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Traditional healers and laypeople: A qualitative and quantitative approach to local knowledge on medicinal plants in Muda (Mozambique)

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ABSTRACT

Ethnopharmacological relevance: Through this study, relevant information was gathered on the knowledge about medicinal remedies in some rural communities of Muda (central Mozambique). The use of 198 different medicinal plants has been recorded and a significant number of medicinal species and uses new for Africa and particularly for Mozambique has been detected. Our investigation appears to be the first comparing knowledge about medicinal plants between laypeople and traditional healers and also between the two kinds of healers (*curandeiros* and *profetas*).

Materials and methods: Ethnobotanical data were gathered through semi-structured interviews with 67 informants: 9 *curandeiros* (traditional healers believed to be guided by spirits), 12 *profetas* (independent Pentecostal churches "prophets" healing both souls and bodies) and 46 untrained lay villagers. Data were entered in a data base and processed, also by means of suitable quantitative indexes.

Results: A total of 546 citations were recorded for 198 different *ethnospecies* (i.e. basic ethno-taxonomical units). The species with the highest cultural value (estimated with Cultural Importance index) resulted to be *Ximenia caffra* (CI = 0.224), *Zanha golungensis* (CI = 0.194) *Vernonia colorata* (CI = 0.149) and *Ozoroa reticulata* and *Holarrhena pubescens* (both with CI = 0.134). Eight out of the 162 identified plants mentioned by the informants were not previously recorded as medicinal plants in Africa: *Cissus bathyrhakodes*, *Clematis viridiflora*, *Combretum goetzei*, *Dioscorea cochleari-apiculata*, *Grewia pachycalyx*, *Indigofera antunesiana*, *Ipomoea consimilis*, *Tricliceras longipedunculatum*. More than half of the species reported by our informants and already known as medicinal in Africa resulted to be newly documented for Mozambique. Comparing the mean number of species known by each informant group, statistically significant differences were observed both between *curandeiros* and laypeople and between *profetas* and laypeople. No significant differences emerged instead between *curandeiros* and *profetas*. Yet, even laypeople proved to hold quite a good knowledge about medicinal remedies; women in particular use several different plants to heal common diseases of the whole family, mostly for children and female health problems.

Conclusions: The high number of plants and uses recorded demonstrates that in the study area ethnobotanical knowledge is still quite rich and alive. The finding of many medicinal plants and uses new for Mozambique or even Africa shows the importance of recording this knowledge before it vanishes, also as a basis for further investigations on possible pharmacological properties of local plants.

The lack of health infrastructures in Muda results in the need for lay villagers of acquiring and developing a rather high degree of knowledge about plants remedies; in a different interaction between healers and lay villagers, compared to urban areas; ultimately, in a different distribution and wider spread of traditional knowledge on medicinal plants.

1. Introduction

Currently, in Mozambique only 40% of inhabitants can access public health system (WHO, 2004) and most of them still rely on traditional medicine for most of their health care needs. The doctor to patient ratio is 1:50,000, while the traditional healer to patient ratio is 1:200 (Hamilton, 2004). About 10% of the 5500 plant species recorded in Mozambique are used in traditional medicine (World Conservation Monitoring Centre, 1992). During the colonial period (1891–1975) and even at the time of the *República Popular de Moçambique* (1975–1990), the use of medicinal plants was not encouraged, because it was considered as a sum of superstitious folk beliefs. But since the last decades of 20th century, traditional medicine has been gaining more and more respect by national governments and health care providers. In 1990 an association of traditional healers was founded – AMETRAMO (Associação de

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prática de Medicina Tradicional de Moçambique) – and a national policy on traditional medicine including a strategy for its development was published in 2004 (Ministério da Saúde, 2004).

In Mozambique rural communities there is a wide variety of providers in traditional health-service, and among them two main groups can be identified: *curandeiros* (*nyanga* in local ChiTewe language), i.e. healers believed to be possessed by spirits, and 'prophets' or *profetas*. *Curandeiros* are the recognized traditional figures devoted to the healing of diseases. They belong to the traditional animist religion and as a general rule their task is not the mere administration of medicines. When asked for help, a *curandeiro* tries first to understand the origin of the disease. In African culture, diseases are often put down to a system of misfortune in which material causes (how it occurred) are closely linked to social and spiritual factors (why it happened to that person) (Granjo, 2009). Severe diseases caused by evil spirits and sorcerers or sorceresses (*feitiçeros*/*as*, or *varoya* in local ChiTewe language) can be due to loss of protection from the ancestors as a consequence for having neglected ritual ceremonies of respect and memory or having had an immoral behavior, such as infidelity and intra-family conflicts (Pfeiffer, 2005). According to Pfeiffer et al. (2007), due to socio-economic crisis of recent years, *curandeiros* are currently especially sought after by men wishing to improve their luck and job prospects.

Since the 1990s, the increasing socioeconomic disparity has encouraged the proliferation of *Igrejas Africanas Independentes* (AICs) (Pfeiffer, 2005). The spreading of these Pentecostal churches has caused many people, mostly women, to leave the traditional animist religion turning to church 'prophets' (*profetas* or *maprofeta* in local ChiTewe language) even to resolve spiritual crises believed to cause health problems and misfortune (Pfeiffer et al., 2007). The traditional healer *curandeiro* has to be paid a lot for his services, while the prophets' healing is offered for free (Pfeiffer, 2005). Moreover, *curandeiros* are viewed with some suspicion, because they are related to evil spirits which are believed to cause social conflicts within families or between neighbors (Pfeiffer, 2005). It has to be mentioned that some basic elements of the traditional cultural system survived the arrival of new faiths, and even the prophets attribute the cause of illnesses to evil spirits. Their healing rites are linked to Christian beliefs because *profetas* chase away spirits with prayers. The invocation of Holy Spirit has to be related to their vision of the traditional knowledge as part of a lesser culture closely linked to paganism. Some congregations even forbid their followers to rely on traditional medicine, so in some villages some prophets do not use medicinal plants at all and possibly do not even know their properties, restricting the practice to the healing power of prayer (Pfeiffer, 2005).

Studies on medicinal uses of plants in Mozambique are rather recent. Most of them are merely lists of medicinal plants used in different regions of Mozambique and their uses (Watt and Breyer-Brandwijk, 1962; Amico and Bavazzano, 1968; Amico, 1977; Jansen and Mendes, 1983, 1984, 1990, 1991; Maite, 1987; Verzar and Petri, 1987; Jurg et al., 1991; Fato, 1995; Dai, 1997; Chamba et al., 2000; Gaspar, 2000; Mussanhane, 2000; Pereira, 2000; Matavele and Habib, 2000; Bandeira et al., 2001; Jansen et al., 2001; Simone, 2001; Chelene, 2003). Krog et al. (2006) carried out a study on plants sold in markets in Maputo; Ribeiro et al. (2010), in an investigation conducted in the southern part of the nation, performed also some quantitative analyses on collected data, in order to explore the distribution of knowledge within the community.

The primary aim of our study was to record and discuss current knowledge on plants uses in traditional medicinal practices in a rural area of Mozambique, including details on how plants are used (preparation, diseases treated, ways of administration) and which plant parts are used in healing treatments. We also attempted to verify if local knowledge about medicinal plants is differently distributed among different groups of informants. Beside common laypeople, two key informant groups (*curandeiros* and *profetas*) were selected, in order to investigate whether and how different cultural and religious systems bear on knowledge about plant resources and their use. As reported above, some studies have already approached the anthropological and socioeconomic context within which these models of healing processes evolve in modern Mozambique society (Pfeiffer, 2005; Chapman, 2006; Pfeiffer et al., 2007). However, no study has been carried out so far about the distribution of ethnobotanical knowledge among the different figures of traditional healers.

2. Materials and methods

2.1. Study area

The investigation was conducted in Muda-Serração, an area located in the province of Manica, district of Gondola, in the Republic of Mozambique (Fig. 1).

The whole district is densely populated, with about 41.2 inhabitants per km^2 (Ministério di Administraçã Estatal, 2005). Soils are predominantly sandy, slightly acidic (pH 5.7–6.5), of a grayish brown color, deep and with moderate content of organic matter. They are quite infertile, poor in nutrients, with a moderate potential determining shifting agriculture, the main activity carried out by families in Muda. There are two climatic seasons: a cool and dry season from April to October and a hot and rainy season from November to March. The annual average precipitation is 1000–1500 mm. The prevailing ecosystem type of the area is the *miombo*, a woodland dominated by trees belonging to the subfamily *Caesalpinioideae* (gen. *Brachystegia*, *Julbernardia* and others).

The study was carried out in seven communities (Table 1).

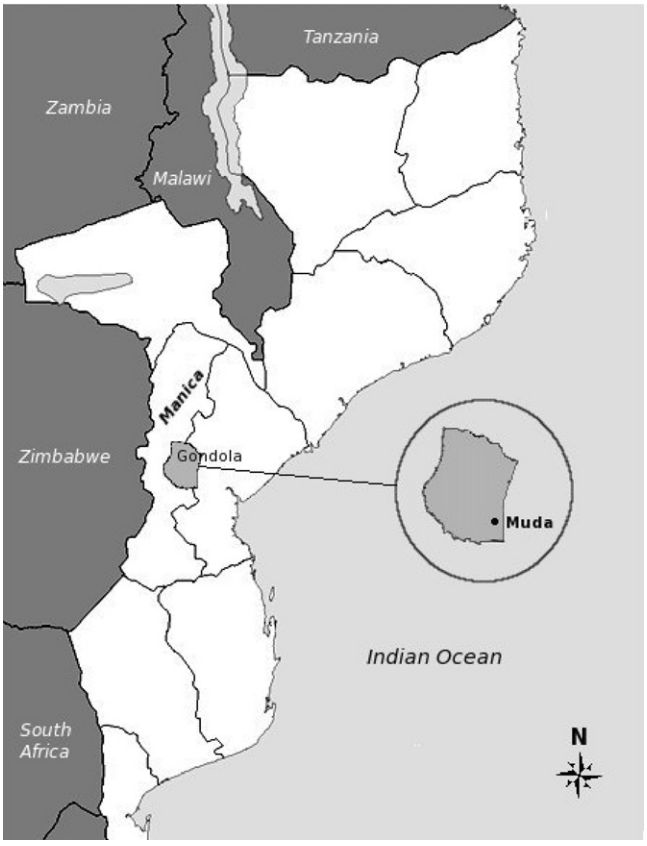

Fig. 1. Location of the investigated area.

Table 1
Investigated communities: main geographic and demographic features; number of informants.

Locality	Latitude[a]	Longitude[a]	Altitude (m)	Inhabitants (number)	Families (number)	Informants (number)			
						Laypeople	*Curandeiros*	*Profetas*	Total
Muda-sede	7862024	587057	163	486	83	10	1	2	13
Zivale	7866980	580750	257	2033	326	4	0	1	5
Toa Mafufu	7866208	575526	225	1090	163	6	0	1	7
Nhamanguena	7859169	584077	175	1426	306	13	3	3	19
Mucorué	7859365	592309	160	828	144	4	0	1	5
Chibuto	7847014	591544	212	949	175	5	2	2	9
Manica-Sofala	7837205	590776	198	553	93	4	3	2	9
Total				7365	1290	46	9	12	67

[a] UTM zone 36 WGS84.

