND DISCUSSION

The sample universe covered a range between 29 and 68 years of age for the interviewees, of whom 11 were men, corresponding to 73.33% and 4 women (26.67%). The mean age was 47 years, with a standard deviation of 12.86 years for the total number of interviewees (Table 1). Considering the gender of respondents, the mean age was 37.75 (women) and 52.09 years for men, with a minimum and maximum age of 32 and 44 years for women, with 29 and 68 for men.

Popular knowledge of medicinal resources may vary according to the characteristics of an individual, such as: sex, age, educational level, income, social status and the economic roles played within the family. On the other hand, most ethnobiological studies associate age to traditional knowledge (Laleye *et al*., 2015). Gender clearly influences knowledge about plant resources because gender roles and occupations are differentiated and knowledge of men and women can be reflected in distinct patterns of plant ownership and use (Almeida *et al*., 2010).

From the study in the community, 45 species of plants used by the residents with indication of medicinal uses were indicated, distributed in 31 families. The botanical families that stood out for the greatest number of species were Fabaceae (five species), Lamiaceae (four species), Asteraceae and Bignoniaceae (three species each). The other families presented one species each (Table 2).

Table 1 - Age and gender of respondents

Age group	Men	Women	Total	Relative frequency (%)
25 - 29	1	-	1	6.67
30 - 34	-	1	1	6.67
35 - 39	1	2	3	20
40 - 44	1	1	2	13.33
45 - 49	-	-	-	-
50 - 54	2	-	2	13.33
55 - 59	3	-	3	20
60 - 64	2	-	2	13.33
65 - 69	1	-	1	6.67
Total	11	4	15	100

Table 2 - List of medicinal plants, indication of use, part of the plant used and origin in the São Tomé community

Family/Scientific name	Vernacular name	Indication	Part of the plant used	Origin *
AMARANTHACEAE				
Chenopodium ambrosioides L.	Mastruz	restorative, vermifuge, thud	Leaf	C
ANACARDIACEAE				
Mangifera indica L.	Mangueira	fever, virus disease	Bark	S
Spondias mombin L.	Taperebazeiro	kidney diseases	Bark	S
APOCYNACEAE				
Himatanthus sucuuba (Spruce ex Müll.Arg.) Woodson	Sucuúbeira	stomachache,	Resin bark and Leaf	S
Parahancornia amapa (Huber) Ducke	Amapazeiro amargo	lung disease, skin sores	Resin	S
ARACEAE				
Caladium lindenii (André) Madison	Brasileirinho	stingray wounds	Leaf	C
ASTERACEAE				
Galinsoga parviflora Cav.	Picão	hepatitis	Roots	C
Spilanthes oleracea L.	Jambú	cough, flu	Leaf	C
Vernonia condensata Baker	Boldo	stomachache, liver, malaria,	Leaf	C
BIGNONIACEAE				
Anemopaegma arvense (Vell.) Stellfeld ex De Souza	Catuaba	chronic bronchitis, nervous diseases	Leaf	C
Arrabidaea chica (Bonpl.) Verl.	Pariri	anemia, weakness	Leaf	C
Handroanthus impetiginosus (Mart. ex DC.) Mattos	Ipê	Treatment of inflammations and ulcers	Bark	C
CARICACEAE				
Carica papaya L.	Mamoeiro	diabetes, asthma, vomit,	Leaf	C
COSTACEAE				
Costus spicatus (Jacq.) Sw.	Canaficha	diuretic	Bark	C
CRASSULACEAE				
Bryophyllum calycinum Salisb.	Pirarucu	allergic conditions	Bark	C
CRYSOBALANACEAE				
Licania macrophylla Benth	Anoerá	Anti-inflammatory	Bark	S
EUPHORBIACEAE				
Pedilanthus tithymaloides (L.) Poit.	Coramina	inflammation	Leaf	C
FABACEAE				
Dalbergia monetaria L. f.	Verônica	flu, anemia	Bark	S
Dipteryx odorata (Aubl.) Willd.	Cumarú	headache, cough	Bark	S
Hymenaea courbaril L.	Jatobá	gripe, fever	Bark, resin	S
Dialium guianense (Aubl.) Sandwith	Jutaí	treatment of renal diseases	Bark	S
Pentaclethra macroloba (Willd.) Kuntze	Pracaxizeiro	gastritis, inflammation	Seed oil	S
LAMIACEAE				
Aeollanthus suaveolens Mart. ex Spreng.	Catinga-de-mulata	fever, headache/ stroke/flu	Leaf	C
Mentha pulegium L.	Hortelanzinho	child disease, pain	Leaf	C
Ocimum minimum L.	Manjericão	headache	Leaf	C
Plectranthus amboinicus (Lour.) Spreng.	Hortelã	bronchitis	Leaf	C

