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Ethnopharmacology in the Vicinity of the Botanical Garden of the Federal University of Juiz de Fora, Brazil

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Research

Abstract

This study aimed to collect ethnopharmacological data in communities in the vicinity of the Botanical Garden of the Federal University of Juiz de Fora regarding the use of medicinal plants, and to scientifically validate the information with the scientific literature, aiming to inform the future planting of a community medicinal garden. Data and botanical material were collected with the population and key informants. The collected material was identified and registered at the CESJ herbarium. The informant community identified 104 medicinal species, with 25 species highlighted for further analysis based on consensus by a subset of key informants. The use-value and agreement regarding the main use of each species were calculated, and the primary use was validated through scientific literature. From statistical analysis and pharmacological confirmations of the listed species, we found that *Mentha spicata* L., *Vernonanthura phosphorica* (Vell.) H.Rob., and *Gossypium hirsutum* L. were considered the most important species relative to use-value among the 25 listed species that could be used in the proposed community medicinal garden. Sixteen species were scientifically confirmed regarding agreement and main use. Among the plants with the highest agreement taking into account the main use index, only *V. phosphorica* showed no concordance between popular knowledge and academic science.

Introduction

The history of man has always been linked to the surrounding environment. The first civilizations realized that there were plants with healing potential. The confidence in the healing potential of herbs decreased with the rise of the pharmaceutical industry (Lima *et al*. 2007). The use of medicinal plants by populations is guided by a knowledge accumulated through the interaction of people with the environment and the diffusion of information, traditionally transmitted orally through subsequent generations (Moreira *et al*. 2002). The ethnopharmacological approach to rescue both popular and traditional plant knowledge is considered an efficient strategy in the search for species with bioactive potential (Rodrigues & Otsuka 2011). According to Andrade-Cetto (2009), the study of biological diversity of plants and their use as traditional medicine can lead to (1) knowledge of their modes of action and (2) ensuring their use, operation, and development as herbal remedies. In addition, the involvement of local people in this type of study allows them to function as a tool in the quest for recovery of green areas (Albuquerque & Andrade 2002), especially those located around conservation areas, such as the Botanical Garden of the Federal University of Juiz de Fora (BG-UFJF).

Fonseca-Kruel and Pereira (2009) emphasize that one of the global missions of the BG-UFJF is to promote and disseminate ethnobotanical/ethnopharmaceutical knowledge for the sustainable use of plant resources and en-

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vironmental protection. This knowledge could promote biodiversity maintenance in the communities around the BG-UFJF, contributing, according to Nilon (2011), to an improvement of the quality of life for that population. For this reason, this work aimed to use ethnopharmacology as a tool for the evaluation of anthropic intervention in the area near the BG-UFJF and rescue the knowledge about the medicinal plant use by the urban communities in the neighborhoods surrounding the garden. This was achieved through an ethnopharmacological study with key informants, with subsequent analysis to evaluate the importance of the main plant species used and scientific literature confirmation of their main uses in order to implement a participatory community medicinal garden in the physical space of BG-UFJF. Creation of the community medicinal garden may link the conservation of cultural diversity and flora and at the same time allow the safe use of medicinal plants, as well as guide further pharmacological studies on certain species.

Material and Methods

Study area

The study area consists of neighborhoods surrounding the BG-UFJF: Alto Eldorado, Eldorado, Nossa Senhora das Graças, Santa Terezinha, and Vista Alegre, which are all located in the city of Juiz de Fora, Minas Gerais, Brazil. The BG-UFJF is a property attached to the Environmental Protection Area (EPA) Mata do Krambeck. This area is residual atlantic forest (central coordinates 21°43'58.43''S latitude and 43°22'13.33'' W longitude), and the vegetation found in BG-UFJF is montane semideciduous seasonal forest (Veloso *et al*. 1991). The urban forest at the BG-UFJF represents 84.55 ha of the total 291.9 ha of continuous forest of the Krambeck EPA. The local climate is Köppen-Geiger Cwa (altitude subtropical) with two well-defined seasons, one with higher temperatures and higher pluviometric precipitation (October to April), and the other colder with less precipitation (May to September) (PMJF 2011). The average annual rainfall is close to 1500 mm, with highest rates in January (~300 mm), while the annual average temperature fluctuates around 18.9°C (PMJF 2011). According to Fonseca and Carvalho (2012) this area currently represents the biggest forest fragment in Juiz de Fora. Drummond *et al*. (2005) assert that this fragment constitutes an important ecological corridor in Minas Gerais State, and its preservation is indispensable for the conservation of countless species. The Krambeck EPA is bordered by the Paraibuna River to the south and the urbanized study area adjoining BG-UFJF on its eastern side (Figure 1).

Brief history of the BG-UFJF

The Krambeck Woods is one of the biggest remnants of atlantic vegetation in an urban area of Minas Gerais, Brazil (Rabelo & Magalhães 2011) and was previously considered by Municipal Law 8527/94 as the largest urban tropical private environmental reserve in the world. The Krambeck EPA was created by Municipal Law No 10.943 in 1992, originally with an area of 374.1 ha, and consisted of the farms "Retiro Novo," "Retiro Velho," and "Malícia." The State Law No. 11.336 of 1993 reiterated the creation of the EPA but excluded Malícia. This area consisted of private space and unauthorized access to neighboring communities, having been sold to a residential development company, but it was bought by UFJF in early 2010, and at present is under implementation of the BG-UFJF.

The area related to BG-UFJF is largely in an advanced stage of regeneration (Rabelo & Magalhães 2011). Fonseca and Carvalho (2012) claim that the vegetation of this fragment began to emerge after the abandonment of a coffee plantation over 70 years ago. During forest development, the area remained in direct contact with a pasture and was subject to pressure from increasing surrounding urbanization, suffering recurrent anthropogenic disturbances such as fires, selective timber cuts, and introduction of exotic species. Formation of the neighboring communities dates back to the first record of coffee production in the area.

Preliminary survey

A preliminary survey was performed during November 2009, where 400 structured questionnaires were applied according to Alexíades (1996) in all streets of the districts surrounding the BG-UFJF. Data such as age, origin, gender, education, family income, and knowledge about the use of medicinal plants were collected, as well as other data specifically focused on the implementation of the BG-UFJF.

