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Medicinal uses of plant species in background pasture areas in Northeast Brazil

[Usos medicinales de las especies de plantas en áreas de fondo de pastoreo en el noreste de Brasil]

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Abstract: This study aimed to identify grazing background areas in the communities of St. Benedict (SB) and Patamuté (PT) in the municipality of Curaçá, Brazil which medicinal plants most used by the population, the amount and type of use, proposing to low importance value index (IVI) for reforestation. Interviews were conducted semi-structured form. For location and collection of plants, not probabilistic intentional sampling was performed. For the calculation of the IVI was carried out phytosociological sampling. The most used plants were *Myracrodruon urundeuva* (aroeira) in SB and *Libidibia ferrea* (pau-ferro) in PT. The maximum use values obtained were 1.33 and 0.77 aroeira in SB pau-ferro in PT. Both species have medicinal use in inflammatory conditions. The species *M. urundeuva* is among the smallest IVI, being proposed to integrate reforestation projects in the areas of savanna studied.

Keywords: Brazil, medicinal plants, savanna, vegetation

Resumen: Este estudio tuvo como objetivo identificar las plantas medicinales utilizadas por las personas que viven cerca de las áreas de fondo de pastoreo de las comunidades de São Bento (SB) y Patamuté (PT) en el municipio Curaçá (Bahia, Brasil). Entrevistas acerca de la ubicación y la recolección de plantas se llevaron a cabo en una forma semi-estructurada. Para el cálculo de la IVI se llevó a cabo el muestreo fitosociológico. Se entrevistó a un total de 25 personas. Los informantes identificaron los usos para 38 especies en SB y 25 especies en PT, que pertenecían a 15 familias botánicas. Las plantas más utilizadas fueron *Myracrodruon urundeuva* (aroeira) en SB y Libidibia ferrea (pau - ferro) en PT. Los valores máximos de uso obtenidos fueron 1,33 de aroeira en SB y 0,77 de pau ferro en PT. Ambas especies tienen uso medicinal en condiciones inflamatorias. La especie *M. urundeuva* se encuentra entre el IVI más pequeño, que se propone integrar los proyectos de reforestación en las áreas de savana (caatinga) estudiados.

Palabras clave: Brasil, plantas medicinales, sabana, vegetación

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INTRODUCTION

Humans act as selective agents for plant populations by changing their life cycles and patterns of mortality, reproduction, and survival. Moreover, humans also take advantage of the chemical defenses of plants for their own benefit. Ethnobotanical studies indicate that the structure of plant communities and landscapes are always affected by people as a result of the operation and promotion of managed resources. The way of life of traditional communities allows them to cope with ecological changes based on their traditional environmental knowledge. According to Toledo and Barrera-Bassols (2009), the knowledge of nature is a critical component for the drafting and implementation of survival strategies developed through continuous interaction with nature as a whole.

Therefore, it is necessary to study the impact of traditional populations on their surrounding environments in order to identify less damaging ways to develop their cultural activities (Albuquerque & Andrade, 2002).

"Background pastures" are unoccupied areas owned by the Union (refer to a political/governmental unit) and used collectively by the people living around them. According to Diamantino (2007), background pasture communities are social, cultural, and economic formations with management systems that allow space, equipment, and natural resources to be shared. These communities are found and accepted in the northeast of Brazil, mainly in northern and western Bahia. It is possible to confirm that these are the most recent traditional Bahia populations in terms of traditional community identification. There are 20,000 families (approximately 90,000–100,000 people) distributed among 450 such communities in more than 30 cities in Bahia (Ferraro & Bursztyn, 2008).

The background pasture vegetation examined in this study is in Caatinga, a type of dry savanna biome. This vegetation includes several physiognomies and occupies most of the Brazilian semiarid region in the northeast (Giulietti, 2004). The Caatinga is characterized by high rates of evapotranspiration, prolonged dry periods, shallow soils, and low water-holding capacity (Silva *et al.*, 2009). However, according to Bezerra *et al.* (2014), the Caatinga is highly resilient, which is evident during heavy rains. Even small amounts of precipitation produce a quick response in dry native vegetation, which becomes crisp and green. The Brazilian semiarid region has approximately 25 million inhabitants and this biome comprises approximately 10% of the total area of the country.

The scientific consensus is that the empirical base developed by traditional communities regarding the medicinal uses of plants provides scientific evidence for the pharmacological potential of local plant species, and this traditional knowledge can facilitate industrialization. Currently, several authors have proposed ways to evaluate traditional folk knowledge and the interaction of local populations with available plant resources. Begossi (1996) proposed the use of ecological concepts, such as the species diversity index, to assist in understanding human-environment interactions. Such diversity indices can be useful in comparing the exploitation of biological resources by different human populations in the diverse cultures that occupy different environments.