Table 2 - *Continuation*

Family/Scientific name	Vernacular name	Indication	Part of the plant used	Origin *
LAURACEAE				
Cinnamomum zeylanicum Blume	Caneleira	soothing, stomachache	Leaf	C
MALVACEAE				
Scleronema micranthum Ducke	Cedrinho	toothache	Leaf	S
MELIACEAE				
Carapa guianensis Aubl.	Andirobeira	infection	Seed oil	S
MYRTACEAE				
Psidium guajava L.	Goiabeira	dysentery	Leaf	C
OCHNACEAE				
Ouratea hexasperma (A. St.-Hil.) Baill.	Barbatimão	women's genitourinary infections	Bark	C
OLACACEAE				
Ptychopetalum olacoides Benth.	Marapoama	stroke	Leaf	C
OXALIDACEAE				
Averrhoa bilimbi L.	Limão Caiena	diabetes	Fruit and Leaf	C
PEDALIACEAE				
Sesamum indicum L.	Gergelim	fever, pneumonia	Leaf	C
PHYTOLACCACEAE				
Petiveria alliacea L.	Mucuracaá	headache, flu, absces	Leaf	C
PIPERACEAE				
Piper callosum Ruiz & Pav.	Elixir paregórico	stomachache	Bark	C
PLANTAGINACEAE				
Plantago major L.	Tanchagem	wound healing	Leaf	C
POACEAE				
Cymbopogon citratus (DC.) Stapf	Capim santo	flu, stomachache	Leaf	C
PORTULACACEAE				
Portulaca pilosa L.	Amor crescido	pulled muscles, fractures	Leaf	C
RUBIACEAE				
Morinda citrifolia L.	Noni	cholesterol, kidneys	Fruit	C
Uncaria tomentosa (Willd. ex Roem. & Schult.) DC.	Unha-de-gato	rheumatism, inflammation	Bark	C
RUTACEAE				
Ruta graveolens L.	Arruda	colic, stomachache	Leaf	C
SIMAROUBACEAE				
Quassia amara L.	Quina	fever, intestinal fever, malaria	Leaf, Bark	C
STYRACACEAE				
Styrax argenteus C. Presl	Esturaque	infections	Leaf	C
VERBENACEAE				
Lippia alba (Mill.) N.E. Br. ex Britton & P. Wilson	Erva Cidreira	pain, fever	Leaf	C

The genera with the highest number of species were Citrus (seven species), Capsicum (three species), Annona, Artocarpus, Averrhoa, Hibiscus, Manilkara, Oenocarpus, Piper, Psidium, Theobroma (two species each), representing approximately 14% of the total, the others had frequency equal to one species.

In the eastern Amazon, Coelho-Ferreira (2009) identified 229 medicinal plants distributed in 81 families and 176 genus. The families with the highest number of species were Lamiaceae (15 species), Euphorbiaceae and Asteraceae (12), Fabaceae (11) and Caesalpiniaceae (9). In the western Amazon, to verify the most abundant environment in the supply of medicinal plants, Pedrollo *et al*. (2016) interviewed 62 informants, resulting in 119 documented botanical species that had their sites of occurrence cited.

In Alto Rio Negro, Frausin *et al*. (2015) found 55 species of neotropical plants, mainly native, 34 families, with indication of medicinal use. The detailed uses of these plants: 64.5% of plants for the specific treatment of malaria, 51 records (17.6%) of plants used in the treatment of liver problems and 29 records (10%) of plants used in control of fevers.

In the Amazon, some forest species have several uses and high potential for medicinal use, for example, the use of *Carapa guianensis*, andirobeira (Santos and Guerra, 2010; Sist *et al*., 2014; Nardi-Santos *et al*., 2016) and pracaxizeiro (*Pentaclethra macroloba*), whose bark is widely used by forest peoples in disease treatments (Dantas *et al*., 2017).

The São Tomé community used the most diverse components of vegetables in the preparation of medicines and with respect to the used part of the plant, the following results were found in order of indication: leaves, stems, seeds, resins, fruit, roots and oils (Figure 2).

In the Amazon region, Lima *et al.* (2016) reported that the most common plant parts were leaves (324 citations), followed by bark (162), whole plants (130), aerial parts (88), roots 80), fruits (76) and seeds (63).