Taking into account the criteria of the Brazilian Association of Market Institute (ABIPEME 2006), the neighborhoods can be categorized as urban community of middle class, shifting between classes B and C, with predominantly rural origin and average residence time in the neighborhoods of at least 25 years.

Unanimous community interest was reported for the implementation of the BG-UFJF. Furthermore, 44% of survey respondents reported knowing people who frequented the area of the BG-UFJF, even though at the time this area was privately owned. Most respondents reported seeing burning, waste disposal, deforestation, and invasions for hunting and fishing in the area, and 71% of respondents made use of medicinal plants, 100% of which were acquired outside the BG-UFJF. These preliminary data highlighted promising potential for a formal ethnopharmacological study as a way of evaluating the vulnerability of this urban forest in relation to anthropic actions by the BG-UFJF surrounding communities.

Figure 1. Geographic location of the Botanical Garden of the Universidade Federal de Juiz de Fora (BG-UFJF), Minas Gerais, Brazil.

Quantitative survey

The quantitative survey, performed in 2010, consisted of ethnopharmacological data collection from the same population of districts surrounding the BG-UFJF, with the monitoring of the respective community leaders. Ethnopharmacological data were collected as per Rodrigues and Otsuka (2011) with some additions: (1) the main health problems in the family, (2) the types of medicines most commonly used (plants, conventional, or homeopathic medicines), and (3) in the case of use of medicinal plants, whether such use is reported to a doctor and the doctor's opinion. These data were collected through the application of 303 semi-structured questionnaires (Appendix A) following the model of Alexíades (1996) and adapted by Albuquerque & Lucena (2004). The interviews were conducted during four months of 2010 in all streets of the neighborhoods, focusing on the oldest member of each family. Random residence sampling was attempted, following the right and left side of each street, skipping two properties after each interview using a map of predetermined streets of the districts. During the interviews, when possible, botanical material was collected for the preparation of vouchers according to Lipp (1989) and Alexíades (1996). Vouchers were deposited in the Herbarium CESJ. When the botanical material was sterile, its identification was made through comparisons with botanical materials deposited in the Herbarium CESJ and image records of the Virtual Herbaria: Auguste de Saint-Hilaire (Muséum National d'Histoire Naturelle de Paris), Royal Botanical Gardens (Kew), and Missouri Botanical Garden.

The checklist method proposed by Alexíades (1996) and Albuquerque and Lucena (2004) was used for the botanical terms mentioned by respondents for which samples could not be collected. This method presents photographs of botanical species (here, from Lorenzi and Matos (2008)) to the respondents to confirm the species to which the botanical term mentioned was referring.

Qualitative survey/Free listing with the key informants

Ethnopharmacological data were collected from key informants and connoisseurs of medicinal plants. Through open interviews (Alexíades 1996), informants were asked to freely list the medicinal plants of their knowledge (Albuquerque & Lucena 2004). The key informants had been identified in the previous phase during the quantitative survey using the snowball technique (Becker 1993) where a resident widely known by the community (presidents of neighborhood associations) indicated others to be interviewed, and by the technique adopted by Maroyi (2011) where local community members, randomly selected from informal visits to the area, were asked to give the names of connoisseurs of medicinal plants of the neighborhoods. In the houses of the informants, samples of the botanical material were collected for depositing and identification procedures as described in the previous step.

Data analysis

Quantitative and qualitative data were compared to evaluate the use of certain plants by the general respondents with those plants and uses recommended by key informants. This step aimed to identify the influence of key informants on the population, as well as to create a list of plants for the implementation of the medicinal garden in BG-UFJF. Twenty-five plants of common use between the population and key informants were listed, forming a ranked list with the 18 most-cited plants among the population (> 5% citation) and the 20 most-cited plants among the informants, with overlap.

The Use Value Index (Phillips & Gentry 1993) was used to identify the importance of the plants listed by the study population. For each species we calculated the use value (UV_s) using the following formula:

$$UV_s = \Sigma UV_{is}/N,$$

where UV_{is} is the use value of a species for an informant and N is the total number of interviewed informants. UV_{is} was calculated as

$$UV_{is} = \Sigma U_{is}/n_{is},$$

where U_{is} is the number of uses mentioned by the informant for the species and n_{is} is the number of interviews made with the informant. For this work, n_{is} is 1 for all species because only one interview per informant was conducted. Therefore, the value of UV_{is} is equal to U_{is} and the final working formula is

$$UV_s = \Sigma U_{is}/N.$$

To assess the Fidelity Index of the mentioned uses for each species, we used the methodology proposed by Friedman *et al*. (1986) and modified by Amorozo and Gély (1988). We calculated the percentage of agreement related to the most-cited main uses for the species (AMU) by multiplying the number of informants who mentioned the main use (N_{MU}) by 100 and dividing by the number of informants who cited the species (N_S). Due to differences in the number of informants who cited uses for each species, it is necessary to use a correction factor (CF). The CF is the number of informants who cited uses for the species (N_{MU}) divided by the number of informants who mentioned the main species (N_S), i.e., with the largest number of uses listed. To calculate the corrected percentage of agreement related to the main uses for each species (cAMU), we multiplied AMU by CF. The final working formula is as follows:

$$cAMU = AMU \times CF,$$
where $AMU = N_{MU} \times 100 / N_S$ and $CF = N_{MU} / N_S$.

Pharmacological information obtained from the key informants was verified with scientific literature obtained through reviews made in the main databases.

Results

Community profile

Older residents were preferred for interviews as the preliminary survey found that the average age of people with medicinal plant knowledge in the study districts was 55 years. Of 303 conducted interviews, 70% were women and 30% were men, with an average age of 52 years among them. Seventy percent of respondents reported being born in urban areas, but 80% of rural populations descended from near the city of Juiz de Fora, and the average residence time in the respective districts was 27 years. Of the total respondents, 90% know the medicinal plants, and among these 70% use them in traditional treatments. Source of knowledge was 87% from older family members (grandparents, uncles, etc.), 5% from TV, 5% from magazines/books/newspapers, 2.7% from teachers and/or health professionals, and 0.3% from the internet. Of this, 60% reported to pass on their knowledge, showing that person-to-person transmission is still common.

