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Ethnobotanical survey of medicinal plants used by the community of Sobradinho, Luís Correia, Piauí, Brazil

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An ethnobotanical survey of medicinal plants used by the Sobradinho community, Luís Correia, Piauí, Brazil was undertaken to recover and document traditional knowledge with the aim of supporting chemical, biological, agronomic, pharmaceutical and socio-economic studies related to the region's biodiversity. Fifteen research visits to the community were made between March 2013 to January 2014 involving 31 respondents from the community, the majority (74.4%) being women aged between 27 and 84 years. The methodology used was interview by the snowball method using questionnaires. Analysis of the data gathered was based on use value and the Shannon-Wiener diversity index. Botanical voucher specimens were made of the species cited by informants and deposited at the HDELTA herbarium. 57 species belonging to 33 families were identified, of which 56% were native and 44% exotic. The best represented families were Fabaceae (14%), Lamiaceae and Myrtaceae (9% each). The leaves were the most frequently used plant parts (69%), followed by the stem (22%), fruit (4%), flower (2%), root and seed (1%). The species that showed the highest use value (VU) were *Cymbopogon citratus* (DC.) Stapf (capim-santo) and *Morinda citrifolia* L. (noni) with VU = 0.26. The Shannon-Wiener index value was highest for the elderly group (n=15, 48% of total respondents), but young people were not represented among the informants. A total of 67 different medicinal indications were recorded, the highest number of species being used to treat medical conditions associated with inflammation, pain and fever. Informants claimed to have learned the use of medicinal plants from older members of the community and there was little interest evident among young people in acquiring this knowledge. Community informants are the holders of medicinal plant knowledge of the local flora and its practical application.

Key words: Biological diversity, ethnobotany, floristics, medicinal plants, Piauí.

INTRODUCTION

Local community knowledge in the use and management of natural resources and their ethical, biological and cultural implications are relevant and important factors in the management of both the development and the conservation of protected areas (Fonseca-Kruel and Peixoto, 2004; Miranda and Hanazaki, 2008). However, it

is known that popular knowledge of medicinal plants has been diminishing over time, because of the extinction of indigenous peoples who left no written records, also due to new social habits and better access to modern medical services, which leads to a preference for science-based therapies introduced from outside local cultural traditions (Amorozo, 2002). The study and preservation of this knowledge, comprising the direct interrelationships between humans and plants characteristic of traditional, non-science-based societies, is part of the research field of ethnobotany (Albuquerque, 2010).

Ethnobotanical research covering various areas of Brazil has increased noticeably over recent decades and has both demonstrated the importance of local plant knowledge and highlighted the need for further scientific studies (Hanazaki et al., 1996; Silva-Almeida and Amorozo, 1998; Silva and Proença, 2008; Chaves and Barros, 2012; Sousa et al., 2012; Povh and Alves, 2013; Carvalho et al., 2013; Viganó et al., 2013; Cavalcante and Silva, 2014; Nascimento, 2014; Ribeiro et al., 2014; Baliano et al., 2015).

In developing countries, ethnobotanical research has a potential role of immense value to local communities and to regional and national stakeholders, by drawing attention to plants with market potential that could generate sustainable income without damaging the environment (Oliveira et al., 2009). Furthermore, popular knowledge of plant uses, accumulated over centuries, often represents the only therapeutic resource for many communities and ethnic groups with very low disposable incomes and poor access to modern industry-based medicine.

The importance of ethnobotanical research in Brazil is a consequence of the nation's great biological and cultural diversity, the latter including communities such as settlements of indigenous peoples, quilombos (settlements founded by escaped slaves), fishing communities, smallholder farming communities, ribeirinhos (traditional riverside communities), among others. Brazil's flora (46,097 species currently recognized; Lista de Espécies da Flora do Brasil, 2015) includes about 22% of all plant species described worldwide, and these are the source of material for all kinds of craft objects, genetic resources, economically important plant products and articles of symbolic and religious significance for such communities (Albuquerque, 2004).

Although, there are many published research articles on the ethnobotany of different parts of Northeast Brazil (Ritter et al., 2015); there are still few for the state of Piauí (Vieira et al., 2008; Aguiar and Barros, 2012; Meireles, 2012; Baptistel et al., 2014; Nascimento, 2014). The knowledge gaps in currently available information influence public policies on conservation and filling these information lacunae makes research planning guided and financed by government and non-government bodies more effective (Ritter et al., 2015).

As part of its policy for the protection of natural resources, the Brazilian government has included within conservation units representative areas of various biomes and one of such is the coastal biome (Arruda, 2001). The study area of the present paper, the community of Sobradinho in the municipality of Luís Correia, Piauí State, lies within the Area of Environmental Preservation (APA) of the Rio Parnaíba Delta, itself located within the coastal biome. The specific aim of the present study was thus to record for posterity traditional cultural knowledge of medicinal plants retained by the population of Sobradinho.