All the communities totally lack health infrastructures, as the nearest hospital is in Gondola, a town very far from all the investigated villages (average distance: 70 km). In order to reach the hospital, people have to pay for expensive and hard to find transportation, and consequently hospitalization is restricted only to cases of extreme necessity. Consequently, for most diseases, traditional medicine is the only affordable healing treatment available in the area.

2.2. Ethnobotanical data collection

Data were collected during two different missions. The first lasting from November 2005 to February 2006 (during rainy season), and the second from July to September 2006 (during dry season). First visits consisted in conversations with local leaders, as well as in community meetings introducing the research, its methods and purposes. This also helped to identify and contact possible key informants (*curandeiros* and *profetas*) and laypeople. Some of the informants belonging to all three groups were interviewed during the first mission and the remaining in the following year. Ethnobotanical data were gathered through semi-structured interviews, carried out in local languages (ChiTewe and ChiNdau) with the help of local interpreters and not implying the use of any rigid interview schedule or questionnaire. Collected information concerned both diseases (most frequent ones, way of classifying and diagnosing them, etc.) and medicinal plants (local names, indications of use, plant parts used, places/methods/rituals of gathering, utilization and administration). Personal and socio-economic data relating to each informant (gender, age, working activity, etc.) were also gathered.

Following the 'emic' approach that is commonly adopted in ethnobotanical research, during this investigation diseases and other health problems were recorded just according to names, diagnoses and/or symptoms reported by the informants. In order to refer local names of illnesses to usual biomedical terminology, reference was made to previous anthropological studies carried out in the same area (Green et al., 1994; Green, 1999) or in different African regions (Snover, 2005). Diseases reported by the informants were grouped by us into the categories reported in Table 2.

The last category (magical practices) was added as misfortune and evil spirits play an important role as causes of diseases in African folk health system. Although many uses pertaining to medicinal category include some magical aspects, only those in which a magical element was definitely predominant were included in this category.

The term *remedy*, as applied in the context of this paper, refers to a single species or even to a mixture of species, used (irrespective of way of preparation or plant part used) to treat an illness, to relieve a disease, to bestow good fortune or to ward off misfortune and evil spirits, as reported by one or more informants.

In the course of our investigation, collecting and recording of information was always in accordance with rules provided by international codes of ethics (see The Society For Economic Botany Ethics, 1995; ISE, 2006) which concern – among the others – protection of the biodiversity and intellectual property rights of indigenous people and local governments. These rules include respect, free prior and informed consent and basic fairness towards those who hold knowledge.

2.3. Plant identification

Voucher specimens were collected for each plant species, with the exception of the most common plants (for example, *Sclerocarya birrea*, *Ximenia caffra*, *Ziziphus mucronata*, etc.), which were identified by us directly on the field. Plant specimens prepared following standard botanical procedures were identified thanks to the aid of botanists belonging to the staff of Herbarium LMA (Dept. of Botany, Maputo), where voucher specimens of collected plants were lodged. Mainly due to their phenological stages, a few specimens did not show all the diagnostic characters and could not be identified. Species names and classification are in accordance with Flora of Mozambique (Hyde and Wursten, 2011).

2.4. Data analyses

All the collected data were filed in a spreadsheet (Microsoft Excel). Each row represents a record, intended as a *citation*, i.e. a single use reported for a single species by a single informant (Signorini et al., 2009). In case of mixed preparations, all the species contained in the remedy were counted once for each different medicinal use of that remedy. Citations reported by a single informant and differing in minor aspects, such as used part of the plant, way of use, detailed

Table 2
Disease categories.

1. Colds, respiratory tract diseases
2. Digestive system diseases
3. Sexual-reproductive system diseases
4. Muscular and skeletal system diseases
5. Obstetric and puerperal problems
6. Children diseases (diseases reported as specific of childhood)
7. Neurological diseases
8. Skin diseases and wounds
9. Poisoning (food and snake bites)
10. Eye problems
11. Ear problems
12. Fever (unspecified cause)
13. Toothache
14. Headache
15. Malaria and related diseases
16. General weakness treated with tonic remedies
17. Magical ritual/propitiatory practices used to heal different diseases

therapeutic indication, way of preparation, way of administration, were combined into a single citation (Signorini et al., 2009).

All the data were processed, but quantitative analyses were carried out only on plants identified at least at a genus level. Comparisons between plants cited by men and women respectively and by different informant groups were statistically tested with the Mann–Whitney test (5%). The Kruskal–Wallis test was used to compare medicinal plant knowledge among informants affiliated to different religions ($P < .05$). All statistical analyses were performed using STATISTICA for Windows 6.0 (Statsof, Tulsa, USA).

Relative importance of each cited plant was estimated measuring its Cultural Importance value (CI_s), as suggested by Tardío and Pardo-de-Santayana (2008). CI is assumed as the sum of the frequencies of informants reporting each species use and was calculated as follows:

$$CI_s = \sum_{u=u_1}^{u_{NC}} \sum_{i=i_1}^{i_N} \frac{UR_{ui}}{N}$$

where u is the category of use (e.g.: digestive system diseases, sexual-reproductive system diseases), NC is the total number of different categories of use (of each '*i*' species), UR is the total number of use-reports for each species (corresponding in the present study to 'citations', as defined above), N is the total number of informants.

Informant Agreement Ratio (IAR_s) was estimated through the formula originally proposed by Trotter and Logan (1986) and later modified by Thomas et al. (2009) to identify the informants agreement on the uses reported for each species. IAR was calculated for each species s as follows:

$$IAR_s = \frac{n_r - n_a}{n_r - 1}$$

where n_r is the total number of citations for that species; n_a is the number of ailments that are treated with that species.

Following the suggestions of Thomas et al. (2009), but using CIs instead of Quality Use Value (QUVs), we combined both parameters in a Cultural Agreement Index (CAI_s), defined as follows:

$$CAI_s = CI_s \times IAR_s$$

IAR was also calculated for each category of ailments, in order to assess the informants agreement on treatments reported for that group of ailments (Trotter and Logan, 1986).

Knowledge diversity was estimated with Hurlbert's PIE diversity index (Probability of Interspecific Encounters, Hurlbert, 1971), using EcoSim software (Gotelli and Entsminger, 2004). PIE is a diversity index adopted in ecological analyses, expressing the chance for two individuals randomly drawn from a group to belong to two different species. It has already been used in ethnobotanical studies as an estimator of knowledge evenness (Heindrickson Cunha Merétika et al., 2010), because it is less affected by sample size than other indices such as Shannon-Wiener (Gotelli and Graves, 1996).

Hurlbert's PIE is calculated as follows:

$$PIE = \frac{N}{N+1}\left(1 - \sum p_i^2\right)$$

where N is the total number of species in the assemblage, $p(i)$ is the proportion of the entire sample represented by species i.

3. Results and discussion

3.1. Plant species—diversity, life forms and habitats

A total of 546 citations was recorded, pertaining to 198 different medicinal plants. One hundred sixty-two plants were identified: 139 up to species level, 23 at genus level only. In the following Table 3, the comprehensive list of all the identified plants, their uses and other information are reported.

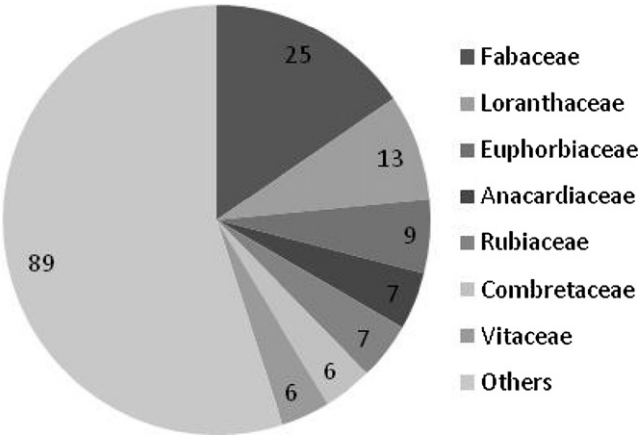

Fig. 2. Distribution of the 162 identified medicinal plants species among botanical families.

Thirty-six plants could not be identified and have been recorded only under their local folk names; as already mentioned, they did not undergo quantitative analyses.

Some informants reported the use of *injusu*, that is the local name for different species of *Loranthus*, parasitic plants growing on the branches of woody plants and mostly used for magical and magical-medical purposes. *Injusu* was intended by all informants as a part of the plant it grows on, and was identified and named according with the host tree name (Grønhaug et al., 2008): for example, *injusu* of *mussocossa* (*Loranthus* sp. on *Afzelia quanzensis*); *injusu* of *ivainofgare* (*Loranthus* sp. on *Hymenocardia acida*). Following an emic approach, we kept the informants' classification of *injusu* and its differentiation in distinct *folk taxa* or *ethnospecies*, as defined by Signorini et al. (2008). An *ethnospecies* is the basic folk-taxonomic unit, roughly corresponding to the *folk-generic* in the sense of Berlin, 1973 (see Signorini et al., 2009). It is identified by local people on the ground of morphological characters, habitat and use and may have one or more local names. An ethnospecies may or may not exactly correspond to a botanical species: the two ethnospecies "*injusu of mussocossa*" ("*Loranthus* sp. growing on *Afzelia quanzensis* Welw.") and "*injusu of ivainofgare*" ("*Loranthus* sp. growing on *Hymenocardia acida* Tul.") could possibly be referred to the same botanical species of *Loranthus*, even if these plants could not be identified at the species level due to lacking of diagnostic characters of collected specimens. Moreover, we kept this folk classification of *injusu* also because it is possible that the phytochemical composition of the parasite varies according to the host, and that therefore for the purposes of determining the medicinal use local taxonomy makes more sense than botanical taxonomy of *Loranthus*.

The identified species and genera are distributed among 63 botanical families. The most represented one is the family Fabaceae with 25 species (15%), which include 7% Faboideae, 4% Caesalpinioideae and 4% Mimosoideae (Fig. 2). One hundred twenty-one medicinal species (75%) are trees or shrubs, 34 (22%) are herbaceous plants and 7 (3%) are lianas.

The predominance of Fabaceae could be explained with the floristic composition of *miombo* woodlands, characterized by a canopy layer dominated by tree species belonging to the subfamily Caesalpinioideae. A high diversity of shrubs, trees, vines and perennial herbs belonging to the subfamily Faboideae dominates lower vegetation layers.

Based on the interviews, most plants were collected in forest environments: *mato denso* or *mato fechado* (closed forest). Only

Table 3
List of medicinal plants.

