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Ethnobotanical study in a rural settlement in Amazon: contribution of local knowledge to public health policies

Estudo etnobotânico em um Assentamento rural na Amazônia: contribuição de saberes locais às políticas públicas de saúde

Estudio etnobotánico en un asentamiento rural de la Amazonía: contribución del conocimiento local a las políticas de salud pública

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Paula Maria Correa de Oliveira-Melo
ORCID: https://orcid.org/0000-0003-0354-8584
Museu Paraense Emílio Goeldi, Brazil
E-mail: paulacorrea92@hotmail.com
Pedro Glécio Costa Lima
ORCID: https://orcid.org/0000-0002-7469-5533
Museu Paraense Emílio Goeldi, Brazil
E-mail: gleciolima@gmail.com
Joseane Carvalho Costa
ORCID: https://orcid.org/0000-0002-1913-6579
Universidade Federal do Sul e Sudeste do Pará, Brazil
E-mail: joseane03@gmail.com
Márlia Regina Coelho-Ferreira
ORCID: https://orcid.org/0000-0001-7861-3120
Instituto Nacional da Mata Atlântica, Brazil
E-mail: marliacf@hotmail.com

Abstract
Medicinal plants continue to be appropriate and preferred alternatives for primary health care among rural Amazon populations, although their incorporation into conventional health services has been slow and challenging. Besides that, few Amazon plants have been considered in current public health policies. We sought here to better understand the role of medicinal plants in the therapeutic practices of residents of the Paulo Fonteles Land Settlement at Mosqueiro, a district within Belém (Pará State, Brazil) and identify species of potential value for government health services. Ethnobotanical data was obtained through semi-structured interviews with 61 residents. Results were analyzed using indices of use-report (Ur) and by consulting official documents of the Brazilian Ministry of Health (MS). The settlers use at least 61 exotic plants and 67 natives to Brazil; of the latter species, 21 were endemic to the Amazon region. The medicinal plants cited by the settlers were used for treating 76 symptoms and/or illnesses, especially related to digestive, respiratory, dermatological, and women's health problems; *Anacardium occidentale*, *Alternanthera brasiliana*, and *Dalbergia monetaria* had the highest URs. Forty plants are cited in MS documents. This research incentive more studies with Amazonian species and shows a list of 11 species for inclusion in health services offered to local populations.
Keywords: Basic healthcare services; Rural settlements; Ethnobotany.

Resumo
As plantas medicinais continuam sendo uma alternativa apropriada e preferencial entre as populações rurais amazônicas na assistência primária à saúde, contudo a sua incorporação aos serviços convencionais tem sido um desafio. Nesta pesquisa buscou-se entender o papel das plantas medicinais nas práticas terapêuticas dos moradores do Assentamento Paulo Fonteles, Mosqueiro, distrito de Belém (Pará), preocupando-se em identificar espécies potenciais a serem valorizadas nos serviços oficiais de saúde. Os dados etnobotânicos foram obtidos junto a 61 moradores por meio entrevistas semiestruturadas. Os resultados foram analisados utilizando o índice use-reports e consultas a documentos oficiais do Ministério da Saúde. Os assentados, utilizam pelo menos 61 plantas exóticas, 67 nativas do Brasil, 21 destas restritas à Amazônia. Estas plantas combatem 76 sintomas e/ou doenças, sobretudo problemas digestivos, respiratórios, dermatológicos e feminino para os quais *Anacardium occidentale*, *Alternanthera brasiliana* e *Dalbergia monetaria* apresentaram maior UR, respectivamente. Dentre as espécies citadas, 40 constam em documentos do MS. Esta pesquisa incentiva mais estudos com espécies amazônicas e apresenta uma lista de 11 espécies para inclusão nos serviços de saúde oferecidos às populações locais.
Palavras-chave: Serviços básicos de saúde; Assentamentos rurais; Etnobotânica.

Resumen
Las plantas medicinales siguen siendo una alternativa adecuada y preferida entre las poblaciones rurales amazónicas en la atención primaria de salud, sin embargo su incorporación a los servicios convencionales ha sido un desafío. Esta investigación buscó comprender el papel de las plantas medicinales en las prácticas terapéuticas de los habitantes del Asentamiento Paulo Fonteles, Mosqueiro, distrito de Belém (Pará), enfocándose en identificar especies potenciales a ser valoradas en los servicios oficiales de salud. Se obtuvieron datos etnobotánicos de 61 residentes mediante entrevistas semiestructuradas. Los resultados se analizaron mediante el índice "use-reports (UR)" y consultas a documentos oficiales del Ministerio de Salud. Los pobladores utilizan al menos 61 plantas exóticas, 67 nativas de Brasil, 21 de las cuales están restringidas a la Amazonía. Estas plantas combaten 76 síntomas y/o enfermedades, en especial los problemas digestivos, respiratorios, dermatológicos y femeninos para los cuales Anacardium occidentale, Alternanthera brasiliana y Dalbergia monetaria presentaron mayor UR, respectivamente. Entre las especies mencionadas, 40 se enumeran en documentos de MS. Esta investigación fomenta más estudios con especies amazónicas y presenta una lista de 11 especies para su inclusión en los servicios de salud que se ofrecen a las poblaciones locales.
Palabras clave: Servicios básicos de salud; Asentamientos rurales; Etnobotánica.

1. Introduction

Medicinal plants continue widely used in developing countries to provide basic health assistance (Melro, et al., 2020; Heringer, et al., 2021). In Brazil, cultural, environmental, and economic factors contribute to use of these resources as the first choice of treatment. This country not only hosts the most diverse flora in the world with more than 55.000 species of plants but also has significant socio-cultural diversity (MMA, 2021). In addition, the plant-derived remedies can complement conventional pharmaceutical drugs, or cover gaps in more modern pharmaceutical treatments (World Health Organization (WHO), 2013).