Traditional populations preserve biodiversity in general, but excessive use of a particular rare species in traditional folk medicine can be harmful to their maintenance. If rare species are to live up to their pharmacological potential, their population numbers must be increased. This study aims to identify the rare woody species in the background pasture that are used in traditional folk medicine.

MATERIALS AND METHODS

Study area

Curaçá (6,709 km^2) is located in northern Bahia along the São Francisco River, 592 km from Salvador, at 09°09′06.2″ S, 39°38′04.1″ W, and at an elevation of 450 m. It is in an area that is a conservation priority (Velloso *et al.*, 2002). The São Bento (SB) and Patamuté (PT) communities are 36 and 74 km, respectively, from the municipal capital. The climate is semiarid (Koppen type Bh), hot, and dry, and rainfall is irregular, with an average annual total of 486 mm. The dry season is from May to November, with critical intervals occurring between July and October. The maximum average temperature is 24° C (Vieira *et al.*, 2005).

Ethnobotanical data collection

Before data collection, the project was submitted for approval to the Research Ethics Committee of the

State University of Feira de Santana (CEP/UEFS) under Protocol 050/2011 (CAAE Nº 0054.0.059.000 - 11). It was subsequently submitted to the Institute of Historical and Artistic Heritage (IPHAN) for access to traditional knowledge associated with genetic heritage (file Nº 02000.001044/2012 - 24, authorization Nº 008/2013).

Initial communication was done with leaders of a non-governmental organization, Project Mata Branca, which had already done community work in the city under study, and data were collected from June 2011 to March 2012.

The informants were chosen following the recommendations of Amorozo (1996): informants had to be at least 18 years old, actual community residents, regional residents for a significant length of time, and willing to participate. After initial communication with the locals, we found that many did not use medicinal plants themselves, or if they did, they only used plants as instructed by their elders. Therefore, in this study we used a non-probabilistic intentional sample, which can be used to describe phenomena and to generate data and hypotheses using the snowball technique (Albuquerque *et al.*, 2010). This technique was based on the specific knowledge of people who did use medicinal plants, people we identified based on communication with community residents to determine whether they knew someone who could participate in the study (i.e., individuals who used plants from background pasture areas for medicinal purposes).

Before starting each interview, the Free and Enlightened Acceptance Terms document was read to each participant in order to clearly and concisely explain the interview objectives and the risks involved in the research. After clarifying all doubts, the interviewer conducted semi-structured interviews according to procedure of Albuquerque *et al.* (2010), in which forms were supplied to each member of the community based on established criteria. The forms included questions about personal data (e.g., name, age, and gender) and key questions about the use of plants considered to have medicinal effects (e.g., Which plant is used? For what it is used? Which part of the plant is used? How it is used?). These data were used to determine socio-economic characteristics of the informants, botanical and ecological characteristics of the plants used as medicines, and therapeutic indications.

Collection of botanical materials

Plants cited by respondents were located using the tour-guided method (Albuquerque *et al.*, 2008). Because the vernacular names of species can be highly variable among regions and among individuals in the same community, this method was used to confirm the plant names mentioned in the interviews. The first collection was carried out soon after the interview with the voluntary assistance of the interviewee in plant identification. When respondents could not help in plant identification, they indicated someone who could correctly identify the plant. One trial was later subjected to phytosociological sampling. Transects were placed at a minimum distance of 200 m from the interviewee’s house, in order to avoid influencing the sampling. This phytosociological sampling aimed to identify the frequency, density, and importance of the plants that are used in traditional medicine in background pasture areas. The quadrant point method was used, according to the methodology suggested by Mueller & Ellenberg (1974), in ten 200 m transects with 20 points spaced at 20 m intervals. Individual shrubs and trees taller than 1.3 m with a diameter at ground height greater than or equal to 3.0 cm were sampled. The IVI (importance value index) was calculated as the arithmetical sum of relative density (individual number of plants/ha), relative dominance (m^2/ha), and relative frequency (occurrence percentage of a species in sample area). Botanical materials were collected following the recommendations of Mori *et al.* (1989). The species were classified according to the Angiosperm Phylogeny Group III system (APG, 2009), and those that were endemic to the Caatinga were identified using the list proposed by Sampaio *et al.* (2002). The analysis of phytosociological data was performed using the Fitopac1 program (Shepherd, 1995).

Analysis of data

The following five variables were examined: use, species, part of the plant used, use form, and informant.

The use consensus value (UC) between the informants and the use value (VU) for each species were calculated. The following equation was used to calculate UC values: UC = $2n_s/n-1$, where n_s is the number of people using the species. The UC is informative if different respondents agree in their plant-use knowledge, and it also measures the degree of agreement among respondents regarding the usefulness of the species. VU defines the most important plant as the plant with the largest number of uses. It is calculated using the formula VU = $\Sigma U/n$, where: U = Uses reported by informants and n = total number of informants. However, it is important to remember that use is based on evidence, not on the species (Albuquerque *et al.*, 2010).

