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Ethnobotany applied to the selection of medicinal plants for agroecological crops in rural communities in the Southern End of Bahia, Brazil

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Abstract

The present work targeted the ethnobotanical survey of medicinal plants for introduction to agroecological crops in 9 rural communities in the southern end of the state of Bahia, Brazil, as an economic and therapeutic alternative for the local populations. Prior agreement from the communities was requested and the research was submitted to the ethics committee; the registration of access to genetic heritage and associated traditional knowledge was performed. The following methodologies were used: participant observation, “snowball”, “walking in the woods”; semi-structured questionnaires and calculation of the Main Uses Concordance index (CUPc). The species were evaluated according to their origin and degree of threat. 233 species, distributed in 73 families, were cited, with emphasis on Asteraceae (27spp.), Fabaceae (18 spp.) and Lamiaceae (16 spp.). Among these, 48% are native, 52% are naturalized and/or exotic and one vulnerable species was found (*Euterpe edulis* Mart.) and one endangered (*Cariniana legalis* (Mart.) Kuntze). The CUPc revealed 25 spp. with a value equal to or greater than 50% in at least one community. These results are expected to contribute to the selection of medicinal plants that serve as an economic and therapeutic alternative for vulnerable communities, as well as in stimulating the preservation of sociobiodiversity.

Keywords: Phytotherapy. Popular medicine. Sociobiodiversity. Traditional knowledge.

Introduction

Since the beginning of human civilization, medicinal plants have been used as resources in the treatment of diseases aiming at their prevention or even the cure. The empirical knowledge about the use of these plants has been passed down until today, becoming a common practice in popular medicine[1,2].

Although the use of medicinal plants is recurrent in popular medicine, only recently the pharmaceutical area has turned its attention to the subject. Until the mid-1980's, the pharmaceutical industry produced medicines by means of the recognition, isolation and synthesis of molecules. However, starting in the 1990s, due to the high cost of producing these drugs and the discovery of phytocomplexes, a movement began for the valorization of the traditional use of medicinal plants, as well as the developement of herbal medicines[3-5].

This valorization process was strengthened in Brazil with the implementation of the National Policy on Medicinal Plants and Herbal Plants (PNPMF)[6] which aims to promote actions, mainly focused on *Sistema Único de Saúde* (SUS) (Unified Health System), aimed at safe and rational use of medicinal plants and herbal medicines. Specific legal instruments have also been created, such as the Resolution of the Collegiate Board of ANVISA - RDC nº 26[7] that defines the categories of herbal medicines and traditional herbal products in addition to establishing the minimum requirements for their registration.

Even with the advent of SUS, the use of medicinal plants represents, in several Brazilian communities, the role of a sole therapeutic resource. It is believed that this practice is benefical to human health, as long as the user has prior knowledge of its purpose, risks and benefits[8].

This scenario has been favoring ethnobotany research focused on the area of medicinal plants. According to Fonseca-Kruel et al.[9], this discipline can subsidize works on the sustainable use of biodiversity, through the utilization and valorization of the popular knowledge of human societies. Almassy Jr.[10] considers that ethnobotany, besides having a multi and interdisciplinary character, seeks, together with traditional communities, comprehension of human relations with the environment and can recover management strategies. The importance of these studies, in this context, allows the recording of information connected to ethnopharmacology, as well as the environmental preservation of the different medicinal species used[11].

It is worth mentioning that, together with these conditions, rural settlements are areas whose populations are composed of people from different regions of the country and, therefore, rich in sociobiodiversity. Thus, ethnobotanical studies also allow an evaluation of how the residents gather information brought from their places of origin with that obtained in the place where they have settled in order to adapt, in this new environment, the plants that are useful to their needs[12].

In the southern region of the state of Bahia, some of the last fragments of the remaining Brazilian Atlantic Rainforest are concentrated, in addition to several rural communities that live in isolation from the great urban centers, representing a space for research on the traditional knowledge focused on medicinal plants species.

Despite the ecological importance of the Atlantic Rainforest areas, associated with the rich sociobiodiversity, there is very little information about the potential and dynamics of these fragments. This knowledge gap is one of the causes of the slowness in the search for medicines that have long been part of the therapy of traditional communities, not to mention the fact that the value of medicinal resources derived from plants has significant potential as an alternative economic resource for the communities in the region[13].

In view of the issues presented, the purpose of the present work was to carry out an ethnobotanical survey in rural communities and agrarian reform settlements in the southern end region of Bahia, aiming at the selection of medicinal plants to be inserted in agroecological cultivation systems as an economic and therapeutic alternative for the local populations.

Methods

Areas of study

The areas of study were chosen when the Center for Innovation in Biodiversity and Health (CIBS/Farmanguinhos/Fiocruz) was invited to participate in the Agroecological Settlements Project (PAA), articulated between the Landless Rural Workers Movement (MST) and the Support Center for Culture and Extension in Education and Environmental Conservation at the Luiz de Queiroz Superior School of Agriculture of the University of São Paulo (NACE PTECA – ESALQ/USP).

CIBS was responsible for selecting plant species of medicinal interest with the purpose of inserting them into productive systems of the MST agroecological settlements (Bela Manhã, José Martí, Antônio Araújo, Jaci Rocha, Herdeiros da Terra, Abril Vermelho e São João) and in two rural communities (Ribeirão and Pouso Alegre). These areas are distributed in four municipalities in the southern end of Bahia: Itamaraju, Alcobaça, Prado and Teixeira de Freitas.