The World Health Organization (WHO) has recommended the recognition about the use of these resources in the health field (WHO, 2013). In Brazil, these recommendations had an impact on the creation of the National Policies on Integrative and Complementary Practices (PNPIC) and Medicinal Plants and Herbal Medicines (PNPMF). Both aimed mainly to include the traditional therapeutic practices in the Unified Health System (SUS) and the guarantee of both safe and effective access to medicinal plants and herbal medicines (Brasil, 2016). Furthermore, these policies were essential to promote an extensive review and standardization of the administrative protocols and use of phytotherapeutics protocols and use of phytotherapeutics (Anvisa, 2008; 2010; 2014; 2016; 2021; MS 2010) to allow and encourage their use as complementary pharmaceutical products in the SUS system (Almeida, et al., 2014). Independent of those national policies, many municipalities in Brazil have developed local initiatives for the use of medicinal plants and phytotherapeutics in public healthcare since the 1990s (Antonio, et al., 2013; Ogava, et al., 2003; Silva, et al., 2006)

Almeida et al. (2014) examined the representivity of traditional phyto-pharmacopeias in official documents in order to propose the inclusion medicinal plants as alternatives within the SUS healthcare system, in conformity with national policies. That study stressed the importance of considering regional and cultural traditional knowledge, as well as the regional Brazilian floras, to improve the role of PNPMF. In respect to the Brazilian Amazon, which contains the second most diverse flora in that country (Forzza, et al., 2020), it is important to note that in spite of its huge variety of native species with therapeutic potential (Bieski, et al., 2015; Coelho-Ferreira, 2009; Rodrigues, 2006) few of those plants have been studied to determine their safety and effectiveness. This fact may partially explain the inexpressive numbers of plants from that region recorded in official documents such as the National List of Plants of Interest to SUS - Renisus (Carvalho, et al., 2018). However, the the goals of the PNPMF and the Strategy for Traditional Medicine 2014 – 2023 were designed to incentivize research into the native species of each Brazilian biome (WHO, 2013; Anvisa, 2016).

Among many social groups in the Amazon region are agricultural families in rural land settlement areas, which, together with traditional Amerindian communities, considered by the PNPMF to be indispensable actors in the structuring of

productive chains of medicinal and psychotherapeutic plants (Brasil, 2016). One of the principal characteristics of rural settlements in the Amazon region has been their role in maintaining the Legal Reserve Forests required by Brazilian legislation (Cunha & Bortolotto, 2011). They also have potential for developing agro-extractivism projects that would lend value to Amazonian medicinal plants and foster the diversification of the economic activities of those rural groups (De Almeida, et al., 2013). Within that context, the present ethnobotanical study undertaken in the Paulo Fonteles Settlement Lands (APF), located in the Mosqueiro district (Belém, Pará State), sought to elucidate the roles of medicinal plants in local therapeutic practices and identify species of potential value to official health services.

2. Methodology

This research was based in a fieldwork ethnobotany using qualitative and quantitative approaches (Albuquerque, 2019). The date was obtained in the Paulo Fonteles settlement (PFS), located in the Brazilian Amazon in the Mosqueiro district, metropolitan region of Belém do Pará, in northern Brazil (01º04‘ - 01º14‘S, 48º19‘ - 48º29‘W). The PFS is situated in an estuary environment with marine influences, at approximately 15 m above sea level. The climate there is equatorial, with a mean annual temperature of 25.9 ºC, a mean relative humidity of 84%, and a mean annual rainfall of 2800 mm. The vegetation in the area is characterized by a few remnant trees of economic value, secondary forests ("capoeiras") in various stages of development, and pasture lands (INCRA, 2020). The settlement is located near an environmental protection area with great floristic diversity of upland and floodplain forest landscapes and mangrove swamps.

Established in 2006, the PFS occupies an area of 930 ha divided into 60 lots, with 50 families, all members of the Landless Workers’ Movement - MST, totaling approximately 100 people whose principal economic activities are centered around subsistence agriculture. There is no basic sanitation infrastructure.

In order to generate representative data covering the entire community, at least one member of each resident family (18 years or older) was invited to participate. The overall sample was composed of 61 informants, of which 22 were men and 39 women, ranging in age from 18 to 80, and thus corresponding to approximately 50% of the total number of residents. Fifteen of those collaborators had been living in the area even before the creation of the PFS, 23 have been living in the area for ten years since the settlement was officially established, and 21 arrived in the PFS up to eight years ago. As for the origins of the collaborators, 15 are native to the Mosqueiro district, 33 are from other municipalities in Pará State, and 13 arrived from other Brazilian states.

Fieldwork was undertaken between January and November/2015, using both a semi-structured interview and a free listing technique to obtain sociodemographic and ethnobotanical data (Albuquerque, et al., 2014). The informants were also asked to describe their therapeutic indications, methods of preparation and the plant part used.

At least one voucher for each plant cited in the interviews was collected, with the exception of 12 plants not encountered during guided tours or “walking in the woods” arranged with informants (Albuquerque, et al., 2014). The samples were identified by comparisons with collections at the MG herbarium at the Paraense Emílio Goeldi Museum and the help of technicians and taxonomists at that institution. The fertile specimens were deposited in that herbarium, with sterile material and fertile duplicate specimens being deposited in the Marlene Freitas da Silva herbarium (MFS) of the State University of Pará. The botanical classification system adopted was that of the Angiosperm Phylogeny Group - APG IV 2016 (Chase, et al., 2016). We searched the species names and phytogeographical origins of the species using the Brazilian Flora Species 2020 List (JBRJ, 2017) and Mobot database, respectively.

We classified the symptoms and illnesses mentioned in the interview following the the International Classification of Primary Care (ICPC) (Miller, et al., 2009) . Illness categories were analyzed by quantifying use-reports (URs), as described by (Trotter & Logan 1986).

In order to identify the medicinal species used in the settlement that also appear in official registries, we consulted the Monographs on Selected Medicinal Plants (WHO, 1999; 2002; 2007; 2009); the Farmacopeia Brasileira (Silva, 1929; BRASIL, 1959; 1977; 1996; 2019); specific guidelines on phytotherapics by the Brazilian drug administration authority (Anvisa, 2008, 2010, 2014), the national list of plants of interest to SUS (MS, 2010), and the Herbal Medicine Compendium 1st and 2nd Ed (Anvisa, 2018; 2021) and Herbal Medicine Memento (Anvisa, 2016), both published by the Farmacopeia Brasileira.