Three forms of use were recognized: maceration, decoction, and infusion. The definition of each form of use was in accordance with the Brazilian Pharmacopoeia (Brazil, 2010).

RESULTS

The floristic and phytosociological data show that both areas have 24 woody species. In the SB community, we registered 16 species and in PT we identified 22. In both SB and PT, the species with the highest importance values (IVI) were *Cnidoscolus quercifolius, Poincianella laxiflora,* and *Jatropha mollissima.*

A group of 25 people were interviewed, including 14 men and 11 women. In the SB community, 12 people between 30 and 87 years of age were interviewed, and 50% of these respondents were older than 60 years. In the PT Community, 13 people between 35 and 96 years of age were interviewed, and 77% were older than 60 years. Most respondents had been in the community throughout their lives due to farming activities. The informants identified uses for 38 species in SB and 25 species in PT, belonging to 15 botanical families.

Table 1 shows that the maximum use values were 1.33 for *Myracrodruon urundeuva* Allemão in SB and 0.77 for *Libidibia ferrea* (Mart. ex Tul.) L. P. Queiroz in PT. Both species have medicinal use in inflammatory conditions. The average use values were 0.38 and 0.23 in SB and PT, respectively.

Table 1
Use value (VU) and use consensus value (UC) for plants in the São Bento community (SB) and the Patamuté community (PT).

Scientific name	Common name	VU SB	UC SB	VU PT	UC PT	Family
Amburana cearensis (Allemão) A. C. Smith	Umburana de cambão	0.08	0.05	0.15	0.17	Leguminosae
Anadenanthera colubrina (Vell.) Brenan	Angico	0.42	0.27	0.15	0.17	Leguminosae
Annona squamosa L.	Pinha	-	-	0.08	0.08	Annonaceae
Argemone mexicana L.	Sarraia	-	-	0.08	0.08	Papaveraceae
Aspidosperma pyrifolium Mart.	Pau pereiro	0.08	0.05	0.08	0.08	Apocynaceae
Calliandra sp.	Carquejo	0.25	0.11	-	-	Leguminosae
Calotropis procera S. W.	Lã de seda	0.08	0.05	-	-	*Asclepiadaceae*
Cereus jamacaru Dc.	Mandacaru	0.17	0.11	-	-	Cactaceae
Cnidoscolus quercifolius Pohl	Faveleira	0.92	0.38	0.54	0.50	Euphorbiaceae
Combretum monetaria Mart.	Mororo	-	-	0.08	0.08	*Combretaceae*
Commiphora leptophloeos (Mart.) J. B. Gillett	Umburana de cheiro	0.67	0.22	0.38	0.33	*Burseraceae*
Coursetia rostrata Benth.	pau de colher	0.17	0.05	-	-	Leguminosae
Croton sp. 1	Mameleiro Amargo	0.25	0.11	-	-	Euphorbiaceae
Croton sp. 2	Mameleiro doce	0.17	0.11	-	-	Euphorbiaceae
Croton sp. 3	Quebra facão	0.67	0.27	0.31	0.33	Euphorbiaceae
Erythrina mulungu Mart. ex Benth.	Mulungu	-	-	0.15	0.17	Leguminosae
Hymenaea courbaril L.	Jatobá	0.08	0.05	-	-	Leguminosae
Jatropha mollissima (Pohl) Baill.	Pinhão	0.08	0.05	-	-	Euphorbiaceae