MATERIALS AND METHODS

The study was carried out in the community of Sobradinho (2°58'22"S and 41°33'16"W), municipality of Luís Correia, Piauí State. Luís Correia is one of the four municipalities of the coastal region of Piauí located in the micro-region "Litoral Piauiense". It consists of an irregular area of 1,072.20 km^2, limited to the north by the Atlantic Ocean, to the south by the municipality of Cocal, to the east by the municipality of Cajueiro da Praia and the state of Ceará, and to the west by the municipalities of Parnaíba and Bom Princípio do Piauí (Aguiar, 2004). According to the latter author, the community of Sobradinho is included in a Rural Macrozone of Environmental Preservation within the municipality of Luís Correia and lies 20 km from the municipal administrative center, that is, the town of Luís Correia. According to data obtained by the community agent, the total population of Sobradinho consists of 345 inhabitants.

The ethnobotanical data were collected during 17 excursions between March 2013 and January 2014 using quantitative and qualitative methods. For qualitative analysis, interviews were conducted using standardized forms containing structured and semi-structured questions, as implemented by Martin (1995), Alexiades (1996) and Albuquerque and Lucena (2006).

The "snowball" technique was used to find informants (Albuquerque, 2004) as follows: the first person contacted within the community was asked to indicate the first specialist informant, who then indicates other experts who in turn indicate others, until no new specialist informants are identified and the cycle terminates.

Contact with the interviewees was made directly at their homes using a non-probabilistic sampling design, which by definition is "a subset of the population in which the choice of the elements does not depend on chance, but on the characteristics of the research" (Sampieri et al., 2006). Authorization was given by informants prior to interviews, in the form of signed informed consent forms.

The data sought from the questions included socioeconomic information about the informants, such as education level, age, occupation, income, time of residence, level of knowledge on the use of local plant species for medicinal purposes, and information on modes of preparation and plant parts used. The names of the plants were recorded according to the pronunciation of the interviewees.

For quantitative analysis, the use value criterion was employed, a

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method proposed by Phillips and Gentry (1993) and modified by Rossato et al. (1999). Use value is defined by the formula VU = ΣU / n, where VU = use value; U = number of reports (or uses) of the ethnospecies per informant and n = total number of informants. Another quantitative measure used was the Shannon-Wiener diversity index, as implemented in the analysis software PAST (Magurran, 1988), which assesses the knowledge of individuals by their gender and age group. The medicinal use categories of the plants followed the disease classification of the database of the International Classification of Diseases (SCTIE, 2006). The data was organized in worksheets of the spreadsheet software EXCEL 2010, for the purpose of statistical summary and analysis.

Data collection was supported with the help of a person in the community recognized as knowledgeable about the flora and its uses. The preparation of herbarium specimens and identification of sampled plants were carried out using standard taxonomic methods (Fidalgo and Bononi, 1984). Identification was carried out with the help of taxonomic literature, analytic keys and whenever possible, by comparison with previously determined specimens. The names of botanical taxa and their authors follow the Lista de Espécies da Flora do Brasil (2015). The plant family classification of APG III (2009) was used.

Voucher specimens of the plant species were incorporated into the collection of the herbarium of the Rio Parnaíba Delta (HDELTA), at the Federal University of Piauí, Campus Ministro Reis Velloso, Parnaíba, Piauí, Brazil.

RESULTS AND DISCUSSION

Of the thirty one interviewees included in the study, 13% were men aged between 36 and 69 years and 87% were women aged between 27 and 84 years. The average age of the respondents was 57 years, showing that possession of ethnobotanical knowledge tends to be characteristic of older adults in the Sobradinho community. Cavalcante and Silva (2014) recorded the age range of informants as 28 to 60 years, 56% women and 44% men, 50% older than 40 years. Similar results on women's knowledge about plants were found by Pinto et al. (2006), Voeks and Leony (2004) and Quinteiro et al. (2015). According to the last author, women had higher involvement with cultivated plants in backyards and gardens as this required less concerted effort, while men focused on collecting medicinal plants in the wild, guided by popular knowledge. These facts demonstrate that there is a desire to maintain, if not increase the number of native species used for medicinal purposes by local rural communities.

Fifty two percent of the interviewees were categorized as adults and 48% as elderly people. No young informants were mentioned or included in the sample. A similar predominance of adult informants was found by Sousa (2010) and Meireles (2012) in their ethnobotanical surveys. The lack of young participants may be a consequence of reduced opportunities for formal education (only primary school is available) and for employment. Thus, young people move out of the community to the surrounding towns, especially to Luís Correia, the administrative center of the municipality. Other studies (Pinto et al., 2006; Voeks and Leony, 2004; Quinteiro, 2015) show that the advanced age of most informants may result from young individuals in these communities losing interest in understanding local plants and their potential uses. The presence of compulsory education systems in communities seems to be inversely related to the level of empirical knowledge of medicinal plants (Voeks and Leony, 2004; Quinteiro, 2015). The latter study showed that popular knowledge has not been transmitted to younger generations, highlighting the need to carry out ethnoscientific biodiversity studies before this knowledge is lost for good (Quinteiro et al., 2015).