Each interviewee gave his/her written consent to cooperate with the present study, which was approved by the Research Ethics Committee (CEP) of the Federal University of Pará (UFPA/ICS nº 2.911.438) and is registered with the National System of Genetic Heritage Management and Associated Traditional Knowledge (SisGen nº AE259B4), as required by the Biodiversity Law (13,133/2015).

3. Results

Ethnomedicinal flora

A total of 126 plants were mentioned by the interviewees, of which 117 were identified to the species level, and nine to the genus level; the taxa were distributed among 110 genera and 54 families (Table 1). The families Asteraceae, Fabaceae, and Lamiaceae stood out in terms of their large numbers of species. Those plants are mainly cultivated in backyards (71%), or collected in forest areas (24%), fields (4%), or gardens (4%). Most species were trees (53) and herbs (45), followed by shrubs (13) and lianas (12). The settler families use numerous native Brazilian (N = 64) and introduced (N = 61) species. Among the native species, 22 occur only in the Amazon biome, and are plants of significant relevance to the local pharmacopeia.

All vegetative parts were cited, with leaves (43%) being most widely used for preparing natural remedies. The 628 preparation recipes cited could be grouped into nine classes, especially extraction (teas) or maceration in water, followed by consumption in their fresh form as juice, syrup, alcoholic macerations, or application as a plaster or ointment.

Table 1. Medicinal plants used in the settlement Paulo Fonteles, Mosqueiro District, Belém, Pará. * = Medicinal use absent from official documents; 1: Monographs of medicinal plants selected by WHO; 2: Brazilian Pharmacopoeia editions; 3: Herbal medicine list for simplified registration; 4: Renisus; 5: RDC 10/2010; 6: Herbal Medicine Compendium; 7: RDC26/2014; 8: Herbal Medicine Memento. Or: origin; NB: native from Brazil; NA; occur only in the Amazon biome; EX: exotic (origin).

Family/ scientific name/Voucher number	Vernacular name	UR	Or.	Ethnomedicinal use	Official documents
Acanthaceae		**3**			
Justicia pectoralis Jacq.	Corrente	1	NB	Flu	3,4,5
Justicia secunda Vahl./221285	Sulfato-ferroso	2	NA	Gastritis	
Adoxaceae		**6**			
Sambucus nigra L./MFS006176	Sabugueiro	6	$EX_{(eur)}$	Chickenpox*, measles*, asthma*	1,2,3,4,5,6
Amaranthaceae		**43**			
Alternanthera brasiliana (L.) Kuntze/221286	Ampicilina, meracelina	20	NB	Chickenpox, hemorrhage; headache, catarrh, wounds, vaginal cleansing	
Dysphania ambrosioides (L.) Mosyakin & Clemants/221805	Mastruz	23	$EX_{(Am)}$	Tuberculosis, anemia, worms, gastritis, bone fractures, cough with catarrh, pulmonary problems, wounds	4
Amaryllidaceae		**5**			
Allium sativum L.	Alho	5	$EX_{(EUA)}$	Bellyache*, flu, menstrual cramps*	2,3,4,5,6,8
Anacardiaceae		**41**			

Anacardium giganteum W.HancockexEngl. /MFS006096	Cajuí, cajuaçu	8	NA	Gastritis, wounds, diabetes, women's genitourinary inflammation,	
Anacardium occidentale L./221319	Caju	25	NA	Diarrhea, bellyache, wounds	4,5
Mangifera indica L.	Mangueira	4	EX(As)	Diarrhea, catarrh	
Schinus sp. /MFS006158	Aroeira	4	-	Wounds	
Annonaceae		**4**			
Annona mucosa Jacq./MFS006085	Biribazeiro	1	NB	Lice bugs	
Annona muricata L./221325	Gravioleira	2	EX(Am)	Hypertension, inflammation of the thyroid	
Annona squamosa L.	Ata	1	EX(Am)	Diarrhea	
Apiaceae		**2**			
Foeniculum vulgare Mill.	Erva-doce	1	EX(Am)	Infant colic	
Petroselinum crispum (Mill.) Fuss	Cheiro-verde	1	EX(Er)	Worms (pin worms)	
Apocynaceae		**23**			
Aspidosperma excelsum Benth./MFS006183	Carapanã, carapanaúba	2	NA	Gastritis	
Himatanthus articulatus (Vahl) Woodson/MFS006173	Sucuúba	9	NB	Diarrhea, worms, gastritis, luxation, R: lung problems, women's genitourinary inflammation impotence	
Parahancornia fasciculata (Poir.) Benoist	Amapá	12	NA	Tuberculosis, hemorrhaging, malaria, anemia, worms, gastritis, stomach ulcer, flu, bronchitis, lung problems, wounds	
Arecaceae		**11**			
Cocos nucifera L.	Coco	2	EX(As; Oc)	Head ache, catarrh	
Euterpe oleracea Mart.	Açaizeiro	9	NA	Diarrhea	
Asteraceae		**28**			
Acmella oleracea (L.) R.K. Jansen /221308	Jambu	1	EX(Am)	Anemia	2
Artemisia vulgaris L./MFS006147	Losna	2	EX	Menstrual cramps	
Ayapana triplinervis (M.Vahl) R.M.King&H.Rob./MFS006146	Japana-branca	1	NA	Cough with catarrh	
Centratherum punctatum Cass./221306	Macela	6	NB	Bellyache, headache	
Cichorium endivia L.	Chicória	1	EX(Am)	Worms (giardia),	
Gymnanthemum amygdalinum (Delile) Sch.Bip. ex Walp./221306	Boldo	9	EX	Stomachache, bellyache, indigestion, liver problems	
Lactuca sativa L.	Alface	3	EX	Stomachache, anxiolytic, kidney stones	
Mikania sp. /MFS006167	Sucuriju	3	-	Inflammation, stomachache	
Pectis brevipedunculata (Gardner) Sch.Bip./ 221314	Capim-marinho	1	NB	Fever	
Solidago chilensis Meyen/221296	Arnica, marcela	1	NB	Wounds*	2,4
Bignoniaceae		21			
Fridericia chica (Bonpl.) L.G.Lohmann/ MFS006092	Pariri	11	NB	Fever, inflammation, anemia	4
Handroanthus impetiginosus (Mart. ex DC.) Mattos/ MFS006083	Ipê-roxo	1	NB	Women's genitourinary inflammation	
Handroanthus sp./ MFS006086	Ipê-amarelo	1	-	Women's genitourinary inflammation	
Mansoa alliacea (Lam.) A.H.Gentry/ MFS006086	Cipó-d'alho	7	NA	Fever, bellyache, worms, heart problems, flu	
Newbouldia laevis (P. Beauv.) Seem./ MFS006089	Akokô	1	EX(Af)	To improve the mental hability	
Bixaceae		**7**			
Bixa orellana L./221310	Urucum	7	NB	Inflammation, intestinal cleansing, flu with catarrh, wounds, wart	
Brassicaceae		**1**			
Brassica oleracea L.	Couve	1	EX	Stomach diseases	