The southern end of Bahia is a region that is classified by the State of Bahia both as an identity territory, due to its cultural diversity, and as one of the main economic regions of the state. The southern end is composed of twenty one municipalities and its borders are demarcated as follows: to the North, Southwest of Bahia and the South Coast of Bahia; to the South, with the State of Espírito Santo; to the West, with the State of Minas Gerais; and, to the East, with the Atlantic Ocean[14].

This region is also known for its low Human Development Index (IDH), economies based on agriculture, monoculture of eucalyptus and problems with unemployment and violence. The monitoring of health conditions shows a large proportion of rural deaths without medical assistance, making clear the lack of inclusion of these communities in public health policies[15].

Sampling and data analysis

The data were collected from june 2016 to june 2017. At the beginning of the work, a meeting was organized with each of the nine communities in order to present the project and its objectives. In these meetings, the statement of prior consent was presented, and the consent of the community was also requested for the development of the work.

The project was submitted to the Research Ethics Committee of the Oswaldo Cruz Institute (IOC) of Fiocruz (Resolution 196/96 of the National Health Counsil) through *Plataforma Brasil*, and was approved and registered as CAAE: 56440416.6.000.5248. Since the project accesses genetic patrimony (PG) and Associated Traditional Knowledge (TK), according to Law 13,123/2015, it was also registered in the National Management System for Genetic Patrimony and Associated Traditional Knowledge (SISGEN) of the Management Council for Genetic Patrimony, receiving the following registration: AA79350.

The selection of respondents to carry out the ethnobotanical survey began through indications from the communities in the first meetings and then proceeded with the snowball method[16].

In the fieldwork, aiming to collect information on medicinal plants and socioeconomic aspects of the communities, direct observation[17] was applied along with semi-structured interviews based on a form. The collection of plant species was carried out after the interviews, with the respondents follow-up, using the "walking in the woods" method [18,19]. The plant species were herborized, assembled, identified and incorporated into the herbarium: Fiocruz's Botanical Collection of Medicinal Plants (CBPM). The botanic identifications were performed by comparison with the material deposited at CBPM; In the herbarium of the Botanical Garden of Rio de Janeiro (RB); by consulting the relevant literature and specialists.

The spelling of the scientific names was checked using the database of *Flora do Brasil 2020*[20]. For the listing of the taxa, the APG IV (2016)[21] was followed.

In order to understand the relationship between conservation and indication of medicinal plants, we sought to classify the species according to their origin and degrees of threat by consulting the database of *Flora do Brasil 2020*[20] and of National Flora Conservation Center (CNCFlora), respectively[22].

Aiming to select, among the total species of the survey, which should be indicated for insertion in agroecological productive systems, we chose to favor the ones that presented the highest rate of Main Uses Concordance index (CUPc)[23]. The final selection included species with a CUPc equal to or greater than 50% in at least one of the communities studied and was later compared with the list of medicinal plants of interest to the Unified Health System (Renisus)[24].

Results and Discussion

Altogether, 180 people were interviewed, citing 233 species of medicinal plants distributed in 73 botanical families (**TABLE 1**), and the most representative ones were: Asteraceae (27 species); Fabaceae (18 species); Lamiaceae (16 species); Euphorbiaceae (9 species); Solanaceae (9 species) e Myrtaceae (8 species). According to Guarim Neto et al.[25], the greater the number of species in a botanical family, the greater the possibility that they will be used by human populations using flora resources. Galvão et al.[26], however, believe that this probability can increase according to the presence of a great number of species of economic importance or of easy harvesting of the parts used, mainly for medicinal purposes. Consequently, the tendency of the presence of the Asteraceae, Fabaceae and Lamiaceae families can be justified among the most cited families in a large part of the ethnobotany works involving medicinal plants.

TABLE 1: List of species cited by the respondents: Botanical Family/Scientific Names; Use Indication and Popular Name.

Botanical Family / Scientific Names	Use Indication	Popular Name
Acanthaceae		
Justicia gendarussa Burm.f.	body aches	abre-caminho
Justicia pectoralis Jacq.	fever, flu, body aches	anador, imburaninha
Adoxaceae		
Sambucus nigra L.	chickenpox, measles, bronchitis	sabugueiro
Alismataceae		

