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Article

Ethnopharmacological survey: a selection strategy to identify medicinal plants for a local phytotherapy program

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Ethnopharmacological studies are important for documenting and protecting cultural and traditional knowledge associated with the medical use of biodiversity. In this paper, we present a survey on medicinal plants used by locals in a community of Nova Viçosa, Viçosa, MG, Brazil, as a strategy to select medicinal plants for a phytotherapy-based local healthcare program. Eleven knowledgeable local informants were chosen by snowball sampling and interviewed about the use of medicinal plants. Plant samples were collected, herborised and then identified using traditional techniques and specialised literature. We sampled 107 medicinal plant species belonging to 86 genera and 39 families, predominantly Asteraceae with 16 species. *Costus spicatus* (Jacq.) Sw, *M. pulegium* L., *Rosmarinus officinalis* L. and *Ruta graveolens* L. were found to have Consensus of Main Use corrected (CMUc) values above 50%, which were in agreement with the traditional uses described by the informants. However, species with CMUc values equal to or above 20%, combined with the scientific information survey, were also used to select medicinal plants for the phytotherapy-based local healthcare program. The selection of medicinal plants based on the CMUc index from this particular community, in combination with the scientific survey, appears to be an effective strategy for the implementation of phytotherapy programs.

Uniterms: Ethnopharmacology. Medicinal plants. Phytotherapy.

Estudos etnofarmacológicos são importantes no registro e na preservação de conhecimentos de uma cultura tradicional associada ao uso medicinal da biodiversidade. No presente trabalho, foi realizado o levantamento das plantas medicinais utilizadas por conhecedores populares na comunidade de Nova Viçosa, Viçosa, Minas Gerais, Brasil, como ferramenta para auxiliar na seleção de espécies vegetais visando à implantação de um programa de fitoterapia local na comunidade estudada. Participaram 11 conhecedores escolhidos por amostragem Bola de Neve e submetidos a entrevistas semiestruturadas. Amostras dos espécimes foram coletadas, herborizadas e identificadas conforme metodologias usuais e literatura especializada. Foram amostradas 107 espécies medicinais pertencentes a 86 gêneros e 39 famílias botânicas, destacando-se Asteraceae com 16 espécies. *Costus spicatus* (Jacq.) Sw., *Mentha pulegium* L., *Rosmarinus officinalis* L. e *Ruta graveolens* L. apresentaram Consenso de Uso Principal corrigido (CUPc) superior a 50%, evidenciando consensos de uso popular entre os entrevistados. Espécies com CUPc igual ou superior a 20%, juntamente com o levantamento de informações em bases científicas, foram utilizadas para selecionar as espécies para o programa de fitoterapia local. A seleção de plantas medicinais, levando-se em consideração o índice de CUPc obtido de uma determinada comunidade aliado ao levantamento científico, mostra-se como estratégia a ser considerada na implantação de programas fitoterápicos.

Unitermos: Etnofarmacologia. Plantas medicinais. Fitoterapia.

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INTRODUCTION

Ethnopharmacology is defined as the interdisciplinary scientific exploration of the biologically active agents of plants, animals and other substances traditionally employed or observed by man (Bruhn, Holmstedt, 1981; ISE, 2012). Furthermore, it combines information from traditional users of medicinal flora with chemical and pharmacological studies, allowing for the formulation of hypotheses about the pharmacological activities and substances responsible for the reported therapeutic activities (Elisabetsky, 2003).

Data from the World Health Organization (WHO) show that approximately 80% of the world population depends on medicinal plants or herbal medicines for primary health care. Developing countries hold 67% of plant biodiversity on the planet, highlighting their participation in the process of enhancing the use of medicinal plants in health care promoted by the WHO (Brasil, 2006). However, there has been a major loss of traditional knowledge regarding medicinal plants in these countries, and the degradation of natural environments, especially tropical forests, has reduced the availability of medicinal plants (Bermúdez, Oliveira-Miranda, Velázquez, 2005).

The acculturation of modern societies, early industrialisation and the subsequent urbanisation and cultural globalisation have put traditional plant knowledge on hold in several regions (Camejo-Rodrigues, 2001, Santos *et al*., 2007).

In Brazil, the Ministry of Health has recently launched two important programs regarding the uses and research of medicinal plants: the National Program on Medicinal Plants and Herbal Medicines (PNPMF) (Brasil, 2009) and the National Policy on Integrative and Complementary Practices (PNPIC) (Brasil, 2006). PNPMF shares common goals aimed to ensure the safe access and rational use of medicinal plants and herbal medicines in Brazil, the development of technologies and innovations, the sustainable use of Brazilian biodiversity, and the strengthening of the productive chain of herbal products. PNPIC includes policies, actions and government responsibilities for the insertion of therapeutic practices, including phytotherapy, in the National Health System (SUS). These government initiatives have encouraged many Brazilian cities to implement phytotherapy-based healthcare programs, increasing the choice of medical treatments provided by SUS.

The state of Minas Gerais has the largest number of municipalities in the country, with 853 cities. Approximately 80% of these cities have less than 20,000 inhabitants and are known for their strong agricultural traditions (FJP, 2003). Moreover, this state comprises two major biomes, the Cerrado and Atlantic Forest, both of which are considered hotspots with high biodiversity, high endemism and severe environmental degradation (Myers *et al.*, 2000).

