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Medicinal plants popularly used in the Brazilian Tropical Atlantic Forest

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Abstract

A survey of medicinal plants used by rural and urban inhabitants of the three cities of the Tropical Atlantic Forest, Region of Vale do Ribeira, State of São Paulo, Brazil was performed by means of 200 interviews with medicinal plant users and extractors and, traditional healers. One hundred fourteen herbal remedies were recorded and the following information reported: Latin, vernacular and English names, plant part used, forms of preparation and application of the herbal remedies, medicinal or food uses, areas of plant collection, economic importance (when available) and other data.

Keywords: Medicinal plants; Ethnopharmacology; Mata Atlântica; Tropical Atlantic Forest; Traditional medicine; State of São Paulo; Brazil

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1. Introduction

This report is a second part of an effort for documenting the traditional uses of medicinal plants in several Brazilian forests. In the first paper [1] we reported 117 medicinal plants used in the Brazilian Amazon. In this study, we present information on plant species used as medicines by people that inhabit an important and singular tropical ecosystem, the Tropical Atlantic Forest, known as Mata Atlântica.

Recent data show that tropical forests contain more than half of the world's estimated 500 000 plant species and less than 1% of these plants have been researched for medicinal activity [2]. Tropical plant species contain three to four times the number of active chemical constituents than their temperate counterparts [3]. On the other hand, an often-stated assumption is that the discovery of a new drug from a plant drug will undoubtedly help in conservation efforts, particularly in rain forest regions [3], where people live in absolute poverty. In this way, ethnopharmacological surveys are necessary for documenting the traditional uses of plants before this knowledge will be forgotten. In Brazil, there is an urgent need for collecting, documenting, and saving tropical botanical resources. Several ethnobotanical books are available in Brazil [4–7], but our actual ethnopharmacological knowledge is insufficient to support interdisciplinary research [8].

With the exception of the Amazon, few studies on medicinal plants have been performed in other Brazilian forest areas such as the Mata Atlântica, Caatinga, Pantanal, and Cerrado. In the Tropical Atlantic Forest, preliminary ethnobotanical studies have been performed in some provinces [9,10]. On the other hand, except for limited reserves, the native Mata Atlântica is deforested in the southern region [8]. Approximately 8% of the original vegetation of the Mata Atlântica are conserved in the State of São Paulo, mostly as fragments mixed with secondary vegetation [11] with 70% situated in the Vale do Ribeira [12], the research area of the present study.

Based on the above information, the present report includes a preliminary survey of medicinal plant utilization by the rural and urban communities of the Tropical Atlantic Forest (Vale do Ribeira, State of São Paulo, Brazil). This survey is important because we know that traditional knowledge on medicinal plants is the main basis for biocultural and ecosystem conservation as well as selection of forest plants for further pharmacological, phytochemical, toxicological and ecological studies.

2. Experimental background

2.1. Research area

The field research was carried out in collaboration with urban and rural inhabitants of the cities Eldorado, Jacupiranga and Sete Barras, Vale do Ribeira, State of São Paulo, Brazil. The region of Vale do Ribeira is situated in the Southern of State of São Paulo and includes 23 cities [11] distributed in an area of