Botanical species (or genus)	Local name(s)	Botanical family (or subfam.)	Used parts	Therapeutic uses (preparation; administration)	Number of informants mentioning the species	Number of citations	Number of mixtures containing the plant
Abrus precatorius L.	mutitivaroi, mini-mini	Faboideae	roots	diarrhea (macerated in water; oral); stomachache (decoction; oral); *chinhamucaca* (mush; as food); *bandama* (mush; as food); female infertility (macerated in water or mush; oral or as food); menstrual cycle (mush; as food); wounds (ash; direct application)	7	10	10
Acalypha sp.	mpama	Euphorbiaceae	roots	female infertility (infusion; oral); menstrual cycle troubles (infusion; oral)	1	1	0
Adenia gummifera (Harv.) Harms	movole, muore	Passifloraceae	leaves; roots; stems	to induce or speed delivery process [N] (macerated in water; vaginal lavage); female infertility (macerated in water; oral); wounds (macerated in water; lavage); against adversities (cooked; as food)	3	4	2
Afzelia quanzensis Welw.	mussocossa, chanfuta	Caesalpinioideae	bark; roots	*bandama* (cooked; as food); fontanelle syndrome (mush; as food); to close fontanelle (decoction; oral); menstrual cycle troubles (macerated in water; oral); venereal diseases (macerated in water; oral); earache [N] (macerated in water; direct application).	5	6	6
Albizia antunesiana Harms	mucarati munhachipa	Mimosoideae	bark	toothache [N] (decoction; mouthwash)	1	1	0
Albizia versicolor Welw. ex Oliv.	mutundurulo, mugomati	Mimosoideae	roots	diarrhea (macerated in water; oral); stomachache (macerated in water; oral); hernia (macerated in water; oral); venereal diseases (macerated in water; oral)	3	3	0
Aloe parvibracteata Schonland	ruangararo	Asphodelaceae	leaves	venereal diseases (macerated in water; oral)	1	1	1
Amblygonocarpus andongensis (Welw. ex Oliv.) Exell et Torre	mutindiri	Mimosoideae	roots	epilepsy (decoction; oral)	1	1	0
Anacardium occidentale L.	mukejhu, caju	Anacardiaceae	leaves; roots	hernia [N] (macerated in water; oral); cough (macerated in water; oral)	2	2	0
Annona senegalensis Pers.	muroro	Annonaceae	bark; leaves; roots	stomachache (macerated in water; oral); intestinal worms (macerated in water; oral); cough (infusion or decoction; oral); tuberculosis (macerated in water or cooked; oral or as food); asthma (macerated in water or cooked; oral or as food); fever (decoction; oral)	9	10	5
Antidesma venosum E. Mey. ex Tul.	mushongo, muruadondo, muxongosora	Euphorbiaceae	roots	diarrhea (macerated in water; oral); bloody vomit (macerated in water; oral); venereal diseases (macerated in water; oral); hernia (macerated in water; oral)	5	5	4
Artabotrys brachypetalus Benth.	gobso, mudamphire, gofui, mucosho	Annonaceae	roots	intestinal worms (macerated in water; oral); stomachache (macerated in water; oral); poisoning by food or snake bites [N] (macerated in water; oral); female infertility (macerated in water; oral); stomachache due to stomachache of the mother during pregnancy (mush; as food); general weakness [N] (macerated in water; oral); others (decoction; oral); venereal diseases (macerated in water; oral)	11	14	12
Asparagus africanus Lam.	chibaiagore, mushamabi	Asparagaceae	roots	to induce or to speed the delivery process (macerated in water; oral)	1	1	0
Asparagus falcatus L.	munhamazwina	Asparagaceae	leaves	female infertility (not prepared; direct appliction)	1	1	0
Asparagus plumosus Baker.	munhassuru	Asparagaceae	leaves	headache [N] (decoction; inhalation)	1	1	0

Table 3 (*Continued*)

Botanical species (or genus)	Local name(s)	Botanical family (or subfam.)	Used parts	Therapeutic uses (preparation; administration)	Number of informants mentioning the species	Number of citations	Number of mixtures containing the plant
Baccharoides adoensis Schultz–Bip. ex Walp.	muchena	Asteraceae	leaves	propitiatory (decoction; bath)	1	1	1
Bauhinia galpinii N. E. Br.	mutandaze	Caesalpinioideae	roots	to close fontanelle (decoction; oral); fontanelle syndrome (macerated in water; oral); bloody vomit (cooked; as food); general weakness [N] (decoction; oral); cough (macerated in water; oral)	8	9	8
Berchemia discolor (Klotzsch) Hemsl.	mugonahamba	Rhamnaceae	roots	bloody vomit (cooked; as food); cough (macerated in water; oral)	1	2	1
Bersama abyssinica Fresen.		Melianthaceae	roots	toothache (ash; direct application)	1	1	0
Boscia albitrunca (Burcf.) Gilg et Bened.	muvalavala, mupopu	Capparaceae	roots	muscular pains [N] (macerated in water; massage); constipation (macerated in water; oral)	1	2	1
Brackenridgea zanguebarica Oliv.	mumino	Ochnaceae	bark; roots	diarrhea (macerated in water; oral); to induce or to speed the delivery process (macerated in water; oral); venereal diseases [N] (macerated in water; oral); miscarriage (macerated in water; oral); wounds (nor prepared; direct application); against adversities (not prepared; other)	7	8	3
Breonadia salicina (Vahl.) Hepper et J.R.I. Wood	muonha	Rubiaceae	leaves; roots	to induce or to speed the delivery process [N] (macerated in water; oral); stomachache (sap; oral)	3	3	0
Burkea africana Hook.	mucarati mussimbe	Faboideae	roots	tuberculosis [N] (decoction; oral); asthma [N] (decoction; oral)	1	1	0
Cajanus cajan (L.) Millsp.	mundogi	Faboideae	roots	earache (macerated in water; direct application)	1	1	0
Cannabis sativa L.	seruma	Cannabaceae	roots	sedative (infuse; oral)	1	1	0
Carica papaya L.	mupapaya	Caricaceae	leaves	diarrhea (macerated in water; oral)	1	1	0
Cassia abbreviata Oliv.	murumanhama	Caesalpinioideae	bark; roots	*bandama* (decoction; oral); stomachache due to stomachache of the mother during pregnancy (cooked; oral); to close fontanelle (macerated in water; oral); dysentery (macerated in water; oral); bloody vomit (decoction; oral); venereal diseases (macerated in water; oral); hernia (macerated in water; oral); bilharzia (cooked; oral); snake bites [N] (ash; oral); post-partum pain (macerated in water; oral); menstrual cycle troubles (macerated in water; oral).	8	12	10
Cassytha filiformis L.	ruangaro	Lauraceae	bulbs; leaves	stomachache (cooked; as food)	2	2	1
Catharanthus roseus (L.) G.Don	mufilori	Apocynaceae	roots	venereal diseases (macerated in water; oral)	1	1	0
Catunaregam obovata (Hochst.) Gonçalves	chihabwebwe, muhambuem-bue	Rubiaceae	roots	to close fontanelle (macerated in water; oral); venereal diseases (macerated in water; oral); tuberculosis (decoction; oral); asthma (decoction; oral)	3	3	0
Cissus bathyrhakodes Werd.	murucutu	Vitaceae	roots	to facilitate placenta expulsion (macerated in water; oral)	1	1	0
Cissus integrifolia (Baker) Planch.	renja, murapajonono	Vitaceae	roots; stems	conjunctivitis (sap; direct application); wounds (not prepared; compress); hernia (decoction; oral); to induce or to speed the delivery process (poultice; direct application)	5	7	1
Cissus quadrangularis L.	bangaratanai	Vitaceae	leaves; roots; stems	venereal diseases (macerated in water; oral); leprosy (ash; direct application)	3	3	2

Table 3 (*Continued*)

Botanical species (or genus)	Local name(s)	Botanical family (or subfam.)	Used parts	Therapeutic uses (preparation; administration)	Number of informants mentioning the species	Number of citations	Number of mixtures containing the plant
Citrullus lanatus (Thunb.) Matsum. et Nakai	marasia	Cucurbitaceae	fruits	*bandama* (not prepared; direct application)	1	1	0
Citrus sinensis (L.) Osbeck	muraranji	Rutaceae	roots	venereal diseases (macerated in water; oral)	1	1	1
Citrus sp.	mufurungu	Rutaceae	leaves	cough (decoction; oral)	1	1	1
Cladostemon kirkii (Oliv.) Pax et Gilg	miashicombo, munhabsi-combo	Capparaceae	roots	diarrhea (macerated in water; oral) stomachache (macerated in water; oral)	2	2	0
Cleistochlamys kirkii (Benth.) Oliv.	munzinda, mutarara	Annonaceae	leaves; roots	stomachache [N] (macerated in water; oral); stomachache due to stomachache of the mother during pregnancy [N] (macerated in water; oral); vomit [N] (mush; oral); cough (decoction; oral); muscular pains (macerated in water; oral); venereal diseases [N] (decoction; oral); hernia (decoction; oral); general weakness [N] (decoction; oral)	7	8	4
Clematis viridiflora [N] Bertol.	mucoca	Ranunculaceae	leaves; roots	headache (not prepared; inhalation)	2	2	0
Cocculus hirsutus (L.) Diels	mussoropotu	Menispermaceae	leaves; roots	diarrhea (macerated in water; oral); stomachache (macerated in water; oral); female infertility (macerated in water; oral); menstrual cycle troubles (macerated in water; oral); miscarriage [N] (macerated in water; oral); general weakness (macerated in water; oral)	3	5	6
Coddia rudis (E. Mey. ex Harv.) Verdc.	mupupu	Rubiaceae	roots	sprains (poultice; direct application)	1	1	0
Combretum apiculatum Sond.	mucamanjera, muvucavuca	Combretaceae	bark	aphrodisiac [N] (macerated in water; oral)	1	1	0
Combretum goetzei [N] Engl. et Diels	ngochi	Combretaceae	roots	diarrhea (mush; as food); *cupiranganica* (mush; as food)	2	2	0
Combretum imberbe Wawra	muringari, muheti, munangari	Combretaceae	leaves; roots	stomachache (macertaed in water; oral)	1	1	1
Combretum sp.	chipoza	Combretaceae	bark; leaves	wounds (macerated in water; lavage)	1	1	1
Commiphora africana (A.Rich.) Engl.	mupatacufa, mugimba, nhavindima	Burseraceae	leaves; roots	stomachache (macerated in water; oral); fontanelle syndrome (macerated in water; oral); hernia [N] (macerated in water; oral)	4	4	2
Crinum sp.	ngoranguo	Amaryllidaceae	bulbs	muscular pains (decoction; massage or compress)	2	2	0
Crossopteryx febrifuga (Afzel. ex G. Don) Benth.	chicobengua, mucobengua	Rubiaceae	bark; leaves; roots	diarrhea (macerated in water; oral); stomachache (macerated in water; oral); wounds (not prepared; direct application); backache [N] (not prepared; direct application)	3	3	2
Cucumis hirsutus Sond.	mucacashango	Cucurbitaceae	roots	stomachache (decoction or infusion; oral); vomit (decoction or infusion; oral); fontanelle syndrome (macerated in water or mush; oral or as food); female infertility [N] (macerated in water; oral)	4	4	3
Cyphostemma congestum (Baker) Descoings ex Willd. et Drummond	chirinja	Vitaceae	roots	stomachache in childhood (macerated in water; oral); venereal diseases [N] (macerated in water; oral); hernia [N] (decoction; oral)	2	3	2
Dalbergia melanoxylon Guill. et Perr.	chiwiti	Faboideae	roots	wounds (not prepared; direct application); general weakness [N] (macerated in water; oral)	2	2	2
Datura stramonium L.		Solanaceae	fruits	backache (ash; direct application)	1	1	0