In the past, the Atlantic Forest covered approximately 1 million km², corresponding to 12% of the Brazilian territory, but today, only an estimated 5% of the original area is still intact and highly fragmented (Borém, Oliveira-Filho, 2002). Brazil is noted for having the greatest biodiversity on the planet. For instance, Brazilian ecosystems comprise approximately 22% of all of the biological species in the world. The Atlantic Forest, even with its dramatic decline, supports approximately 20,000 species of vascular plants, of which 8,000 are endemic (Marques, 2000; Mittermeier *et al.*, 2003; Tabarelli *et al*., 2005). However, Brazil also has a wide range of ethnic and cultural diversity, with many traditional indigenous people and urban dwellers that cultivate medicinal plants in old home gardens (Diegues *et al.*, 2000; Brasil, 2006; Alves *et al.*, 2008).

An old home garden is commonly a plot of land around a house with easy access, in which residents grow or maintain many species of plants that account for part of the nutritional needs of the family, while other products are used as firewood and medicinal plants (Brito, Coelho, 2000). Home gardens are one of the oldest forms of land management. They are vital for the sustainability of people and knowledge and the management of natural environments, and they contribute to the livelihoods of certain populations (Moura, Andrade, 2007; Amaral, Guarim-Neto, 2008).

This study is part of a larger project on the implementation of phytotherapy in the Health System for the state of Minas Gerais (Brasil, 2009). This is the first study that combines quantitative research on ethnopharmacology with a database of scientific information, which will help select plants for the production of phytotherapies to be provided in the public primary healthcare system. Furthermore, this study is aimed to perform a survey of medicinal plants used by the locals in the community of Nova Viçosa, Viçosa, Minas Gerais, Brazil by using the index of Consensus of Main Use corrected (CMUc), which can be implemented by local phytotherapy programs.

MATERIAL AND METHODS

STUDY AREA

The city of Viçosa is located in the southeast Brazilian "Zona da Mata" Region in the State of Minas Gerais (20°45'S and 42°55'W) (Figure 1). The municipality

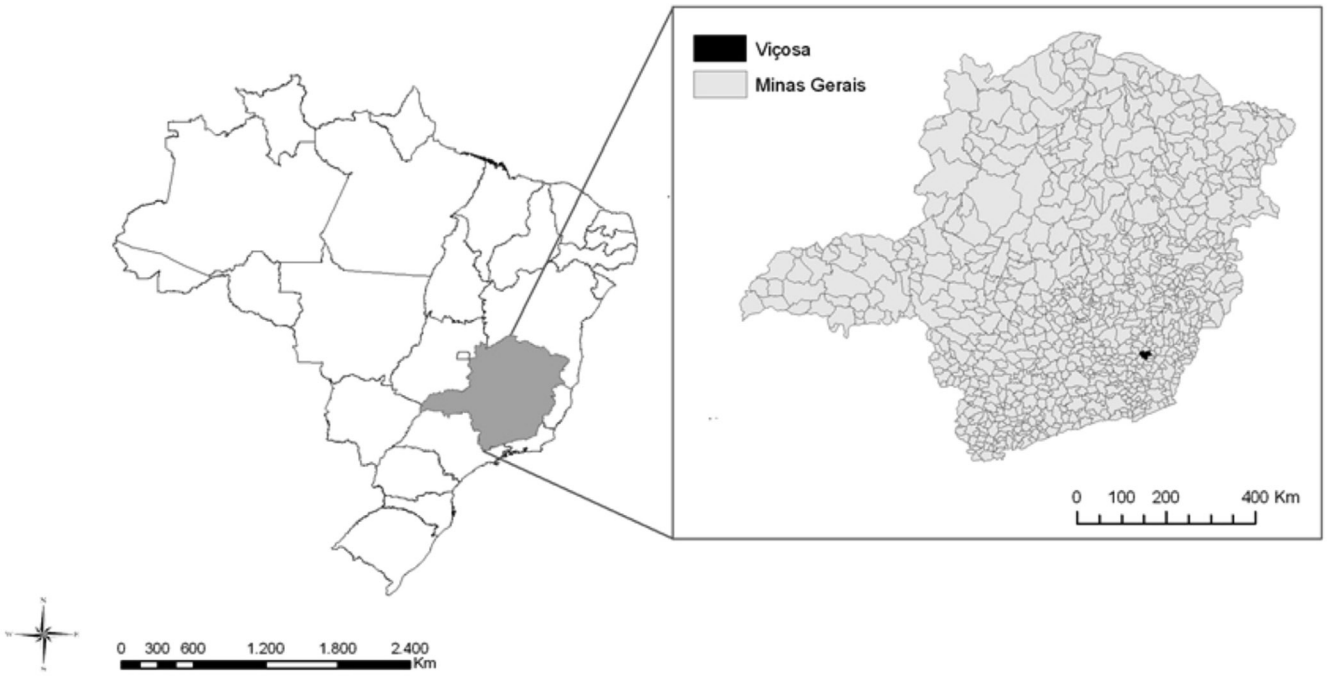

FIGURE 1 - Location of the city of Viçosa, Minas Gerais, Brazil.

comprises an area of 299 km^2 and currently has approximately 72,000 inhabitants (IBGE, 2010). It was founded in the late eighteenth century, during the gold cycle, when settlers came in search of fertile land for agriculture and livestock because of the depletion of mineral deposits and the growing food shortages in the neighbouring towns (Mello, 2002).