Bromeliaceae		**7**			
Ananas comosus (L.) Merril	Abacaxizeiro	7	NB	Inflammation, cough, bronchitis, kidney stones	4
Caricaceae		1			
Carica papaya L./221321	Mamão	1	$EX_{(Am)}$	Worms	
Connaraceae					
Connarus perrottetii var.angustifolius Radlk. /MFS006095	Barbatimão	16	NA	Intestinal infections, gastritis, menstrual cramps, vaginal cleansing, women's genitourinary inflammation	
Costaceae		**8**			
Costus spicatus (Jacq.) Sw. /MFS006152	Canarana	8	$EX_{(Am)}$	kidney stones, urine pain	4
Crassulaceae		**29**			
Kalanchoe pinnata (Lam.) Pers./MFS006091	Pirarucu	29	$EX_{(Am)}$	Tuberculosis, inflammation, flu with catarrh, asthma, erysipelas, boil, wounds, ringworm, chilblains	4
Cucurbitaceae		1			
Cucumis anguria L./221279	Maxixe	1	NB	High cholesterol	
Cucurbita moschata Duchesne/221282	Abóbora	1	EX	High cholesterol	
Momordica charantia L./221281	Melão-de-são-caetano	3	$EX_{(As, Af)}$	Itching	1,4,5,6
Dilleniaceae		**3**			
Davilla sp. / MFS006154	Cipó-de-fogo	2	-	Malaise, weakness ,	
Dillenia indica L./MFS006182	Pataca	1	$EX_{(As)}$	joint pains	
Euphorbiaceae		**24**			
Euphorbia tirucalli L./MFS006161	Pau-pelado	7	$EX_{(Af)}$	Wounds, pitizriasis, wart, ringworm, skin cancer	7
Euphorbia tithymaloides L./221287	Coramina	9	NB	Hypertension, arrhythmia, heart problems	7
Jatropha curcas L./221301	Pião-branco	3	$EX_{(Am)}$	Wounds	7
Jatropha gossypiifolia L./221302	Pião-roxo	6	NB	Earache, wounds mouth, herpes, leishmaniasis,	4
Manihot esculenta Crantz/221327	Mandioca	1	NB	bellyache	7
Fabaceae		61			
Bauhinia sp.	Pata-de-vaca	1	-	Diabetes	
Cajanus cajan L./MFS006164	Feijão-andu	1	$EX_{(Af)}$	Stroke	
Copaifera martii Hayne/MFS006180	Copaíba	7	NB	Inflammation, contusion, joint pains , flu	
Dalbergia monetaria L.f./MFS006170	Verônica	31	NA	Inflammation, anemia, gastritis, úlcer, bellyache, diarrhea, bones pain, back pain, urinary infections, wounds, women's genitourinary inflammation, postpartum inflammation	
Diplotropis purpurea (Rich.) Amshoff/ MFS006181	Sucupira	1	NA	sore throat	
Hymenaea courbaril L./MFS006094	Jatobá	5	NB	Inflammation, hemorrhage, Cough, flu, prostate cancer	
Libidibia ferrea (Mart. exTul.) L.P.Queiroz/221292	Jucá	10	NB	Inflammation, bellyache, diarrhea, stroke, rheumatism, cough, wounds, women's genitourinary inflammation	4,5,6
Schnella splendens (Kunth) Benth. /MFS006694	Escada-de-jaboti	6	NA	Diarrhea, bellyache, women's genitourinary inflammation	
Tachigali glauca Tul./MFS006149	Taxi	1	NA	kidney problems,	
Vouacapoua americana Aubl./MFS006171	Acapu	3	NA	Inflammation, tumour in the uterus	