In the eastern Amazon, Coelho-Ferreira (2009) identified a wide variety of plant parts used to prepare traditional medicines, especially leaves (98 citations), followed by roots (42), bark (29), fruits (27), whole plants (22), branches (18), latex, flowers, seeds (13 each), stems (12), wood and shoots (5 each) and others (4). According to this author, in the case of Amazonian trees, the bark is more commonly used, which can be attributed to the fact that it is easier to access than the leaves.

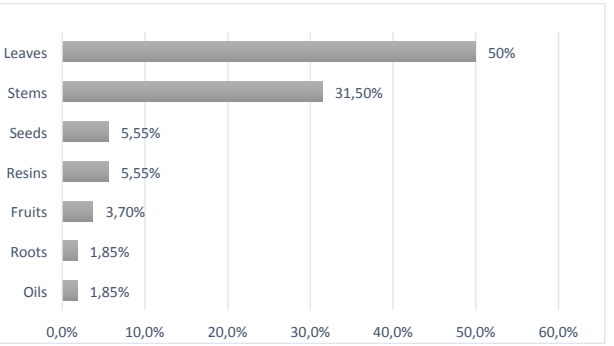

Figure 2 - Parts of the plant used in traditional medicine in the community.

In a study in western Amazonia, Frausin *et al*. (2015) identified that stem bark was the most used part to the preparation of the medicines, (30% of total reported), followed by leaf (26%) and root bark (17%). Other preparations included seeds (5.1%), whole plant (4.7%) and fruits (1.6%).

Of the species registered in the community as medicinal, 66.67% were cultivated in backyards and in vegetable gardens and 33.33% were species that were born spontaneously in the environment, this being the yard itself, paths to the forest and the forest.

Different results were obtained by Coelho-Ferreira (2009), regarding the introduced plants, reporting that 49% of the species were native to the Amazon region and 39% were introduced. Among the native species, 78 were spontaneous, 25 were cultivated, being *Carapa guianensis, Brosimum acutifolium* and different copaífera species, native plants originating from flooded and terra firme forests, far from the city, making it difficult to access them.

In the Amazon, Pedrollo *et al.* (2016) have identified that the most prominent medicinal species are widely distributed and culturally recognized.

Exotic species were 20% of the total and 37% of the species were cultivated. The authors further state that the plants in backyards were usually associated with the disease of children or women, 80% of the plants collected were native to the Amazon rainforest.

Almeida *et al*. (2010) identified that the vast majority of exotic plants in the rural communities studied was herbaceous, and these plants grow more easily near houses, consequently, this occurrence speeds up the collection process and may have influenced informants' preferences for the species they most used.

In Marudá-Pará, Coelho-Ferreira (2009) found 58.8% of cultivated species, 34.6% of spontaneous and 6.6% of both forms. This shows that the greatest quantities of medicinal species used in this traditional community were obtained through cultivation.

Regarding the importance of these species to the local populations, Ribeiro *et al*. (2016) reported that all 60 local experts interviewed in the riparian communities studied believed in the efficacy and use of medicinal plants in the treatment of diseases. In a study in a quilombola community, Santana *et al*. (2016) state that the community maintains a considerable knowledge of the medicinal value of the local flora.

However, little of this knowledge is derived from the ancient rainforests, with their pharmacopoeia presenting a hybrid blend of wild and cultivated, native and exotic species. In addition, medicinal plants also have cultural significance for locals and traditional belief systems of people (for example, protection against evil spirits) are intrinsically related to the use of medicinal plants (Jamba and Kumar, 2018).

Each site or region has a set of specific rituals and management in the use of ethnospecies that are transmitted over generations (Albuquerque *et al*., 2012; Ribeiro *et al*., 2016). Lima *et al*. (2013) emphasize that the recognition of traditional knowledge should be considered in actions to value the cultural heritage of these places. In São Tomé, this relationship was also verified with a variety of medicinal plants and the community has shown that these plants were commonly used, there were a dependency of the Community in relation to natural medicines obtained from the forest and its backyards.

CONCLUSIONS

Even with current technological advances, the population continued to be interested in using plants for medicinal purposes. Some of the factors that influenced this choice by natural remedies is that the population considered that these plants did not provoke undesirable reactions (for example, allergies) and produced satisfactory effects against diseases, and the knowledge of its benefits runs through previous generations.

In São Tomé, it was found that its population, although small, had access and knowledge to a wide variety of medicinal plants related to the cure or prevention of diseases that affected its inhabitants and that were lost due to hydroelectric plants installed in the region.

This study improves the understanding of botanical resources in Amazonian ecosystems, highlighting the use of different species of medicinal plants and the destruction of these environments can pose serious risks to traditional peoples, causing the loss of the empirical knowledge and the genetic heritage of these environments, as occurred in the São Tomé.

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