After the gold cycle, coffee farming began to expand rapidly throughout the region. Coffee is a predatory crop based on the deforestation it caused, and coffee monoculture quickly became unproductive because of the soil (predominantly Red-Yellow Dystrophic Latosol) and relief (hilly landscape) characteristics. Plantations were replaced with new coffee plants or abandoned, and some of these areas were used for extensive cattle raising, which further hampered the natural regeneration of forests (Paula *et al.*, 2002).

The climate in the region is mesothermal (Cwb), with hot and rainy summers and cold and dry winters, according to the Köppen system (Arato, Martins, Ferrari, 2003). The vegetation is classified as a Montane Semideciduous Forest, a mix of deciduous and evergreen species established above a 500 m altitude in the Atlantic Forest domain (Veloso, Rangel-Filho, Lima, 1991).

This study was conducted in the small community of Nova Viçosa belonging to the municipality of Viçosa, MG, with a population of 8,000 inhabitants. Carvalho *et al.* (2004) listed several problems that residents of this district face, including precarious housing conditions, poor hygiene practices, the abandonment of a large open space that could be used as a recreational area for the benefit of the residents, and the lack of landscape and urban planning. The community also lacks the financial support to perform proper economic activities in the neighbourhood and harness the potential of public spaces to generate socio-cultural and economic benefits in the local community. The authors reported that, since 2003, a number of urban agriculture projects have been performed in the community. The aims of these programs are to improve the quality of life and food security of people occupying idle plots and backyards with vegetable and medicinal plant gardens.

ETHNOPHARMACOLOGICAL SURVEY

Eleven knowledgeable informants were interviewed about the use of medicinal plants between March and August 2008. Participant observations were also recorded during the study period in the community. Informants were selected for their recognition in the community as being knowledgeable of the medicinal properties of plants grown in their backyards. The snowball sampling method was used according to Albuquerque and Lucena (2004). All interviews were semi-structured and conducted in the presence of a local healthcare agent. The questions addressed to the knowledgeable informants dealt with information on the following: the source of traditional knowledge, the species cultivated in the backyards and used by the family,

common names of plants, therapeutic indications, the plant parts used, and preparation methods.

During the interviews, we collected fertile and/or sterile specimens that were subsequently herborised using traditional techniques (Bridson, Forman, 1999). The species were then identified by specialised literature and comparison with specimens at the VIC Herbarium, Federal University of Viçosa.

The species names were placed in their respective families following APG III (2009), except for Leguminosae, which was placed according to Lewis *et al.* (2005), and the classification has been confirmed by The International Plant Names Index (IPNI, 2009). The names of the authors are in accordance with Brummit and Powell (1992).

Data were analysed qualitatively using reports obtained through interviews. Quantitative analysis was performed by applying the index adapted by Amorozo and Gély (1988) to assess the relative importance of the medicinal plant species among the knowledgeable informants. This same index was also used to assess the consensus for the plant uses of each species mentioned by four or more informants. In this study, we considered a percentage of Consensus of Main Use corrected (CMUc) above 20% as significant.

Values for the Consensus of Main Use (CMU) and the Correction Factor (CF) of each species were applied to the formula $CMUc = CMU \times CF$ to find the Consensus of Main Use corrected (CMUc) percentages.

Ethnopharmacological data systematisation

Ethnopharmacological data were compared with available scientific information on the efficacy and toxicology of the medicinal plants used from specialized databases, such as PubMed and Science Direct. We also searched national and international specialised literature officially recognised as parameters to evaluate the therapeutic efficacy and safety of the herbal drugs (Brasil, 2010). Species showing a CMUc above 20% and the scientific basis for therapeutic indications according to the informants were selected to compile a list of medicinal plants, systematised by therapeutic categories, to be included in the phytotherapy programs of the primary healthcare system.

RESULTS AND DISCUSSION

Profiles of the Informants

Ninety-one per cent of interviewees were women, and 82% were over 50 years of age. The average age of the informants was 63.1 years (with a range of 37-83 years). Most informants (73%) acquired knowledge about medicinal plants from their families, which was associated or not with other forms of knowledge acquired by personal experiences, neighbours, books, television and teachers. We also found that the majority of informants (91%) have passed on their knowledge whenever they have been asked. However, many interviewees reported their children and grandchildren lack interest in this knowledge. This scenario characterises a risk of loss for an oral tradition, emphasising the importance of documenting traditional knowledge about plant use. It is also important to note that this knowledge is a vital strategy in drug discovery and in the valuation of biodiversity and is a major part of the patrimony of a nation (Brasil, 2012).

Ethnopharmacological study

Knowledgeable informants of the community of Nova Viçosa reported the use of 107 medicinal plant species, belonging to 86 genera and 39 families (Table I). Cultivation of these medicinal species was recorded in all of the sampled yards, with an average of 23 (a minimum of 11 and a maximum of 49) species in each yard, totalling 258 plant species used in traditional medicine.