Leucaena leucocephala (Lam.) R. de Wit	Leucena	0.17	0.16	-	-	Leguminosae
Libidibia ferrea (Mart. ex Tul.) L. P. Queiroz	Pau ferro	0.75	0.32	0.77	0.50	Leguminosae
Melochia tomentosa L.	Embira	0.17	0.05	-	-	Malvaceae
Mimosa tenuiflora (Willd) Poir.	Jurema Preta	0.50	0.27	0.08	0.08	Leguminosae
Myracrodruon urundeuva Allemão	Aroeira	1.33	0.54	0.69	0.50	Anacardiaceae
Parkinsonia aculeata L.	Truquia	0.67	0.22	-	-	Leguminosae
Poincianella laxiflora (Tul.) L. P. Queiroz	Catingueira de porco	0.17	0.05	0.54	0.25	Leguminosae
Poincianella microphylla (Mart. ex G. Don) L. P. Queiroz	Catingueira	0.83	0.38	-	-	Leguminosae
Prosopis juliflora (Sw.) DC.	Algaroba	0.08	0.05	0.08	0.08	Leguminosae
Pseudobombax simplicifolium A. Robyns	Umbururçu	0.25	0.05	0.08	0.08	Leguminosae
Schinopsis brasilienses Engl.	Braúna	0.83	0.32	0.23	0.25	Anacardiaceae
Sideroxylon obtusifolium (Roem. & Schult.) T.D.Penn.	Quixabeira	0.67	0.27	0.23	0.17	Sapotaceae
Spondias tuberosa Arruda	Umbuzeiro	0.42	0.27	-	-	Anacardiaceae
Tabebuia aurea (Silva Manso) Benth. & Hook. f. ex S. Moore	Craibeira	0.58	0.22	0.31	0.25	Bignoniaceae
Tabebuia sp.	Pau d'arco	0.17	0.05	0.08	0.08	Bignoniaceae
Tacinga inamoena (K. Schum.) N. P. Taylor & Stuppy	Quipar	0.08	0.05	-	-	Cactaceae
Terminalia catappa L.	Castanhola	0.08	0.05	-	-	Combretaceae
Ximenia americana L.	Ameixa	0.83	0.32	0.15	0.17	Olacaceae
Ziziphus joazeiro Mart.	Juazeiro	0.42	0.22	0.31	0.33	Rhaminaceae
Not Identified 1	Arapiraca	0.17	0.05	-	-	-
Not Identified 2	Candeia	0.67	0.27	-	-	-
Not Identified 3	Caixa cobra	0.17	0.05	-	-	-
Not Identified 4	Pau de besta	0.08	0.05	-	-	-
Not Identified 5	Unha de gato	0.17	0.05	-	-	-
Not Identified 6	Marizeiro	-	-	0.15	0.08	-
Not Identified 7	Pau – branco	-	-	0.08	0.08	-
Not Identified 8	Quina-quina	-	-	0.08	0.08	-

Regarding the species use citation frequency in SB, aroeira (*Myracrodruon urundeuva*) was most frequently mentioned by the respondents (9%), followed by faveleira (*Cnidoscolus quercifolius*; 6%), pau-ferro (*Libidibia ferrea*; 6%), and catingueira (*Poincianella laxiflora*; 6%). In PT, the pau-ferro was the most frequently mentioned (13%), followed by aroeira (11%), faveleira (9%), and catingueira (9%). There was a greater consensus among the SB informants in terms of the use of aroeira, faveleira, catingueira, ameixeira, and braúna. Moreover, the consensus among PT informants was higher for aroeira, faveleira, pau-ferro, joazeiro, quebra-facão, and umburana de cheiro.

The medicinal uses of the plants were classified according to six disease categories: inflammatory diseases, blood disorders, respiratory diseases, pain, bone diseases, and other diseases or symptoms (This category was not compared to the others because it includes a wide variety of diseases and some of the uses reported by the informants were symptoms rather than illnesses). The greatest UC among the PT and SB informants were blood disorders (0.66) and inflammatory diseases (0.62), respectively. The plant most commonly used to cure inflammatory diseases was aroeira, followed by ameixeira, truquia, and faveleira. Pau-ferro and braúna were used for blood disorders. The largest number of symptoms treated were in the pain category (Figure 1), and the plant parts that were used most by respondents in SB and PT were the bark (64%) and bast (39%), respectively (Figure 2). The macerated form was the most cited use form for both communities (46% in SB and 66% in PT).

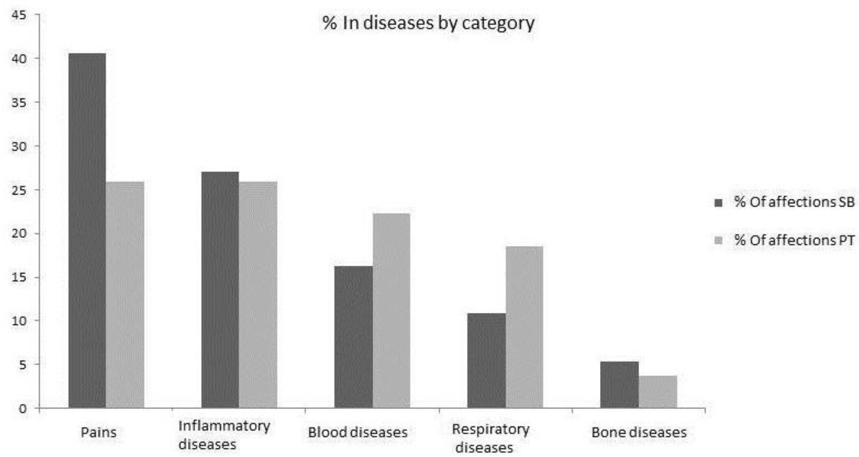

Figure 1
Frequency percentage of number of affections by disease category. SB = São Bento, and PT = Patamuté