Table 3 (*Continued*)

Botanical species (or genus)	Local name(s)	Botanical family (or subfam.)	Used parts	Therapeutic uses (preparation; administration)	Number of informants mentioning the species	Number of citations	Number of mixtures containing the plant
Deinbollia oblongifolia (E. Mey. ex Arm.) Radlk.	carafundu	Sapindaceae	roots	stomachache (macerated in water; oral)	1	1	1
Dichrostachys cinerea L.	chinteni, chinjonjonjo	Mimosoideae	roots	*chinhamucaca* (macertaed in water; oral); bloody vomit (macerated in water; oral)	1	1	1
Dioscorea cochleari-apiculata [N] De Wild.	ndia, ndirindiri	Dioscoreaceae	tubers	stomachache (cooked; as food)	1	1	0
Diospyros galpinii (Hiern.) De Winter	chiconboti	Ebenaceae	roots	diarrhea [N] (macerated in water; oral); stomachache [N] (macerated in water; oral)	2	2	0
Diospyros mespiliformis Hochst. ex A. DC.	mussuma, macoma, mucula	Ebenaceae	leaves	propitiatory (decoction; bath)	1	1	1
Diplorhynchus condylocarpon (Müll. Arg.) Pichon	m'toa	Apocynaceae	latex; roots	diarrhea (sap; oral); vomit (macerated in water; oral); vertigo [N] (sap; oral)	4	4	2
Dombeya burgessiae Gerrard ex Harv.	chitohue	Sterculiaceae	bark; roots	bloody vomit (decoction; as food); cough [N] (macerated in water; oral)	1	1	1
Ehretia amoena Klotzsch	guaracuasho	Boraginaceae	roots	dysentery (macerated in water; oral); stomachache (macerated in water or decoction; oral); venereal diseases [N] (decoction; oral)	4	4	1
Elephantorrhiza goetzei (Harms) Harms	churai, mus-sambanhanga	Mimosoideae	bark; roots	stomachache (cooked; as food); bloody vomit (decoction; oral); *cupiranganica* (macerated in water; oral); venereal diseases (macerated in water, oral); cough [N] (decoction; oral); backache [N] (macertaed in water; oral); general weakness [N] (cooked; as food)	7	10	8
Euclea natalensis A.DC.	murara, mushangula, uchangula, muzipirabungu	Ebenaceae	roots	stomachache (macerated in water or cooked; as food or oral)	8	8	6
Euphorbia hirta L.	chinhamucaca de flor	Euphorbiaceae	roots	*chinhamucaca* (mush; as food)	1	1	1
Euphorbia tirucalli L.	muhegi	Euphorbiaceae	latex	toothache (sap, direct application)	1	1	0
Faidherbia albida (Delile) A.Chev.	gohua	Mimosoideae	bark; roots	bloody vomit (decoction; oral); cough (decoction; oral); skin infections (decoction; oral)	1	3	2
Ficus glumosa Delile	mucuiu	Moraceae	latex	toothache (sap, direct application)	1	1	0
Ficus sycomorus L.	coacoane, mucoane	Moraceae	latex	toothache (sap, direct application)	1	1	0
Flacourtia indica (Burm.f.) Merr.	mutondombira, mutucuzuzo	Flacourtiaceae	leaves; roots	stomachache (decoction; oral); malaria (macerated in water; bath)	2	2	2
Friesodielsia obovata (Benth.) Verdc.	mudandachonco	Annonaceae	roots	stomachache (macerated in water; oral)	1	1	0
Garcinia livingstonei T. Anders.	m'pimbe	Clusiaceae	leaves	conjunctivitis [N] (decoction; inhalation)	1	1	0
Gardenia ternifolia Schumach. et Thonn. subsp. *jovis-tonantis* (Welw.) Verdc.	chintarara	Rubiaceae	bark; roots	diarrhea (mush; as food); dysentery (mush; as food); stomachache in childhood (macerated in water; oral); tuberculosis (cooked; as food); ashtma (cooked; as food); to induce or to speed the delivery process (macerated in water; oral); to chase away evil spirits (cooked; inhalation)	5	5	5
Grewia pachycalyx [N] K. Schum.	muntotorito	Tiliaceae	roots	tuberculosis (decoction; oral)	1	1	0
Gymnosporia heterophylla (Eckl. et Zeyh.) Loes.	mutunga-macheche	Celastraceae	leaves; roots	diarrhea (macerated in water; oral); stomachache in childhood (macerated in water or cooked; oral); male infertility (macerated in water; oral); HIV [N] (decoction; oral); snake bites (macerated in water; oral);	5	6	6

Table 3 (*Continued*)

Botanical species (or genus)	Local name(s)	Botanical family (or subfam.)	Used parts	Therapeutic uses (preparation; administration)	Number of informants mentioning the species	Number of citations	Number of mixtures containing the plant
Holarrhena pubescens (Buch.-Ham.) Wall. et G. Don	mucacho	Apocynaceae	roots	stomachache (macerated in water or decoction; oral); vomit (macerated in water; oral); venereal diseases (macerated in water; oral); earache [N] (macerated in water; direct application)	9	10	9
Hymenocardia acida Wall. ex Lindl.	chimbare, ivaindigare, mbenguiuiu	Euphorbiaceae	roots	vomit (macerated in water; oral); menstrual pain (macerated in water; oral); general weakness (mush; as food)	2	3	1
Hypoxys hemerocallidea Fisch., C.A. Mey. et Avé-Lall.	quiqui	Hypoxidaceae	tubers	venereal diseases (macerated in water; oral)	1	1	0
Indigofera antunesiana [N] Harms	mashulana	Faboideae	roots	general weakness (macerated in water; oral)	1	1	1
Ipomoea consimilis [N] Schulze-Menz	murugia, sarasugi	Convolvulaceae	roots	stomache ache (decoction; oral); constipation in childhood (decoction; oral)	3	3	0
Jasminum fluminense Vell.	mujamabi	Oleaceae	roots	stomachache in childhood [N] (macerated in water; oral)	1	1	2
Justicia flava (Vahl) Vahl	biroviro	Acanthaceae	leaves	cataract (not prepared; direct application)	1	1	0
Kalanchoe lateritia Engl.	munhamanvuco	Crassulaceae	leaves	to chase away evil spirits (not prepared; other); *fetiçeria* (not prepared; other)	2	2	0
Kigelia africana (Lam.) Benth.	muvveve, muvunguti	Bignoniaceae	leaves	cicatrization of the navel (ash; direct application)	1	1	0
Lagenaria sphaerica (Sond.) Naudin	burbugi	Cucurbitaceae	fruits	*bandama* (not prepared; direct application); to close fontanelle [N] (not prepared; direct application)	3	3	5
Lannea discolor (Sond.) Engl.	mumbo, chumbo	Anacardiaceae	roots	diarrhea (mush; as food); female infertility (macerated in water; oral)	2	2	0
Lannea schweinfurthii Engl.	m'sutototo	Anacardiaceae	roots	venereal diseases (macerated in water; oral)	1	1	1
Lippia javanica (Burm.f.) Spreng.	mussani	Verbenaceae	roots	*chinhamucaca* [N] (decoction; oral); venereal diseases (decoction; oral)	2	2	2
Loranthus sp.	injusu maram-bacoupotua	Loranthaceae	whole plant	propitiatory (not prepared; other)	1	1	0
Loranthus sp.	injusu dovetove	Loranthaceae	whole plant	to chase away evil spirits (macerated water; bath)	1	1	0
Loranthus sp. growing on *Abelmoschus esculentus* Moench.	injusu nofrire	Loranthaceae	whole plant	propitiatory (ash; direct application)	1	1	0
Loranthus sp. growing on *Afzelia quanzensis* Welw.	injusu mussocossa	Loranthaceae	whole plant	leprosy (macerated in water; oral)	1	1	1
Loranthus sp. growing on *Cissus integrifolia*	injusu renja	Loranthaceae	whole plant	leprosy (macerated in water; oral)	1	1	1
Loranthus sp. growing on *Combretum* sp.	injusu chipoza	Loranthaceae	whole plant	female infertility (mush; as food); wounds (not prepared; direct application)	1	2	0
Loranthus sp. growing on *Hymenocardia acida* Tul.	injusu ivainofgare	Loranthaceae	whole plant	propitiatory (not prepared; other)	1	1	0
Loranthus sp. growing on *Kirkia acuminata* Oliv.	injusu muvumira	Loranthaceae	whole plant	to chase away evil spirits (macerated in water; bath)	1	1	0
Loranthus sp. growing on *Ochna natalitia* Warp.	injusu chissequera	Loranthaceae	whole plant	propitiatory (ash; direct application)	1	1	0

Table 3 (*Continued*)