The most frequently mentioned plant families in this study, with the largest number of species, were Lamiaceae with 17 species (mentioned 64 times) and Asteraceae with 16 species (mentioned 36 times). Asteraceae, which contains 1,535 genera and 32,000 species and is considered the largest family of angiosperms (Pruski, Sancho, 2004), and Lamiaceae, which contains 300 genera and 7,500 species (Souza, Lorenzi, 2009), including a considerable number of aromatic species, are among the families with the greatest diversity of species mentioned in studies of medicinal plants.

Similar results were found in studies from different regions of the country. Pilla, Amorozo and Furlan (2006), in a study conducted in the district of Martim Francisco, a municipality of Mogi Mirim, São Paulo, mentioned the use of 107 species. Among these species, 14 were Lamiaceae and 12 were Asteraceae. Ming and Junior (2005), in a study conducted in the Extractive Reserve of Chico Mendes in the State of Acre; Pinto, Amorozo and Furlan (2006), in the rural communities of the Atlantic Forest domain in Itacaré (BA); and Santos, Lima and Ferreira (2008), in Ariquemes, the State of Rondônia, also found similar data on the number of species and the most representative botanical families.

The predominant habits of the surveyed species were herbaceous (60%), subshrub (15%), shrub (14%), tree

TABLE I - Medicinal species used by locals in the community of Nova Viçosa, Viçosa, Minas Gerais, Brazil

Family/Species	Common name	Used part	Method of preparation	Mentioned use	Habit	Status of origin in South America*	Number of times mentioned by informants
ADOXACEAE							
Sambucus australis Cham. & Schltdl.	Sabugueiro	lf	Infusion	Influenza; cough	sb	na[1]	1
AMARANTHACEAE							
Alternanthera brasiliana (L.) Kuntze	Terramicina; terramicina verde; terramicina roxa	lf; fl	Infusion	Antibiotic; wound; toothache	he	na[1]	4
Amaranthus sp	Caruru	lf	Fresh	Anaemia	he	na[4]	1
Chenopodium ambrosioides L.	Santa maria; erva de santa maria	lf; fl	Infusion	Abdominal pain; vermifuge; fleas	he	na[1]	3
Iresine herbstii Hook.	Sangue de cristo	lf	Infusion	Suspension	sb	na[2]	1
Pfaffia glomerata (Spreng) Pedersen	Novalgina	lf	Infusion	Fever; pain	sub	na[1]	1
AMARYLLIDACEAE							
Allium fistulosum L.	Cebolinha verde	lf	Fresh	Appetite stimulator	he	ex[1]	1
ANACARDIACEAE							
Mangifera indica L.	Manga	lf	Infusion	Influenza	cl	ex[3]	1
Schinus terebinthifolia Raddi	Aroeira	lf; ba	Infusion (topical)	Allergy; itching; wounds	cl	na[1]	1
APIACEAE							
Apium graveolens L.	Aipo	lf; bra	Infusion	Blood pressure; gas; belching; abdominal pain	he	ex[1]	3
Eryngium foetidum L.	Coentro do chile; coentro	lf	Infusion	Digestive problem; pre-menstrual tension	he	na[1]	2
Foeniculum vulgare Mill.	Funcho	lf	Infusion	Influenza; soothing; liver pain; blood pressure	he	ex[1]	5
Petroselinum crispum (Mill.) Fuss	Salsa	lf	Fresh	Vermifuge	he	ex[1]	1
ARACEAE							
Colocasia esculenta (L.) Schott.	Inhame	tu	Decoction	Chilblains; detoxifying; depurative	he	ex[2]	1
ASPARAGACEAE							
Agave sp	Piteira	lf	Maceration (topical)	Mange	he	ex[4]	1
ASTERACEAE							
Achillea millefolium L.	Mil folhas; novalgina	lf	Infusion	Analgesic; fever	he	ex[1]	3
Ageratum conyzoides L.	Mentraste; mentrastro	lf	Infusion	Stomach discomfort; colic	he	na[1]	2
Artemisia absinthium L.	Losna; losnão	lf	Decoction	Cholesterol control; diabetes; stomach discomfort	sub	ex[1]	2
Artemisia vulgaris L.	Macaé; macaé paulista	lf	Infusion	Stomach discomfort; abdominal pain	he	ex[1]	2

TABLE I - cont.