Echinodorus grandiflorus (Cham. &Schltdl.) Micheli	urinary tract problems	chapéu-de-couro
Amaranthaceae		
Alternanthera brasiliana (L.) Kuntze	anti-inflammatory, antibiotic, colic	novalgina
*Amaranthus viridis*L.	anemia	caruru
Celosia argentea L.	throat tinflammation	crista-de-galo
Dysphania ambrosioides (L.) Mosyakin & Clemants	vermifuga	mentruz
Gomphrena globosa L.	fever	perpétua
Pfaffia glomerata (Spreng.) Pedersen	fever, flu, headache	doril
Amaryllidaceae		
Allium sativum L.	expectorant	alho
Allium cepa L.	expectorant	cebola
Anacardiaceae		
Anacardium occidentale L.	anti-inflammatory, wound healing and gastric problems	cajú
Mangifera indica L.	expectorant, acceletrate labor	manga
Schinus terebinthifolia Raddi	anti-inflammatory, wound healing and skin allergy	aroeira
Spondias cf. tuberosa Arruda	pains and bone fracture treatment	amesca
Tapirira guianensis Aubl.	thrush (*Candida albicans*)	cupuba
Annonaceae		
Annona muricata L.	diuretic, control high blood pressure and, diabetes	graviola
Annona squamosa L.	snake poison remedy	pinha
Xylopia frutescens Aubl.	body aches	pindaíba
Apiaceae		
*Coriandrum sativum*L.	menstrual cramps, digestive	coentro
Eryngium foetidum L.	thrush (*Candida albicans*) inflammation of the uterus	coentro-maranhão
Foeniculum vulgare Mill.	sedative, control high blood pressure, gastric problems	erva-doce, funcho
Petroselinum crispum (Mill.) Fuss	inflammation of the uterus	salsinha
Apocynaceae		
Geissospermum laeve (Vell.) Miers	gastric problems	doutor-embira
Thevetia peruviana (Pers.) K.Schum.	contusion and muscular pains	bálsamo
Araceae		
Xanthosoma sagittifolium (L.) Schott	depurative of blood	taioba
Arecaceae		
Cocos nucifera L.	gastric and kidney problems	coco
Euterpe edulis Mart.	snake poison remedy	jussara-branca
Aristolochiaceae		
Aristolochia cymbifera Mart. & Zucc.	hernia remedy	jarrinha-da-mata
Asparagaceae		
Agave americana L.	back problems	pita
Sansevieria trifasciata Prain	body aches	espada-de-são-de-jorge

Asteraceae		
Acanthospermum australe (Loefl.) Kuntze	vaginal discharge	lã-de-carneiro
Acanthospermum hispidum DC.	fever, flu, expectorant, pneumonia	maroto
Achyrocline satureioides (Lam.) DC.	sedative, control high blood pressure	marcela, macela
Ageratum conyzoides L.	inflammation of the uterus, gastric problems	mentraste
Argemone mexicana L.	expectorant, pneumonia, postpartum breathing problems	cardo-santo
Artemisia absinthium L.	(uterine cleansing), problems in the female reproductory system	losna
Artemisia vulgaris L.	menstrual cramps, problems in the female reproductory system	artemijo
Baccharis crispa Spreng.	gastrictract problems	carqueja
Baccharis dracunculifolia DC.	anti-inflammatory	alecrim-do-campo
Bidens pilosa L.	abortive, urinary tract problems,	picão, carrapicho-agulha, pico de mina
Centratherum punctatum Cass.	stomach ache	flor-roxa, balaio-de-velho
Chaptalia nutans (L.) Pol.	rheumatism	bem-me-quer
Chromolaena odorata (L.) R.M. King & H. Rob	swelling, anti-inflammatory	desinchadeira
Conyza bonariensis (L.) Cronquist	skin alergies	rabo-de-raposa
Coreopsis grandiflora Hogge x Sweet	sedative, laxative	camomila
Cyrtocymura scorpioides (Lam.) H.Rob.	skin alergies	peruguai
Eclipta prostrata (L.) L.	wound healing, contusions	arnica
Gymnanthemum amygdalinum (Delile) Sch.Bip. ex Walp.	gastric system problems	alumã
Helianthus annuus L.	vermifuge	girassol
Lactuca sativa L.	sedative	alface
Pluchea sagittalis (Lam.) Cabrera	erysipelas	quitoco
Porophyllum ruderale (Jacq.) Cass.	eyepain, mycosis	escova-de-rato, cravinho, arrudinha
Sonchus oleraceus L.	anemia	serralha
Tagetes erecta L.	bronchitis, body aches	cravo-de-defunto
Tagetes minuta L.	bronchitis, body aches	cravo-de-defunto
Tithoniadiversifolia (Hemsl.) A. Gray	stomach ache	arnica, mão-de-Deus
Vernonanthura polyanthes (Sprengel) Vega & Dematteis	expectorant, flu	assa-peixe
Bignoniaceae		
***Crescentia cujete* L.**	kidney problems	cabaça
Fridericia chica (Bonpl.) L. G. Lohmann	cough, fever	pitanga-do-mato
Handroanthus chrysotrichus (Mart. ex DC.) Mattos	rheumatism	ipê-amarelo
Handroanthus heptaphyllus (Vell.) Mattos	rheumatism, bronchitis, asthma	ipê-rosa
Handroanthus impetiginosus (Mart. ex DC.) Mattos	skin alergies	cinco-folhas
Handroanthus serratifolius (Vahl) S.Grose	rheumatism	ipê-amarelo
Mansoa alliacea (Lam.) A.H.Gentry	expectorant	cipó-alho
Bixaceae		
Bixa orellana L.	cholesterol control	urucum, coloral
Boraginaceae		