Botanical species (or genus)	Local name(s)	Botanical family (or subfam.)	Used parts	Therapeutic uses (preparation; administration)	Number of informants mentioning the species	Number of citations	Number of mixtures containing the plant
Loranthus sp. growing on *Piliostigma thonningii* (Schumach.) Milne-Redh.	injusu mussequessa	Loranthaceae	whole plant	to chase away evil spirits (macerated water; bath)	1	1	0
Loranthus sp. growing on *Rourea orientalis* Baill.	injusu munhadozwarozwa, sambau-caranga, muziriri	Loranthaceae	whole plant	stomachache (mush; as food)	1	1	1
Loranthus sp. growing on *Sclerocarya birrea* Hochst.	injusu mudangua	Loranthaceae	whole plant	to chase away evil spirits (ash; direct application)	1	1	0
Loranthus sp. growing on *Xeroderris stuhlmannii* (Taub.) Mendonça et E.P.Sousa	injusu muvamaropa	Loranthaceae	whole plant	to chase away evil spirits (macerated in water; bath)	1	1	0
Mangifera indica L.	mumanga	Anacardiaceae	roots	hernia (macerated in water; oral)	1	1	0
Margaritaria discoidea (Baill.) G.L. Webster	mugarahamba	Euphorbiaceae	roots	stomachache (decoction; oral); bloody vomit (mush; as food); tuberculosis (decoction; oral); ashtma (decoctions; oral)	2	3	0
Markhamia zanzibarica (Bojer. ex DC.) K. Schum.	feva	Bignoniaceae	roots	general weakness [N] (cooked; as food)	1	1	1
Melia azedarach L.	muquinini, mikenine	Meliaceae	roots	venereal diseases (macerated in water; oral)	1	1	0
Millettia stuhlmannii Taub.	mussara, panga panga	Faboideae	bark; roots	wounds [N] (not prepared; direct application); venereal diseases [N] (macerated in water; oral)	3	3	2
Momordica balsamina L.	cacana, nkakana, mugaca, ngaca	Cucurbitaceae	bark; leaves; roots	malaria (decoction or cooked; oral or as food); general weakness (cooked; as food)	4	5	3
Monotes glaber Sprague	mugarantede	Dipterocarpaceae	bark; roots	aphrodisiac (not prapared or macerated in water; as food or oral)	2	2	2
Morus alba L.	mushongo, amore	Moraceae	roots	diarhhea (macerated in water; oral); stomachache in childhood (macerated in water; oral); hernia (macerated in water; oral); bilharzia (macerated in water; oral); venereal diseases (macerated in water; oral)	6	6	5
Mucuna coriacea Bak.	uriri (feijao maluco)	Faboideae	roots	venereal diseases [N] (decoction; oral)	1	1	0
Ochna schweinfurthiana F. Hoffm.	chimonhua	Ochnaceae	roots	to induce or to speed the delivery process [N] (macerated in water; oral); miscarriage [N] (macerated in water; oral)	1	1	1
Oncoba spinosa Forssk.	mutuzo	Flacourtiaceae	roots	hernia (macerated in water or decoction; oral)	2	2	0
Opuntia ficus-indica (L.) Mill.	ndungantunga	Cactaceae	stems	cough (decoction; oral)	1	1	0
Ormocarpum trichocarpum (Taub.) Engl.	cigimamuriro	Faboideae	leaves; roots	burns [N] (macerated in water; oral)	1	1	1
Ozoroa obovata (Oliv.) R. Fern. et A. Fern.	mumburu	Anacardiaceae	roots	stomachache (macerated in water; oral); venereal diseases (macerated in water; oral)	2	2	2
Ozoroa reticulata (Baker f.) R. et A. Fern.	mundungu, mudabikeni, chirenje, cataossaro	Anacardiaceae	leaves; roots	diarrhea (macerated in water; oral); stomachache (macerated in water; oral); intestinal worms (macerated in water; oral); stomachache due to stomachache of the mother during pregnancy (mush; as food); hernia (macerated in water; oral); venereal diseases (macerated in water or ash; oral or direct application)	12	14	9

Table 3 (*Continued*)

Botanical species (or genus)	Local name(s)	Botanical family (or subfam.)	Used parts	Therapeutic uses (preparation; administration)	Number of informants mentioning the species	Number of citations	Number of mixtures containing the plant
Parinari curatellifolia Planch. ex Benth.	mbura, muchacata, mumbula	Chrysobalanaceae	roots	cough (decoction; oral)	2	2	0
Pentarrhinum sp.	mundarumepe	Asclepiadaceae	roots	stomachache (decoction; oral); to induce or to speed the delivery process (macerated in water; oral); menstrual pain (macerated in water; oral); snake bites (macerated in water; oral)	4	4	2
Philenoptera violacea (Klotzsch) Schrire	mupanda	Faboideae	roots	earache [N] (macerated in water; direct application)	1	1	0
Phyllanthus sp.	mussossoti	Euphorbiaceae	roots	cough (macerated in water; oral); bloody vomit (decoction; oral)	1	2	2
Piliostigma thonningii (Schumach.) Milne-Redh.	mussèquessa	Caesalpinioideae	bark; leaves; roots	bloody vomit (decoction; oral); cough ue to a wrongful behavior (decoction; oral); bilharzia (decoction, oral); fever (decoction; oral); venereal diseases (macerated in water; oral); backache (decoction; oral)	6	9	8
Pseudolachnostylis maprouneifolia Pax.	mussonjoa, musandzoa	Euphorbiaceae	roots	cough (decoction; oral)	1	1	0
Pterocarpus rotundifolius (Sond.) Druce	chimpanda	Faboideae	roots	fontanelle syndrome (mush; as food)	1	1	1
Pycnostachys urticifolia Hook.	bucussa	Lamiaceae	leaves; roots	malaria (macerated in water; bath)	1	1	1
Rhipsalis baccifera (J. M. Mill.) Stearn.	ngocha	Cactaceae	whole plant; roots	general weakness [N] (decoction; bath)	1	1	0
Rhoicissus revoilii Planch.	dambacerera	Vitaceae	roots	diarrhea (macerated in water; oral); stomachache (macerated in water; oral); cupiranganica (decoction; oral); bloody vomit (decoction; oral); cough [N] (macerated in water or decoction; oral); tuberculosis [N] (macerated in water; oral); fever [N] (decoction; oral); general weakness [N] (direct application)	8	9	6
Rhoicissus tomentosa (Lam.) Willd. et Drummond	govuva	Vitaceae	roots	miscarriage (not prepared; direct application)	1	1	0
Rhus dentata Thunb.	bindaopinda, dambacerera, deiambeva, muteambeva	Anacardiaceae	leaves; roots	*chinhamucaca* [N] (macertaed in water; oral); stomachache [N] (macerated in water; oral); bloody vomit [N] (macerated in water; oral); headache [N] (decoction; inhalation); muscular pain [N] (ash; direct application)	4	4	3
Rhynchosia sublobata (Schumach.) Meikle	munhachiropa, nhaxiropa, mupeta	Faboideae	roots	*chinhamucaca* (mush; as food); *bandama* (mush; as food); dysentery (mush; as food); stomachache (macerated in water or infusion; oral); stomachache due to stomachache of the mother during pregnancy (mush; as food); backache [N] (decoction; oral); cough ue to a wrongful behavior (decoction; oral)	5	8	5
Rourea orientalis Baill.	munhadoz-warozwa, sambaucaranga, muziriri	Connaraceae	bark; leaves; roots	*chinhamucaca* [N] (macerated in water; oral); diarrhea [N] (macerated in water; oral); bloody vomit [N] (decoction; oral); menstrual cycle troubles [N] (macerated in water; oral); venereal diseases [N] (macerated in water; oral); to induce or to speed the delivery process [N] (sap; oral)	5	6	8

Table 3 (*Continued*)

Botanical species (or genus)	Local name(s)	Botanical family (or subfam.)	Used parts	Therapeutic uses (preparation; administration)	Number of informants mentioning the species	Number of citations	Number of mixtures containing the plant
Sansevieria hyacinthoides (L.) Druce	chiquenga	Dracaenaceae	roots	stomachache in childhood (macerated in water; oral); weakness in children [N] (macerated in water; oral); venereal diseases (macerated in water or decoction; oral); snake bites [N] (macerated in water; oral)	6	7	5
Schrebera trichoclada Welw.	muc'ac'ata	Oleaceae	roots	female infertility [N] (mush; as food)	1	1	1
Sclerocarya birrea (A. Rich.) Hochst.	machangua	Anacardiaceae	leaves	cough (macerated in water; oral)	1	1	0
Securidaca longepedunculata Fresen.	mupupo, compupu, muvalavala	Polygalaceae	bark; roots	stomachache (decoction, mush or macertaed in water; oral or as food); constipation (macerated in water; oral); stomachache in childhood (decoction; oral); intestinal worms in children (macerated in water; oral); venereal diseases (macerated in water; oral); wounds (decoction; lavage)	9	10	10
Senna sp.	mudemberembe	Caesalpinioideae	leaves; roots	diarrhea (macerated in water; oral); stomachache (macerated in water; oral); to close fontanelle (macerated in water; oral); female infertility (infusion; oral); tuberculosis (decoction; oral); asthma (decoction; oral)	6	6	4
Solanum panduriforme E. Mey.	mutendeho, mudundulùdua	Solanaceae	latex; roots	stomachache (decoction; oral); toothache (not prepared; direct application); snake bites [N] (decoction; oral)	4	4	1
Solanum sp.	mbagi	Solanaceae	whole plant	to chase away evil spirits (not prepared; other)	2	2	0
Sonchus oleraceus L.	chinhamucaca niacave, chinhahuasse	Asteraceae	latex; roots	vomit (macerated in water; oral); chinhamucaca (macerated in water; oral);	3	3	3
Spirostachys africanus Sond.	mutonvoti	Euphorbiaceae	bark; latex; roots	stomachache (decoction; oral); constipation (decoction; oral); female infertility (ash; oral); menstrual cycle troubles (ash; oral); miscarriage (ash; oral)	3	4	2
Steganotaenia araliacea Hochst.	mupandashuli, mubobo, manune	Apiaceae	leaves; roots	stomachache (macerated in water; oral); constipation (macerated in water; oral); weakness in children [N] (mush; as food); female infertility [N] (macerated in water; oral); headache (macerated in water; oral)	6	6	2
Stereospermum kunthianun Cham.	potanjo	Bignoniaceae	leaves	to induce or to speed the delivery process (macerated in water; oral)	1	1	0
Striga gesnerioides (Willd.) Vatke ex Engl.	gunzwani, chinhamuriro	Faboideae	roots	bloody vomit [N] (decoction; oral)	1	1	1
Strychnos innocua Delile	umquaqua	Loganiaceae	bark; leaves; roots	to induce or to speed the delivery process (macerated in water or sap; oral); to facilitate placenta expulsion (macerated in water; oral); madness (decoction; oral)	6	6	5
Strychnos spinosa Lam.	mutamba, ntupa, massala	Loganiaceae	roots	venereal diseases (macerated in water; oral); hernia (decoction; oral); to induce or to speed the delivery process (macerated in water; oral); snake bites (ash; oral)	7	7	0
Stylochaeton natalensis Schott	geveishulo	Araceae	roots	snake bites [N] (macerated in water; oral); earache (macerated in water; oral)	2	2	2
Synaptolepsis kirkii Oliv.	dahuanga	Thymelaeaceae	bark; roots	constipation (macerated in water; oral); skin blisters [N] (decoction; bath)	2	2	0

Table 3 (*Continued*)