Family/Species	Common name	Used part	Method of preparation	Mentioned use	Habit	Status of origin in South America*	Number of times mentioned by informants
ASTERACEAE							
Baccharis trimera (Less.) DC.	Carqueja	lf	Infusion	Diabetes	sub	na[1]	1
Bidens pilosa L.	Picão	lf; rt	Infusion	Urinary tract infection; hepatitis; anaemia; jaundice	he	na[1]	5
Dendranthema sp	Amor-do-senhor	lf	Infusion	Headache	he	ex[4]	1
Emilia fosbergii Nicolson	Serralha	lf	Juice	Depurative	he	ex[1]	1
Lactuca sativa L.	Alface	lf	Fresh	Insomnia	he	ex[1]	1
Mikania glomerata Spreng.	Guaco	lf	Infusion	Influenza	cl	na[1]	3
Polymnia sonchifolia Poepp. Endl.	Yacon	tu	Fresh	Diabetes	sb	na[4]	2
Solidago chilensis Meyen	Arnica; ponta livre	lf	Maceration (topical)	Wounds; pain; cold	sub	na[1]	3
Tanacetum parthenium (L.) Sch. Bip.	Artemijo	lf; fl	Decoction	Headache; stomach discomfort; worms; abortive	he	ex[2]	5
Taraxacum officinale F.H. Wigg.	Dente de leão	lf	Infusion	Weight loss	he	ex[1]	2
Vernonia condensata Baker	Boldo	lf	Infusion	Liver; hangover	sb	ex[1]	1
Vernonia polyanthes Less	Cambarazinho; assa peixe; cambará	lf	Juice (topical)	Healing	sb	na[1]	2
BALSAMINACEAE							
Impatiens balsamina L.	Beijo branco	fl	Infusion	Ovary	he	ex[2]	1
BIXACEAE							
Bixa orellana L.	Urucum	sd	Decoction	Measles	sb	na[1]	1
BORAGINACEAE							
Symphytum officinale L.	Confrei	lf	Poultice	Healing	he	ex[1]	3
BRASSICACEAE							
Brassica rapa L.	Mostarda	lf	Decoction	Tonic	he	ex[1]	1
Brassica sp1	Couve de cristo	lf	Decoction	Allergy	he	ex[4]	1
Brassica sp2	Saião	lf	Infusion	Influenza	he	ex[4]	1
Coronopus didymus (L.) Sm.	Mentrustro	lf	Infusion	Inflammation	he	na[1]	1
Nasturtium officinale R. Br.	Agrião	lf	Fresh	Bronchitis; influenza; cold; chest pain	he	ex[1]	4
CARICACEAE							
Carica papaya L.	Mamão	fl	Infusion	Influenza	sb	ex[1]	2
CONVOLVULACEAE							
Cuscuta racemosa Marth.	Cipó-chumbo	pt	Infusion	Influenza	li	na[4]	1
COSTACEAE							
Costus spicatus (Jacq.) Sw.	Cana de macaco; cana do brejo; caninha do brejo	lf	Decoction	Kidney stones	sub	na[1]	5
CRASSULACEAE							
Kalanchoe pinnata (Lamk.) Pers.	Fortuna	lf	Infusion	Cough	he	ex[1]	1
Kalanchoe brasiliensis Cambess.	Barspo; saião	lf	Fresh	Stomach discomfort; ear infection	he	na[1]	2
Kalanchoe sp	Barspo	lf	Fresh	Stomach discomfort; pain; leg pain; pneumonia	he	ex[4]	6

TABLE I - cont.

Family/Species	Common name	Used part	Method of preparation	Mentioned use	Habit	Status of origin in South America*	Number of times mentioned by informants
CUCURBITACEAE							
Momordica charantia L.	São caetano	-	Infusion	Fever; influenza	cl	ex[1]	1
Sechium edule (Jacq.) Sw.	Chuchu	lf; td	Decoction	High blood pressure	cl	ex[1]	2
EUPHORBIACEAE							
Euphorbia hirta L.	Olho de santa luzia	lf; bra	Infusion	Abdominal pain (diarrhoea)	he	na[4]	1
Ricinus communis L.	Mamona	lf; sd	Oil (topical)	Healing; toothache	sb	ex[1]	3
LAMIACEAE							
Lavandula angustifolia Mill.	Alfazema	lf	Infusion	Influenza; abdominal pain	sub	ex[1]	2
Leonotis nepetaefolia (L.) R. Br.	Cordão de frade	lf; fl	Decoction	Influenza; diabetes; fever; back pain; cholesterol control; diarrhoea; pressure	sub	ex[1]	4
Leonurus sibiricus L.	Macaé	lf	Infusion	Stomach discomfort; abdominal pain; influenza; heart; blood pressure; wounds	he	ex[1]	7
Mentha arvensis L.	Vick	lf	Infusion	Decongestant	he	ex[1]	1
Mentha pulegium L.	Poejo	lf	Infusion	Influenza; catarrh	he	ex[1]	5
Mentha sp1	Erva-cidreira-de-horta; levante	lf	Infusion	Influenza; colic; seasoning	he	ex[4]	3
Mentha sp2	Hortelã	lf	Infusion	Influenza; vermifuge (worm); infection; abdominal pain; seasoning	he	ex[4]	7
Ocimum basilicum L.	Manjericão	lf	Infusion; fresh	Influenza; blood pressure; abdominal pain	sub	ex[1]	3
Ocimum gratissimum L.	Titoco; alfavaca	lf	Infusion	Influenza	sub	ex[1]	2
Ocimum selloi Benth.	Alfavaca; manjericão; manjericão branco	lf; fl	Infusion	Influenza; soothing; diuretic	sub	na[1]	7
Origanum vulgare L.	Manjerona; orégano	lf	Infusion; fresh	Influenza; gases; blood pressure	he	ex[1]	5
Peltodon radicans Pohl.	Erva cidreira	lf	Infusion	Varicose veins	he	na[1]	1
Plectranthus amboinicus (Lour.) Spreng.	Hortelã pimenta	lf	Infusion; Inhalation	Asthma	he	ex[1]	1
Plectranthus barbatus Andrews	Boldo	lf	Infusion	Depurative; headache; liver; hangover	sub	ex[1]	4
Plectranthus ornatus Codd.	Estomazil	lf	Infusion	Gastritis; ulcer	he	ex[1]	1
Rosmarinus officinalis L.	Alecrim; alecrim de horta	lf; bra	Infusion; fresh	High blood pressure; shortness of breath; colic	sub	ex[1]	8

TABLE I - cont.