Cordia rufescens A.DC.	kidney problems	baba-de-boi-árvore
Symphytum officinale L.	anti-inflammatory	confrei
Varronia curassavica Jacq.	anti-inflammatory, contusions	erva-baleeira, maria-preta
Brassicaceae		
Lepidium virginicum L.	cough, flu	agrião
Bromeliaceae		
Ananas comosus (L.) Merril	flu, asthma, bronchitis	abacaxi
Tillandsia usneoides (L.) L.	prostate problems	barba-de-timango
Cactaceae		
Opuntia ficus-indica (L.) Mill.	anti-inflammatory	palma
Pereskia grandifolia Haw.	anti-inflammatory	ora-pro-nobis
Caricaceae		
Carica papaya L.	vermifuge	mamão
Cleomaceae		
Tarenaya aculeata (L.) Soares Neto & Roalson	urinary system problems	xixi-de-galinha
Combretaceae		
Terminalia catappa L.	backproblems, cholesterol control	amendoeira
Commelinaceae		
Commelina benghalensis L.	nervous system problems	marianinha-preta, emenda-nervos
Convolvulaceae		
Ipomoea batatas (L.) Lam.	toothache, anemia	batata-doce
Ipomoea carnea Jacq.	asthma	zabumba
Operculina macrocarpa (L.) Urb.	vermifuge, depurative of blood	batata-de-purga
Costaceae		
Costus scaber Ruiz & Pav.	urinary system problems	cana-de-macaco
Costus spicatus (Jacq.) Sw.	urinary system problems	cana-de-macaco
Costus spiralis (Jacq.) Roscoe	urinary system problems	cana-de-macaco
Crassulaceae		
Kalanchoe crenata (Andrews) Haw.	flu, cough, bronchitis, respiratory system problems	saião
Cucurbitaceae		
***Cucurbita pepo* L.**	laxative, vermifuge	abóbora
Fevillea trilobata L.	depurative of blood, gastric system problems	gindiróba
Luffa cylindrica (L.) M. Roem.	sinusitis	bucha
Momordica charantia L.	fever, flu, stomach ache	melão-de-são-caetano
*Sicyos edulis*Jacq.	control high blood pressure	chuchu
Cyperaceae		
Rhynchospora speciosa (Kunth) Boeckeler	pneumonia, urinary problems	capim-estrela
Dilleniaceae		
Davilla rugosa Poir.	swelling, skin alergies, expectorant	cipó-caboclo, mata-pasto
Dioscoreaceae		
Dioscorea bulbifera L.	depurative of blood	inhame

Euphorbiaceae		
Cnidoscolus pubescens Pohl	toothache	cansanção
***Euphorbia hirta* L.**	diarrhea	tranca-rabo
Euphorbia prostrata Aiton	urinary system problems	quebra-pedra, quebra-pedra-rasteiro
Euphorbia tirucalli L.	wound healing, anti-inflammatory	pau-graveto,doutor-graveto
Jatropha curcas L.	wound healing, kidney problems	pinhão-branco
Jatropha gossypiifolia L.	wound healing, injuries in the corner of the mouth	pinhão-roxo
Jatropha multifida L.	wound healing	mertiolate, rifocina
Manihot esculenta Crantz	wound healing, diarrhea	mandioca
Ricinus communis L.	cure new belly button	mamona
Fabaceae		
Amburana cearensis (Allemão) A. C. Sm.	gastric system problems	imburana
Bauhinia cheilantha (Bong.) Steud.	diabetes, kidney problems	pata-de-vaca-branca
Bauhinia variegata L.	diabetes, kidney problems	pata-de-vaca
Cajanus cajan (L.) Huth	flu, cold, headache	guandú, feijão-andú
Canavalia ensiformis (L.) DC.	appetit estimulant	feijão- de-porco
Desmodium incanum (Sw.) DC.	kidney problems	venta-de-vaca
Hymenaea courbaril L.	kidney problems, depurative of blood	jatobá
Indigofera cf. blanchetiana Benth	body aches	bálsamo-do-mato
Indigofera cf.suffruticosa Mill.	flu, expectorant, vermifuge	sena
Libidibia ferrea (Mart. exTul.) L. P. Queiroz	diabetes, sexual stimulant, wound healing	pau-ferro
Machaerium cf. isadelphum (E.Mey.) Standl.	diarrhea	sete-casaca
Mimosa pudica L.	whooping cough, hemorrhoid	onze-horas, mariquinha
Mucuna pruriens (L.) DC.	sinusitis, migraine	mucuna-preta
Pterodone marginatus Vogel	bronchitis, diabetes, ulcer gastritis	sucupira
Senna alata (L.) Roxb.	fever, flu, cough, sinusitis	fedegoso
Senna occidentalis (L.) Link	fever, flu, cough, sinusitis	fedegoso
Vigna unguiculata (L.) Walp.	toothache	feijão-de-corda
Zornia sericea Moric.	urinary system problems	arroizinho
Hernandiaceae		
Sparattanthelium tupiniquinorum Mart.	back problems	arco-de-barril
Lamiaceae		
Aegiphila integrifolia (Jacq.) B.D.Jacks.	headache	murula
Leonotis nepetifolia (L.) R.Br.	diabetes	cordão-de-frade, cordão-de-São-Francisco
Leonurus sibiricus L.	fever, flu, abortive	erva-macaé
Mentha arvensis L.	expectorant, post partum uterine cleansing	alevante, hortelã-miúdo
Mentha piperita L.	flu, expectorant and poor digestion	hortelazinho, hortelã-miúdo
Mentha pulegium L.	bronchitis, expectorant, gastric system problems	poejo
Mentha spicata L.	expectorant, post partum uterine cleansing	alevante