All respondents approved the proposal of establishing a community and participatory medicinal garden in the BG-UFJF. Only 57% were interested in volunteering in the garden, which could potentially damage the participatory nature of it. The main activities which the participants would like to accomplish are watering (19.35%), weeding (21.8%), planting (27.66%), periodic visits to control pests and weeds (28.9%), and exchange information on medicinal plants in regular meetings in the garden (49.46%). These data when combined exceed 100% because some respondents listed more than one volunteer activity.

Use of traditional medicine by the community

Comparing the use of medicinal plants versus synthetic drugs, 91% of respondents think medicinal plants are cheaper and more available, 52% believe they have greater effect, and 59% trust more in the healing power of plants than in synthetic drugs. Regarding the treatment of any disease, 48% use medicinal plants and synthetic drugs, 35% use only synthetic drugs, 10.5% use only medicinal plants, 5.5% use only homeopathic medicines, 4% chose the form of treatment according to symptoms, and 1% uses all forms of treatment concomitantly. For those who use medicinal plants, only 42% report such use to doctors, and 45% of doctors were reported to be favorable to the use, while 20% were against it and 35% had no opinion about it.

When the main health problems in the family were surveyed, it was found that among those affected 71% were women, 29% were men, 19% were children, 46% were adults, and 35% were elderly. The main diseases cited were categorized according to ICD-10: International Sta-

Table 1. Reported categories of disease and the most-cited disease (MCD) in each category with respective citation percentages for communities surrounding the Botanical Garden of the Universidade Federal de Juiz de Fora (BG-UFJF), Minas Gerais, Brazil.

Categories	% of citation (N = 389)	Most-cited disease (MCD)	% of citation of MCD
Circulatory system diseases	29.8	Hypertension	75
Respiratory system diseases	29.0	Bronchitis	33
Endocrine, nutritional, & metabolic diseases	14.39	Diabetes	91
Diseases, symptoms, & signs involving the digestive system & abdomen	8.48	Gastritis	73
Genitourinary system diseases	5.91	Kidney problems	39
Skin & subcutaneous diseases	3.89	Dermatitis	80
Other infectious & parasitic diseases	3.89	Dengue	33
Osteomuscular system & connective tissue diseases	2.86	Back problems	90
Mental or behavioral diseases	2.31	Depression	33
Neoplasms	2.0	Cervical & prostate cancer	38
General symptoms & signs	2.0	Sore throat & headache	50
Nervous system diseases	1.54	Alzheimer's disease	50
Others	1.09	Inflammation	100
Eye diseases	1.02	Glaucoma	50
Intestinal infectious diseases	0.77	Worms	100

tistical Classification of Diseases and Related Health Problems (WHO 2000) as seen in Table 1, which shows the percentage of citations, from a total of 389. The same reference provides the respective diseases; however, Table 1 shows only the most commonly cited disease in each category. The data correspond to the epidemiological scenario of the health center that serves the community under study, with hypertension and diabetes being the most-cited diseases during the survey.

Among those who use medicinal plants, 57% get the plant in a neighbor's house, 16% cultivate in their own homes, 11% buy in stores, and 5% get from the BG-UFJF space, these being grown in a small clearing "illegally" built on an area of approximately 20 m² at the intersection of the BG-UFJF quarter and Santa Terezinha. This space is used for two families of the community and has exotic species brought from home gardens and naturally colonizing that area.

Plant species

Regarding the use of herbal remedies, we identified 104 medicinal plants, 99 to species-level and 5 to genus-level, across 50 plant families (Table 2). Regarding native origins of these plants, 27% of them are endemic to Brazil while the majority are from Europe. The predominant families were Lamiaceae (16 species), Asteraceae (14 species), Solanaceae (5 species), Amaranthaceae (4 species), Fabaceae (4 species), and Poaceae (4 species). Among the

Table 2. Medicinal plants used by the population in the vicinity of Botanical Garden of the Universidade Federal de Juiz de Fora (BG-UFJF), Minas Gerais, Brazil. Habit: herbaceous (H), tree (T).

Scientific name	Geographic origin	Vernacular name	Primary use	Habit	Voucher Number
Lamiaceae					
Glechoma hederacea L.	Europe, Asia	**Erva Terrestre**	Flu	H	58348
Lavandula angustifolia Mill.	Europe	**Alfazema, Lavanda**	Anxiety	H	-
Leonurus sibiricus L.	China	**Mané Turé, Macaé, Mané Magro**	Stomach problems	H	56956
Mentha arvensis L.	Japan	**Vique, Menta**	Flu	H	57120
Mentha cf. × *piperita* L.	Europe	**Elevante, Alevante, Levante**	Flu	H	-
Mentha pulegium L.	Europe, Asia, Arabia	**Poejo, Poejinho, Poejo Branco**	Flu	H	57143
Mentha spicata L.	Europe	**Hortelã, Hortelã Italiano**	Vermifuge	H	57126
Ocimum basilicum L.	Asia	**Manjericão comum, Alfavaca**	Heart problems	H	56732
Ocimum basilicum var. *purpurea* L.	East	**Manjericão roxo**	Flu	H	56071
Ocimum carnosum (Spreng.) Link & Otto ex Benth.	Brazil	**Erva doce de Folha, Anis**	Soothing	H	56729
Ocimum gratissimum L.	East	**Alfavaca, Assapeixe do Reino**	Flu	H	56961
Plectranthus barbatus Andrews	New Guinea	**Boldo comum, Boldo**	Liver problems	H	57068
Plectranthus neochilus Schltr.	South Africa	**Boldinho do Chile, Boldinho**	Liver problems	H	-
Rosmarinus officinalis L.	Mediterranean	**Alecrim**	Heart tonic	H	57853
Salvia officinalis L.	Europe	**Sálvia**	Heart tonic	H	56733
Vitex agnus-castus L.	Africa	**Alecrim de Angola, Viagra**	Impotence	H	57138
Asteraceae					
Acmella ciliata (Kunth) Cass.	Africa	**Necroton, Boldo Chinês**	Liver problems	H	56724
Acmella uliginosa (Sw.) Cass.	Tropical America	**Agrião bravo, Jambú**	Tootache	H	57139