Family/Species	Common name	Used part	Method of preparation	Mentioned use	Habit	Status of origin in South America*	Number of times mentioned by informants
LAMIACEAE							
Salvia officinalis L.	Salvinha; sálvia; salvinha miúda	lf; bra	Infusion	Headache; delayed menstruation; aphthae	he	ex[1]	3
LAURACEAE							
Persea americana Mill.	Abacate	lf	Decoction	Kidney problems	cl	ex[1]	2
LEGUMINOSAE							
Cajanus cajan (L.) Millsp.	Feijão andu	lf	Decoction (topical)	Toothache	sb	ex[1]	1
Erythrina speciosa Andrews	Barbatimão	ba	Decoction	Depurative	cl	na[4]	1
Stylosanthes viscosa (L.) Sw.	Salsa cavalo	pt	Decoction	Uterus inflammation	he	na[4]	1
MALVACEAE							
Abelmoschus esculentus (L.) Moench	Quiabo	fr; rt	Decoction	Kidneys; haemorrhage	sb	ex[3]	2
Gossypium hirsutum L.	Algodão	lf; fl; oi	Infusion; oil (topical)	Ear pain; inflammation; infection	sb	ex[1]	3
Malva sp	Malva	lf	Infusion	Soothing; headache; blood pressure	he	ex[4]	5
PAPAVERACEAE							
Fumaria officinalis L.	Fumária	lf	Decoction	Depurative; rash	he	ex[1]	2
PHYLLANTHACEAE							
Phyllanthus niruri L.	Rebenta pedra; quebra pedra	lf; bra	Infusion	Kidney stones	he	na[1]	2
Phyllanthus tenellus Roxb.	Quebra-pedra	lf	Infusion	Kidney stones	he	na[1]	1
PHYTOLACCACEAE							
Petiveria alliacea L.	Guiné	lf	Infusion	Rheumatism; cough	he	na[1]	4
PIPERACEAE							
Piper umbellatum L.	Capeva	lf	Infusion	Ovary	sub	na[1]	1
PLANTAGINACEAE							
Plantago australis Lam.	Transagem; tansagem	lf	Infusion	Influenza; sore throat; smoking cessation	he	ex[1]	3
Plantago major L.	Transagem; tansagem	lf	Infusion	Sore throat; depurative; smoking cessation	he	ex[1]	5
Scoparia dulcis L.	Vassourinha doce	bra; rt	Decoction	Fever	he	na[1]	1
POACEAE							
Coix lacryma-jobi L.	Lágrima de nossa senhora	lf; rt; sd	Decoction	Fever; urine problem; nutrient	he	ex[1]	3
Cymbopogon citratus (DC) Stapf.	Capim cidreira; erva cidreira de capim	lf	Infusion	Soothing; influenza; blood pressure	he	ex[1]	7
POLYGALACEAE							
Polygala paniculata L.	Vassourinha de são pedro	bra	Bath	Pain	he	na[1]	1

TABLE I - cont.

Family/Species	Common name	Used part	Method of preparation	Mentioned use	Habit	Status of origin in South America*	Number of times mentioned by informants
POLYGONACEAE							
Polygonum hydropiperoides Michx.	Erva de bicho	lf; bra	Bath	Haemorrhoids; bruises; itching / scabies	he	ex[1]	2
Polygonum sp	Erva de bicho	lf; bra	Bath	Itching /scabies	he	ex[4]	1
ROSACEAE							
Eriobotrya japonica (Thunb.) Lindl.	Ameixa	lf; ba	Infusion; decoction	Inflammation	cl	ex[4]	1
Rosa sp	Rosa branca	fl	Infusion	Ovary	sb	ex[4]	1
RUTACEAE							
Citrus sinensis (L.) Osbeck	Laranja	lf; fr	Infusion; maceration	High blood pressure; influenza; headache; sadness	cl	ex[4]	4
Ruta graveolens L.	Arruda	lf; bra	Compress (topical)	Pain in the eye; conjunctivitis; hoarseness; “eye problems”	sub	ex[1]	9
SCROPHULARIACEAE							
Buddleja stachyoides Cham. & Schltdl.	Barbaço	lf	Decoction	Asthma; influenza	sb	na[1]	1
SOLANACEAE							
Nicotiana tabacum L.	Fumo	lf	Bath	Inflamed wound; kills mosquitos	he	na[1]	2
Solanum gilo Raddi	Jiló	lf	Infusion	Headache	he	na[4]	1
Solanum paniculatum L.	Jurubeba	fr	Infusion; decoction	Kidneys; toothache; diabetes	sb	na[1]	2
Solanum pimpinellifolium L.	Tomate-miúdo	lf	Decoction (topical)	Gum inflammation	he	na[4]	1
Solanum sp.	Jequiri; jiquiri	lf; bra	Infusion	Inflammation; infection	cl	na[4]	6
Solanum viarum Dun.	Joá bravo	rt; fr	Decoction; maceration	Injury; uterus infection	he	na[4]	1
TROPAEOLACEAE							
Tropaeolum majus L.	Chagra	lf; fl	Fresh; decoction	Depurative; syphilis; migraine; nutritive	he	ex[1]	3
VERBENACEAE							
Lantana camara L.	Mal me quer	lf; fl	Infusion; syrup	Cold; influenza	sb	na[1]	2
Lippia alba (Mill.) N. E. Br.	Erva-cidreira; erva cidreira de arbusto	lf	Infusion	Influenza	sub	na[1]	2
Lippia sp	Menta; melissa	lf	Infusion	Decongestant; soothing	he	na[4]	2
Stachytarpheta cayennensis (Rich.) Vahl	Jurubão	lf	Maceration (topical)	Wounds	sub	na[1]	1
VITACEAE							
Cissus verticillata (L.) Nicholson & C.E. Jarvis	Insulina	lf	Infusion	Diabetes	cl	na[1]	1
XANTHORRHOEACEAE							
Aloe arborescens Mill.	Babosa	lf	Fresh (topical) syrup	Hair; cancer	he	ex[1]	1