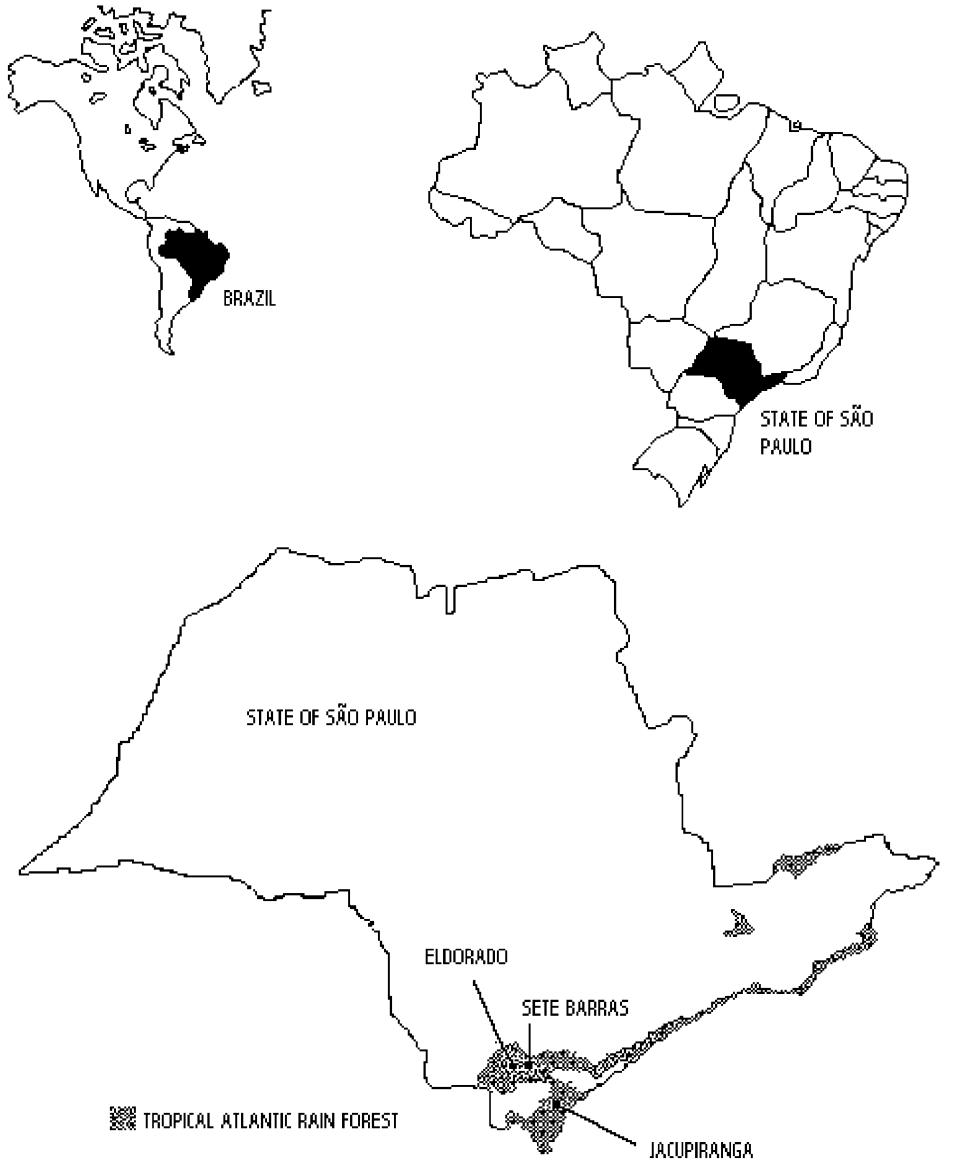

Fig. 1. Places of ethnobotanical data collection of the Tropical Atlantic Rain Forest, São Paulo, Brazil.

16 327 km^2. The cities of Eldorado, Jacupiranga and Sete Barras are included in the Ribeira Lowlands Subregion (Fig. 1).

The research area includes a humid forest with accentuated relief, a mountainous area (up to 800 m above sea level), typic tropical forest vegetation with high

plant and animal biodiversity. The area includes several forest formations and ecosystems as Dense Ombrophilous Atlantic Forest, Mixed Ombrophilous Forest, Open Ombrophilous Forest, Decidual Ombrophilous Forest, Semidecidual Ombrophilous Forest, mangrove growth, sandbanks, swamps, and secondary vegetation. The climate is classified as tropical with temperatures over 20 °C, and one rainy season from December to February (approx. 4000 mm/year).

2.2. Data collection and assessment

In all study areas, the data on the medicinal uses of plants were collected from urban inhabitants of Eldorado, Jacupiranga or Sete Barras and local members from ten rural communities. The collection of information was based on both open (free open-ended interviews recorded on tape recorder) and structured interviews (questionnaires containing identification data of the interviewees and their uses of medicinal plants). Three hundred ninety-four inhabitants were preliminarily contacted and exactly 200 inhabitants were selected based on one of the following criteria: (1) inhabitants that have been living in the region for more than 10 years and use medicinal plants as the main medicine or (2) inhabitants identified as medicinal plant extractors or traditional healers (medicine men, women healers, sorceresses, witch doctors, shamans and others). The selection of informants was performed based on a questionnaire containing data of personal identification. The interviewees live in very precarious conditions of basic sanitation, health, feeding with approximately four people per family surviving on a net income of US$ 75/month [12]. The interviewers were carried out for 4 years by seven researches (authors of the present study).

To incorporate the medicinal plants in this inventory, two inclusion criteria were used: (1) only those herbal remedies that were said to be handed down from oral tradition were considered; and (2) only those plant species that could be directly indicated and collected by the person interviewed are cited in this paper.

In order to collect voucher specimens, field trips were made with the member interviewed on the different forest areas of the three cities. All plant species were identified by taxonomists of the Herbarium BOTU, Departamento de Botânica, Instituto de Biociências de Botucatu, UNESP, São Paulo, Brazil where the voucher specimens are deposited. The taxa are listed by botanical family according to the Cronquist system modified by Kubitzki and standardized by Mabberley [13]. For each plant species listed, the following information is reported: Latin, vernacular and English names (when available); plant part used; form of preparation of herbal remedies; medicinal and/or food uses; and area of plant collection.

In order to analyze the cultural importance of each plant species, the medicinal uses of the plants were assigned into 14 major categories (e.g. diseases of the respiratory system, diseases of the central nervous system) [1]. A plant species may be listed in more than one category. For each medicinal plant we also registered the number of positive responses for their medicinal or food uses. In addition, the ethnomedicinal data are analyzed according to distribution in botanical families, main traditional preparation, plant part used, and area of plant collection.

3. Results and discussion

In the present report 628 medicinal uses are described for 290 folk remedies based on 114 plant species belonging to 50 families and 99 genera (Table 1). Local traditions on the use of plants in popular medicine are still extensive and quite varied. The families with the highest number of reported medicinal species are Asteraceae (15 species recorded), Lamiaceae (12), Piperaceae (6), Cucurbitaceae (5), Myrtaceae (5), Fabaceae (5), Arecaceae (4), Caesalpiniaceae (4), and Solanaceae (4). Similar data on the main botanical families were recorded in a study performed in the Brazilian Amazon [1]. The Asteraceae (Compositae) and Lamiaceae (Labiatae) include approximately 22 750 and 6700 plant species, respectively, of which a great number are cosmopolitan (herbs, shrubs, trees and climbers) and known worldwide as medicinal plants. Table 1 also shows the species with the highest number of reported uses as herbal medicine: *Matricaria chamomila* (46.0%), *Mentha piperita* (41.5%), *Pimpinela anisum* (39.0%), *Mikania glomerata* (38.0%), *Cymbopogon citratus* (35.5%), *Baccharis trimera* (33.0%), *Lippia alba* (29.5%), *Vernonia* sp (29.0%), *Achillea millefolium* (26.0%), *Piper gaudichaudianum* (26.5%), *Mentha pulegium* (24.0%), *Psidium guajava* (24.0%), *Ocimum gratissimum* (23.0%), *Piper umbellatum* (22.0%), *Allium sativum* (20.5%), *Cecropia peltata* (19.0%), *Piper lhotskianum* (18.5%), *Echinodorus grandiflorus* (18.0%) *and Bauhinia forficata* (17.5%). *Matricaria chamomila, Mentha piperita, Pimpinela anisum, Cymbopogon citratus, Mentha pulegium, Achillea millefolium, Ocimum gratissimum* and *Allium sativum* are cosmopolitan species, cultivated or spontaneous in garden and secondary vegetation in the Tropical Atlantic Forest region. The majority of these species are well studied phytochemically and pharmacologically and have a rather wide market as medicinal plants or condiments. On the other hand, other species like *Piper umbellatum, Piper gaudichaudianum, Piper lhotskianum, Bauhinia forficata, Cecropia peltata, Psidium guajava, Echinodorus grandiflorus, Mikania glomerata* and *Baccharis trimera* are native forest plants with natural distribution and wide occurrence in the Tropical Atlantic Forest. These species are important economic resources for local people as well as a rich source of phytomedicines or, potentially, new drugs with therapeutic activity.