Scientific name	Geographic origin	Vernacular name	Primary use	Habit	Voucher Number
Ageratum conyzoides (L.) L.	Tropical America	**Erva de São João, São João**	High cholesterol	H	56960
Artemisia absinthium L.	Europe, Asia, Africa	**Losna, Losma, Absinto**	Liver problems	H	57851
Artemisia alba Turra.	Europe, Asia, Africa	**Cânfora**	Beating pain	H	-
Baccharis trimera (Less.) DC.	Brazil	**Carqueja**	Weight loss	H	58343
Bidens pilosa L.	Tropical America	**Picão, Picão Preto**	Jaundice	H	57140
Centaurea benedicta (L.) L.	Europe	**Cardo Santo**	Liver Problems	H	-
Cynara cardunculus L.	Mediterranean	**Alcachofra**	Weight loss	H	58342
Matricaria chamomilla L.	Europe	**Camomila**	Soothing	H	-
Mikania glomerata Spreng.	Brazil	**Guaco, Guapo**	Flu and Pneumonia	H	56736
Solidago chilensis Meyen	South America	**Arnica**	Beating pain	H	57142
Tanacetum parthenium (L.) Sch.Bip.	Greece, Albania	**Artimijo, Artemijo**	Flu	H	-
Vernonanthura phosphorica (Vell.) H.Rob.	Brazil	**Assapeixe, Assapeixe do Mato**	Flu and Pneumonia	H	58050
Solanaceae					
Lycopersicon esculentum Mill.	Turkey, Bolivia	**Tomate cereja**	General infections	H	-
Nicotiana tabacum L.	Tropical America	**Tabaco**	Diarrohea	H	56914
Solanum cernuum Vell.	Brazil	**Panacéia**	Cleanses the blood	H	57854
Solanum lycocarpum A. St.-Hil.	Brazil	**Fruta de Lobo**	High cholesterol	H	57862
Solanum melongena L.	India	**Berinjela**	High cholesterol	H	-
Amaranthaceae					
Alternanthera brasiliana (L.) Kuntze	Brazil	**Terramicina, Penicilina**	General infections	H	56735
Alternanthera sp.	Brazil	**Carrapixinho**	General infections	H	57136
Amaranthus sp.	Tropical America	**Carirú, Carirú de porco**	Stimulating lactation	H	56962
Dysphania ambrosioides (L.) Mosyakin & Clemants	Tropical America	**Erva de Santa Maria**	Vermifuge	H	57061
Fabaceae					
Bauhinia purpurea L.	China	**Pata de vaca**	Diabetes	T	57850
Desmodium incanum DC.	Mexico, Argentina	**Carrapicho**	Febrifuge	T	58049
Pterodon emarginatus Vogel	Brazil	**Sucupira**	Rheumatism	T	-
Stryphnodendron sp.	Brazil	**Barbatimão**	Ulcer	T	-

Scientific name	Geographic origin	Vernacular name	Primary use	Habit	Voucher Number
Poaceae					
Coix lacryma-jobi L.	Asia	**Conta de Lágrima**	Flu	H	58052
Cymbopogon citratus (DC.) Stapf	Asia	**Capim Limão, Capim Cidreira**	Soothing	H	57859
Saccharum sp.	Asia	**Cana**	Flu	H	-
Zea mays L.	Central America	**Milho**	General infections	H	-
Bignoniaceae					
Fridericia chica (Bonpl.) L.G.Lohmann	Brazil	**Cajurú do Índio, Crajirú**	Kidney problems	H	58351
Handroanthus impetiginosus (Mart. ex DC.) Mattos	American	**Ipê roxo**	Muscle aches	T	-
Jacaranda sp.	Brazil	**Caroba**	General infections	T	-
Euphorbiaceae					
Euphorbia hirta L.	Tropical America	**Erva de Santa Luzia**	Diarrohea	H	-
Euphorbia tirucalli L.	Madagascar	**Aveloz, Coroa de Cristo**	Cancers general	H	-
Ricinus communis L.	India, Africa	**Mamona**	Hemorrhoids	H	-
Myrtaceae					
Corymbia citriodora (Hook.) K.D.Hill & L.A.S.Johnson	Australia	**Eucalipto, Eucalipto de Cheiro**	Flu	T	-
Eugenia uniflora L.	Brazil	**Pitangueira**	Diarrhoea	T	58051
Psidium guajava L.	South America	**Goiabeira**	Diarrhoea	T	-
Rutaceae					
Citrus × *aurantium* L.	Asia	**Laranja, Laranja amarga**	Flu	H	-
Citrus limon (L.) Osbeck	Asia	**Limão**	Flu	H	57857
Ruta graveolens L.	Southern Europe	**Arruda**	Conjunctivitis	H	56723
Amaryllidaceae					
Allium cepa L.	Asia	**Cebola**	Sore throat	H	-
Allium sativum L.	Europe	**Alho**	Flu	H	-
Brassicaceae					
Brassica rapa L.	Southern Europe	**Mostarda**	Low pressure	H	-
Nasturtium officinalie R.Br.	Europe	**Agrião**	Anemia	H	-
Crassulaceae					
Kalanchoe laciniata (L.) DC.	Brazil	**Saião**	Ulcer	H	56997
Sedum dendroideum Moc. & Sessé ex DC.	Mexico	**Bálsamo**	Ulcer	H	-
Lauraceae					
Laurus nobilis L.	Asia	**Louro**	Gastritis and ulcer	T	-