Botanical species (or genus)	Local name(s)	Botanical family (or subfam.)	Used parts	Therapeutic uses (preparation; administration)	Number of informants mentioning the species	Number of citations	Number of mixtures containing the plant
Tacca leontopetaloides (L.) Kuntze	ranga, mugarapadina	Taccaceae	tubers	menstrual cycle troubles (cooked; as food); snake bites [N] (macerated in water; direct application); toothache (not prepared; direct application)	3	3	3
Tamarindus indica L.	mushika, tambalina	Caesalpinioideae	roots	stomachache (decoction; oral); tuberculosis (decoction; oral)	2	2	0
Terminalia mollis M. A. Lawson	chicoriro	Combretaceae	bark	asthma [N] (macerated in water; oral)	1	1	1
Terminalia sericea Burch. ex DC.	mussussu	Combretaceae	leaves; roots	diarrhea (macerated in water; oral); menstrual pain (macerated in water; oral); menstrual cycle troubles (infusion; oral); female infertility (infusion; oral); venereal diseases (macerated in water; oral); *fetiçeria* (not prepared; other)	5	5	3
Tricalysia sp.	mutendera	Rubiaceae	roots	stomachache (macerated in water; oral); constipation (macerated in water; oral); earache (macerated in water; direct application)	2	2	0
Trichilia dregeana Sond.	muchiquiri	Meliaceae	leaves; roots	stomachache (macerated in water; oral)	1	1	1
Tricliceras longipeduncula-tum [N] (Mast.) R. Fern.	chijongue	Turneraceae	roots	snake bites (not prepared; direct application)	2	2	0
Turraea nilotica Kotschy et Peyr.	mutangasua	Meliaceae	roots	diarrhea (macerated in water; oral); dysentery (macerated in water; oral); venereal diseases [N] (macerated in water; oral); bilharzia [N] (cooked; as food); *bandama* [N] (not prepared; direct application)	5	6	5
Vangueria infausta Burch.	mumzwiro	Rubiaceae	bark; leaves; roots	stomachache (macerated in water; oral); cough (decoction; oral); asthma (decoction; oral); to induce or to speed the delivery process (macerated in water; oral); skin blisters [N] (decoction; oral)	5	5	3
Vepris reflexa I. Verd.	nhabangu	Rutaceae	roots	aphrodisiac (macerated in water; oral)	1	1	2
Vernonia colorata (Willd.) Drake	bembezuco, chipanzeco, vucussa	Asteraceae	leaves; roots	stomachache (macerated in water; oral); constipation (macerated in water; oral); venereal diseases (macerated in water; oral); to induce or to speed the delivery process (decoction or macerated in water; oral); post-partum pain (macerated in water; oral); general weakness (macerated in water; oral); vertigo [N] (macerated in water; oral)	9	12	6
Vernonia sp.		Asteraceae	roots	venereal diseases (macerated in water; oral)	1	1	1
Vitex payos (Lour.) Merr.	mucubvo, huvu	Lamiaceae	bark; leaves; roots; seeds	general weakness (macerated in water; oral); burns (macerated in water; direct application); toothache [N] (ash; direct application)	3	5	4
Xeroderris stuhlmannii (Taub.) Mendonça et E.C. Sousa	muramaropa	Faboideae	roots	intestinal worms in children (macerated in water; oral); tuberculosis (cooked; as food); menstrual cycle troubles (macerated in water; oral)	3	3	1
Ximenia caffra Sond.	mutengueni	Olacaceae	leaves; roots	stomachache (macerated in water; oral); constipation (macerated in water; oral); intestinal worms in children (macerated in water; oral); weakness in children (macerated in water; oral); female infertility (macerated in water, mush or not prepared; oral, as food or direct application); menstrual cycle troubles (macerated in water; oral); venereal diseases (macerated in water; oral); tuberculosis (decoction; oral); cough (decoction; oral); leprosy (ash; direct application); propitiatory (decoction; bath)	12	16	11

Table 3 (*Continued*)

Botanical species (or genus)	Local name(s)	Botanical family (or subfam.)	Used parts	Therapeutic uses (preparation; administration)	Number of informants mentioning the species	Number of citations	Number of mixtures containing the plant
Zanha golungensis Hiern	magogomere, muzarazara, chicumbiti, muharahaso	Sapindaceae	bark; leaves; roots; twigs	stomachache [N] (macerated in water; oral); constipation (macerated in water; oral); wounds [N] (decoction; lavage); sprains (not prepared; direct application or massage); muscular pain (ash; direct application); headache (not prepared; direct application); toothache [N] (not prepared; direct application); malaria (macerated in water; oral); general weakness [N] (macerated in water; oral)	13	16	6
Zea mays L.	mubomore, milho	Poaceae	fruits	aphrodisiac [N] (macerated in water; oral)	1	1	1
Ziziphus mucronata Willd.	muchechene	Rhamnaceae	roots	stomachache (macerated in water; oral); constipation (macerated in water; oral); muscular pain (decoction; oral)	2	2	0
(unidentified)	caribepandua		roots	propitiatory (decoction; bath)			
(unidentified)	catasa		roots	bloody vomit (cooked; as food); propitiatory (decoction; oral)			
(unidentified)	chicato		roots	headache (not prepared; direct application)			
(unidentified)	chicodoro		roots	diarrhea (decoction; oral)			
(unidentified)	chimbambara		bark; roots	diarrhea (macerated in water; oral); venereal diseases (macerated in water; oral)			
(unidentified)	chimboroboro		roots	propitiatory (mush; as food)			
(unidentified)	chinhahuaje		roots	*chinhamucaca* (decoction; oral)			
(unidentified)	chisacasso		roots	backache (decoction; oral); cough (decoction; oral)			
(unidentified)	churuquira		roots	diarrhea (decoction; oral); stomachache (decoction; oral); vomit (decoction; oral)			
(unidentified)	coraçao de boi		leaves	hearth disease (decoction; oral)			
(unidentified)	dovetove		twigs	propitiatory (not prepared; other)			
(unidentified)	gimashituca		roots	skin blisters (ash; direct application)			
(unidentified)	gonde		leaves	venereal diseases (sap; direct application); earache (sap; direct application)			
(unidentified)	hiqui		roots	tuberculosis (macerated in water; oral)			
(unidentified)	masonungure		roots	stomachache (macerated in water; oral)			
(unidentified)	mpampa		roots	aphrodisiac (macerated in water; oral)			
(unidentified)	muchangoma		roots	venereal diseases (macerated in water; oral)			
(unidentified)	mucucumba		roots	snake bites (macerated in water; oral)			
(unidentified)	mucuirantede		bark	aphrodisiac (mush; as food)			
(unidentified)	mucuramacheche		roots	general weakness (macerated in water; oral)			
(unidentified)	mugarapashulu		roots	bloody vomit (mush; direct application)			
(unidentified)	mungodenga		roots	stomachache (decoction; oral)			
(unidentified)	mungurahue		roots	diarrhea (decoction; oral)			
(unidentified)	munhacuru		roots	snake bites (decoction; oral)			
(unidentified)	munhajongue		roots	snake bites (decoction; oral)			
(unidentified)	mushunguenga		roots	general weakness (macerated in water; oral)			
(unidentified)	mussunganhamba		leaves	female infertility (not prepared; direct appliction)			
(unidentified)	ngumbiti		bark	toothache (decoction; mouthwash)			
(unidentified)	nhabandama		roots	stomachache (decoction; oral)			
(unidentified)	nhamapenge		bulbs	madness (mush; as food)			
(unidentified)	niacalimuhane		bulbs	miscarriage (cooked; as food)			
(unidentified)	niafiri		roots	stomachache (macerated in water; oral)			
(unidentified)	ntunguru		roots	stomachache (mush; as food)			
(unidentified)	tombo		roots	to prevent wife from cheating (cooked; as food)			
(unidentified)	zafarao		roots	stomachache (mush; as food)			
(unidentified)	zimairomunhanha		tubers	hernia (decoction; oral)			

[N]: species or use new for Africa (see the text for discussion and references).

Table 4
List of species recorded in this study and not previously reported in African ethnobotanical literature.

Species	Botanical family	Use
Cissus bathyrhakodes Werd.	Vitaceae	roots macerated in water taken to facilitate placenta expulsion
Clematis viridiflora Bertol.	Ranunculaceae	not prepared leaves and roots inhaled to treat headache
Combretum goetzei Engl. et Diels	Combretaceae	roots macerated in water assumed as an aphrodisiac
Dioscorea cochleari-apiculata De Wild.	Dioscoreaceae	cooked tubers eaten to treat stomach ache
Grewia pachycalyx K. Schum.	Tiliaceae	decoction of roots taken to treat tuberculosis
Indigofera antunesiana Harms	Fabaceae (Faboideae)	roots macerated in water assumed in case of general weakness
Ipomoea consimilis Schulze-Menz	Convolvulaceae	decoction of roots assumed to treat stomach ache and children constipation
Tricliceras longipedunculatum (Mast.) R. Fern.	Turneraceae	not prepared roots applied in case of snake bites

few species were gathered in cultivated fields (*machambas*), ruderal areas and/or open woodland (*mato abierto*).

Among the 139 identified species, 118 are native and 21 are exotic. One native species (*Ipomoea consimilis*) is endemic to the Manica and Sofala provinces (Da Silva et al., 2004). From a biodiversity conservation standpoint, it can be noticed that according to Da Silva et al. (2004), only four species fall within IUCN categories: *Cissus bathyrhakodes* (classified as VUD2, 'vulnerable'); *Afzelia quanzensis* (LR-nt, 'near threatened', due to forestry overexploitation); *Millettia stuhlmannii* (LR-lc, 'least concern'); *Ipomoea consimilis* (DD, 'data deficient'). Krog et al. (2006) report that H*ypoxis hemerocallidea* is to be regarded as a threatened plant, due to the destructive procedure of harvesting, the wide popularity of its use and also to the difficulties of the species in seed production.

3.2. Plants and medicinal uses not previously recorded for African ethnopharmacology

The following eight species (Table 4) recorded in this study were not previously reported in African specialized literature (Watt and Breyer-Brandwijk, 1962; Kokwaro, 1976; Iwu, 1993; Neuwinger, 1996; Schmelzer et al., 2010) and/or in databases (Long, 2005).

Even if all these plants were cited by only one or few informants ($\leq$3), their medicinal uses appear to be worthy of further in-depth investigations, in order to verify their possible effectiveness and pharmacological activity, with a special regard to plants used for illnesses that are difficult and/or costly to be treated in developing countries.

Among the species recorded in this study and already known for African ethnopharmacology, more than half (76.59%) were not previously reported for Mozambique (see Jansen and Mendes, 1983, 1984, 1990, 1991; Maite, 1987; Verzar and Petri, 1987; Jurg et al., 1991; Matavele and Habib, 2000; Jansen et al., 2001; Bandeira et al., 2001; Ribeiro et al., 2010).

Moreover, we found a high number of medicinal uses that were not previously known for the whole Africa: 73 uses, reported for 57 different species.

These results provide a relevant contribution of novelty to the knowledge on medicinal plants in Mozambique. They also demonstrate the importance of collecting new ethnobotanical information even on well-known medicinal plants. This is the case, for example, of *Zanha golungensis*: three of the uses reported in Muda (to treat stomach ache, to heal wounds and as a general tonic) are new for this species, despite being one of the most widely used medicinal plants in the whole Africa.

Medicinal plants or uses not previously known for Africa are also highlighted in Table 3.