TABLE I - cont.

Family/Species	Common name	Used part	Method of preparation	Mentioned use	Habit	Status of origin in South America*	Number of times mentioned by informants
XANTHORRHOEACEAE							
Aloe sp	Babosa	lf	Fresh (topical) syrup	Hair; dandruff; cancer; wounds; abdominal pain	he	ex[1]	3
ZINGIBERACEAE							
Alpinia zerumbet (Pers.) B. L. Burtt & R. M. Sm.	Colônia	lf	Infusion	Blood pressure	he	ex[1]	1
Zingiber officinale Roscoe	Gengibre	ri	Decoction	Influenza	he	ex[1]	1

Part Used: lf=leaf, fl=flower, ba=bark, bra=branches, tu=tuber, rt=root, sd=seed, fi=filament, td=tendril, fr=fruit, pt=whole plant, oi=oil, ri=rhizome. Habit: tr=tree, sb=shrub, sub=subshrub, he=herbaceous, climb=climber, li=liana. Status of origin in South America: ex=exotic, na=native.

* Status of species: 1=Lorenzi and Matos, 2008, 2=Lorenzi and Souza, 2008; 3=Simpson and Ogorzaly, 2001; 4=Souza and Lorenzi, 2009.

(6%), climber (4%) and liana (1%). Sixty per cent were exotic, and 40% were native to South America. Exotic species dominate other species because the study was conducted with species grown in backyards of an urban area, and medicinal plants native to Europe, Asia and Africa became popular in South America with the cultural miscegenation that historically occurred in the study area.

Different plant parts were used as medicines for the treatment of diseases by the local traditional healers. The most frequently mentioned parts were leaves (85.0%), followed by branches (10.3%), flowers (9.4%), roots (4.7%), fruits (3.7%) and seeds, bark and tubers (2.8% each). Leaves are traditionally the most used part for folk medical treatment, most likely because of the ease of obtaining them and because they are present on the plant throughout the majority of year, compared with flowers and fruits (Alves *et al.*, 2008).

Forty-two of the 107 species (39%) surveyed in this study are reported by the scientific literature, with information about the pharmacological effects of extracts and / or isolated compounds from these plants assigning the medicinal effects reported by the knowledgeable informants. The survey of pre-clinical and clinical scientific studies gave support to the therapeutic efficacies of the folk medicines reported, and this support is crucial when selecting medicinal plants for phytotherapy programs.

Interestingly, all of the informants reported that they were aware of the contraindications of herbal infusions during pregnancy. However, regarding the general perception of adverse effects with medicinal plants, only two informants (18%) reported occurrences in certain situations. The majority of the informants attributed lack of toxicity to herbal infusions. These results show that in the sphere of public health, there is a need for more information on the rational use of medicinal plants among the population.

Relative importance of species

Four species showed CMUc values above 50% and were mentioned by four or more informants: *Costus spicatus* (cana de macaco/spiked spiral flag), which is used to treat kidney stones; *M. pulegium* (poejo/pennyroyal), which is used in the treatment of influenza; *Rosmarinus officinalis* (alecrim/rosemary), which is used for problems with the circulatory system; and *Ruta graveolens* (arruda/rue), which is used to treat eye problems (Table II). Aside from *Costus spicatus*, the other species are exotic, and all four have preclinical scientific studies that support their use as mentioned by the knowledgeable informants. Table II shows CMUc indices for the most frequently mentioned species in the study.

Species showing high CMUc values may have greater potentials for medical use (Silva, Proença, 2008). This index, additionally with the survey of scientific study, represents a strategy for selecting the species to be used in local phytotherapy programs (Pinto, Amorozo, Furlan, 2006). We selected a list of plants compiled from the CMUc index (equal to or above 20%) based on information from the scientific literature attesting to the main use mentioned by informants (Table III).