Scientific name	Geographic origin	Vernacular name	Primary use	Habit	Voucher Number
Persea americana Mill.	Central America	**Abacate**	Kidney problems	T	58341
Rosaceae					
Rosa alba L.	Mediterranean	**Rosa branca**	General infections	H	56916
Rubus brasiliensis Mart.	Brazil	**Amora Silvestre**	Flu	H	58045
Alismataceae					
Echinodorus grandiflorus (Cham. & Schltdl.) Micheli	Brazil	**Chapéu de couro**	High blood preassure	H	56861
Anacardiaceae					
Mangifera indica L.	Asia	**Mangueira**	Cystits	T	-
Apiaceae					
Foeniculum vulgare Mill.	Europe	**Funcho**	Stomachache	H	57071
Balsaminaceae					
Impatiens walleriana Hook.f.	Africa	**Beijo branco**	Uterine infections	H	57855
Bixaceae					
Bixa orellana L.	Tropical America	**Urucum**	High blood pressure	T	57137
Boraginaceae					
Symphytum officinale L.	Europe, Asia	**Confrei**	General infections	H	-
Bromeliaceae					
Ananas comosus (L.) Merr.	Brazil	**Abacaxi**	Kydney problems	H	-
Caricaceae					
Carica papaya L.	Caribbean	**Mamão**	Flu	T	-
Caryophyllaceae					
Dianthus caryophyllus L.	Europe	**Cravo**	Headache	H	-
Celastraceae					
Maytenus truncata Reissek	Brazil	**Espinheira Santa**	Ulcer	T	-
Convolvulaceae					
Ipomoea batatas (L.) Lam.	America	**Batata doce**	General problems	H	-
Costaceae					
Costus spicatus (Jacq.) Sw.	Brazil	**Cana de Macaco, Caninha**	Kidney problems	H	56956
Curcurbitaceae					
Sechium edule (Jacq.) Sw.	Central America	**Chuchú**	Anti-hypertensive	H	57155
Dilleniaceae					
Davilla sp.	Brazil	**Cipó Caboclo**	Cleanses the blood	T	-
Equisetaceae					
Equisetum giganteum L.	Brazil	**Cavalinha**	Anemia	H	-

Scientific name	Geographic origin	Vernacular name	Primary use	Habit	Voucher Number
Lythraceae					
Punica granatum L.	Asia	**Romã**	Sore throat	T	56728
Malpighiaceae					
Malpighia glabra L.	Central America	**Pitangueira**	Flu	T	58051
Malvaceae					
Gossypium hirsutum L.	India	**Algodão**	General infections	T	57852
Moraceae					
Morus alba L.	India, China	**Amora**	Regulating hormones	T	56917
Oxalidaceae					
Averrhoa carambola L.	India, Malaysia	**Carambola**	Clear the kidneys	T	-
Passifloraceae					
Passiflora edulis Sims	Brazil	**Maracujá**	Soothing	H	58054
Phyllanthaceae					
Phyllanthus tenellus Roxb.	Paleotropics	**Quebra Pedra, Arrebenta Pedra**	Kidney problems	H	56955
Phytolaccaceae					
Petiveria alliacea L.	Brazil	**Guiné**	Muscle aches	H	57060
Piperaceae					
Piper aduncum L.	Brazil	**Jaborandi**	Circulatory problems	H	-
Plantaginaceae					
Plantago major L.	Europe, Brazil	**Transagem, Tanchagem**	General infections	H	57026
Polygonaceae					
Persicaria hydropiper (L.) Delarbre	Europe	**Erva de Bicho**	Intestinal infections	H	-
Staphyleaceae					
Turpinia occidentalis (Sw.) G.Don	Mediterranean	**Marmelinho**	Kidney problems	H	56915
Talinaceae					
Talinum paniculatum (Jacq.) Gaertn.	Brazil	**Ora-Pronóbis de pedreira**	Anemia	H	56957
Tropaeolaceae					
Tropaeolum majus L.	Mexico, Turkey	**Capuchinha**	Cellulitis & anemia	H	56913
Urticaceae					
Cecropia sp.	Brazil	**Embaúba**	Asthma	T	-
Verbenaceae					
Lippia alba (Mill.) N.E.Br. ex Britton & P.Wilson	Brazil	**Erva cidreira, Melissa, Cidreira**	Soothing	H	57122

Scientific name	Geographic origin	Vernacular name	Primary use	Habit	Voucher Number
Vitaceae					
Cissus verticillata (L.) Nicholson & C.E.Jarvis	Brazil	**Insulina**	Diabetes	H	-
Winteraceae					
Drimys winteri J.R. Forst. & G.Forst.	Chile	**Casca d'anta**	Constipation	T	-
Xanthorrhoeaceae					
Aloe arborescens Mill.	Arabian peninsula	**Babosa**	Burns	H	58046
Zingiberaceae					
Zingiber officinale Roscoe	India	**Gengibre**	Sore throat	H	58047

prevalent species (> 5% referenced), all are herbaceous with an emphasis on *Mentha spicata* L. (40.0%), *Plectranthus barbatus* Andrews (31.7%), and *Lippia alba* (Mill.) N.E. Brown ex Britton & P.Wilson (18.8%) (Figure 2).

Eighteen key informants were identified, of which we could locate and conduct interviews with 12 of them. Nine of these were women with a mean age of 72 years. From the comparison between the quantitative data (population) and qualitative (key informant), 25 plants were selected for further analysis to determine their importance based on use value and percentage of agreement about the main uses (Table 3). Based on the 18 most-cited plants by the population (> 5% referenced) and the 20 plants deemed most relevant by the key informants, a list of 25 plants were prioritized for subsequent statistical analysis (Table 3). Use value (UV) was estimated to evaluate the importance of each one of the plants listed. According to the UV criterium, the number of uses mentioned for a species establishes its importance to the study community. Because of this, the greater the number of uses mentioned for the species, regardless of the category, the greater its importance to the community. The species of major importance were *M. spicata* (2.5%), *Vernonanthura phosphorica* (Vell.) H.Rob. (2.18%), and *Gossypium hirsutum* L. (2%) (Table 3). The cAMU for each species is also shown in Table 3. The higher the value of cAMU for each one of the species, the greater the number of infor-