3.3. Plants used, parts and ways of preparation and administration

3.3.1. Plants

Most of the plants mentioned during the interviews have a highly specific use: 115 species (71%) have only a medicinal use, 32 (20%) have a different use too; 15 species (9%) have three or more uses. In particular, 26 species (16%) have also an alimentary use, confirming that food and medicinal uses are often closely related (Bonet and Vallès, 2002; Alì et al., 2009). Out of the 22 species included in the category magical ritual/propitiatory species, 8 are used in medical/magical practices and 14 have only a magical/propitiatory use; 9 of these (64%) are different sorts of *injusu* (*Loranthus* sp. pl.).

Eighty-six medicinal species (53%) have only one medicinal use, that is they are used to treat a specific disease; 62 (38%)

Table 5
Main quantitative results for most frequently mentioned species (species cited by seven informants or more). cu: *curandeiros*. pr: *profetas*. lp: laypeople. CI: Cultural Importance index. IAR: Informant Agreement Ratio. CAI: Cultural Agreement Index.

Species	Number of informants mentioning the species				Number of citations				Number of uses	CI	IAR	CAI
	cu	pr	lp	Total	cu	pr	lp	Total				
Ximenia caffra	3	2	7	12	6	8	2	16	6	0.224	0.615	0.138
Zanha golungensis	2	2	9	13	4	4	8	16	8	0.194	0.417	0.081
Vernonia colorata	1	2	6	9	7	1	9	12	5	0.149	0.688	0.103
Ozoroa reticulata	2	2	8	12	3	2	9	14	3	0.134	0.846	0.114
Holarrhena pubescens	1	4	4	9	2	4	4	10	3	0.134	0.778	0.104
Abrus precatorius	2	2	3	7	5	2	3	10	5	0.119	0.556	0.066
Securidaca longepedunculata	2	3	4	9	2	4	4	10	4	0.119	0.667	0.080
Bauhinia galpinii	1	6	1	8	1	2	6	9	4	0.119	0.625	0.075
Cleistochlamys kirkii	1	3	3	7	2	3	3	8	6	0.119	0.286	0.034
Annona senegalensis	1	2	6	9	2	2	6	10	4	0.104	0.667	0.070
Strychnos spinosa	2	1	4	7	2	1	4	7	3	0.104	0.667	0.069
Cassia abbreviata	1	2	5	8	3	2	7	12	6	0.090	0.545	0.049
Elephantorrhiza goetzei	2	0	5	7	5	0	5	10	6	0.090	0.444	0.040
Rhoicissus revoilii	1	3	4	8	2	3	4	9	5	0.090	0.500	0.045
Euclea natalensis	1	2	5	8	1	2	5	8	2	0.090	0.857	0.077
Artabotrys brachypetalus	1	2	8	11	1	3	10	14	6	0.075	0.615	0.046
Brackenridgea zanguebarica	0	1	6	7	0	1	7	8	4	0.045	0.769	0.034

have 2–4 different uses and 14 (9%) have 5–7 uses. In Table 5 the results for most frequently mentioned species are reported. *Ximenia caffra*, cited by 12 informants (16 citations) for 6 different uses, showed the highest Cultural Importance value (CI = 0.224), followed by *Zanha golungensis* (CI = 0.194) cited by 13 informants (16 citations) for 8 different uses, by *Vernonia colorata* cited by 9 informants (12 citations) for 5 different uses (CI = 0.149). The highest values of IAR (Informant Agreement Ratio) are reached by *Euclea natalensis* (0.857) and *Ozoroa reticulata* (0.846). Those of CAI (Cultural Agreement Index), calculated combining CI and IAR, by *X. caffra* (CAI = 0.138), followed by *O. reticulata* (CAI = 0.114), *Holarrhena pubescens* (CAI = 0.104) and *V. colorata* (CAI = 0.103). CI and IAR values are slightly lower than those reported in other studies on medicinal plants in different countries (Thomas et al., 2009 in Bolivia; González et al., 2010 in Spain; Mutheeswaran et al., 2011 and Pandikumar et al., 2011 in India; Ghorbani et al., 2011 in China). This could possibly be due to the uneven distribution of knowledge among the three informant groups of our communities and to the better specific knowledge of traditional healers compared to villagers.

3.3.2. Plant parts, mixtures of plants, ways of preparation and administration

The most used parts are roots, cited for 116 species (72% of citations), followed by leaves, cited for 45 species (12% of citations). Of other plant parts, each one was mentioned in less than 6% of citations.

Also Ribeiro et al. (2010) found that the most frequently used parts were represented by roots (38.8%), followed by leaves (17.5%) and stems (13.6%). The important role of roots has to be underlined. The informants often used the ChiNdau word *miji* (meaning 'root') just as a synonym for 'medicine', and specified the part used only if it was different from the root, in this way assuming that remedies are usually prepared with this part of the plant. In European countries, on the other hand, vegetal remedies are mostly made from leaves (see Signorini et al., 2009, also for other references on the subject), and the word 'herb' (and many other derived terms, also in different European languages) is commonly used to mean 'medicinal plant'. The fact that in Muda villages roots are much more used as medicinal remedies than other plant parts may be due to the frequency of forest fires occurring in *miombo* ecosystem. Protected by soil, roots can survive the passage of fire and be always available, while other parts of the plant are more easily destroyed or damaged.

Ninety-three species (57%) were used by informants in 92 different mixtures (see Table 3). About 71% of mixtures are composed of two or three plants, 29% of four or more. The most used species in mixture were *Artobrotys brachypetalus* (12 mixtures), *Ximenia caffra* (11 mixtures), *Abrus precatorius*, *Cassia abbreviata* and *Securidaca longepedunculata* (10 mixtures), *Holarrhena pubescens* and *Ozoroa reticulata* (9 mixtures). Some informants explained the use of mixtures depending on their belief of a synergic effect produced by the use of several distinct species. It is possible that interactions among different species involve strengthening of therapeutic effects as well as attenuation of toxicity or of adverse effects of some plants composing the mixture.

Remedies are mostly prepared as macerates (266 citations, 99 species) or as decoctions (110 citations, 65 species), or without any preparation (37 citations, 23 species) (Fig. 3).

Oral dosing, direct application and use of the plant as food are the most frequently recorded ways of administration (Fig. 4).

3.4. Conservational issues

As can be argued from a few examples, people in the studied community appear to be quite aware of the importance of plant resources and of the need for a sustainable approach to their exploitation.

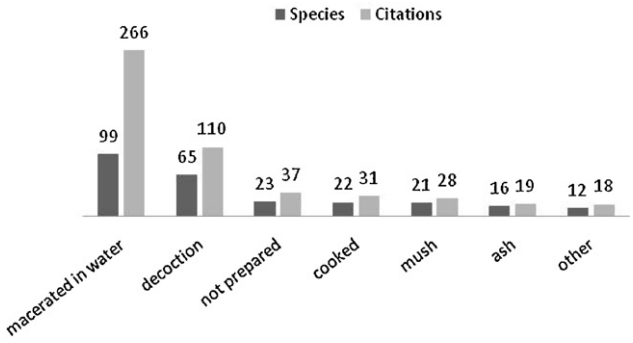

Fig. 3. Medicinal remedies: preparations.

Many informants reported that before collecting roots for healing purposes they perform a ritual, explaining to the plant why they are taking its root, in order to get its permission. Some of them even use to leave an offering to the plant paying tribute for its sacrifice: a copper ring, some flour, or money. Collecting *injusu* (*Loranthus* sp. pl.) has been reported as possibly fatal both to the parasite and the host (Dzerefos et al., 1999). However, we could personally observe that in Muda the informants use to cut off only the external parts of the parasite, so that not only the host plant, but the *injusu* itself can survive after harvesting, as part of the stem remains living within the host branch.

Many woody medicinal plants are protected by local rules, forbidding people to use them as a source of firewood and charcoal or to produce poles. Overexploitation of some species—such as *Sclerocarya birrea*, *Brackenridgea zanguebarica*, *Millettia stuhlmannii*, *Ochna schewinfurthiana* and *Hymenocardia acida* - is also prevented by traditions or taboos: for instance, it is believed that people who harvest some of them can go through misfortune and other problems. Taboos, seasonal and social restrictions on harvesting medicinal plants and the nature and rituals of harvesting all served to limit medicinal plant gathering (Cunningham, 1993). Moreover, we could observe that plant collection in the studied area is generally forbidden at graves sites for religious and spiritual reasons. As noticed by Cunningham (1993), protection of vegetation at grave sites is a common feature in many parts of Africa and it represents an important tool to preserve biological diversity outside core conservation areas.

3.5. Ailments treated

3.5.1. Ailment categories

The 162 medicinal plants detected were used to treat 43 different ailments. In total, 324 different remedies were cited by the

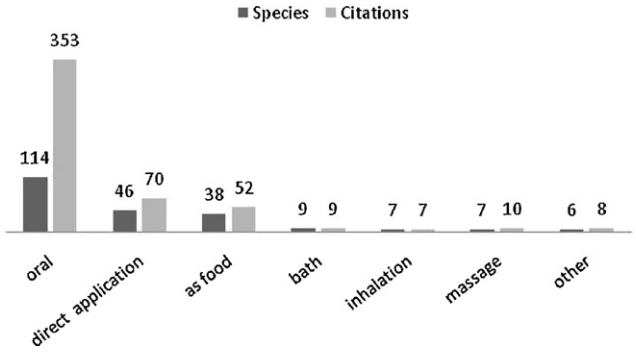

Fig. 4. Medicinal remedies: ways of administration.

Table 6
Ailments healed with medicinal remedies in different informants groups. cu: *curandeiros*. pr: *profetas*. lp: lay people.