Humiriaceae		**2**			
Endopleura uchi (Huber) Cuatrec./MFS006172	Uxi	2	NA	Inflammation, tumour in the uterus	
Hypericaceae		**5**			
Vismia guianensis (Aubl.) Choisy/MFS006172	Lacre/ sangue-de-cristo	5	NB	Pitizriasis, diabetes	
Iridaceae		**23**			
Eleutherine bulbosa (Mill.) Urb./221309	Marupazinho	23	NB	Diarrhea, vomiting, bellyache, Intestine cleansin, hemorroida	4
Lamiaceae		**89**			
Hyptis sp. /MFS006177	Sambacaitá	2	-	Wounds	
Mentha pulegium L./MFS006179	Hortelãzinho	21	EX(eur, As)	Fever, Infant colic, bellyache, diarrhea, worms, bone pain, flu	5
Ocimum basilicum L./221315	Manjericão	13	EX(As)	Flu, catarrh, sinusites, coryza, headache,	
Ocimum campechianum Mill. /221307	Alfavaca	3	NB	Bellyache, flu	
Ocimum gratissimum L./221299	Alfavacão	3	EX(Af)	Flu with catarrh	4
Plectranthus amboinicus (Lour.) Spreng./MFS006088	Malvarisco	7		Cough with catarrh, sore throat, asthma	
Plectranthus barbatus Andr./MFS006184	Anador	14	EX(As, Af)	Fever, bellyache, headache	4,5,6
Plectranthus sp.	Urtiga	2	-	Anemia, rheumatism	
Plectranthus ornatus Cood /MFS006166	Boldinho	19	-	Diarrhea, bellyache, stomachache, liver problems	
Pogostemon heyneanus Benth. /MFS006084	Oriza	5	EX	Hypertension, stroke, headache, flu, wounds	
Lauraceae		**15**			
Cinnamomum verum J.Presl/221312	Canela	8	EX(As)	Fever, vomiting, low blood pressure, anxiolytic	2,5,6
Persea americana Mill./221293	Abacate	7	EX(Am)	Anemia, wounds, ringworm, kidney problems, urinary infections	2,4
Lecythidaceae		5			
Bertholletia excelsa Bonpl./MFS006165	Castanha-do-brasil	2	NB	Inflammation, anemia	
Lecythis pisonis Cambess. /MFS006093	Sapucaia	3	NB	Skin allergies, scabies, itching	
Malpighiaceae		2			
Callaeum antifebrile (Griseb.) D.M.Johnson/ MFS006163	Cabi	1	NA	Ringworm	
Malpighia emarginata DC./ 221323	Aceroleira	1	EX(Am)	Flu	
Malvaceae		21			
Gossypium arboreum L./ 221305	Algodão	17	EX	Anemia, flu, catarrh, either hemorrhage postpartum or during pregnancy	
Theobroma grandiflorum (Willd. ex Spreng.) K.Schum./ 221316	Cupuaçu	2	NA	Diarrhea	
Malva erecta J. Presl& C. Presl	Malvarosa	1	EX	Stroke	
Abelmoschus esculentus (L.) *Moench*	Quiabo	1	EX	Diabetes	
Melastomataceae		**2**			
Bellucia egensis (DC.) Penneys, Michelangeli, Judd, and Almeda/221291	Papa-terra	2	NA	Inflamation	
Meliaceae		**8**			
Azadirachta indica A.Juss./221313	Nim	1	EX(As, Af)	Liver problems	
Carapa guianensis Aubl./MFS006155	Andiroba	7	NA	Inflammation, contusion, bone pain, dismintidura, catarrh, sore throat, wounds	4
Moraceae		**1**			
Ficus sp.	Caxinguba	1	-	worms	
Musaceae		**4**			

Musa paradisiaca L./221276	Bananeira	4	$EX_{(As)}$	Flu, asthma, snake bite, burn	
Myrtaceae					
Eucalyptus sp.	Eucalipto	6	EX	Fever, diarrhea, vomiting, flu	
Myrcia bracteata (Rich.) DC./221304	Murta-cabeluda	-	NB	-	
Psidium guajava L./221300	Goiaba	22	$EX_{(Am)}$	Diarrhea, bellyache	1,2,4,6,7
Syzygium aromaticum (L.) Merr. & L.M.Perry /221317	Ameixeira	2	$EX_{(As)}$	Diarrhea diabetes	1
Olacaceae		**3**			
Ptychopetalum olacoides Benth.	Marapuama	3	NA	Weakness, rheumatism, impotence	2
Oxalidaceae		**1**			
Averrhoa carambola L./221311	Carambola	1	$EX_{(As)}$	Diabetes	
Passifloraceae		**1**			
Passiflora edulis Sims/221277	Maracujá	1	NB	Anxiolytic	2,3,4,5,6
Pedaliaceae		**1**			
Sesamum orientale L./221326	Gergilim-preto	1	EX	Stroke	
Phyllanthaceae		**9**			
Phyllanthus niruri L./221324	Quebra-pedra	9	NB	kidney problems	2,4,5,6
Phytolaccaceae		**6**			
Petiveria alliacea L./221297	Mucuracaá, caatinga da mulata	6	$EX_{(Am)}$	Earache, headache	7
Piperaceae		**3**			
Piper callosum Ruiz &Pav./221295	Elixir-paregórico	1	NB	Diarrhea	
Piper hispidum Sw./221294	Pimenta-longa	2	NB	Nasal congestion, sore throat	
Poaceae		**20**			
Saccharum officinarum L.	Cana	1	EX	Anemia	
Cymbopogon citratus (DC.) StPFS/MFS006162	Capim-santo	15	EX	Fever, vomiting, anxiolytic,	2,5,6
Cymbopogon nardus (L.) Rendle/221803	Citronela	4	EX	Fever, bellyache	
Polygalaceae		**9**			
Caamembeca spectabilis (DC.) J.F.B.Pastore/221278	Caamembeca	9	NB	Worms, diarrhea, tumor in uterus	
Portulacaceae		**7**			
Portulaca pilosa L./221318	Amor-crescido	4	NB	Inflammation, headache, control blood pressure, sore throat	4
Talinum paniculatum (Jacq.) Gaertn. /221280	Cariru	3	NB	Anemia	
Rhizophoraceae		**2**			
Rhizophora racemosa G.Mey./MFS006159	Mangue	2	NA	Diarrhea, contusion	
Rubiaceae		**38**			
Borreria verticillata (L.) G.Mey./221288	Vassorinha-de-botão	11	NB	Swelling hemorrhage, diarrhea, intestinal infection, headache, itching, allergy, quebranto	
Coffea arabica L./221322	Café	1	EX	Catarrh	
Genipa americana L./221322	Jenipapo	1	NB	Anemia	
Morinda citrifolia L./221289	Noni	16	EX	Inflammation, hemorrhage, anemia, Stomach problems, ulcer, hypertension, cough, kidney problems, uterus inflammation, prostate inflammation	
Uncaria guianensis (Aubl.) J.F.Gmel./MFS006169	Unha-de-gato	9	NB	Clean the blood, stomachache, back pain, kidney problems, women's genitourinary inflammation, snake bite	
Rutaceae					
Citrus aurantifolia Swingle	Limão-galego	1	$EX_{(As)}$	Flu	