Our results also suggest that most ethnobotanical knowledge is not being transmitted from the elderly to younger people. This may be because of the continuing urbanization of the community and the migration of younger generations to larger cities where they have greater access to jobs, education and health and where new options are available for products and services beyond those offered by traditional knowledge of biodiversity (Diegues, 2000). Generally, popular knowledge of medicinal plants is transferred from generation to generation by word of mouth (oral tales) rather than in written form (Yirga et al., 2012). There is a great danger that this knowledge will be lost in the future due to lack of interest by younger people.

Regarding educational attainment, 32% of respondents had no schooling, 58% had an incomplete primary education and 10% had a complete or incomplete high school level education. Tamiru et al. (2014) and Quinteiro et al. (2015) recorded that most key informants (62%) were either illiterate or only studied as far as elementary school.

The overall family income of respondents ranged from one to four times the minimum salary. Sixty five percent of the respondents earned the minimum salary, 29% up to two minimum salaries and 6% earned two or more minimum salaries. Oliveira et al. (2010), in their study of rural communities in the town of Oeiras in the semi-arid region of Piauí, found that family income in 75% of informants was one minimum salary or less. This is a reflection of the shortage of local employment and low wage levels. The income-generating activities within the Sobradinho community include traditional fishing and agriculture, which are carried out mainly by men.

Fifty seven species of plants used in traditional medicine by the Sobradinho community were recorded, distributed among 52 genera and 33 plant families (Table 1). The families with the largest number of species were Fabaceae (14% of total recorded medicinal species), Lamiaceae and Myrtaceae (9% each). The Fabaceae was also the best-represented family in medicinal plant surveys carried out in Pernambuco (Rodrigues and Andrade, 2014) and in Ceará (Ribeiro et al., 2014) and Lamiaceae was the most frequently recorded family in studies by Coutinho et al. (2015), Cavalcante and Silva (2014), Mosca and Loiola (2009), Oliveira and Menini Neto (2012) and Coutinho et al. (2015).

Table 1. Medicinal uses of plant species used by residents of the Sobradinho community, Luís Correia, Piauí.

Species	NV	UP	TI	OR	HA	VU
Acanthaceae						
Justicia pectoralis Jacq.	Anador	Leaf	Headache, cold/flu	N	Subshrub	0.06
Amaranthaceae						
Dysphania ambrosioides (L.) Mosyakin and Clemants	Mastruz	Leaf	Abdominal pain, cicatrizant, inflammation, kidney/bladder stones, cold/flu, muscular pain	N	Subshrub	0.19
Anacardiaceae						
Anacardium occidentale L.	Cajueiro	Stem	Inflammation	N	Tree	0.06
Mangifera indica L.	Mangueira	Leaf	Backpain	E	Tree	0.03
Myracrodruon urundeuva Allemão	Aroeira	Stem and leaf	Inflammation, cold/flu	N	Tree	0.13
Annonaceae						
Annona muricata L.	Araticum	Leaf	Cholesterol	N	Tree	0.03
Apocynaceae						
Allamanda cathartica L.	Grão-de-bode	Root	Prostate inflammation	N	Shrub	0.03
Allamanda blanchetii ADC.	Quatro-Pacata	Root	Diarrhoea	N	Shrub	0.03
Asteraceae						
Lactuca sativa L.	Alface	Leaf	Arthritis	E	Herb	0.03
Vernonia condensate Baker	Boldo (folhapequena)	Leaf	Digestion aid, liver pain	E	Tree	0.03
Bignoniaceae						
Handroanthus impetiginosus (Mart. ex DC.) Mattos	Pau-d´arco-roxo	Stem	Prostate inflammation	N	Tree	0.03
Caricaceae						
Carica papaya L.	Mamão	Flower	Diarrhoea, prostate inflammation	N	Tree	0.03
Chrysobalanaceae						
*Licania tomentosa (*Benth) Fritsch	Oiti	Stem	Diabetes, cholesterol	N	Tree	0.10
Combretaceae						
Terminalia catappa L.	Almenda	Leaf	Gastritis, heart pain	E	Tree	0.10
Convolvulaceae						
Operculina macrocarpa (L.) Urb.	Goma-de-purga	raiz	Hemorrhoids	N	Shrub	0.03
Crassulaceae						
Bryophyllum pinnatum (Lam.) Oken	Corama	Leaf	Cold/flu, cough, sore throat, gastritis	E	Herb	0.19

Table 1. Cont'd.