Table 2 shows the distribution of the 114 medicinal taxa according to area of collection. These data showed that 42 species (36.9%) are primary forest, of which 5.3% also are cultivated by local inhabitants and 5.3% also are spontaneous in secondary vegetation. Medicinal plants exclusively collected from secondary vegetation are 4.4% and those spontaneous in garden and/or secondary vegetation are 14.0%. Overall, 44.7% are cultivated. The majority of the cultivated plants are exotic species that have become acclimated to the region. These data show that 55.3% of all species reported are easily collected in the region of study.

With the exception of *Coffea arabica*, which is used after fruit dehydration and toasted, all herbal remedies are used in the fresh state (Table 3) and the most frequently used plant parts are leaf (58.3%), root (9.7%) and fruit (7.9%). Similar results are known for ethnobotanical uses of medicinal plants in the Brazilian Amazon [1]. The higher frequency of the use of leaves in preparation of herbal

Table 1
Medicinal plants used in the region of Tropical Atlantic Forest, São Paulo, Brazil

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
ALISMATACEAE					
Echinodorus grandiflorus[1] Michelli Chapéu de couro/Burhead	18.0	L	1	Renal and hepatic complaints, headache, bellyache, lower backpain, bad cold, diabetes, sedative, worms (mainly *Ascaris lumbricoides*)	Fo
		L	D	Renal disturbances, analgesic (mainly headache)	
ANACARDIACEAE					
Schinus terebenthifolius Raddi	3.5	L	Mw	Wound healing, analgesic, against itching	Fo
Arueira/Brazil peppertree		L	I	Internally against rheumatism	
		L	Fr	Wound healing, against gingivitis (mastication)	
APIACEAE					
Coriandrum sativum[1,2] L.	2.5	S	I	Menstrual colic, hypertension	Cu
Coentro/Coriander		S	I	Sore throat (gargling)	
		L	I	Headache, migraine	
		L	Fr	Edible as condiment	
Hydrocotyle exigua (Urban.) Malme	2.0	L	I	Cough, bronchitis	FSF
Erva-Terrestre/Pennywort					
Petroselium sativum[1,2] L.	2.0	L	I	Depurative	
Salsa/Common parsley		R	I	Renal disturbances	Cu
		L	Fr	Edible as condiment	
Pimpinela anisum[1,2] L.	39.0	L	I	Expulsion of intestinal worms, sedative, against bad cold, fever, bellyache, constipation, cough, diarrhea, uterine colic.	
Erva-doce/aniseed					
		S	I	Insomnia, fever, bellyache, same uses of infusion of leaves	
		S	D	Toxic for central nervous system (side effect cited)	
		S	Fr	Mastication for toothache	
ARECACEAE					
Euterpe edulis[2] M.	6.0	St	J	Internal use against bellyache, haemorrhagia; snake bite (external use)	Fo
Palmiteiro/Euterpe palm		St	Fr	After industrial process is used as food	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
ARISTOLOCHIACEAE					
Aristolochia sp	2.0	L	D	Stomach and hepatic complaints, mainly nausea and vomiting	Fo
Milomem/Dutchman's pipe		L	I	Bellyache, constipation, bad cold, cough, parasitic worms	
ASTERACEAE					
Acanthospermum australe[(1)] Kuntze	8.0	L	D	Wound healing (internal and external uses)	SGS
Carrapicho/Paraguay starbur					
Achillea millefolium[(1)] L.	26.0	L	I	Fever, headache, general pains, stomach complaints, bad cold	Cu
Novalgina/Yarrow or milfoil		L	D	General pains, fever, stomach complaints	
Ageratum conyzoides[(1)] L.	9.0	R	I	Internal use as analgesic, antirheumatic, against menstrual colic	SGS
Mentrasto/Tropic ageratum		R	B	Antiseptic, against skin infections	
		Wp	I	For menstrual regulation, general pains and hepatic complaints	
Artemisia absinthium[(1)] L.	16.0	L	I	Analgesic (mainly bellyache and headache) antiemetic, against nausea, stomach and hepatic disturbances, parasitic worms.	Cu
Losna/Wormwood					
		L	B	Elimination of head lice	
		L	Mw	Ulcers, hepatic disturbances, bad cold	
Artemisia sp-Lorde	4.0	L	I	Internal use for menstrual regulation	SGS
Baccharis trimera[(1)] L.	33.0	L	I	Analgesic, diuretic, against renal, intestinal, stomach and intestinal complaints, hypertension, diabetes	FSF
Carqueja					
		L	B	External use against edemas	
		L	D	External use against edemas	
		R	I	Obesity and for body detoxification	
		L	I	Analgesic, diuretic, anti-inflammatory, antipyretic	
		As	D	Diuretic, to grow thin and against stomach, hepatic and renal complaints, brain hemorrhage.	
Baccharis[(4)] sp	4.0	L	D	Analgesic	Fo
Vassoura-rainha		L	I	External use against edemas, fever	
		L	B	External use against edemas, fever	
		R	B	External use for rheumatism	
Bidens pilosa[(1)] L.	9.0	L	Mw	Anti-inflammatory, against stomach complaints	SGS
Picão/Beggar-ticks or Bur		L	B	Hepatitis	
marigold		L	I	Hepatitis	
		Wp	I	Hepatitis	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
Gnaphalium purpureum L.-Macela	2.0	As	I	Diarrhea, intestinal complaints, bellyache	SGS
Lactuca sativa(2) L.-Alface/Lettuce	2.5	F	I	General infections, bellyache, renal complaints and as depurative	Cu
Matricaria recutita(1) L.	46.0	L	I	Sedative for children (mainly against insomnia)	Cu
Camomila/German chamomile		L	I	Internal use against cough, renal colic, diarrhea, nausea, skin eruption, fever, bad cold, headache, bellyache, constipation, as sedative, for expulsion of parasitic worms. External use for eyes infections.	