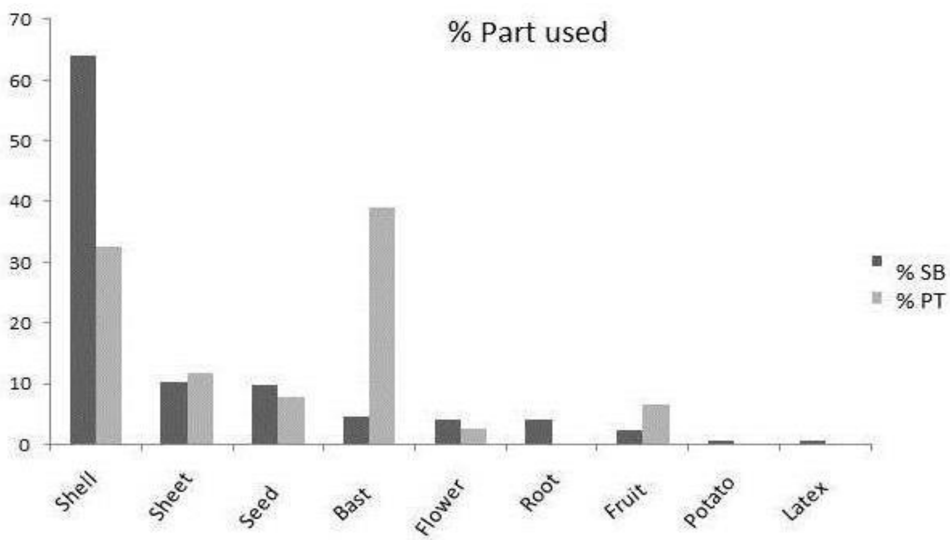

Figure 2
Parts of the plants used in traditional medicine in the communities of São Bento (SB) and Patamuté (PT).

Among the uses mentioned by study informants, treatments for stomachache, flu, inflammation, kidney pain, and cicatrization were the most frequent. According to the phytosociological survey in the background pasture areas around the informants' houses, 17 of the 24 identified species were used as medicinal aids by the population. Furthermore, of these species, 13 have an importance value index (IVI) of less than 15%, and eight of these species are Caatinga endemics (Table 2, Figure 3).

Table 2
Species identified in the phytosociology surveys, with their importance value index (IVI) and endemism. Asterisks (*) indicate species cited during the interviews. SB = São Bento, and PT = Patamuté.

Species	IVI SB	IVI PT	Endemic species
*Cnidoscolus quercifolius**	70.12	33.98	
*Poincianella laxiflora**	59.41	149.51	X
*Jatropha mollissima**	37.07	34.89	X
*Anadenanthera colubrina**	25.61	7.88	
*Spondias tuberosa**	14.03	9.26	X
*Commiphora leptophloeos**	13.96	1.71	
*Myracrodruon urundeuva**	13.03	4.04	
*Aspidosperma parvifolium **	10.95	2.71	X
*Pseudobombax simplicifolium**	6.21	-	
*Schinopsis brasilienses**	4.18	-	
*Melochia tomentosa**	1.71	-	
*Mimosa tenuiflora**	1.04	-	
*Sideroxylon obtusifolium**	0.96	-	
*Cereus jamacaru**	0.8	-	X
*Jatropha multabilis**	-	13.29	X
*Ziziphus joazeiro**	-	1.53	X
Croton sp.	-	13.57	
Lippia microphylla Cham.	-	11	
Pilosocereus gounellei (F. A. C. Weber) Byles & Rowley	1.59	5.04	X
Tacinga palmadora (Britton & Rose) N. P. Taylor & Stuppy	-	3.7	X
Manihot sp.	-	2.45	
Erythroxylum caatingae Plowman	-	2.19	
Coursetia rostrata Benth.	-	2.17	X
Facheiroa sp.	-	0.79	
Croton blanchetianus Baill.	32.24	-	
Lonchocarpus sericeus (Poir.) Kunthex DC.	2.08	-	

The species *Pseudobombax simplicifolium*, *Schinopsis brasiliensis*, *Melochia tomentosa*, *Mimosa tenuiflora*, *Sideroxylon obtusifolium*, and *Cereus jamacaru* only occurred in SB, and *Jatropha mutabilis* and *Ziziphus joazeiro* only occurred in PT. These species are very common in the Caatinga, and so their absence from individual areas may be related to human activity. For instance, species such as *S. tuberosa* and *Z. joazeiro* are used to feed goats and sheep, and this reduces their abundance.