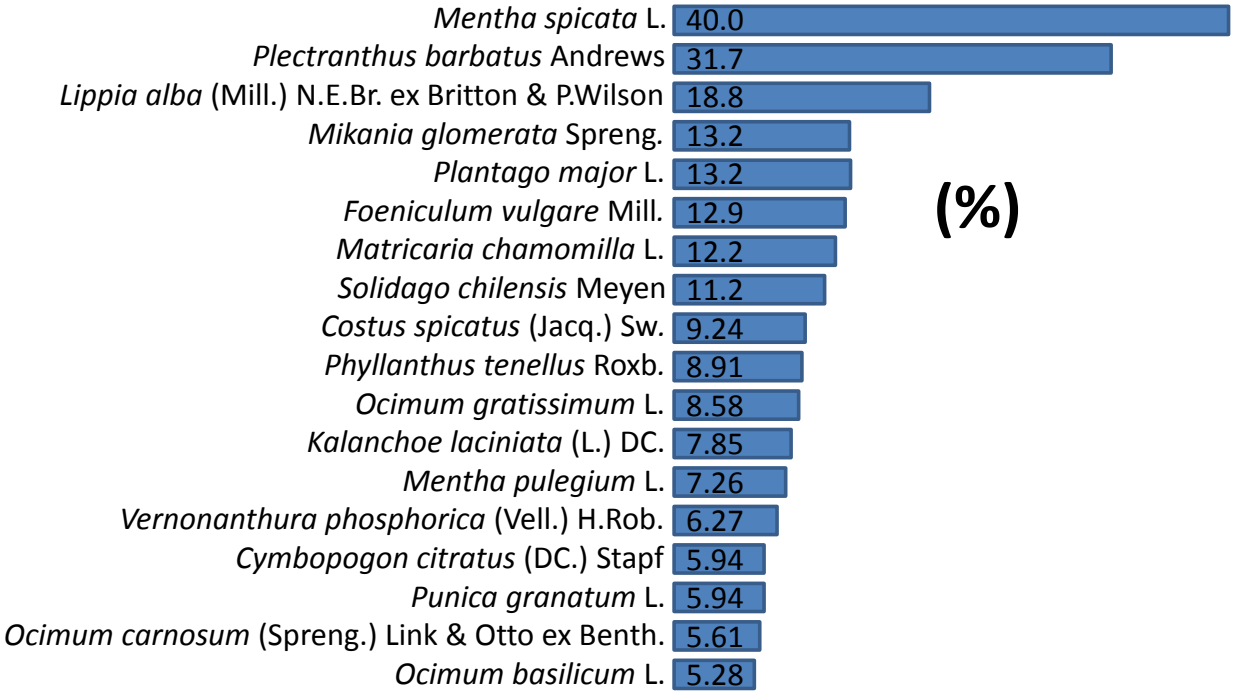

Figure 2. Most widely used medicinal species among the population in the vicinity of the Botanical Garden of the Universidade Federal de Juiz de Fora (BG-UFJF), Minas Gerais, Brazil.

Table 3. Use Value Index and Fidelity Index for the most-cited medicinal plant species relative to area surrounding the Botanical Garden of the Universidade Federal de Juiz de Fora (BG-UFJF), Minas Gerais, Brazil. ΣUV_{is} = use value of one species to an informant; UV_s = use value for a species; AMU = percentage of agreement related to the main uses; CF = correction factor; cAMU = corrected percentage of agreement related to the main uses.

Names		ΣUV_{is}	UV_s	AMU (%) * CF	cAMU (%)
Scientific	**Vernacular**				
Acmella ciliata (Kunth) Cass.	**Necroton**	11	1.1	80.0 * 0.90	72
Artemisia absinthium L.	**Losna**	15	1.5	40.0 * 0.90	36
Baccharis trimera (Less.) DC.	**Carqueja**	16	1.77	33.3 * 0.81	27
Bidens pilosa L.	**Picão**	18	1.8	90 .0 * 0.90	81
Costus spicatus (Jacq.) Sw.	**Cana de macaco**	13	1.3	80.0 * 0.90	72
Cymbopogon citrates (DC.) Stapf	**Capim limão**	10	1.42	71.4 * 0.63	45
Foeniculum vulgare Mill.	**Funcho**	14	1.4	50.0 * 0.90	45
Gossypium hirsutum L.	**Algodão**	20	2	60.0 * 0.90	55
Kalanchoe laciniata (L.) DC.	**Saião**	11	1.57	71.0 * 0.63	45
Lippia alba (Mill.) N.E.Br. ex Britton & P.Wilson	**Erva cidreira**	14	1.75	87.5 * 0.72	63
Mentha pulegium L.	**Poejo**	10	0.9	88.8 * 0.81	72
Mentha spicata L.	**Hortelã comum**	25	2.5	27.2 * 1.00	27
Mikania glomerata Spreng.	**Guaco**	15	1.5	80.0 * 0.90	72
Ocimum basilicum L.	**Manjericão**	7	1.57	33.0 * 0.70	9
Ocimum carnosum (Spreng.) Link & Otto ex Benth.	**Erva doce de folha**	8	1.14	85.0 * 0.63	54
Ocimum gratissimum L.	**Alfavaca**	15	1.36	81.8 * 1.00	82
Phyllanthus tenellus Roxb.	**Quebra pedra**	11	1.1	100 * 1.00	100
Plantago major L.	**Transagem**	14	1.55	77.0 * 0.81	62
Plectranthus barbatus Andrews	**Boldo**	13	1.18	63.6 * 1.00	64
Plectranthus neochilus Schltr.	**Boldinho**	7	1	71.4 * 0.63	45
Punica granatum L.	**Romã**	12	1.33	90.0 * 0.81	74
Sechium edule (Jacq.) Sw.	**Chuchu**	11	1.1	100 * 1.00	100
Solidago chilensis Meyen	**Arnica**	15	1.4	90.0 * 0.90	81
Turpinia occidentalis (Sw.) G.Don	**Marmelinho**	10	1.25	87.5 * 0.72	63
Vernonanthura phosphorica (Vell.) H.Rob.	**Assapeixe**	24	2.18	100 * 1.00	100

mants who mentioned the main use for the species, i.e., the greater the agreement of the population in the indication of such use.

A literature review confirmed the medicinal value of 16 of these 25 most-cited species (Table 4). The three most important medicinal plants (listed above) showed no scientific studies supporting the effectiveness of their principal reported use. But among the three plants showing cAMU 100%—*Phyllanthus tenellus* Roxb., *Sechium edule* (Jacq.) Sw., and *V. phosphorica*—just *V. phosphorica* lacked scientific confirmation.

Discussion

Mendonça-Filho and Menezes (2003), Moreira *et al*. (2002), Schardong and Cervi (2000), and Souto and Ticktin (2012) found medicinal plant knowledge to be concentrated in an age group similar to that found here (i.e., elderly women). The urban provenance and residential permanence of the majority of respondents supports the transmission of local plant knowledge. The longer the time of residence in a particular location, the better preserved the ethnobotanical knowledge (Lima 1996), often via transgenerational knowledge, perpetuated orally by intense contact between generations, especially in domestic groups of shared parentage (Amorozo 1996).