Ocimum basilicum L.		majericão, alfavaquinha-do-mato
Ocimum carnosum (Spreng.) Link & Otto ex Benth.	flu	alfavaquinha-de-galinha
Ocimum gratissimum L.	flu, poor digestion,	tioiô, alfavaca
Plectranthus amboinicus (Lour.) Spreng.	anti-inflammatory, expectorant, respiratory system problems	hortelã-gordo, hortelã-grosso
Plectranthus barbatus Andr.	liver and stomach problems, hangover	boldo
Plectranthus neochilus Schltr.	liver problems, gastritis	rinzinho, boldo-do-chile
Rosmarinus officinalis L.	heart problems, control high blood pressure	alecrim
Tetradenia riparia (Hochst.) Codd	toothache	mirra
Vitex agnus-castus L.	sinusitis, sexual stimulant	pimenta-da-costa
Lauraceae		
Cinnamomum verum J. Presl	flu	canela
Persea americana Mill.	kidney problems, stomach problems	abacate
Lecythidaceae		
Cariniana legalis (Mart.) Kuntze	anti-inflammatory, body aches	jequitibá-rosa
Eschweilera ovata (Cambess.) Mart. ex Miers	diarrhea, asthma	biriba
Loranthaceae		
Struthanthus flexicaulis (Mart.) Mart.	cancer	agasalho-de-anú
Lythraceae		
Punica granatum L.	throat inflammation	romã
Malpighiaceae		
Byrsonima crassifolia (L.) Kunth	diabetes	murici-verdadeiro
Byrsonima intermedia A. Juss.	diabetes	murici
Malpighia emarginata DC.	fever, flu, control blood pressure	acerola
Malpighia glabra L.	fever, flu, control blood pressure	acerola
Malvaceae		
Abelmoschus esculentus (L.) Moench	expectorant, asthma, furuncle	quiabo
Abutilon sp.	flu, expectorant	malva-lisa
Gossypium hirsutum L.	anti-inflammatory, flu, expectorant	algodão
Theobroma cacao L.	hemorrhoids	cacau
Marantaceae		
Maranta arundinacea L.	diarrhea	araruta
Melastomataceae		
Leandra australis (Cham.) Cogn.	fever, diarrhea	remela-de-cachorro
Meliaceae		
Melia azedarach L.	repellent	neem
Menispermaceae		
Abuta selloana Eichler	fever, diarrhea and intestinal gas	buta
Moraceae		
Artocarpus altilis (Parkinson) Fosberg	control high blood pressure and cholesterol	fruta-pão
Artocarpus heterophyllus Lam.	swelling	jaca-dura
Ficus carica L.	stomach ache and e liver pain	figo

Ficus gomelleira Kunth	stomach ache and e liver pain	figueira
Maclura tinctoria (L.) D. Don ex Steud.	heart problems, control high blood pressure and cholesterol	amoreira
Morus nigra L.	heart problems, control high blood pressure and cholesterol	amora
Musaceae		
Musa paradisiaca L.	diarrhea, wound healing, respiratory system problems	bananeira
Myristicaceae		
Virola cf. gardneri (A.DC.) Warb.	pain killer, back problems	bicuíba
Myrtaceae		
Corymbia citriodora (Hook.) K.D.Hil l& L.A.S. Johnson	sinusitis, rhinitis, nasal decongestant	eucalipto
Eucalyptus globulus Labil.	sinusitis, rhinitis, nasal decongestant	eucalipto
Eugenia uniflora L.	fever and flu	pitanga
Plinia cauliflora (Mart.) Kausel	kidney problems	jaboticaba
Psidium cattleianum Sabine	diarrhea	araçá
Psidium guajava L.	diarrhea, wound healing	goiaba
Syzygium aromaticum (L.) Merr. & L.M.Perry	flu, cold, headache	cravo-da-índia
Syzygium cumini (L.) Skells	diabetes, control high blood pressure and cholesterol	jamelão
Nyctaginaceae		
Boerhavia diffusa L.	urinary system problems	pega-pinto
Bougainvillea glabra Choisy	toothache	bouganville
Oxalidaceae		
Averrhoa carambola L.	diarrhea, control high blood pressure	carambola
Passifloraceae		
Passiflora alata Curtis	sedative, control high blood pressure	maracujá, maracujá-do-mato
Passiflora edulis Sims.	sedative, control high blood pressure	maracujá
Pedaliaceae		
Sesamum indicum L.	rheumatism, anemia, antibitoic	gergelim
Phyllanthaceae		
Phyllanthus amarus Schumach. & Thonn.	kidney and urinary system problems	quebra-pedra
Phyllanthus tenellus Roxb.	kidney and urinary system problems	quebra-pedra
Phytolaccaceae		
Gallesia integrifolia (Spreng.) Harms	diabetes, rheumatism	pau-alho
Petiveria alliacea L.	rheumatism	guiné
Piperaceae		
Piper aduncum L.	toothache	jaborandi
Piper arboreum Aubl.	toothache	jaborandi
Piper nigrum L.	flu, cough, expectorant	pimenta-do-reino
Piper umbellatum L.	urinary system problems	capeba
Plantaginaceae		
Plantago major L.	anti-inflammatory, expectorant, problems in the female reproductory system	transagem, tansagem
Scoparia dulcis L.	vision problems and uterine problems	vassourinha, vassourinha-de-nossa- senhora