In this ethnopharmacological survey, we found two species of the genus *Mentha* that have not been completely identified. *Mentha* sp2 showed a high CMUc index for worm treatment. The ease of interspecific hybridisation within the genus *Mentha* contributes to the difficulty of identifying this species (Dimech *et al.*, 2006). *Mentha*

TABLE II - Surveyed species with Consensus of Main Use corrected (CMUc) percentages above 20%

Scientific name	Main use	NIMSU	NIMMU	CMU	CF	CMUc
Alternanthera brasiliana	Antibiotic; toothache	4	2	50.0	0.44	22.0
Foeniculum vulgare	Influenza; soothing	5	3	60.0	0.56	33.0
Bidens pilosa	urinary infection; ovary	5	2	40.0	0.56	22.0
Tanacetum parthenium	headache	5	2	40.0	0.56	22.0
Nasturtium officinale	Bronchitis; influenza, colds; chest pain	4	4	100	0.44	44.0
Costus spicatus	kidney stones	5	5	100	0.56	56.0
Kalanchoe sp	upset stomach	6	3	50.0	0.67	33.0
Leonotis nepetaefolia	Influenza; diabetes	4	2	50.0	0.44	22.0
Leonurus sibiricus	stomach disorders; abdominal pain	7	4	57.1	0.78	44.0
Mentha pulegium	influenza	5	5	100	0.56	55.0
Mentha sp2	Influenza; vermifuge (worms)	7	3	42.9	0.78	33.0
Ocimum selloi	influenza	7	3	42.9	0.78	33.0
Origanum vulgare	influenza	5	3	60.0	0.56	33.0
Rosmarinus officinalis	high blood pressure; heart trouble	8	5	62.5	0.89	55.6
Malva sp	soothing	5	2	40.0	0.56	22.0
Plantago major	sore throat; infection of the throat	5	4	80.0	0.56	44.0
Cymbopogon citratus	soothing	7	4	57.1	0.78	44.0
Citrus sinensis	high blood pressure; influenza	4	2	50.0	0.44	22.0
Ruta graveolens	pain in the eye; conjunctivitis	9	5	55.6	1.0	55.6
Solanum sp	Inflammation; infection	6	4	66.7	0.67	44.0

NIMSU=total number of informants that mentioned the use of the species; NIMMU=number of informants that mentioned the main use of the species; CMU=consensus of the main use; CF=correction factor; CMUc=consensus of main use corrected.

TABLE III - Medicinal plants selected for inclusion in a local phytotherapy program on the basis of the CMUc index and scientific evidence for both safety and efficacy

Therapeutic category	Species	PU	CMUc	Scientific evidence
Antiparasitic	*Mentha crispa*	lf	33.0	Pianowski (2000)
Anxiolytic	*Cymbopogon citratus*	lf	44.0	Silva *et al*. 2010
Antimicrobial	*Bidens pilosa*	lf; rt	22.0	Deba *et al*., 2008
Antispasmodic	*Foeniculum vulgare*	lf	33.0	Boskabady, Khatami, Nazari (2004)
Anti-inflammatory	*Plantago major*	lf	44.0	Guillén *et al*. (1997)
Antilipidemic	*Rosmarinus officinalis*	lf; bra	55.6	Bakırel *et al*. (2008)
Antiulcerogenic	*Kalanchoe pinnata*	lf	33.0	Pal, Chaudhuri (1991)
Bronchodilator	*Mentha pulegium*	lf	55.0	Alonso (2008)
Diuretic	*Rosmarinus officinalis*	lf; bra	55.6	Haloui *et al*. (2000)

PU= part used: lf= leaf, bra= branch, rt= root

crispa, family Lamiaceae, is a hybrid derived from the cross of *Mentha spicata* L. and *Mentha suaveolens* Ehlh (Matos, 1991). Additionally, *M. crispa* is known as *Mentha x villosa* Hudson or *Mentha spicata* L.

A similar case is observed with species of the genus *Kalanchoe*. In Brazil, the two most frequent species are *K. brasiliensis* Camb. and *K. pinnata* (Lamk.) Pers., both of which are known as "folha-da-fortuna" or "saião". In this study, we identified the species *K. brasiliensis*. The other species was not completely identified because the plants did not have flowers at the time of collection; however, as the plants were used to treat stomach discomfort, they were

likely of the *K. pinnata* species, which has scientific evidence of antiulcer activity (Amaral, Simões, Ferreira, 2005).

Based on these above cases, it was vital to define the species correctly based on the studies regarding therapeutic efficacy because that information would allow for their inclusion in phytotherapy programs and would ensure only cultivated plants from certified nursery sources are used in the future. In this study, the species *M. crispa* and *K. pinnata* were verified for use in the phytotherapy program. Furthermore, these and the other species selected for the phytotherapy program showed CMUc indices above 22% and provided scientific evidence for both safety and efficacy, meeting the medical criteria for prescribing phytotherapeutics (Ribeiro, Leite, Barros, 2005).

CONCLUSION

The ethnopharmacological survey of medicinal plants conducted with knowledgeable informants in a community provided information on the medicinal properties of 107 species of plants used in local traditional medicine. To implement a local program utilising the herbal medicines, methodology implementing the CMUc index, combined with a scientific information survey, was used to compile a list of medicinal plants for use in nine different therapeutic classes, which resulted from eight selected species. The species selected were *Mentha crispa* (antiparasitic), *Cymbopogon citratus* (anxiolytic), *Bidens pilosa* (antimicrobial), *Foeniculum vulgare* (antispasmodic), *Plantago major* (anti-inflammatory), *Rosmarinus officinalis* (antilipidemic and diuretic), *Kalanchoe pinnata* (antiulcerogenic) and *Mentha pulegium* (bronchodilator).

The combined use of quantitative data from the ethnopharmacological survey and the scientific literature to select medicinal plants for phytotherapy programs benefited from the use of information from local residents and the scientific community. This approach seeks to enhance the involvement of the community and health professionals in the local phytotherapy program.

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