Euphorbiaceae						
Croton species	Mameleiro-preto	Stem and other parts	Kidney stones	N	Shrub	0.06
Jatropha ribifolia (Pohl) Baill.	Piãomanso	Leaf	Headache	N	Shrub	0.03
Phyllanthus niruri L.	Quebra-pedra	Root	Kidney pain	N	Herb	0.06
Fabaceae-Caesalpinioideae						
Caesalpinia bracteosa Tul.	Catinqueira	Flower	Cold/flu	N	Shrub	0.13
Hymenaea courbaril L.	Jatobá	Stem	Cough, cold/flu, diarrhoea	N	Tree	0.10
Caesalpinia ferrea Mart.	Jucá	Stem and other parts	Inflammation	N	Tree	0.10
Copaifera langsdorffii Desf.	Podói	Stem	Gastritis	N	Tree	0.13
Fabaceae-Mimosoideae						
Vachellia farnesiana (L.) Wight and Arn.	Coronha	Leaf	Body pains	N	Tree	0.03
Anadenanthera colubrine (Vell.) Brenan	Angico-preto	Stem	Prostate inflammation, stomach ache	N	Tree	0.10
Fabaceae-Papilionoideae						
Amburana cearensis (Allemão) A.C.Sm.	Iburana-de-cheiro	Stem	Cold/flu, skin inflammation, headache,virus infection	N	Tree	0.16
Tamarindus indica L.	Tamarindo	Leaf	Stomach ache	E	Tree	0.06
Iridaceae						
Iris sibirica L.	Palmeirinha	Root and other parts	Diarrhoea	E	Herb	0.06
Lamiaceae						
Plectranthus barbatus Andrews	Boldo (folhagrande)	Leaf	Liver pain	E	Herb	0.10
Lippia alba (Mill.) N.E.Br. ex Britton and P.Wilson	Herb-cidreira	Leaf	Calming agent, headache	E	Subshrub	0.23
Mentha spicata L. × *Mentha suaveolens* Ehrh.	Hortelã	Leaf	Heart pain, menstrual pain, stomach ache, cold/flu	E	Herb	0.03
Plectranthus amboinicus (Lour.) Spreng.	Malva	Leaf	Cold/flu, sore throat	E	Herb	0.16
Mentha arvensis L.	Vique	Leaf	Cold/flu	E	Herb	0.16
Liliaceae						
Aloe vera (L.) Burm.f.	Babosa	Leaf	Hair strengthener, wound healing	E	Herb	0.23
Lythraceae						
Punica granatum L.	Romã	Other parts	Sore throat	E	Shrub	0.03
Malvaceae						
Gossypium herbaceum L.	Algodão	Leaf and other parts	Inflammation	E	Shrub	0.10
Marsileaceae						
Marsilea quadrifolia L.	Trevo-de-quatro-folhas	Leaf	Menstrual pain, cold/flu	E	Herb	0.16

Table 1. Cont'd.

Meliaceae						
Azadirachta indica A.Juss.	Ninho	Leaf	Diabetes	E	Tree	0.03
Myrtaceae						
Syzygium jambolanum (Lam.) DC.	Azeitona	Stem	Gastritis	E	Tree	0.03
Eucalyptus globulus Labill.	Eucalipto	Leaf	Fever	E	Tree	0.03
Psidium guajava L.	Goiabeira	Leaf	Diarrhoea	N	Tree	0.06
Campomanesia aromatica (Aubl.) Griseb.	Guabiraba	Leaf	All kinds of diseases	N	Shrub	0.03
Eugenia uniflora L.	Pitanga	Leaf	Diarrhoea	N	Shrub	0.03
Oleaceae						
Ximenia americana L.	Ameixa	Stem and leaf	Inflammation	N	Tree	0.23
Oxalidaceae						
Averrhoa carambola L.	Carambola	Other parts	Kidney pain	E	Tree	0.03
Passifloraceae						
Turnera ulmifolia L.	Chanana	Flower	Wound healing	N	Subshrub	0.03
Poaceae						
Cymbopogon citratus (DC.) Stapf	Capim-santo	Leaf	Cholesterol, intestinal pain	E	Herb	0.26
Rhamnaceae						
Ziziphus joazeiro Mart.	Juá	Stem	Cold/flu, inflammation	N	Tree	0.06
Rosaceae						
Coutarea hexandra (Jacq.) K. Schum.	Quina-Quina	Stem	Intestinal pain	N	Tree	0.06
Rubiaceae						
Morinda citrifolia L	Noni	Other parts	Inflammation, gastritis, kidney pain, cancer, liver pain	E	Tree	0.26
Genipa americana L.	Genipapo	Stem	Inflammation	N	Tree	0.03
Rutaceae						
Citrus × *limonum* Risso	Limão	Leaf and other parts	Cold/flu, sore throat	E	Tree	0.06
Citrus × *aurantium* L.	Laranja	Leaf	Cold/flu	E	Tree	0.06
Ruta graveolens L.	Arruda	Leaf	Uterine inflammation	E	Shrub	0.03
Sapotaceae						
Manilkara dardanoi Ducke	Massaranduba	Stem	Inflammation	N	Tree	0.03

Table 1. Cont'd.