Citrus aurantium L./221804	Laranjeira	13	$EX_{(As)}$	Malaise, anemia, liver and stomach problems, bellyache, worms, catarrh, albuminuria	2,5,6
Citrus limon (L.) Osbeck /221320	Limão	15	$EX_{(As)}$	diarrhea, bellyache, constipation, cholesterol, flu, asthma	
Ruta graveolens L./MFS006174	Arruda	15	$EX_{(Er)}$	Toothache, stroke, headache, earache	2,4
Solanaceae		**7**			
Solanum melongena L.	Berinjela	1	$EX_{(As)}$	High cholesterol	
Turneraceae					
Turnera subulata Sm./221283	Chanãna	3	NB	Gastrites, prevents cancer	
Urticaceae					
Cecropia obtusa Trécul/MFS006153	Imbaúba-branca	3	NB	Boil, inflammation in the uterus, menstrual cramps	
Verbenaceae		**15**			
Lippia alba (Mill.) N.E.Br. ex P. Wilson/221298	Erva-cidreira	13	NB	Fever, headache, anxiolytic	5,6
Stachytarpheta cayennensis (Rich.) Vahl/221290	Rinxão	2	NB	Urine pain	2
Xanthorrhoeaceae		**13**			
Aloe vera (L.) Burm. f. /MFS006090	Babosa	13	EX	Toothache, ulcer, gastritis, cancer, wounds	2,4,5,6,8
Zingiberaceae					
Curcuma longa L./MFS006157	Açafrão	1	$EX_{(As)}$	Flu	4,5,6
Zingiber officinale Roscoe	Gengibre	4	$EX_{(As)}$	Bellyache, flu, sore throat	1,3,4,5,6,7
Renealmia alpinia (Rottb.) Maas /221303	Vindicá	1	NB	catarrh	

Source: Authors.

ICPC categories and Informant Consensus Factor

The species mentioned were indicated for 76 health problems (symptoms and illnesses), distributed among 15 of the 17 ICPC categories (Table 2). Eight categories had UR ≥ 30, with the largest numbers of citations for digestive, respiratory and skin problems, and general symptoms. In this study, the values Informant Consensus Factor (IFC) obtained for plants used in treatment of local infirmities ranged from 0.2 to 0.8. The categories of diseases that presented the highest ICF were digestive (0.8), skin, circulatory (0.73 each) and urology (0. 69) diseases. The category with the lowest ICF was the endocrine, metabolic and nutritional, which include diabetes and thyroid problems, recorded in this Settlement.

Table 2. Use reports for the 15 categories of medicinal use and the most reported medicinal plants used in the treatment of each category, as indicated in the settlement Paulo Fonteles, Mosqueiro District, Belém, Pará. Nur = number of use reports in each category; Nt = number of species used for a given category; % UR_{tot}: percentage of total use-reports.

Classificassion of Diseases ICD – 11	Nt	Nur	(%) UR_{tot}	Most cited plant in the category
Certain infectious or parasitic diseases	41	154	23,6	*Anacardium occidentale* L
Respiratory	31	97	14,8	*Gossypium arboreum* L
Skin	22	85	13	*Alternanthera brasiliana* (L.) Kuntze
Genitourinary	21	72	11	*Dalbergia monetaria* L.f
Digestive	24	65	9,9	*Plectranthus ornatus* Codd
Symptoms, signs or clinical findings, not elsewhere classified	17	50	7,6	*Cymbopogon citratus* (DC.)
Circulatory system	15	38	5,8	*Euphorbia tithymaloides* L
Diseases of the blood or blood-forming organs	14	24	10	*Dalbergia monetaria* L.f
Diseases of the musculoskeletal system or connective tissue	11	19	2,9	*Carapa guianensis* Aubl
Injury, poisoning or certain other consequences of external causes	10	17	2,6	*Alternanthera brasiliana* (L.) Kuntze
Neoplasms	6	11	1,6	*Aloe vera* (L.)
Endocrine, nutritional or metabolic diseases	7	8	1,2	*Anacardium giganteum* W.HancockexEngl.
Pregnancy, childbirth or the puerperium	4	6	0,9	*Hymenaea courbaril* L.
Diseases of the ear or mastoid process	3	5	0,7	*Petiveria alliacea* L.
Certain conditions originating in the perinatal period	2	3	0,4	*Parahancornia fasciculata* (Poir.) Benoist

Source: Authors.

Eight categories had RU ≥ 30, with the largest numbers of citations for digestive, respiratory and skin problems, and general symptoms. Of those eight categories, five native Amazon plant species stood out as indicated treatments. *Anacardium occidentale* (cashew) was the species most cited (RU = 22) in the “digestive” category, with its bark and leaves being used principally to treat infectious diarrhea. *Alternanthera brasiliana* (L.) Kuntze, locally known as "penicillin" or "ampicilin", was primarily used to treat skin problems due to its anti-inflammatory and wound-healing properties.

Dalbergia monetaria L. ("verônica") was found to be the most versatile species, being indicated in eight illness categories, especially for infirmities of the “female genital and breast systems” and inflammations of the uterus (or “woman's inflammations") involving excessive or irregular bleeding and vaginal secretions, according to the definitions of the informants. *Phyllanthus niruri L.* ("quebra-pedra") stood out among species indicated for urological problems, with kidney stones being the principal illness mentioned. *Euphorbia tithymaloides* L. ("coramina") received the greatest number of indications among illnesses and symptoms of the circulatory system, being commonly mentioned for treating high blood pressure, arrhythmia, and chest/heart pain.