Poaceae		
Coix lacryma-jobi L.	kidney problems	milagre
Cymbopogon citratus (DC.) Stapf.	sedative, control high blood pressure	capim-da-lapa, capim-de- aruanda, capim-santo
Imperata brasiliensis Trin.	help in child teething period	sapé
Zea mays L.	urinary system problems	milho
Portulacaceae		
Portulaca oleracea L.	toothache	onze-horas
Rosaceae		
Fragaria ananassa (Duchesne ex Weston) Duchesne ex Rozier	fever, gallstones	morango
Rosa alba L.	heart problems, control high blood pressure	rosa-branca, rosa-menina
Rubiaceae		
Borreria verticillata (L.) G. Mey.	diarrhea, help in child teething period	tapicuruzinho
Genipa americana L.	anemia	genipapo
Morinda citrifolia L.	diabetes, cancer	noni
Rutaceae		
Citrus × *latifolia* (Yu.Tanaka) Yu.Tanaka	flu, fever, expectorant	limão-tahiti
Citrus aurantiifolia (Christm.) Swingle	flu, fever, expectorant	limão-mirim
Citrus aurantium L.	flu, fever, headache	laranja, laranja-da-terra
Citrus limon (L.) Osbeck	flu, fever, expectorant	limão, limão-mirim
Citrus reticulata Blanco	fever and flu	tangerina
Murraya paniculata (L.) Jack	mycosis	murta
Ruta graveolens L.	postpartum uterine cleansing and menstrual cramps	arruda
Sapotaceae		
Mimus opscoriacea (A. DC.) Miq.	diabetes	abricó
Simaroubaceae		
Simarouba amara Aubl.	prostate problems	gaxeta
Siparunaceae		
Siparuna guianensis Aubl.	fever, headache, rheumatism	negramina
Solanaceae		
Capsicum baccatum L.	hemorrhoids	pimenta-passarinho
Capsicum frutescens L.	erysipelas	pimenta-malagueta
Nicotiana glauca Graham	repellent, skinalergies	fumo
Nicotiana tabacum L.	repellent, skinalergies	fumo
Physalis angulata L.	antibiotic	camapú, guanapú
Solanum asperum Rich.	bronchitis, flu	caiçara
Solanum lycocarpum A. St.-Hil.	sexual stimulant	monocobil
Solanum lycopersicum L.	diarrhea, erysipelas	tomate
Solanum paniculatum L.	anti-inflammatory, diabetes, control high blood pressure	jurubeba
Talinaceae		
Talinum fruticosum (L.) Juss.	anemia	beldroega
Talinum paniculatum (Jacq.) Gaertn.	anemia	beldroega

Typhaceae		
Typha domingensis Pers.	hepatitis, gastritis, kidney problems	taboa
Urticaceae		
Cecropia glaziovii Snethl.	cough, whooping cough	embaúba-roxa
Cecropia pachystachya Trécul	control high blood pressure and cholesterol	embaúba-branca
Pilea microphylla (L.) Liebm.	control high blood pressure, uterine problems	brilhantina
Verbenaceae		
Aloysia gratissima (Gillies & Hook.) Tronc.	flu, fever, sedative	alfazema
Lantana camara L.	flu, bronchitis, expectorant	camará, chumbinho
Lippia alba (Mill.) N.E.Br. ex Britton & P.Wilson	sedative, gastric system problems	erva-cidreira, cidreira-miúda
Stachytarpheta cayennensis (Rich.) Vahl	gastric system problems, hepatitis and kidney problems	gervão, carqueja-do-campo
Violaceae		
Pombalia calceolaria (L.) Paula-Souza	vermifuge, laxative, reproductive system problems	batata-de-purga
Xanthorrhoeacee		
Aloe vera (L.) Burm. f.	wound healing, burn injuries, stomach problems	babosa
Zingiberaceae		
Alpinia zerumbet (Pers.) B.L. Burtt & R.M. Sm.	sedative, control high blood pressure	água-de-colônia
Curcuma longa L.	hepatitis, menstrual cramps	açafrão
Hedychium coronarium J. Koenig	labyrinthitis, control high blood pressure	lírio-branco
Zingiber officinale Roscoe	fever, flu, expectorant	gengibre

Among the respondents 114 are women and 66 are men, with ages varying between 15 to 94 years old, distributed among the following age groups: youngsters, up to 19 years old (1); adults, from 20 to 59 (100) and elderly, above 60 years old (79). Most of them declared being from the State of Bahia (77%), while 33% came from the states of Pernambuco, Ceará, Espírito Santo and Minas Gerais. Those who live in the communities of Ribeirão and Pouso Alegre claim to have lived in these localities for over 20 years, and the others have resided in the MST settlements since the date of its creation (on average 10 years at the time the survey was carried out). The predominance of women and elderly individuals may be related to the fact that, according to Viu et al.[27], women have historical and cultural value when considering the food tradition of a region and they are responsible for the health of the family and their food safety. Melo et al.[28], however, point out that elderly individuals in general are able to recognize a greater number of plants than younger ones and, therefore, they have more chances of being appointed as local specialists to be interviewed.