		S	I	Sedative for children, stomach complaints, parasitic worms	
		F	I	Nausea, vomiting, bellyache (internal use); skin diseases (external use)	
Mikania glomerata(1) Spreng.	38.0	L	Sy	Against cough, bronchitis	FC
Guaco/American vine					
Solidago microglossa DC.	11.0	Wp	Me	External use against muscular pain, infections	SGS
Arnica/Brazilian golden rod		Wp	D	Sedative, against digestive complaints (internal use)	
Tagetes erecta L.-Cravo/African marigold	0.5	F	D	For menstrual regulation	Cu
Vernonia(1) sp	29.0	L	I	Stomach-hepatic complaints	Cu
Boldo/Boldutree		L	Mw	Bellyache, nausea, gastritis, bad digestion	
BIGNONIACEAE					
Jacaranda caroba(3) (Vell.) DC.	9.0	L	B	General infections	Fo
Caroba		L	I	Internal use against syphilis, as depurative	
Jacaranda sp	10.5	L	I	Diabetes, hepatic disturbances	Fo
Carobinha		L	Mw	Wound healing, ulcers (external use)	
BIXACEAE					
Bixa orellana(1,3) L.-Urucum/ Annatto	5.5	S	D	Bronchitis, fever in children	Cu
BORAGINACEAE					
Symphytum officinale(1) L.	5.0	L	D	Hepatic, stomach complaints, inflammation, bellyache	Cu
Confrei/Comfrey or knitbone		L	Me	Wound healing (external use)	
		R	Me	Diuretic, against anemia	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
BRASSICACEAE					
Brassica nigra[2] (L.) Koch.	1.0	S	Mw	Internal use against inflammation	Cu
Mostarda/Black mustard		S	Fr	Topical use of triturated seed for inflammation	
		L	Fr	Edible as salad	
Nasturtium officinale[2] R.Br.	12.0	L	Sy	Cough, bad cold, bronchitis	Cu
Agrião/Watercress		L	D	Thyroid disturbances, bronchitis, anemia	
		As	I	Bad cold, bronchitis	
		St	D	Thyroid disturbances, bronchitis, anemia	
		L	Fr	Edible as salad	
CAESALPINIACEAE					
Bauhinia forficata[1] Link.	17.5	L	I	Diuretic, hypoglyaemic, against hypertension, lower backache	Fo
Pata-de-vaca/Bell bauhinia		L	D	Diuretic, hypoglycaemic, against hypertension, lower backache	
Cassia occidentalis[1] L.	11.0	R	I	Bellyache, bad cold, fever, general infections, hepatic, stomach complaints, as diuretic	SF
Fedegoso/Coffee senna		R	Me	Diuretic, against general infections	
		L	I	Analgesic (mainly against headache, bellyache), against diarrhea	
		L	D	Diarrhea, parasitic worms, hepatic disturbances	
		L	Mw	Topical use against conjunctivitis	
Hymenaea courbaril[1,2] L.	2.0	L	I	Bronchitis, mainly for children	
Jatobá/Courbaril tree		T	Sy	Cough, bronchitis	FC
		L	Me	Bronchitis, asthma, as appetite stimulant	
		T	I	Tonic for children	
		Fru	Fr	Edible	
Hymenaea sp	5.0	L	I	Bronchitis, mainly for children	
Jutaí		T	Sy	Cough, bronchitis	Fo
CAPRIFOLIACEAE					
Sambucus nigra L.[1]	3.0	L	I	Fever, cough	FC
Sabugueiro/Common elder		F	I	Muscular pain, bad cold, hoarseness, measles, varicella	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
CARICACEAE					
Carica papaya[2] L.	9.0	F	I	Bad cold, cough, whooping cough	Cu
Mamão/Papaya		F	Sy	Bad cold, cough, whooping cough	
		Fru	Fr	Edible	
CELASTRACEAE					
Maytenus ilicifolia[1]	3.0	L	I	Bellyache, lower backache, sciatica, ulcer	Fo
M.-Espinheira-santa					
Maytenus aquifolium[4]	1.0	L	I	Bellyache	Fo
M.-Espinheira-santa					
CHENOPODIACEAE					
Teloxyx ambrosioides[1]	14.0	L	Mw	Internal or external use as anti-inflammatory	SGS
Bert. ex Stend.					
Erva de Santa Maria/		L	Fr	Topical use of triturate leaves for edemas	
Wormseed goosefoot		L	I	Internal use for rheumatism, bronchitis, parasitic worms, fever, sciatica and external use for skin diseases	
CONVOLVULACEAE					
Ipomoea batatas[2] Poir.	1.5	L	I	Wound healing (external use)	Cu
Batata-doce/Sweet potato		L	I	Gargling of infusion for mouth infections, gingivitis, toothache,	
CUCURBITACEAE					
Cucurbita maxima[2] Wall.	1.5	Fru	Mw	Burns	Cu
Abóbora/Pumpkin		S	Fr	Triturated seed for parasitic worms	
		Fru	Fr	Edible	
Luffa cylindrica	3.0	Fru	Me	Rhinitis	Cu
Roem.-Buchinha/Sponge					
Momordica charantia L.	3.5	As	I	Hepatic complaints, as appetite suppressive	FSF
Melão-de-São-Caetano/ Balsampear					
Sechium edule[2] Sw.	1.5	Bu	D	Hypertension, as sedative	Cu
Chuchu/chayote		Fru	Fr	Edible	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
Wilbrandia ebracteata[4] Cogn.	14.0	L	D	Ulcer, gastritis	
Taiuiá		R	D	Ulcer, gastritis	
DIOSCOREACEAE					
Dioscorea alata L.-Inhame/Yam	1.0	St	D	Depurative	Cu
EUPHORBIACEAE					
Phyllanthus corcovadensis[1] Muel. Arg.	16.5	As	I	For expulsion of renal calculus, against diarrhea	SGS
Quebra-pedra/Fly-roost leafflower		Wp	I	Diuretic, against bellyache	
		L	I	For expulsion of renal calculus, against hepatic complaints	
FABACEAE					
Boudichia sp-Sucupira	2.0	S	Me	Rheumatism	Fo
Cajanus cf. *indicus* Spreng.	3.0	L	B	Bellyache, diarrhea (topical use)	Cu
Guandú/Pigeonpea		L	D	Cough, bad cold, bellyache, diarrhea (internal use)	
		L	I	Constipation	
Cymbosena roseuna Bent. − Flor Terra	1.5	L	I	Hepatic, stomach complaints	Fo
Myrocarpus frondosus Allem.	10.5	T	Mw	Anti-inflammatory, wound healinbg (external use)	Fo
Cabreúva/Brazilian myrocarpus					