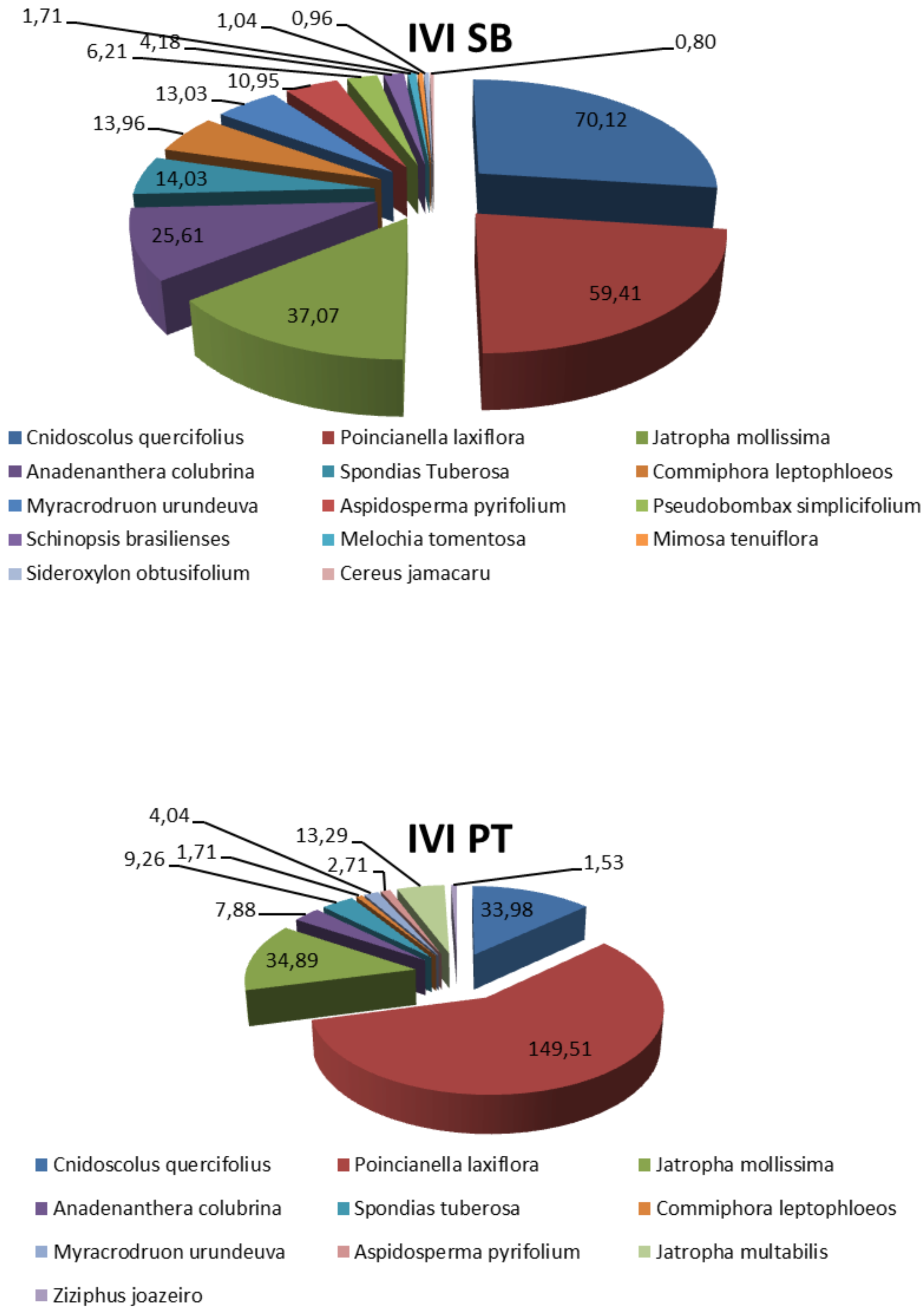

Figure 3
Importance value index (IVI) of the species found in background pasture areas of the São Bento (SB) and Patamuté (PT) communities.

Figure 3 shows that some species, such as *P. laxiflora* and *C. quercifolius,* are most commonly used in traditional medicine, and they still have a high IVI. However, other species, such as *M. urundeuva*, which is the most used plant in SB, are less commonly used and have a small IVI. *L. ferrea* is the most used in PT, but it was not found in the phytosociological survey.

DISCUSSION

A comparison between the two communities shows some interesting differences. In SB, *Myracrodruon urundeuva* had the highest VU, and this species is easily found in the background pasture at both SB and PT. In PT, *Libidibia ferrea* had the highest VU, but this species was not found in the phytosociological survey in either area. *L. ferrea* is, therefore, a species that should be cultivated in the community because it is rare in the local region. *L. ferrea* is a very common species in the Caatinga as a whole, and its rarity in the study areas was very unexpected. Probably, this species is over used in the area because its wood has many uses; only isolated individuals were observed in the field.