The respondents are primarily dedicated to agriculture as an economic activity (95%) and the average family income reaches up to one minimum wage for 91% of their families. As for the level of education, 53% claim to have elementary education, 7% secondary education and 37% did not have access to formal education. When asked about the origin of their knowledge about medicinal plants, 91% claim to have learned it with their own families and the remaining 8% with neighboring communities, including indigenous communities. Most of the respondents (88%) declare that they are regularly approached in order to indicate plants and their uses, however, this approach is restricted to relatives and neighbors who reside in the same community. Only 26% are approached by people outside their communities in order to indicate the use of medicinal

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plants. According to Bandeira[29], ethnobiological studies involving the process of knowledge transmission and acquisition are scarce, however, it may be inferred that this local knowledge is acquired and transmitted through practices and beliefs developed by adaptive processes, which are culturally transmitted between generations[30], especially within family nuclei and among residents of a same community, as observed by Boscolo et al.[31-33]. The transmission of the wealth of this knowledge still finds obstacles frequently cited in ethnobotany studies, such as Boscolo et al.[31-33], in which the following are noted: the process of losing the tradition of transmitting knowledge to successor generations due to the lack of interest of children and grandchildren; the disarticulation of traditional life systems and geographical distance[33].

Among the 233 species of medicinal plants surveyed in the 9 communities it was found, by consulting the *Flora Brasil 2020* list[20] that 48% are considered native, 26% are naturalized and 26% are exotic. As to the level of threat consulted at the CNC Flora database[22], it was observed that 94% of the species have no evaluation, while the others are distributed in: **Least concern** (*Pfaffia glomerata* (Spreng.) Pedersen; *Aristolochi acymbifera* Mart. & Zucc.; *Handroanthus heptaphyllus* (Vell.) Mattos; *Tillandsia usneoides* (L.) L.; *Pereskia grandifolia* Haw.; *Operculina macrocarpa* (L.) Urb.; *Hymenaea courbaril* L.; *Abuta selloana* Eichler e *Genipa americana* L.); **Near-threatened** (*Handroanthus impetiginosus* (Mart. ex DC.) Mattos; *Amburana cearensis* (Allemão) A.C.Sm.); **Vulnerable** (*Euterpe edulis* Mart.) and **Endangered** *Cariniana legalis* (Mart.) Kuntze).

The predominance of naturalized and cultivated exotic species found in the present study could be related to a trend described by Bortolotto [33], in which human populations select plants mainly for subsistence, as in rural communities. It is also worth mentioning that many species of the medicinal plant pharmacopoeia in South America were introduced in the period of the European conquests Bennett et al.[34] and are widely used until today. Another worrying factor in terms of conservation is the increasing anthropization of the southern end region of Bahia, where deforestation caused by large pulp and paper companies generates the loss of natural resources with the extensive eucalyptus culture [35]. As a consequence, plant resources for medicinal use also become increasingly scarce and the production of home medicines falls into disuse, making the search for allopathic medicines grow [25]. The presence of species at different degrees of threat observed in this study draws attention to the urgency of conducting research that values biodiversity and the traditional knowledge associated with it before these resources are lost. Thus, the importance of ethnobotany is evident for the development of sustainable exploitation of ecosystems, in contrast to the current forms of devastation [36].

Diseases related to the gastric system, respiratory and genitourinary systems (**TABLE 1**) were the most cited. Diseases of the gastric system can be related to the lack of basic sanitation and treated water in the communities studied[15]. The presence of a large number of citations related to the genitourinary system follows the same premise observed in Bortolotto[33], where there was also a predominance of women in the sample and they cited species with uses related to the uterus, menstrual cramps and childbirth.

In the face of economic and infrastructure infeasibility to carry out the cultivation of the 233 species resulting from the survey, it was necessary to employ quantitative methods in order to select which would be most suitable for insertion in agroecological productive systems that could be used as therapeutic resources and also as an alternative source of income in the 9 communities studied. Therefore, it was decided to favor the ones which presented and index of concordance regarding the corrected main use (CUPc) equal to or greater than 50% in at least one of the communities in which they were mentioned (**TABLE 2**). According to Roque et al. [37], the more respondents agree on a particular use, the greater is the probability of confirmation of this information which, in the future, may also serve as a basis for pharmacological studies.

TABLE 2: List of species with CUPc equal to or greater than 50% in at least one of the communities studied.