Zollernia ilicifolia[4]	4.5	L	D	Ulcer, bellyache	Fo
Vog.-Espinheira-santa					
FUMARIACEAE					
Fumaria sp	1.0	Wp	B	Topical use for hemorrhoids	Fo
Fel da Terra/Drug fumatory		Wp	I	Internal use against stomach complaints	
LAMIACEAE					
Hyptis crenata Pohl. Ex Benth.	6.0	R	I	General pains, bad cold, rheumatism, menstrual colic	SF
Mentrasto/Rosemallow		R	B	External use against general infections	
		Wp	I	For menstrual regulation	
		L	D	Analgesic	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
Leonotis nepetaefolia L. Rubim/Lion's-ear	11.0	L	I	Internal use against bad cold, rheumatism, hypotension, stomach complaints, general pains; external use as wound healing	SGS
		L	Mw	Sore throat	
Leucas martinicensis R. Br. Cordão de frade	1.0	L	I	External use against muscular pain, rheumatism; internal use against bad cold, cough	SGS
Melissa officinalis[1] L. Melissa/Lemon balm or melissa	3.0	L	I	Sedative for children, against stomach disturbances, bad cold, cough, hypertension	Cu
		L	B	Wound healing (external use)	
		R	D	Bad cold, cough	
Mentha piperita[1,2] L. Hortelã/Mint or Peppermint	41.2	L	J	Wound healing (external use)	Cu
		L	Mw	Topical use as analgesic	
		L	I	Parasitic worms, diarrhea, bronchitis, bellyache, cough; as sedative	
		L	Fr	Appetite stimulant for children	
		S	D	For expulsion of parasitic worms	
		L	Fr	Edible as condiment	
Mentha pulegium[1] L. Puejo/Pennyroyal mint	24.0	L	I	For expulsion of parasitic worms (mainly *Ascaris lumbricoides*, *Entamoeba hystolitica* and *Giardia lamblia*), renal calculus, fever, bad cold, cough, bronchitis, bellyache	Cu
		L	Sy	Bad cold, cough	
		L	D	Abortifacient	
		R	I	Bad cold	
Mentha viridis[1] L. Hortelã preta/Spearmint	1.0	L	I	For expulsion of parasitic worms (mainly *Ascaris lumbricolides*) as analgesic	
Ocimum basilicum[1,2] L. Alfavacão/Basil	16.5	L	Sy	Cough, bronchitis	
		L	I	Cough, bronchitis	
		L	Fr	Edible as condiment	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
Ocimum gratissimum[1,2] L.	23.0	L	B	Topical uses for mycosis	Cu
Alfavaca/Tree basil or		L	Sy	Bronchitis, cough	
Indian basil		R	D	Diarrhea, stomach complaints, headache, as sedative for children	
		R	Sy	Cough, headache	
		L	Sy	Cough, headache	
		L	Fr	Edible as condiment	
Ocimum micranthum[1,2] Willd.	3.5	L	I	General infections, cough, bronchitis	Cu
Manjericão/Sweet basil		L	D	Constipation	
		L	Fr	Edible as condiment	
Origanum vulgare[1,2] L.	2.0	L	Sy	Cough, bronchitis	Cu
Manjerona/Marjoram		L	Fr	Edible as condiment	
Rosmarinus officinalis[1,2] L.	10.5	R	I	Renal disturbances, as diuretic	Cu
Alecrim/Rosemary		As	I	Sedative for children, analgesic, against constipation, hypertension	
		L	D	Abortifacient	
		L	Fr	Edible as condiment	
LAURACEAE					
Laurus nobilis[2] L.	11.0	L	I	Intestinal, hepatic complaints, bellyache, headache, as emetic and abortifacient	Cu
Louro/Bay laurel					
		L	D	Abortifacient, against constipation, bellyache	
Persea americana[2] Mill.	14.0	L	D	Diuretic, antipyretic, analgesic (mainly bellyache), renal calculus	Cu
Abacate/Avocado		L	I	Diuretic, antipyretic, analgesic (mainly bellyache), renal calculus	
LILLIACEAE					
Allium sativum[1,2] L.	20.5	Bb	Me	Bad cold, hypertension	Cu
Alho/garlic		Bb	Fr	Topical use for relief headache	
		Bb	I	Internal use for bad cold, cough, hypertension	
		Bb	Mw	Bronchitis, mainly in children	
		Bb	D	Migraine	
		Bb	Fr	Edible as condiment	
Allium cepa[1,2] L.	2.0	Bb	Mw	Bronchitis	Cu
Cebola/Onion		T	I	Emetic, against parasitic worms	
		Bb	Fr	Edible as condiment	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
Aloe vera[1] L.	6.0	L	J	Anti-inflammatory, wound healing, analgesic (mainly headache)	Cu
Babosa/Barbados aloe		L	Mw	Ulcer	
		L	Fr	Topical use against edemas, general pains, infections	
LOGANIACEAE					
Strychnos triplinervia[1] M. – Quina cruzeiro	8.0	T	D	General pain, fever	Fo
MALVACEAE					
Gossypium barbadense[3] L.	1.5	As	B	Muscular pains, headache	Cu
Algodão/Cotton tree		F	B	Muscular pains, headache	
Malva parviflora L.	4.5	L	Me	Wound healing	Cu
Malva/Rosemallow		L	D	Intestinal complaints, fever	
Sida sp-Capiá	1.0	L	D	External use against rheumatism	Fo
MENISPERMACEAE					
Cissampelos[1] sp-Abutua	5.0	T	D	External use against inflammation	Fo
MORACEAE					
Cecropia peltata[1] L.	19.0	L	D	Cough, bronchitis, bad cold	Fo
Embaúba/Trumpet tree		Bu	Sy	Cough	
Sorocea ilicifolia[4] L.-Espinheira-santa	2.0	L	I	Bellyache	Fo
MYRTACEAE					
Eucalyptus globolus[3] L. – Eucalipto/Blue gum	4.0	L	D	Inhalation of vapor for bronchitis, sinusitis, bad cold	Cu
Eugenia jambos L.-Jambo/Iamb	1.0	L	I	Diabetes	Cu
Psidium guajava[2] L.	24.0	L	I	Bellyache	SGS
Goiaba/Guajava tree		Bu	D	Diarrhea	
		Fru	I	External use against hemorrhoids, skin diseases, edema; internal use against diarrhea	
		Fru	Fr	Edible	
Psidium cf. *guinense* Sw.	12.0	L	D	Anti-inflammatory wound healing (external use)	FSF
Araçá/guava		L	I	As gargling as oral antiseptic; external use as anti-inflammatory	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
Stenocalyx sp	7.0	L	I	Bellyache, bad cold, fever, hypertension, as diuretic	Cu