Potential species for the formal health system

Of the cited species, 40 were recorded in at least one of the official documents consulted (Table 1). Cross referencing use-information about plants recorded in the present study with plants mentioned in official documents revealed that *Sambucus nigra*, *Citrus aurantium*, and *Curcuma longa* were the only species divergent in terms of their reported indications in the two contexts. In this plant list, there are 11 Brazilian species, that naturally occurring in the Amazon (Table 3). Two of these are endemic Amazonian species: *Ptychopetalum olacoides* Benth. was mentioned in the of the Brazilian pharmacopoeia 1st and 2nd Ed. *Carapa guianensis* Aubl. *C. guianensis*, listed in Renisus is the subject of one of the nine monographs published by the Brazilian Health Ministry with pre-clinical and clinical studies that confirm its anti-inflammatory activity.

Table 3. List of native species occurring in the Amazon present in official documents and with their traditional uses historically registered.

Family /scientific name/VN	Vernacular name	Ethnomedicinal use	Official documents	Amazon traditional use (1990-2020)
Justicia pectoralis Jacq.	Corrente	Flu	3,4,5	Grenand, et al., 1987; Rodrigues, 2006; Bieski, et al., 2015
Anacardium occidentale L	Caju	Diarrhea, bellyache, wounds	4,5	Elisabetsky & Shanley, 1994; Rodrigues, 2006; Bieski, et al., 2015
Fridericia chica (Bonpl.) L.G.Lohmann	Pariri	Fever, inflammation, anemia	4	Berg, 1984; Rodrigues, 2006; Bieski, et al., 2015
Jatropha gossypiifolia L.	Pião roxo	Earache, wounds mouth, herpes, leishmaniasis,	4	Berg, 1984; Rodrigues, 2006; Coelho-Ferreira, 2009
Carapa guianensis Aubl.	Andiroba	inflammation, contusion, bone pain, dismintidura, catarrh, sore throat, wounds	4	Berg, 1984; Rodrgiques 2006; Coelho-Ferreira, 2009
Ptychopetalum olacoides Benth.	Marapuama	weakness, rheumatism, impotence	2	Grenand, et al., 1987; Shanley & Luz, 2003; Lima, et al., 2016
Passiflora edulis Sims	Maracujá	anxiolytic	2,3,4,5,6	Coelho-Ferreira, 2009; Bieski, et al., 2015.
Phyllanthus niruri L./221324	Quebra-pedra	kidney problems	2,4,5,6	Grenand, et al., 1987; Coelho-Ferreira, 2009; Bieski, et al., 2015
Portulaca pilosa L./221318	Amor crescido	Inflammation, headache, control blood pressure, sore throat	4	Grenand, et al., 1987; Rodrigues, 2006; Bieski, et al., 2015
Lippia alba (Mill.) N.E.Br. ex P. Wilson/221298	Erva-cidreira	Fever, headache, anxiolytic	5,6	Pascual, et al. 2001; Coelho-Ferreira, 2009; Bieski, et al., 2015
Stachytarpheta cayennensis (Rich.)	Rinxão	Urine pain	2	Austin & Bourne, 1992; Coelho-Ferreira, 2009; Bieski, et al., 2015

Source: Authors.

4. Discussion

In this study, the informants constitute a heterogeneous group of people from different regions of the country, but who share agricultural activities throughout their lives, having medicinal plants as a priority resource in basic health care (Oliveira Melo, et al., 2021). The species collection registered here comprises plants of great importance in primary health care, whose uses have been widespread in the Amazon, where they are recurrent cultivation in backyards, bought in fairs and markets region, and planted in agro-forest systems (Santos, et al., 2018).

The expressive number of exotic plants cited is due in large part to their consumption in local diets and the necessity of the local inhabitants to be self-sustaining in terms of food resources, while at the same time taking advantage of many of those plants for their medicinal value. Exotic species are probably sought after to fill in gaps not satisfied by native species, which reflects their versatility (Alencar, et al., 2010) – an important characteristic for rural populations that can quite often find themselves in situations of social vulnerability and dependent on plants within their reach (Cunha & Bortolotto, 2011). The Amazonian species cited in the present work demonstrates the importance of maintaining forest fragments in the metropolitan region of Belém (the state capital), which, among other functions, act as sources for a great number of native plants utilized for the primary health needs of small rural communities (Amaral, et al., 2012). Those species have been incorporated over many generations to treat common diseases among local populations (Berg, 2010). In addition, 82% of native species recorded in this study were found in backyards. The cultivation and management of these plants is important for the conservation of plant biodiversity, as they consist in a germplasm bank that can be useful to reduce the exploitation of primary vegetation and to facilitate the access to these areas when needed (Albuquerque, et al., 2008)

The infirmities included within the outstanding categories in the present survey reflect physical factors that affect the community, such as precarious sanitary conditions, the hot and humid regional climate, smoke from burning vegetation, and the hard manual labor of farming. In 2016, diarrhea was the main cause of hospitalizations in the health system in the

municipality of Belém (IBGE, 2016). Ethnobotanical studies undertaken in other rural Brazilian communities likewise reported high frequencies of those same infirmities (Cunha & Bortolotto, 2011; Almeida, et al., 2013).

The native plant species most cited in the present study are currently at different phases of scientific investigation. Some of them have been the focus of research on the biological activities of their extracts and/or among those considered most promising or adequate for use in the SUS public health system, as cited in official MS documents. Other species are also widely known to traditional medicine practitioners, although they should be more closely investigated scientifically.

Anacardium occidentale is globally known for its nutritive and medicinal properties and is included in official medicinal plant registries (MS, 2010, Anvisa, 2010) and indicated to treat diarrhea. Its effectiveness against diarrhea was confirmed by Araújo et al., (2015). The review of Dantas et al. (2015) compiled information about its antimicrobial, anti-inflammatory, analgesic, and wound-healing properties, besides other biological activities. *Phyllanthus niruri L.* "quebra-pedra" stood out among species indicated for urological problems, with kidney stones being the principal illness mentioned. This specie use is known throughout the world (Lee, et al., 2016). It is cited in RENISUS (MS, 2010), and its use is recommended in both the RDC 10/2010 (Anvisa, 2010) and the Herbal Medicine Compendium (Anvisa, 2011; 2021). Pre-clinical and clinical studies have demonstrated its anti-urolithic activity (Boim, et al., 2010) as well as other pharmacological properties (Lee, et al., 2016).