The study population demonstrated wide acceptance of the therapeutic resources of medicinal plants, but their

Table 4. Species with common names, uses, parts used, main form of preparation, and scientific evidence about the primary use. Parts used: root (R), stem (St), leaf (L), flower (Fl), fruit (Fr), seed (Se). Preparations: alcoholic tincture (A), decoction (D), infusion (I), maceration (M). Method of administration in all cases was oral except for topical use of Solidago chilensis. Literature used: [1]Amat *et al*. (2010); [2]Soicke and Leng-Peschlow (1987); [3]Dickel *et al*. (2007); [4]Yuan *et al*. (2008); [5]Silva and Parente (2003); [6]Almeida Costa *et al*. (2011); [7]Choie and Hwang (2004); [8]Alexandrovich *et al*. (2003); [9]Mourão *et al*. (1999); [10]Zétola *et al*. (2002); [11]Leal *et al*. (2000); [12]Soares de Moura *et al*. (2002); [13]Umar *et al*. (2010); [14]Bravo *et al*. (2008); [15]Armani *et al*. (2006); [16]Ignácio *et al*. (2001); [17]Santos *et al*. (1994); [18]Hetland *et al*. (2000); [19]Velasco-Lezama *et al*. (2006); [20]Samuelsen (2000); [21]Maioli *et al*. (2010); [22]Chebaibi *et al*. (2011); [23]Jung Lee *et al*. (2010); [24]Lansky and Newman (2007); [25]Ribeiro *et al*. (1986); [26]Gordon *et al*. (2000); [27]Tamura *et al*. (2009); [28]Goulart *et al*. (2007); [29]Liz *et al*. (2008).

Names		Main use	Part(s) used	Most common preparation	Confirmation of drug use related to the main use
Scientific	**Vernacular**				
Acmella ciliata (Kunth) Cass.	**Necroton**	liver problems	L	M	not found
Artemisia absinthium L.	**Losna**	liver problems	L, R, St	I, M	hepatoprotective[1]
Baccharis trimera (Less.) DC.	**Carqueja**	liver problems & weight loss	Fl, L, St	D	anti-hepatotoxic[2] & weight loss[3]
Bidens pilosa L.	**Picão**	jaundice	Fl, Fr, L, R, Se, St	D	treatment of liver injury[4]
Costus spicatus (Jacq.) Sw.	**Cana de macaco**	kidney problems & kidney pain	Fl, L, R, St	I, D	immuno-modulatory & anti-inflammatory[5]
Cymbopogon citratus (DC.) Stapf	**Capim limão**	sedative	L	I, D	anxiolytic & sedative[6]
Foeniculum vulgare Mill.	**Funcho**	abdominal pain	Fr, L, R, Se, St	I (leaf), D (seed)	anti-inflammatory, analgesic[7], & carminative[8]
Gossypium hirsutum L.	**Algodão**	discharge, uterine infections, & other problems	Fl, L, Se	D	not found
Kalanchoe laciniata (L.) DC.	**Saião**	ulcer & gastritis	L	M	anti-inflammatory when in non-fertile phase[9]
Lippia alba (Mill.) N.E.Br. ex Britton & P.Wilson	**Erva cidreira**	sedative	Fl, L	I	sedative[10]
Mentha pulegium L.	**Poejo**	flu	L & other parts	D	not found
Mentha spicata L.	**Hortelã comum**	sedative & vermifuge	L, St	I	not found
Mikania glomerata Spreng.	**Guaco**	flu	L, St	I	bronchodilator[11,12] & expectorant[11]
Ocimum basilicum L.	**Manjericão**	flu, cold, heart problems	L, St	D	hypertension[13] & athero-sclerosis[14, 15]
Ocimum carnosum (Spreng.) Link & Otto ex Benth.	**Erva doce de folha**	sedative	Fr, L, R, Se, St	I	not found
Ocimum gratissimum L.	**Alfavaca**	flu	Fl, Fr, L, Se, St	I	not found

Names		Main use	Part(s) used	Most common preparation	Confirmation of drug use related to the main use
Scientific	**Vernacular**				
Phyllanthus tenellus Roxb.	**Quebra pedra**	kidney problems	Fl, L, R, St	I	antimicrobial[16] & analgesic for inflammatory pain[17]
Plantago major L.	**Transagem**	general infections	L, R, St	D	antimicrobial[18,19,20]
Plectranthus barbatus Andrews	**Boldo**	liver problems	L, St	M	therapeutic potential for some liver diseases[21]
Plectranthus neochilus Schltr.	**Boldinho**	liver problems	L	M	not found
Punica granatum L.	**Romã**	problems related to throat (pain, inflammation & infection)	Fr, L	D	broad-spectrum antibiotic[22] & anti-inflammatory[23, 24]
Sechium edule (Jacq.) Sw.	**Chuchú**	high blood pressure	Fr, L	I	anti-hypertensive[25, 26]
Solidago chilensis Meyen	**Arnica**	pain caused by shocks	Fl, L, R, St	A	anti-inflammatory[27,28,29]
Turpinia occidentalis (Sw.) G.Don	**Marmelinho**	kidney problems	L	I	not found
Vernonanthura phosphorica (Vell.) H.Rob.	**Assapeixe**	pneumonia, flu, & cold	L, Fl, R	M	not found

use was often disconnected from formal medical attention despite two-thirds of the most-cited species having documented medicinal value. Asteraceae and Lamiaceae were the most representative families of all the medicinal plants mentioned, which corresponds to other studies conducted in Brazil (Brito &Brito 1993, Maioli-Azevedo & Fonseca-Kruel 2007). These results also demonstrate the strong influence of European culture, especially in the use of medicinal plants. Bennett and Prance (2000) and Quiroga *et al*. (2012) have already observed the predominance of the therapeutic use of exotic plants in Latin America, and Begossi *et al*. (2002), Brasileiro *et al*. (2008), Guarim Neto and Morais (2003), Pinto *et al*. (2006), Rezende and Cocco (2002), and Souza and Felfili (2006) have already observed the predominance of the therapeutic use of exotic plants in Brazil, showing the European influence on popular knowledge. Almeida (2003) pointed out that in south and southeast regions of Brazil, the medicinal plants of European origin are the most representative because they have adapted and spread easily due to the presence of immigrants. The mixture of native and exotic species introduced pharmacopoeically in the communities of the tropical zone is quite common (Bennett & Prance 2000), which could point to a reduction in pressure on native forest products available for that area (Begossi *et al*. 2002). Moreover, in the present study, the use of exotic plants and crops is a result of the need for alternatives to native plants growing in prohibited or limited-access areas. The prevalence of use reports of herbaceous rather than woody species is likely due to ease of growth in home gardens or similar sites.