Picanga		L	B	Itch, scabies	
		Bb	I	Diarrhea	
MUSACEAE					
Musa acuminata[2] Colla	12.5	Bu	Mw	Cough, asthma	Cu
Banana/Banana tree		Bu	Sy	Bronchitis	
NYCTAGINACEAE					
Boerhavia difusa L.	8.0	L	I	Parasitic worms, mainly *Ascaris lumbricoides*	FSF
Erva-tostão		Wp	I	Hepatitis, diarrhea	
OXALIDACEAE					
Averrhoa carambola[2] L.	2.0	L	I	Diabetes, hypertension, renal disturbances	Cu
Carambola/Carambold		Fru	J	As cooling agent	
		Fru	Fr	Edible	
PASSIFLORACEAE					
Passiflora coccinea Aubl.[2]	3.0	L	I	Internal use as sedative	Cu
Maracujá/Monkeyguzzle		L	Mw	To relief asthma symptoms	
		Fru	J	Sedative	
		Fru	Fr	Edible and as cooling agent	
PIPERACEAE					
Peperomia rotundifolia H.B.K.	7.0	L	I	Sedative, against bellyache	FC
Salva-vida		L	D	To facilitate digestion, against hypertension, stomach complaints, complaints, bad cold, gastritis	
Piper regnelli[4] (L.) Miq.	10.5	L	I	Analgesic, anti-inflammatory	FC
Pariparoba		L	D	Hepatic complaints, nausea	
Piper cernuum[1] Vell.	22.0	L	I	Analgesic (mainly bellyache), against hepatic, renal complaints	Fo
Pariparoba		L	D	Topical use to relief muscular pain	
		R	Fr	Analgesic, against abdominal colic	
Piper gaudichaudianum[4] Kunth.	26.5	L	I	Mastication for toothache	Fo
Iaborandi		L	Fr	Mastication for toothache	
		R	Fr	Internal use as anti-inflammatory, against hepatic complaints	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
Piper cf. *lhostzkyanum* Kunth. − Apeparuão	18.5	L	I	Hepatic, renal, stomach complaints	Fo
Pothomorphe umbellata(1) (L.) Miq.	22.0	L	I	Topical use to relief muscular pain	Fo
Capeba		L	Mw	Hepatic complaints	
PLANTAGINACEAE					
Plantago sp −Tansagen/ Rippleseed plantain	11.0	L	Sy	Gargling for oral inflammations	SGS
POACEAE					
Cymbopogon citratus(1) Stapf.	35.5	L	I	Sedative, against diarrhea, bad cold, headache, muscular pain, rheumatism, fever, hypertension, general pains	Cu
Capim sidrol (Lemon grass)		L	J	As cooling agent, sedative	
		L	D	Bad cold, rheumatism	
		R	I	Antidiuretic	
Saccharum officinarum(2,3) L.	3.0	L	D	Diuretic, against hypertension	Cu
Cana/Sugar cane		R	D	Renal complaints, parasitic worms	
		Bu	I	Diuretic and against parasitic worms	
		L	I	Hypertension	
POLYGONACEAE					
Polygonum hidropiperoides Mich.	8.0	L	B	For elimination of head lice, against itch, hemorrhoids	SF
Erva de bicho/Bitter smartweed		L	I	Internal use as anti-hemorrhage	
POLYPODIACEAE					
Adiantum sp	4.0	L	I	Bad cold, cough	Fo
Avenca/Maidenhair fern		L	Sy	Whooping cough	
PORTULACACEAE					
Portulaca oleracea L.	6.0	L	J	Ulcers, bellyache	SGS
Verduega/Purslane		L	Fr	Mastication of leaves for ulcers, bellyache	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
PUNICACEAE					
Punica granatum L.	7.5	L	I	Bellyache	Cu
Romã/Pomegranate		T	B	Anti-inflammatory and against diarrhea	
		Fru	D	Diarrhea	
ROSACEAE					
Prunus Domestica L.	3.5	L	D	General pains (mainly headache)	Cu
Ameixa/Plum		L	B	Anti-inflammatory	
		T	I	Bellyache, diarrhea	
		S	J	Used as eyewash against eye irritation	
		Fru	I	Hepatic disturbances, bellyache	
		L	D	Diarrhea	
		Fru	D	Diarrhea	
		T	D	Diarrhea	
RUBIACEAE					
Coffea arabica[2] L.	2.5	L	I	Abortifacient, against diabetes, headache	Cu
Café/Coffee tree		Fru	I	Abortifacient	
		Fru	D	Stimulant	
		Fru	I	Drink after dehydration and pulverization	
RUTACEAE					
Citrus limonum[2] Risso	8.5	Fru	J	Bad cold	Cu
Limão/Lemon		Fru	I	Bad cold	
		T	Sy	Bad cold	
		L	I	Diarrhea, bad cold	
		T	I	Bad cold	
		Fru	J	As cooling agent	
Ruta graveolens[1,2] L.	6.0	L	I	Menstrual colic, diarrhea, headache and fever	Cu
Arruda/Common true		L	Mw	Topical use against headache, migraine	
		L	Sy	Cough	
		L	D	Abortifacient	
		L	B	External use against general pains	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
SMILACACEAE					
Smilax sp	6.0	L	I	Diuretic	SGS
Sarsa-parreira/Salsaparilla		R	I	Diuretic	
SOLANACEAE					
Solanum erianthum[3] D.Dom. Fumo bravo	3.0	Wp	Fr	Wound healing (external use)	Cu
Lycopersicon esculentum[2] Miel.	1.0	L	Mw	Topical use against burns	Cu
Tomate/Tomato		Fru	Fr	Prostate complaints	
		Fru	Fr	Edible as salad	
Solanum paniculatum L. Jurubeba/Nightshade	2.0	L	D	Parasitic worms, stomach complaints	SF
Solanum tuberosum[2] L. Batata/Common white or Irish potato	1.0	L	I	Stomach complaints	Cu
URTICACEAE					
Parietaria sp	1.5	L	I	Renal complaints	Fo
Paretária/Wall pellitory		L	B	Topical use against general infections	
		R	B	Topical use against general infections	
VERBENACEAE					
Lippia alba[1] N.E.Br.	29.5	L	I	Sedative, against hypertension, stomach colic, nausea, bad cold	SGS
Erva-cidreira/Lemonverbena		R	I	Bad cold, cough	
		L	B	Wound healing (external use)	
		L	Sy	Cough, bronchitis	
Stachytarpheta polyura Schauer.	7.5	R	Sy	Cough, bronchitis	SF
Gervão/False valerian		L	I	Hepatic complaints	
Verbena sp-Verbena/Verbena	2.0	R	I	Bellyache, constipation	Fo
VIOLACEAE					
Anchietia salutaris St. Hil.	2.5	L	I	External use against scabies, itch; internal use against asthma	Fo
Cipó-suma/Mercury anchietea		As	D	External use against scabies, itch; internal use against asthma	