Other species, on the other hand, although widely used locally, should be the target of further pharmacological and toxicological studies. As the amazon plant *Dalbergia monetaria* that stands out in this research for consensual e versatile use. The studies about the properties of the *D. monetaria* are incipient. The ethyl acetate fraction from their bark and leaves demonstrated antibacterial activity against human pathogenic bacteria, especially *Staphylococcus aureus* and *Pseudomonas* (Moura, et al., 2020). Those authors suggested that the traditional medicinal use of *D. monetaria* might be related to the antibacterial activity of proanthocyanidins produced by the species.

Alternanthera brasiliana (L.) Kuntze, locally known as "ampicilin", was primarily used to treat skin problems due to its anti-inflammatory and wound-healing properties. This plant use has been have a long use historic in the Amazon region (Bieski, et al., 2015; Moraes, et al., 2020). The therapeutic potential of that plant has been demonstrated in numerous *in vitro* and *in vivo* studies confirming its significant wound-healing (Barua, et al. 2009), antimicrobial (Biavatti, et al., 2003), antinociceptive (Macedo, et al., 1999), anti-inflammatory, and analgesic properties (Fomagio, et al., 2012).

Euphorbia tithymaloides received the greatest number of indications among illnesses and symptoms of the circulatory system. Its effectiveness is related to the presence of cardiac glycosides (compounds active against cardiac insufficiency), and it is increasingly recommended for anti-tumor treatments (Fürst, et al., 2017). These plant demonstrates several biological activities that include anti-diabetic, analgesic, stomachic, hemostatic, anti-microbial, antifungal, anti-inflammatory, abortifacient, antivenom, anti-helminth and antibiotic (Srivastava, et al., 2019), although its mechanism(s) of action have not yet been fully investigated. The species is listed as toxic (Anvisa, 2014), possibly due to the presence of euphorbol and diterpene sterols, considered carcinogenic substances (Kumar, et al., 2015).

The list of 40 species recorded in this study and official documents exposes two aspects. The first of which refers to the agreement on the indication of use of these plants in both contexts. These plants have widespread uses worldwide, perhaps stimulated by globalization, which according to Leonti e Casu (2013) has favored the exchange between local and global pharmacopoeias through international trade interests, print media, television and World Wide Web. The occurrence of plants of globalized use in this pharmacopoeia plays a strategic role in primary health care, since the knowledge associated with them is widely validated in different official documents.

The second aspect refers to the use of species registered in official documents is still incipient among populations that use plants for their primary health care necessities, especially those native plants. Among the list of 40 species, only 11 are

native with occurrence natural in the Amazon. Almeida et al. (2014) and Pires, et al. (2020) reported results similar to those reported here in the cities of northeastern and north Brazil, respectively. Pires et al. (2020) also point out that SUS documents do not reflect the reality of ethnobotanical studies conducted in the Amazon since these documents do not include native species of great importance to the population in a significant way. That situation also may be associated with the lower number of Amazon species have been subject of chemical, biological, or even ecological investigations – important steps in the identification of endemic Amazonian plants with medicinal potential. Carvalho et al. (2018) stressed the necessity of research advances focusing on Amazonian plants that would allow their use and economic development in sustainable manners, considering their multiple functions within their natural environment.

The set of 11 amazon species have notable cultural value, a long history of traditional use, whose therapeutic value has confirmed in several chemical and biological studies. *Justicia pectoralis* Jacq., for example, was mentioned locally to treat colds and flu, indications reported for the use of this plant both in the RDC/2010 and in the Herbal Medicine Compendium 1st and 2nd Ed (Brasil, 2011; 2020). This species also are listed in Renisus (MS, 2010), and has been the subject of studies that show its biological activity in the treatment of respiratory system diseases (Leal, et al., 2017) *Lippia alba* (Mill.) N.E.Br. ex P. Wilson and *P. niruri* are either species that appear in several of the consulted documents. The other plants in Table 3 appear only in Renisus and ethnobotanical studies point to their historical traditional uses.

The plants-use represent popularized therapeutic alternatives of easy access to communities in vulnerable socio-economic conditions, since can be easily cultivated in backyards, farm plots and secondary forests or founded in fairs and markets region (Santos, et al., 2018). These species should be better publicized to gain adhesion among SUS patients and health professionals, since that they are apt for use in basic care as offered by SUS – especially in municipalities in the Amazon region, according to the requisites of traditional use.

The inclusion of medicinal plants as alternative remedies in local SUS health stations could reduce public costs, facilitate access to them, and integrate popular culture with scientific knowledge to strengthen basic health treatments and reorient them towards the "front door" of the SUS system (Brasil, 2006). Previous experiences with the incorporation of those practices into the SUS network in Brazil revealed that, in spite of infrastructure difficulties and low investments in support of phytotherapies, medicinal plants represent low-cost and efficient alternatives widely appreciated by the populations being served (Antonio, et al., 2013; Ogava, et al., 2003; Silva, et al., 2006).

5. Conclusion

This study emphasizes the importance of medicinal plants in the primary health care of rural farmers in the Amazon. They used species that occur naturally in the Amazon to heal the main health problems. These plants have been the subject of researches that confirms their therapeutic potential. Among the six species, highlighted, Alternanthera brasiliana and Dalbergia monetaria are not present in any document from the Ministry of Health. Hereby, we also draw attention to the requirement of more research with Amazonian plants, to ensure their inclusion in lists of species of interest to the SUS, since these documents do not present a representative number of species from this region. Finally, we highlight a list of 10 amazon species that must be available in the local health system, given their presence in official documents and traditional use in the country.

Therefore, this study encourages the development of more bioprospection research of Amazonian plants, whose traditional uses have been used for thousands of years by local populations. More knowledge of the therapeutic properties of these species is essential for its valorization within the scope of public health policies.

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