Solanaceae						
Solanum paniculatum L.	Jurubeba	Stem	Uterine inflammation	N	Shrub	0.03
Urticaceae						
Cecropia glaziovii Snethl.	Torém	Leaf	Inflammation	N	Tree	0.03

NV: Local vernacular name; VU: use value; OR: origin; HA: Habit; N: native; E: exotic; TI: indicated therapeutic use; UP: plant part utilized. Species in alphabetical order of plant family.

The community of Sobradinho lacks health services, such as a hospital, and so recourse to alternative medicinal practices is frequent. These practices persist when health services are inaccessible for part of the population (Quinteiro, 2015). Another reason for the preference for treatment based on traditional medicine knowledge is the high cost of allopathic medicines (Medeiros et al., 2004).

Most species used in traditional medicine (56%) belong to the native vegetation of Brazil, as defined by the Lista de Espécies da Flora do Brasil (2015). This corroborates the findings of research conducted in Piauí by Abreu (2000) in the Quilombo Mimbo, municipality of Amarante, by Franco et al. (2006) in the Quilombo Olho D'Água from Pires in Esperantina, and by Vieira (2008) in the Quilombo dos Macacos, São Miguel do Tapuio. Quinteiro et al. (2015) reported 45% native species in their study and concluded that the use of medicinal plants does not seem to be a threat to environmental conservation. Among the native species, mastic (*Myracrodruon urundeuva* Allemão) is included in the official list of endangered species, and in the vulnerable category of ICMbio (Oliveira et al., 2010). Most species cited by informants are cultivated in backyards and gardens.

Plant parts used by Sobradinho community (as a percentage of total plant parts used) are leaf (69%), stem (22%), fruit (4%), flower (2%), root and seed (1%). The leaf is the plant part most commonly used in local folk medicine for the treatment of the diseases cited (use categories) (Figure 1). However, some species do not have leaves throughout the year, because they are deciduous during the dry season. Mindful of this, residents usually gather, dry and store leaves to create supplies for later use. Leaves were also recorded as the most utilized plant part in several other studies such as those of Fuck et al. (2005) and Franco et al. (2006), Quinteiro et al. (2014), Bailano et al. (2015) and Kumar (2015), among others.

Most species recorded in our study were woody: trees (53%), shrubs (19%) and subshrubs (7%), with only 21% of the total being herbs. The high percentage of woody species recorded in our study was similar to that found by Tolossa et al. (2013) who concluded that the high proportion of woody plants was associated with the greater ability of trees and shrubs to withstand long dry seasons. In general, this finding is contrary to the general patterns seen in most medicinal plant inventories, where herbs are the most common life form (Mesfin et al., 2009).

Native species formed 54% of the total recorded in our study, which is a much higher percentage than that found in many ethnobotanical studies of the eastern Atlantic Forest region of Brazil, in which most species cited and identified are exotic (Pinto et al., 2006; Albertasse et al., 2010; Bailano, 2015). This high proportion of exotics in the east coastal region may reflect a greater influence of European and African culture over what remains of indigenous medicinal plant knowledge (Marchese et al., 2009). In our study area, a number of exotic species have successfully adapted to local ecological conditions and may occur spontaneously, such as boldo (*Plectranthus barbatus* Andrews), capim-santo (*Cymbopogon citratus* (DC.) Stapf), malva (*Plectranthus amboinicus* (Lour.) Spreng.), *Phyllanthus niruri* L. and *Turnera ulmifolia* L.

The therapeutic uses of the plants in our study were indicated by 67 recorded statements, which were grouped into eight categories of medicinal use. Many species were mentioned more than once for different uses. The majority of the species were indicated to treat conditions associated with inflammation, pain and fever (21), as well as digestive problems (20), respiratory conditions (13), mental and behavioral disorders (7), conditions of the genito-urinary system (7), problems affecting the skin and nails (6), and diseases of the circulatory system (4) (Figure 2). Similar results were recorded in some other studies such as those of Albertasse et al. (2010) and Bailano et al. (2015). In agreement with the findings of Albertasse (2010), the plants used for medicinal purposes by the Sobradinho community were used mostly for the treatment of relatively minor ailments and are an element of primary