Table 1 (*Continued*)

FAMILY AND SPECIES Local popular name/English name	%	PU	TP	Medicinal uses	SO
ZINGIBERACEAE					
Costus brasiliensis(1) Schum.	15.0	L	I	Hypertension, as diuretic	Fo
Cana do brejo/Spiral flag		L	D	Diarrhea	
		St	I	Hepatitis, bellyache	
Zingiber officinale(1,2) Roscoe	12.0	R	Sy	Bellyache	
Gengibre//Ginger		R	D	Cough, bad cold	

% = relative ratio to 200 informants that cited the plant; PU = PLANT PART USED: Bu: bud; Bb: bulb; F: flowers; Fru: fruits; L: leaves; R: roots; S: seeds; St: stem; T: tight; Wp: whole plant; TP = TRADITIONAL PREPARATION: B: bath; D: decoction; Fr: fresh; I: infusion; J: juice; Me: macerate in ethanol; Mw: macerate in water;; Sy: syrup. SO = Source: Fo: forest; Cu: cultive; FC: forest and cultive; SGS: spontaneous in garden and secondary formation; SF: secondary formation; FSF: forest and secondary formation. (1): economically explored as medicinal plant; (2): economically explored as food; (3): economically explored as raw material for other uses; (4): economically explored as adulteration of other medicinal plant.