Even though the PT community had 22 species and the SB community had only 16 species, the SB community used more of its native vegetation than the PT community: 87.5% of the species identified in the phytosociological survey in SB were used medicinally, whereas only 45.5% of the species recorded in PT had a medicinal use. This difference can be attributed to several factors, including one respondent in SB who cited an especially large number of species (29).

Most of the respondents interviewed were elderly (> 60 years). The use of medicinal plants was considerably high in populations with the greatest number of elderly respondents. This fact suggests that younger members of the population pay less attention to the knowledge of medicinal plants that has been passed down through generations. According to Medeiros *et al.* (2004), the modern media have caused a loss of orally transmitted knowledge about the use of plants, and this reinforces the importance of studies focusing on preserving the ethnopharmacological knowledge of traditional populations.

Regarding the disease categories, the “pain” (In this study, the symptom “pain” was considered a disease since several members of the study population spoke of it as such) category was mentioned most often, and catingueira and umburana-de-cheiro (*Commiphora leptophloeos*) were the species most frequently used to cure intestinal pain. Furthermore, the species most often cited for the healing of inflammatory diseases were aroeira and ameixa (*Ximenia americana*).

Siqueira *et al.* (2011) evaluated the tannin content of the bark of several species, and found that *L. ferrea, A. colubrina, M. tenuiflora, S. brasiliensis,* and *M. urundeuva* had high tannin content. Monteiro *et al.* (2005) conducted a pharmacological trial where tannin was also found in the bark of *M. urundeuva*. Aroeira (*M. urundeuva*) is the species with the greatest diversity of uses, and it was the most cited among the informants. Moreover, aroeira is referenced in many ethnopharmacological studies (Morais *et al.*, 2005; Monteiro *et al.*, 2005; Oliveira *et al.*, 2007; Albuquerque *et al.*, 2011; Leite *et al.*, 2012; Lucena *et al.*, 2012). In pharmacological trials using an ethanol extract of *M. urundeuva* seeds, Ferreira *et al.* (2011) found traces of steroids and alkaloid phenols that showed *in vitro* cytotoxic activity against human tumor cells (twice as active in leukemia cells). Souza et al. (2007), using the model of ulcer induction in rats with ethanol and indomethacin (a nonsteroidal anti-inflammatory drug), showed that orally administered *M. urundeuva* extracts produced anti-ulcer activity. In a study conducted by Carlini *et al.* (2010), extracts prepared using a decoction of the bark had a marked protective effect on the gastric mucosa against ulceration induced by immobilization stress in rats at low temperatures when the pH and gastric content volume were high. However, gastric bleeding and intestinal transit reduction occurred in mice. Goes *et al.* (2005) tested an aqueous extract of *M. urundeuva* bark in rats in order to verify interference with the healing of colonic anastomosis. The results showed that the extract acts by inhibiting the inflammatory phase and interfering with collagen deposition, but does not affect final cicatrization.

Several studies, both ethnobotanical and laboratory-based, have reported the use of *M. urundeuva* for the treatment of general inflammation, cough, and external wounds. According to Albuquerque and Andrade (2002), the use and extraction of the bark of this species for topical use could lead to its extinction in some regions. This is confirmed by MMA (2008), which includes *M. urundeuva* on the official endangered species list. Research and bioprospecting of species with medicinal properties are indeed important for the manufacture of herbal medicines in the future. However, it is essential that these surveys be conducted within the context of the National Policy on Medicinal Plants and Herbal Medicines, which takes into account the sustainability of Brazilian biodiversity and the appreciation and preservation of traditional knowledge associated with traditional communities. These studies support the medicinal use of *M. urundeuva* by traditional populations.

L. ferrea (formerly *Caesalpinia ferrea*) is also on the list of medicinal plants and herbal medicines in the Brazilian Pharmacopoeia (Brazil, 2011), and its gel form is indicated as a healing aid and antiseptic. Lima *et al.* (2011) reported anti-inflammatory activity of *L. ferrea* in albino rat females using an extract from the pod (bark and seeds). Their study concluded that an ethanol extract from this species was able to inhibit inflammatory reactions and pain, and this provides experimental support for the plant's traditional use in treating various diseases associated with inflammation and pain. A preliminary study of phytochemical hydroalcoholic extracts from the bark, stems, and leaves showed the presence of flavonoids, saponins, tannins, coumarins, sterols, and phenolic compounds in *L. ferrea* (Gonzalez *et al.,* 2004). The bark is used for treating rheumatism and is beneficial for the cardiovascular system (Menezes *et al.,* 2007). Some therapeutic properties of this species have been described and include anti-ulcerogenic (Bacchi *et al.,* 1995), anti-inflammatory, and analgesic properties (Thomas *et al.,* 1998). The aqueous seed extract has been shown to contain cellulase and amylase anticoagulants and to exhibit larvicidal properties against *Aedes aegypti* (Cavalheiro *et al.,* 2009). Treatment with the fruit significantly reduced the average number of papillomas in experiments that examined the effects of 12-O-tetra-decanoylphorbol-13-acetate (TPA) on skin tumor formation in mice exposed to 7.12 dimethylbenz [α] anthracene (DMBA) (Nakamura *et al.,* 2002).