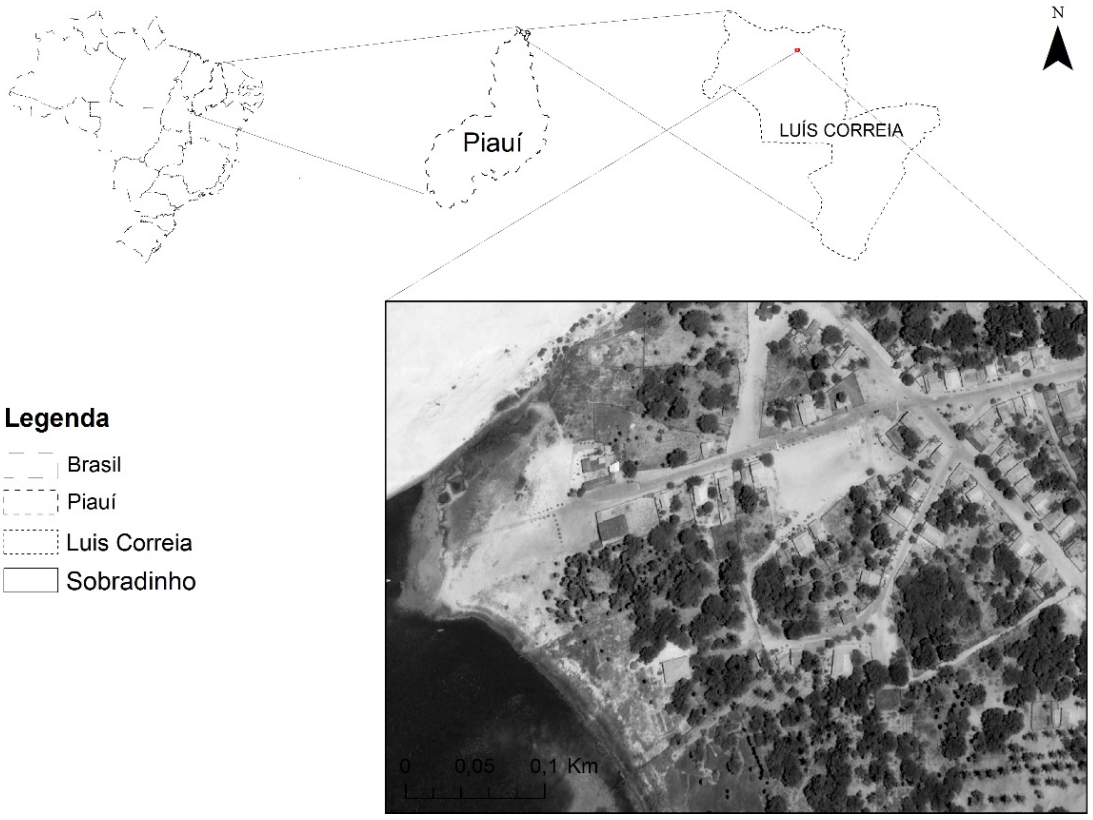

Figure 1. Geographic position of the community of Sobradinho within the municipality of LuísCorreia,Piauí state, Brazil.