Table 2
Areas of plant collection of 114 medicinal plants

(Areas of plant collection)*	Absolute value	Frequency (%)
Primary forest	30	26.3
Primary forest and cultive	06	5.3
Forest and secondary formation	06	5.3
Secondary formation	05	4.4
Spontaneous in garden and secondary formation	15	13.1
Cultive	52	45.6
Total	**114**	**100.0**

*Primary forest: undisturbed or almost undisturbed forest; Secondary formation: artificially disturbed (selective logging) forest or intermediary successional forest stage (after total logging or agricultural land use); spontaneous: species (native or not) with natural occurrence in disturbed forest areas or agricultural land use area.

remedies is largely due to the fact that they can be collected easily and that they are readily available. In addition, leaf is the main raw material used in the production of phytomedicines by Brazilian pharmaceutical laboratories. On the other hand, the use of roots as raw material for herbal remedies preparation is restricted to herbs or shrubs, which can be cultivated easily. It permits easy collection, repositions and also commercialization.

The traditional forms of preparation and application are listed in Table 4. Infusion (40.0%) and decoction (20.3%) are the main traditional preparations as they are in the Brazilian Amazon [1].

Table 5 shows 628 ethnopathological data recorded on 290 herbal remedies prepared from 114 medicinal plants reported. The local people choose to use herbal remedies mainly for treatment of respiratory (18.5%) and gastrointestinal (18.3%) complaints and relief of general pains (17.5%). Socio-economic data show

Table 3
Plant part used for preparation of the 290 herbal remedies from 114 medicinal plant species

Plant part use	Absolute value	Frequency (%)
Aerial parts	08	2.7
Bud	06	2.1
Bulb	09	3.1
Flower	07	2.4
Fruit	23	7.9
Leaf	169	58.3
Root	28	9.7
Seed	13	4.5
Stem	05	1.7
Tight	12	4.1
Whole plant	10	3.5
Total	**290**	**100.0**

Table 4
Local forms of preparation and application of the 290 herbal remedies from 114 medicinal plants

Medication processing	Absolute value	Frequency (%)
Bath	22	7.6
Decoction	59	20.3
Fresh (crude)	35	12.1
Infusion	116	40.0
Juice	10	3.4
Macerate in ethanol	09	3.1
Macerate in water	20	6.9
Syrup	19	6.6
Total	**290**	**100.0**

that health, food, sanitation and socio-economic conditions in this region are still very precarious [12]. These conditions are the main causes for a great number of diseases of the gastrointestinal system, which are also related to infectious diseases induced by parasitic worms, bacteria and other pathogenic microorganisms (7.5%). These pathologies are prevalent in both the tropics and subtropics and are largely due to poor sanitation and socio-economic deprivation. On the other hand, recent data relate that the Tropical Atlantic Forest extends along the Brazilian coast, where the condensation of sea breezes produces a high rainfall (approx. 4000 mm/year) and, consequently, several respiratory diseases [8]. Our results show that

Table 5
Classification of the medicinal uses of 290 herbal remedies from 114 medicinal plants grouped according to organic systems affected or appropriate symptoms

Groups of medicinal uses of medicinal plants	Absolute value	Relative value (%)
Blood and hematopoietic system	07	1.1
Cardiovascular system	18	2.9
Central nervous system	27	4.3
Endocrine system	10	1.6
Gastrointestinal system	115	18.3
Genital system	17	2.7
Renal system	36	5.7
Respiratory system	116	18.5
Skin and related symptoms	33	5.2
Fever	23	3.7
General pains	110	17.5
Infectious diseases	47	7.5
Inflammation	27	4.3
Rheumatism	11	1.8
Food	26	4.1
Other	05	0.8
Total	**628**	**100.0**

diseases of the respiratory system occur widely in the study area (Table 5). The use of medicinal plants as analgesics is very common on all continents. Similar ethopathological data are known for uses of medicinal plants in the Brazilian Amazon [1].

4. Conclusion

On the basis of our data, it is possible to affirm that people of the rural and urban communities of the Tropical Atlantic Forest region have a great knowledge of the medicinal plants. This pharmacological inventory includes 290 herbal remedies prepared from 114 medicinal plants cited for 628 medicinal uses. These data show high herbal diversity of medicinal plants in the Tropical Atlantic Forest as well as great potential for commercialization and, furthermore studies on the pharmacology, toxicology and chemistry of the new drugs. The goal of such subsequent studies will be phytomedicines with efficacy and safety for use in primary health care. On the other hand, the importance of conservation of the biocultural data about medicinal plants is unquestionable, because this knowledge represents additional data for selecting plants that also should be used in studies focusing on ecosystem conservation in order to promote a good standard of life for local inhabitants

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