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Medicinal plants at Rio Jauaperi, Brazilian Amazon: Ethnobotanical survey and environmental conservation



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ABSTRACT

Study background: The Amazon basin is a mosaic of different environments. Flooded riparian and upland forests play a significant role for the establishment of human settlements. Riparian communities in the Amazon have evolved depending on the use of plants applied for therapeutic purposes, thus developing important knowledge about their management and preparation.

Aim of the study: This paper describes and analyzes the use and management of medicinal plants in order to establish links to environmental conservation. The categorization of habitats of occurrence and categories of diseases were held in five riparian communities at *Rio Jauaperi*, in the border between Roraima and Amazonas states in Brazil. The study sight is poorly investigated in terms of scientific research.

Materials and methods: Quantitative and qualitative ethnobotanical field inquiries and analytical methods including observations, individual and focus group discussions, individual interviews, preference ranking by free listing tasks, guided tours and community mapping were applied. Sutrop's cognitive salience index was applied in order to check the most important ethnospesies and diseases. The survey was conducted from February to December 2012.

Results: A total of 62 informants were interviewed, resulting in 119 botanical species documented. The most salient medicinal species are usually wide distributed and recognized transculturally. Arboreal habit was the most important corresponding to 47% of total species used. The most frequent accessed environments were *terra-firme* (upland forest), *vargeado* (flooded forest), poultry (regenerating forest) and *restinga* (seasonally flooded forest) which together provides 59% of the total medicinal plant species. Exotic species played a secondary role with only 20% of the total. Thirty seven percent of the species were cultivated. Plants at homegardens are usually associated with children's or women's disease. Xixuaú is the community with improved ability to environmental preservation using more forestry species. The most worrying disease was malaria. Biomedical assistance is precarious in the region and many diseases and healing rituals are culturally built.

Conclusions: Ethnobotanical surveys of medicinal plants can indicate the level of biodiversity conservation and human health by integrating social and ecological analytical elements. Considering a predominance of management for subsistence, the higher richness of native medicinal species availability indicates that biodiversity and associated traditional knowledge are better preserved. The methods applied here might contribute for the decision-making process regarding conservation public policies and medical assistance in remote areas of the Amazon basin.

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1. Introduction

The Amazon basin supports around 40% of the remaining tropical forests in the world, 16% of fresh water and 30% of plant species, half of these being endemic to this ecosystem (Salati and Santos, 1998). Conservation and management of the Amazon basin

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have proven challenging in the actual social and political scenario of South America. In addition, traditionally used medicinal plants and associated knowledge are disappearing at an alarming rate in the Amazon (Reyes-García et al., 2014) as well as other biomes worldwide (Yirga, 2010; Ramirez, 2007). Natural and anthropogenic factors contribute to these losses but threatening factors may vary from one region to the other (Teklehaymanot, 2009; Ramirez, 2007). Brazil has advantages and opportunities to sustainably develop non-timber forest products (NTFP). However, the country faces legislative barriers both on ethnobiological research as well as how to develop products from patents on traditional knowledge (Pedrollo and Kinupp, 2015).

The use of medicinal plants and other forms of therapies applied in traditional populations systems are often recognized to possess a pharmacological effect or other empirical bases. In some cases, however, plants appear to be dominated by symbolic concepts with low empirical derivation. In other words, local knowledge is a system of symbols (Geertz, 1983). The nuances of a health-disease-cure process are specific for the cultural context a given plant can be used. As a matter of fact, the level of ethnobotanical knowledge can be related to the intrinsic health-care capacity of a given Amazonian society (McDade et al., 2007). Furthermore, the conservation status of the surrounding ecosystems may influence the availability of plants, thus influencing the maintenance of the local traditional ecological knowledge.

The way different groups or ethnicities perceive diseases influence the way that medicines are classified (Staub et al. 2015; Shepard Jr., 2004; Milliken and Albert, 1996). To understand the placement and use of a medicinal plant it is important to establish nosological categories or categories of application of remedies built by the natives themselves (emic view). Both natural and anthropogenic environments are categorized by natives in a similar way. Assuming that individuals from different cultures express themselves through different cognitive realities (Posey, 2001), one might apply emic interpretation rather than researchers direct interpretation (ethic view).