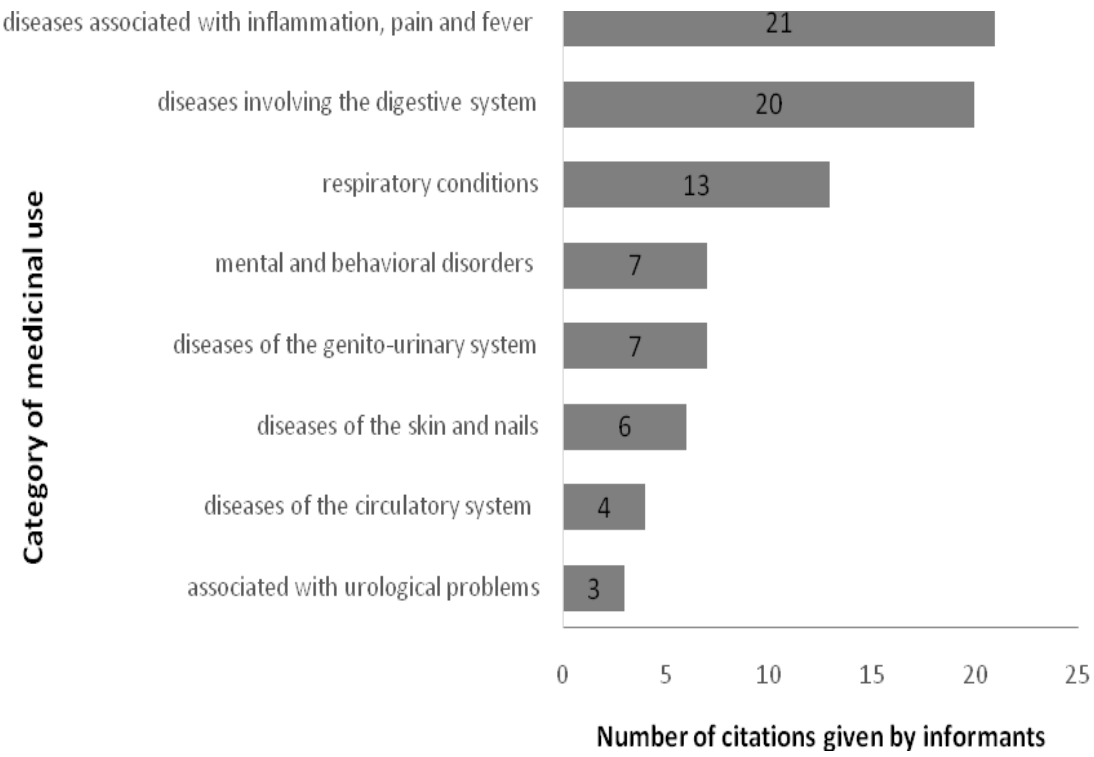

Figure 2. Number of plant species cited by informants in each category of medicinal use.

health care to treat such conditions as ulcers, gastritis, minor wounds, colds and flu, inflammation and pains. Most respondents (96%) use or have used medicinal plants for therapeutic purposes, while 4% said they had never used them. There are no pharmacies in the community, instead just a few small shops that sell some medicines. The community has a family health center provided with a doctor, a nurse and a community agent. The species showing the highest use values, that is, species with the greatest potential for use by the community, were *Cymbopogon citratus* (capim-santo) and *Morinda citrifolia* (noni) with a use value of 0.26, and *Ximenia americana* (ameixa) and *Lippia alba* (erva-cidreira) with a use value of 0.23 (Table 2). These results suggest that the species with the highest use values are actually or potentially important to the rural population of the region and in the case of native species, also important to consider in strategies for local biological conservation.

C. citratus (DC.) Stapf, a species originating from India, is cultivated throughout Brazil originally as an ornamental plant. The following popular uses of this plant are frequently cited: treatment for pain of the stomach and intestines, for diarrhoea, for cellulite and for oily hair (Silva, 2010). According to this author, the chemical composition of the leaves can vary if it is cultivated under environmental stress, e.g. urban air pollution, which reduces the synthesis of more polar compounds and favours the synthesis of leucoanthocynanin, probably for its own protection. These changes can in turn produce alterations in the tea made from the leaves, and consequently in its pharmacological and toxicological properties. Studies indicate that *C. citratus* possesses various pharmacological activities such as anti-amoebic, antibacterial, antidiarrheal, antifilarial, antifungal and anti-inflammatory properties. Various other effects like antimalarial, antimutagenicity, antimycobacterial, antioxidants, hypoglycemic and neurobehaviorial have also been studied (Shah et al., 2011).

C. citratus revealed a good antimicrobial activity against carbapenems-resistant *Klebsiella pneumonia* strains, suggesting possibility of application in the treatment of the nosocomial infections caused by this microorganism (Abu-Gharbia, 2015). It exhibited promising antifungal effect against *Candida albicans*, *Candida tropicalis*, and *Aspergillus niger* and inhibits the skin inflammatory response in animal models (Boukhatem, 2014).

The other species with high use value was *M. citrifolia,* known in Brazil as "noni". It has been reported to have a broad range of health benefits for cancer, infections, arthritis, diabetes, asthma, hypertension and pain and has been used in folk remedies by Polynesians for over 2000 years (Yeng et al., 2002). In our study, the informants reported using noni (*M. citrifolia* L.) mixed with grape juice as an important remedy for combatting inflammation, gastritis, kidney pain, cancer and liver pain. Rossato et al. (1999), Hanazaki et al. (2000), Miranda and Hanazaki (2008) and Sousa et al. (2012) reported the prevention of diabetes as the most common use category of this species. There has been considerable use of noni in Brazil as a result of the biological activity attributed to consumption of the juice of the fruit, particularly anti-cancer properties (Palioto, 2015). Studies carried out by Costa et al. (2013) and Palioto (2015) have shown there is antioxidant activity in the fruit. This activity could be related to its vitamin C content. However, the chemical composition of the plant, which is related to its biological properties, is also strongly influenced by the climate and soils of the locality where it is cultivated (Palioto, 2015).

In most cases, the active molecules of the medicinal herbs reported here are unknown. Studying the biological and pharmacological properties of medicinal plant extracts is a rational approach in the quest for new drugs. Phytochemical and pharmacological studies can lead to evidence of potential therapeutic use of medicinal plants and the development of new medicines. The traditional information accumulated by local people has an important role to play in this effort (Kumar et al., 2015).