Scientific name	AV	AA	BM	HE	JR	JM	PA	RI	SJ
Alpinia zerumbet (Pers.) B .L. Burtt& R. M. Sm.	-	-	-	-	-	-	-	54%	-
Baccharis crispa Spreng.	-	-	-	50%	-	-	-	-	-
Borreria verticillata (L.) G. Mey.	50%	-	-	-	-	-	-	-	-
Citrus aurantium L.	-	64%	-	-	-	-	-	-	-
Cymbopogon citratus (DC.) Stapf.	50%	-	-	50%	-	57%	-	-	71%
Dysphania ambrosioides (L.) Mosyakin & Clemants	-	-	53%	64%	63%	50%	50%	62%	57%
Eugenia uniflora L.	-	50%	-	71%	-	-	-	-	-
Euphorbia prostrata Aiton	-	-	67%	-	63%	-	-	-	-
Foeniculum vulgare Mill.	-	78%	-	57%	56%	-	50%	-	-
Gossypium hirsutum L.	-	57%	-	-	-	-	-	-	-
Kalanchoe crenata (Andrews) Haw.	-	-	-	57%	-	57%	-	-	50%
Lippia alba (Mill.) N.E.Br. ex Britton & P. Wilson	63%	50%	-	79%	81%	50%	50%	77%	57%
Mentha piperita L.	-	-	-	-	-	-	-	54%	50%
Ocimum carnosum (Spreng.) Link & Otto ex Benth.	-	50%	-	-	-	-	-	54%	-
Ocimum gratissimum L.	-	-	-	57%	-	57%	-	-	50%
Operculina macrocarpa (L.) Urb.	-	71%	-	-	-	-	-	62%	-
Persea americana Mill.	-	58%	-	79%	50%	-	-	77%	71%
Phyllanthus tenellus Roxb.	-	80%	-	-	-	85%	-	100%	-
Plantago major L.	-	-	-	57%	69%	-	50%	-	57%
Plectranthus amboinicus (Lour.) Spreng.	-	-	-	-	-	50%	-	-	71%
Plectranthus barbatus Andr.	75%	57%	73%	79%	69%	64%	79%	69%	-
Psidium guajava L.	-	-	-	57%	-	-	-	-	-
Punica granatum L.	-	-	-	-	-	79%	-	-	-
Sambucus nigra L.	-	50%	-	57%	50%	-	-	-	-
Schinus terebinthifolia Raddi	-	79%	-	-	-	-	-	54%	-

AV (Abril Vermelho); AA (Antônio Araújo); BM (Bela Manhã); HE (Herdeiros da Terra); JR (Jaci Rocha); JM (Jose Martí); PA (Pouso Alegre); RI (Ribeirão) and SJ (São João).

The nine communities from the southern end of Bahia contemplated in this study live in a scenario of low income and isolation, in a region of socioenvironmental conflicts, and which until the moment of this study did not have any visibility with the local SUS. Some of these communities did not have a defined geographical delimitation or occupy the border region between two cities, creating difficulties in recognizing which municipality would be responsible for providing medical assistance to their residents. According to Pilla et al.[38], despite the fact that SUS does reach the rural zones, it is not able to properly meet the demand of the population that seeks aid with medicinal plants. Therein resides the importance of ethnobotanical studies that revitalize and systematize the traditional knowledge associated with medicinal plants that may be used to improve the quality of these populations, since for Chaves et al.[39], the healing properties of some plants are the only alternative that several communities have in order to treat diseases.

The introduction of the species (present on **TABLE 2**) in agroecological productive systems in the communities studied not only provides an alternative for the treatment of diseases, but it is also important for the conservation of socio-biodiversity and in the generation of income. Santilli[40] states that agroecology is a tool for the preservation of sociobiodiversity, which in turn is an essential component of sustainable

agricultural systems. The diversification of crops in a particular ecosystem, associated with ecological factors, guarantee stability and less need for pesticides and nitrogen fertilizers. The use of knowledge and management practices of the medicinal plants held by the respondents constitute an asset of immense value for the marketing of these products [12], since according to Ethur et al.[41], there is a market for both the commercialization of teas and parts of medicinal plants *in natura* or dehydrated, as for the production of seedlings, substrates and utensils.

These products cited by Ethur et al.[41] can be sold in markets and free fairs as well as offered to municipal health departments in the southern end region of Bahia, since through the National Policy on Medicinal Plants and Herbal Plants (PNPMF), there are different political and financial actions that aim to directly stimulate Brazilian municipalities to offer medicinal plants and herbal medicines to SUS.

A result that strengthens this option for the communities studied is the fact that when comparing the selection of species with the higher CUPc with the list of medicinal plants of interest to the Unified Health System (Renisus), it can be observed that 60% are included in the latter, namely: *Alpinia zerumbet* (Pers.) B. L. Burtt & R. M. Sm.; *Baccharis crispa* Spreng.; *Dysphania ambrosioides* (L.) Mosyakin & Clemants; *Eugenia uniflora* L.; *Foeniculum vulgare* Mill.; *Mentha piperita* L.; *Ocimum gratissimum* L.; *Persea americana* Mill.; *Phyllanthus tenellus* Roxb.; *Plantago major* L.; *Plectranthus barbatus* Andr.; *Psidium guajava* L.; *Punica granatum* L. and *Schinus terebinthifolia* Raddi.

It should be noted that the methodologies in ethnobotany can also help to update and improve the official lists of medicinal plants recommended by the PNPMF. In the present study we can consider the recognition of at least one species as an example of this case – *Lippia alba* (Mill.) N.E.Br. ex Britton & P. Wilson – that along with *Dysphania ambrosioides* (L.) Mosyakin & Clemants and *Plectranthus barbatus* Andr., presented a CUPc greater than or equal to 50% simultaneously in 7 or more of the 9 communities mentioned, demonstrating its high probability of effectiveness, and however, unlike the other two, *L. alba* is not listed by Renisus.

Conclusion

Methodologies used in ethnobotanical research, such as the concordance regarding the corrected main use (CUPc), prove to be useful in the selection of medicinal plants with a higher probability of effectiveness among the general scope of those observed in surveys. These methodologies can indicate species to be cultivated by rural communities that live in a scenario of socioeconomic vulnerability, respecting the traditional knowledge associated with them and acting as an economic and health alternative in line with the PNPMF. Other factors to be considered are the importance of these studies in stimulating the conservation and sustainable use of sociobiodiversity, as well as in updating and increasing the list of medicinal plant species that can be used by the Unified Health System.

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