Potential use of community gardening as a means of promoting health and preservation of traditional knowledge and biodiversity

This work underpins the approach of folk wisdom to scientific knowledge, which could serve as a basis for maintaining this knowledge in the community through the implementation of a community garden in BG-UFJF. Results showed that respondents currently make use of medicinal plants outside the BG-UFJF. The creation of a new medicinal garden and promotion of BG-UFJF in general will allow the community members access to an area closer to where they live and encourage the use of local resources, positively influencing the man-nature relationship in that area. There is unanimity from the study population regarding interest in this space, and the majority of respondents agreed that the garden space could be an aggregator to exchange information. It is a strategy for the transmission

of sustainability and conservation practices, and regular meetings in the garden for the exchange of information about medicinal plants may be the main tool to spread among the community a greater respect for natural resources. The logistics of planting the garden becomes relevant when it comes to the quality control of raw materials, as well as decreasing unauthorized plant extraction and linking the garden to aspects of environmental education. The garden can also serve as a living pharmacy with proposals to target the correct use of therapeutic resources (Matos 1994) as well as the importance of understanding the concepts of remedies derived from plant resources that are used by the population (Conde 2012).

Hypertension, bronchitis, and gastritis were some of the main diseases cited by the population for which there are scientifically documented herbal treatments using *S. edule*, *Mikania glomerata* Spreng., and *Kalanchoe laciniata* (L.) DC., respectively. A focus on these three native or naturalized plants in the garden could contribute to the rescue and maintenance of traditional medicinal plant knowledge in the community. The creation of a medicinal garden is expected to promote the sustainable use of natural resources and conservation of species of BG-UFJF.

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Appendix A. Semi-structured questionnaire used to obtain data during the quantitative survey stage in the vicinity of the Botanical Garden of the Federal University of Juiz de Fora, Minas Gerais, Brazil.

* preferência aplicar aos mais idosos da residência.

Questionario N___ Quem aplicou: _____ Data: ___/___/___

Nome:_____ Bairro:_____ Sexo:_____ Idade:_____

Temp de residência no bairro: _____ Origem:_____ Rural_____ Urbana_____

Você conhece alguma planta utilizada para fins medicinais? Sim ( ) Não ( ). Se sim, faz uso? Sim ( ) Não ( )

Onde aprendeu sobre as plantas medicinais que utiliza?
Com Familiares (Avós, tios, irmão, e outros) ( ) Livros, revista e journais ( ) TV ( ) Internet ( )
Médico ou Profissional de Saúde ( )
(Especificar complement abaxio:)
_____

Seus familiars estão dando continuidade aos seus conhecimentos sobre as plantas? Sim ( ) quem ___. Não ( )

Conhece alguém (partiera, benzedeira, curandeira, raizeiro) ou mesmo alguém que tem e/ou entende e/ou recita plantas no bairro: Não ( ) Sim ( ) Quem/onde mora/como encontrar:_____

_____

Problema de saúde mais comum na familia:

	Criança	Adulto	idoso
Mulher			
Homem			

Tipos de remédios mais utilizados:
PM ( ) Homeopáticos ( ) Quimicos ( ) PM Quimicos ( ) Todos ( ) Depende da doença ( )

Informa ao médico que tomou fitoterápico? Sim ( ), Não ( ), o médico foi a favor ( ), contra ( ), não opinou ( )
outro_____

Você concorda com a implantação de um horto medicinal comunitário no JB-UFJF? ( )Sim ( )Não

Caso o horto seja implantando você se disponibilizaria a trabalhar de forma voluntária nele?
Não ( ) Sim ( ) quanto tempo por dia ou semana?_____

Qual a atividade você poderia realizar: aguar ( ) capinar ( ) visitas periódicas para controle de plantas invasoras, pragase doenças ( ) plantar ( ) troca de informações ( ) Outros ( )_____

Planta	Quem ensinou? Já fez uso dela?	Parte usada	Finalidade	Modo de preparo	Modo de utilização	Onde consegue a plant? Está com flor?	Toxidez? (S ou N) Interações com outros tratamentos?

Appendix B. Approval of ethics committee for ethnobotanical research in the vicinity of the Botanical Garden of the Federal University of Juiz de Fora, Minas Gerais, Brazil.

UNIVERSIDADE FEDERAL DE JUIZ DE FORA
PRO-REITORIA DE PESQUISA
COMITÊ DE ÉTICA EM PESQUISA - CEP/UFJF
36036900- JUIZ DE FORA - MG – BRASIL

Adendo ao Parecer 311/2009

Protocolo CEP-UFJF: 1907.251.2009 **FR:** 301299 **CAAE**: 0200.0.180.000-09
Projeto de Pesquisa: Produção de plantas medicinais e fitoterapia em municípios do entorno de Juiz de Fora/MG
Area Temática: Grupo III
Pesquisador Responsável: Daniel Sales Pimenta
Instituição: Universidade Federal de Juiz de Fora - ICB

Sumário/comentários:

O pesquisador enviou ao CEP uma solicitação de prorrogação de cronograma.
Foi apresentado o novo cronograma e a data prevista para o término da pesquisa é Novembro de 2012.
O Comitê de Ética em Pesquisa – CEP/UFJF, de acordo com as atribuições definidas na Res. CNS 196/96, manifesta-se pela **aprovação** do novo cronograma e informa que o mesmo será anexado ao projeto e arquivado no CEP.

Juiz de Fora, 13 de julho de 2011

Profa. Dra. Iêda Maria Vargas Dias
Coordenadora CEP/UFJF

RECEBI
DATA: _____/_____/ 2011
ASS: _____