Conclusions

The large number of species cited by the Sobradinho community shows that residents of the Sobradinho community are knowledgeable about medicinal plants and their practical uses. Women use medicinal plants on a daily basis more often than men, and the elderly are more knowledgeable than adults and young people. The species identified in the community supply a number of the residents' basic needs, although manufactured drugs are also required. It is noteworthy that the traditional knowledge can be regarded as an indicator for local initiatives in biological and cultural conservation, since it provides information needed for preserving and sustainably managing areas of different vegetation where the plants occur and also potentially contributes to the implementation of management plans in the study locality, which is part of the Rio Parnaíba Delta Environmental Conservation Area (APA Delta do Parnaíba).

Conflict of Interest

The authors have not declared any conflict of interest.

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Table 2. Use Values of plant species used by residents of the Sobradinho community, Luís Correia, Piauí.

Species	NV	VU
Cymbopogon citratus (DC.) Stapf	Capim-santo	0.26
Morinda citrifolia L	Noni	0.26
Lippia alba (Mill.) N.E.Br. ex Britton and P.Wilson	Herb-cidreira	0.23
Aloe vera (L.) Burm.f.	Babosa	0.23
*Ximenia americana*L.	Ameixa	0.23
Dysphania ambrosioides (L.) Mosyakin and Clemants	Mastruz	0.19
Bryophyllum pinnatum (Lam.) Oken	Corama	0.19
Plectranthus amboinicus (Lour.) Spreng.	Malva	0.16
Mentha arvensis L.	Vique	0.16
Amburana cearensis (Allemão) A.C.Sm.	Iburana-de-cheiro	0.16
Marsile aquadrifolia L.	Trevo-de-quatro-folhas	0.16
Myracrodruon urundeuva Allemão	Aroeira	0.13
Caesalpinia bracteosa Tul.	Catinqueira	0.13
Copaifera langsdorffii Desf.	Podói	0.13
*Licania tomentosa (*Benth.) Fritsch	Oiti	0.10
Terminalia catappa L.	Almenda	0.10
Plectranthus barbatus Andrews	Boldo (folhagrande)	0.10
Hymenaea courbaril L.	Jatobá	0.10
Caesalpinia ferrea Mart.	Jucá	0.10
Gossypium herbaceum L.	Algodão	0.10
Anadenanthera colubrine (Vell.) Brenan	Angico-preto	0.10
Justicia pectoralis Jacq.	Anador	0.06
Anacardium occidentale L.	Cajueiro	0.06
Croton species	Marmeleiro-preto	0.06
Phyllanthus niruri L.	Quebra-pedra	0.06
Iris sibirica L.	Palmeirinha	0.06
Tamarindus indica L.	Tamarindo	0.06
Psidium guajava L.	Goiabeira	0.06
Ziziphus joazeiro Mart.	Juá	0.06
Coutarea hexandra (Jacq.) K. Schum.	Quina-Quina	0.06
Citrus × *limonum* Risso	Limão	0.06
Citrus × *aurantium* L.	Laranja	0.06
Mangifera indica L.	Mangueira	0.03
Annona muricata L.	Araticum	0.03
Allamanda cathartica L.	Grão-de-bode	0.03
Allamanda blanchetii A.DC.	Quatro-Pacata	0.03
Lactuca sativa L.	Alface	0.03
Vernonia condensate Baker	Boldo (folha pequena)	0.03
Handroanthus impetiginosus (Mart. ex DC.) Mattos	Pau-d´arco-roxo	0.03
Carica papaya L.	Mamão	0.03
Operculina macrocarpa (L.) Urb.	Goma-de-purga	0.03
Jatropha ribifolia(Pohl) Baill.	Piãomanso	0.03
Mentha spicata L. × *Mentha suaveolens* Ehrh.	Hortelã	0.03
Punica granatum L.	Romã	0.03
Azadirachta indica A. Juss.	Ninho	0.03
Syzygium jambolanum (Lam.) DC.	Azeitona	0.03
Eucalyptus globulus Labill.	Eucalipto	0.03
Campomanesia aromatica (Aubl.) Griseb.	Guabiraba	0.03
Eugenia uniflora L.	Pitanga	0.03
Averrhoa carambola L.	Carambola	0.03
Turnera ulmifolia L.	Chanana	0.03

Table 2. Cont'd.

Genipa americana L.	Genipapo	0.03
Ruta graveolens L.	Arruda	0.03
Manilkara dardanoi Ducke	Massaranduba	0.03
Solanum paniculatum L.	Jurubeba	0.03
Cecropia glaziovii Snethl.	Torém	0.03
Vachellia farnesiana(L.) Wight and Arn.	Coronha	0.03

NV: Local vernacular name; VU: use value; Species in descending order of use value.

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