Seeking to understand the emic concepts of diseases and their symbolic meanings, as well as how local dwellers use and explore the surrounding ecosystems, cognitive and linguistic categories of the natives should be taken into account. Interdisciplinary approaches are important in works on medicinal plants (Morales, 1996; Marques, 2002), thus reinforcing the importance of documenting not only the local terms for plants, but also the indigenous terms of illnesses and how people describe the signs (or symptoms) of these illnesses (Berlin et al., 1993; Heinrich, 1994). Free listing may help to identify the culturally most important ethnospecies and diseases (Heinrich et al., 2009).

The present study combines ethnobotany and medical anthropology. We evaluated the emic medicinal plants knowledge and related it to environmental conservation in five riparian communities at Jauaperi river. To relate knowledge systems with health and conservation indicators, one can apply several ethnobotanical methods, in which the process of learning and transmitting traditional ecological knowledge might be considered.

2. Material and methods

2.1. Study site

The study was conducted in Rio Jauaperi, a black water river that is part of the watershed of the Rio Negro. Its lower part forms the southern boundary between the states of Amazonas and Roraima, between the municipalities of Rorainópolis/RR with 25,587 inhabitants and Novo Airão/AM with 14,780 inhabitants (IBGE, 2010), bordered by the Rio Branco and Negro. The vegetation of the

region consists predominantly of dense rainforest lowland (IBGE, 2004). This region has significant importance for biodiversity conservation. It is also part of the mosaic of protected areas in the Central Amazon Ecological Corridor (MMA, 2006). Despite over 12 years of efforts from NGOs and local associations to create an extractive reserve, the area remains outside of any conservation unity. Furthermore, the region has been poorly investigated in terms of scientific research, with very little attention to botanical field collections (Hopkins, 2007). This makes the present study exclusively relevant and possibly the first peer reviewed scientific paper in the area.

The five communities studied (Fig. 1) were: Xixuaú, with about 80 residents; Itaquera, with about 100 residents; Sumaúma, with about 15 dwellers – those three belonging to the municipality of Rorainópolis/RR, located on the right bank of the Jauaperi. In addition to these, two communities from Novo Airão/AM, on the left bank of the Jauaperi, were included: São Pedro, with about 20 residents was included, as well as the Gaspar, with about 18 residents. Besides these five communities, the locality today called Mahau (or Mahaua as claimed Carvalho (1982)), located two hours by motor tail canoe (reaching between 9 and 11 miles per hour) north of Xixuaú was included by its two dwellers. One of them is an important healer (*curandeiro*), with great knowledge of medicinal plants and cure rituals, thus making him a master among apprentices.

2.2. Ethical approval and consent

Written permission was obtained from the communities' leadership before the start of the study. The project was approved by the Ethics Committee on Research involving Human Subjects (CONEP), under the CAAE protocol number: 00523812.8.0000.0006. Under the Brazilian law, no specific authorization is required in order to include children since the research has been validated by CONEP. Nonetheless, parents were always asked for authorization before any conversation with children. The National Institute of Historic and Artistic Heritage (IPHAN) authorized access to traditional knowledge without access to genetic resources (number 01450.007883/2012-95 – DPI/IPHAN). Oral and signed consent was obtained from the study participants for the publication of this report and any accompanying images.

2.3. Selection of informants and data collection

Seeking the involvement and confidence of the dwellers, participative observations were made during the preparation of the project in 2011, aiming to ensure the ethical principles established by *rapport* approximation method (Alexiades, 1996) for research involving humans. Afterwards, the first informants were selected at random from the communities. At the end of each semi-structured interview, it was asked what other dweller had knowledge of medicinal plants. Thus we proceeded to the second form of sampling: the intentional non-probabilistic or Snowballing, in which an informant indicates another, and so on. Children were included in the sampling in order to identify which species are better known in early age and thus analyze the process of transmitting knowledge.

We opted to apply *free listings* and *semistructured interviews*. The *free list task* aimed to list all popular names (or ethnospecies) mentioned by respondents when asked *do you know any plant that serves as a remedy?* as well as diseases when asked *what are the most important diseases?* (Sutrop, 2001). The *semistructured interviews* are based on a flexible script containing a list of topics to be covered, allowing us to discover recipes and locations of occurrence of the species. The meaning of illness was subsequently questioned in order to categorize diseases and the recipes of home

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