The faveleira (*C. quercifolius*) is a species with great economic potential, mainly because of its oil content and edible seeds, which are rich in minerals and protein (Marques, 2007). The high-energy oil is an olive oil substitute, with no difference in flavor (Duque, 1980; Gomes, 1982). The oil composition in seeds is 32% and the almond is 54% and that food a high level of nitrogen. (Daun *et al.,* 1987). Recent studies have indicated the presence of coumarins, flavonoids, tannins, and terpenoids in extracts from *Cnidoscolus*, which were also active against standard and coagulase-negative strains and clinical isolates of *Staphylococcus aureus* (Peixoto Sobrinho *et al.,* 2012a). These authors also found that extracts from species of this genus have high levels of phenolic compounds and high antioxidant activity as measured by DPPH assay. The US National Cancer Institute scale for evaluating cytotoxic potential states that cell growth inhibition between 50% and 70% is considered active. Peixoto Sobrinho *et al*. (2012b) found that *C. quercifolius* displayed active potential for two cancer types (cervical and laryngeal), and its cytotoxic potential might lead to promising discoveries of bioactive compounds. Their study demonstrated that *C. quercifolius* is promising because there are several potential substances in the extracts, and the activity of the responsible compounds may have increased their medicinal potential after isolation, allowing a reduction in concentration and carcinogenic activity. In this study, among the various uses cited by our informants, the closest matches to the uses identified by the aforementioned scientific studies are uses for female infections, healing, and inflammation, in which the bark and bast were used as curatives. The presence of flavonoids explains why this species has a high potential for curing inflammatory problems. However, we were unable to identify additional scientific studies with proven medicinal potential that were linked to the many other uses described by the informants.

According to the Brazilian Pharmacopoeia (Brazil, 2011), maceration in water a suitable preparation method for plants with drug substances that degrade upon heating. However, infusion is suggested for herbs with less rigid structures, such as leaves, flowers, inflorescences, and fruits, or those containing volatile active substances. Lastly, decoction is recommended for preparing herbal drugs from rigid plant structures such as bark, roots, rhizomes, stems, seeds, and leathery leaves. It was observed that there is no standard portion used by the local population as compared to the dosage standards recommended by the Brazilian Pharmacopoeia. According to Santos & Beinner (2005) (cited in Dutra, 2009), effective use of active plant ingredients requires the correct preparation (i.e., the specific plant parts used for the extraction of each active

It was not confirmed whether there is a link between the availability and knowledge of uses of the species of the study areas, since knowledge of the local population reflects their needs and the current use is not necessarily associated with positive and negative impacts on the species conservation. Ferraz *et al.* (2006) states that relations between plant species cultural importance, expressed by use value, and and its availability in nature, expressed by the importance value, may mean that not all plant species are used according to their availability and the use of a resource and the knowledge of its use can generate a positive and negative impact on their sustainability.

This situation can be seen in our study area with respect to *Poincianella laxiflora* and *Cnidoscolus quercifolius*. *Poincianella* had a low VU (0.17) and a low IVI (59.12) in SB, but in PT it had a high VU (0.54) and a high IVI (149.51). These numbers shows that the use of *P. laxiflora* follows its availability in nature. By contrast, this pattern was not observed in the *C. quercifolius* numbers in PT, because in that locality it was not very available (IVI = 70.12) and had a high VU (0.92).

Following the Code of Ethics of the International Society of Ethnobiology (ISE, 2006), our research results were made available to the participating communities in the form of pictures and posters describing the most cited species, and these included photos with botanical descriptions. In addition, the population was invited to discuss and ask questions about our research results at an event sponsored by the Mata Branca Project.

CONCLUSION

Traditional knowledge of background pasture community areas will likely contribute significantly to bioprospecting research on Caatinga plants. Some of the listed species are already known scientifically as plants with medicinally active ingredients. The present study revealed other potential medicinal species. We recommend that the low IVI plants be conserved and used for future reforestation activities. For example, we recommend that *Spondias tuberosa*, *A. colubrina*, *Z. joazeiro*, *M. urundeuva*, *S. brasiliensis*, *C. leptophloeos*, *P. simplicifolium*, *Aspidosperma parvifolium*, *J. mutabilis*, *M. tomentosa*, *M. tenuiflora*, and *S. obtusifolium* be propagated and used in reforestation projects in the studied Caatinga areas.

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