Ailments	Informants groups	Species for each informant group		Total number of species	Citations for each informant group		Total number of citations
		Number	Mean ± SD		Number	Mean ± SD	
digestive system diseases	cu	18	2.00 ± 1.41	67	20		122
	pr	32	2.67 ± 1.96		36	3.00 ± 1.87	
	lp	41	0.87 ± 0.74		66	1.40 ± 0.82	
sexual-reproductive system diseases	cu	22	2.44 ± 2.11	59	27	3.00 ± 2.16	114
	pr	24	2.00 ± 1.28		31	2.58 ± 1.62	
	lp	41	0.87 ± 0.62		56	1.19 ± 0.71	
childhood diseases	cu	14	1.56 ± 1.24	43	14	1.56 ± 1.24	64
	pr	18	1.50 ± 1.65		18	1.50 ± 1.65	
	lp	26	0.55 ± 1.36		32	0.68 ± 0.99	
colds, respiratory tract diseases	cu	9	1.00 ± 0.23	24	9	1.00 ± 0.23	40
	pr	17	1.42 ± 0.31		19	1.58 ± 0.36	
	lp	9	0.19 ± 0.23		12	0.26 ± 0.35	
obstetric and puerperal problems	cu	5	0.56 ± 1.70	17	5	0.56 ± 1.70	28
	pr	5	0.42 ± 0.67		6	0.50 ± 0.76	
	lp	11	0.23 ± 0.79		17	0.36 ± 0.44	
skin diseases	cu	9	1.00 ± 0.52	15	9	1.00 ± 0.52	20
	pr	4	0.33 ± 0.65		4	0.33 ± 0.65	
	lp	7	0.15 ± 0.25		7	0.15 ± 0.25	
general weakness treated with tonic remedies	cu	6	0.67 ± 0.42	14	6	0.67 ± 0.42	17
	pr	6	0.50 ± 1.00		6	0.50 ± 1.00	
	lp	5	0.11 ± 0.12		5	0.11 ± 0.12	
muscular and skeletal system diseases	cu	5	0.56 ± 0.41	13	5	0.56 ± 0.41	16
	pr	2	0.17 ± 0.58		2	0.17 ± 0.58	
	lp	7	0.15 ± 0.55		9	0.19 ± 0.30	
malaria	cu	8	0.89 ± 0.42	10	9	1.00 ± 0.51	15
	pr	2	0.17 ± 0.39		2	0.17 ± 0.39	
	lp	4	0.09 ± 0.12		4	0.09 ± 0.12	
poisoning	cu	9	1.00 ± 1.02	9	9	1.00 ± 1.02	13
	pr	0	0.00 ± 0.00		0	0.00 ± 0.00	
	lp	3	0.06 ± 0.32		4	0.09 ± 0.29	
evil spirits	cu	6	0.67 ± 0.42	9	7	0.78 ± 0.65	14
	pr	6	0.50 ± 0.33		5	0.42 ± 0.44	
	lp	2	0.04 ± 0.19		2	0.04 ± 0.19	
misfortune	cu	7	0.78 ± 0.57	8	7	0.78 ± 0.57	8
	pr	0	0.00 ± 0.00		0	0.00 ± 0.00	
	lp	1	0.02 ± 0.15		1	0.02 ± 0.15	
toothache	cu	3	0.33 ± 0.23	9	3	0.33 ± 0.23	9
	pr	3	0.25 ± 0.19		3	0.25 ± 0.19	
	lp	3	0.06 ± 0.06		3	0.06 ± 0.06	
headache	cu	1	0.11 ± 0.31	5	1	0.11 ± 0.31	8
	pr	1	0.08 ± 0.29		1	0.08 ± 0.29	
	lp	5	0.11 ± 0.31		6	0.13 ± 0.42	
neurological diseases	cu	1	0.11 ± 0.12	5	1	0.11 ± 0.12	5
	pr	0	0.00 ± 0.00		0	0.00 ± 0.00	
	lp	4	0.09 ± 0.11		4	0.09 ± 0.11	
eye diseases	cu	2	0.22 ± 0.21	3	2	0.22 ± 0.21	4
	pr	1	0.08 ± 0.29		1	0.08 ± 0.29	
	lp	1	0.02 ± 0.15		1	0.02 ± 0.15	
ear diseases	cu	1	0.11 ± 0.31	3	1	0.11 ± 0.31	4
	pr	1	0.08 ± 0.29		1	0.08 ± 0.29	
	lp	2	0.04 ± 0.19		2	0.04 ± 0.19	
fever	cu	3	0.33 ± 0.23	2	3	0.33 ± 0.23	3
	pr	0	0.00 ± 0.00		0	0.00 ± 0.00	
	lp	0	0.00 ± 0.00		0	0.00 ± 0.00	

Table 7
Diseases in most relevant illness categories treated with plant remedies.

Disease	Number of species used
Digestive system	
Stomach ache	40
Diarrhea	21
Bloody vomit	15
Vomit	6
Bloody diarrhea (dysentery)	5
Stomach ache due to contact with a menstruating woman	4
Intestinal worms	3
Children diseases	
Chinhamucaca (milky diarrhea)[a]	8
Stomach ache and constipation (not due to stomach ache of the mother during pregnancy)	8
Bandama[c]	7
Delay in closing fontanelle	6
Stomach ache linked with a fontanelle syndrome[b]	5
Stomach ache due to stomach ache of the mother during pregnancy	5
Cupiringanica (children diarrhea)[a]	3
Intestinal worms	
Sexual-reproductive system	
Venereal diseases	35
Female infertility	15
Hernia	13
Menstrual problems	12
Male infertility and impotence	5
Bilharzia	4
HIV	1
Malaria	4
Obstetric and puerperal troubles	
Stalled (or too slow) labor	14
Miscarriage	5
Labor pain	2
Difficulties in placental expulsion	2
Colds and respiratory tract diseases	
Cough	17
Tuberculosis	11
Asthma	6
Cough due to a wrongful behavior	2

[a] Further explanations in the text.
[b] Depressed fontanelle, generally accompanied by other dehydration symptoms and linked to severe diarrhea, are recognized as a symptom of a serious health problem due to downward movement of an invisible snake *(nyoka)* that inhabits the body.
[c] The term *bandama* refers to a children disease characterized by splenomegaly, anemia, and fever and correspond to severe malaria symptoms.

informants. The most frequently reported medicinal uses were for digestive system (67 species, 81 remedies and 122 citations), sexual-reproductive system (59 species, 75 remedies and 114 citations), children diseases (43 species, 58 remedies and 64 citations), colds and respiratory tract diseases (29 species, 37 remedies and 40 citations) and obstetric and puerperal problems (17 species, 20 remedies and 28 citations) (Table 6). Treated diseases within each of these categories are listed in Table 7.

The informant consensus values were higher for fever (IAR = 0.50), sexual-reproductive system diseases (IAR = 0.49), digestive system diseases (IAR = 0.45), headache (IAR = 0.43) and obstetric and puerperal problems (IAR = 0.41). As reported by Bandeira et al. (2001), stomach and intestine related disturbances, sexual complaints and respiratory complaints affect a large proportion of people and produce a high rate of mortality in Mozambique. Also Ribeiro et al. (2010) found that more than half (54.7%) of the plants cited in their study were used for digestive system diseases, and 38% out of them were used to treat diarrhea and dysentery. As generally observed in African health belief systems (Janzen and Prins, 1981), many illnesses are regarded as "natural" or "unnatural", according to the circumstances and the context in which they occur: "natural" diseases are the mere result of evident natural causes such as germs, food, water, cold air; while "unnatural" ones are originated by some personal, social and/or spiritual factor, including the moral behavior of the sick person, the action of evil spirits, the loss of protection from the ancestors. Some kinds of diarrhea are reported as "unnatural", as they affect men who break a taboo, such as having intercourse with a menstruating woman. *Chinhamucaca*, a milky diarrhea accompanied by vomiting in children, is considered to be due either to contaminated breast milk or to other "natural" causes, but also to extramarital intercourse of the child's father in the absence of a purification ceremony. *Cupiringanica* is a form of diarrhea affecting infants (0–12 months) accompanied by loss of strength, caused by the fact that the father had sex with a woman and subsequently also with his wife, before purifying himself. Some informants reported some unnatural causes also for cough with blood: an intercourse of the sick man's daughter without his knowing, or an extramarital intercourse of his wife. Most of the species (70.8%) used to treat "unnatural" illnesses were also used to treat "natural" ones; only 7 species (21.2%) were reported as specific to heal only "unnatural" diseases.

3.5.2. Magical uses

The use of plants in magical/propitiatory practices was mainly associated to earning success/fortune (6 species) or to warding off evil spirits (8 species). However, the topic is culturally and socially sensitive and very little information about it was reported by informants. In local religious belief system misfortune is attributed to spiritual causes (usually the intervention of an evil spirit), that require specific treatment (Pfeiffer et al., 2007). According to what was reported by our informants, harmful spirits can be warded off through baths or fumigations with specific plants, and other plants can be used to make tattoos that "close" (*fechar*) the body to prevent their return. The use of *injusu* (*Loranthus* sp. pl.) to earn fortune and to ward off spirits confirms the high trans-cultural symbolic value of different sorts of mistletoe (see for instance Anderson, 1982; Fornaro et al., 2009).

3.6. Distribution of knowledge among informants

3.6.1. Informants

Among the 67 informants interviewed 31 were men (46%) and 36 women (54%). Nine were *curandeiros* (5 men and 4 women; age: 44 ± 13) and 12 *profetas* (7 men and 5 women; age: 44 ± 10) and the remaining 46 informants were common lay villagers: 19 men and 27 women (age: 48 ± 13) (Table 1). All the *curandeiros* adhered to traditional religion based on animist beliefs; seven *profetas* were member of the Church "Zione Apostolo de Moçambique" and five of the Church "Apostolo de São Lucas". To the Church "Zione Apostolo de Moçambique" were also affiliated 50% of the interviewed laypeople. The remaining laypeople were catholic (30%), animist (10%) or affiliated to other churches such as "Assembleia de Deus", "Cuera de Apostolo" and "Giovanni Massora de Zimbabwe" (10%).

Each informant knew on average 6.6 ($\pm$7.9) species and reported 7.6 ($\pm$11.2) citations. Eighty species (49%) were cited by only one informant; 59 species (36%) by 2–5 informants and 18 species (11%) by 6–9 informants. Only 4 species (2%) were cited by 10 or more informants (*Ximenia caffra*, *Zanha golungensis*, *Ozoroa reticulata*, *Artabotrys brachypetalus*). This rather heterogeneous distribution of knowledge and the high number of species reported only by one or few informants are surprising, since all the people have access to similar environments, habitats and species. Nonetheless, we believe that this more likely reflects a high specificity of knowledge rather than a low ethnobotanical value of species cited by

Table 8
Real and expected species richness and knowledge diversity in different informants groups.

	Curandeiros	*Profetas*	Laypeople
Species richness (number of cited species)	102	90	92
Cited species per informant (mean value ± SD)	11.33 ± 10.23	7.5 ± 6.12	2.14 ± 1.23
Citations	161	150	234
Hurlbert's PIE (Confidence interval)	0.99115 (0.99035–0.99209)	0.99123 (0.99099–0.99191)	0.98829[a] (0.98744–0.98912)

[a] Significant value.

one or very few informants. This consideration is supported by a significant *Spearmann* rank correlation ($r = 0.36$; $P < 0.01$) between the number of informants citing one species and the number of its uses; in fact, species known by only one or few informants have only one or very few uses. Phillips and Gentry (1993) have hypothesized that this might be related to the fact that the acquisition and development of knowledge about medicinal plants is a lifelong process, more difficult to learn than other ethnobotanical uses. Our observations carried out in the same studied communities (unpublished data) showed that knowledge for food uses is actually more homogeneously spread among informants.

3.6.2. Age, gender and religion

It was not possible to detect any significant relation between knowledge on medicinal plants and groups of informants of different age. Informants over 40 years showed a higher knowledge (8.3 ± 11.3 species; 10 ± 16.4 citations) than under 40 (6.6 ± 5.1 species; 7.2 ± 5.9 citations), but the difference was not significant (Mann–Whitney, $U = 175.00$, $P = 0.468$). No differences were found between age groups in respect of treated illnesses.

Comparing the knowledge held by men and women respectively, the only significant result (Mann–Whitney, $U = 117.00$, $P = 0.05$) was that within the laypeople group women showed a much higher knowledge on medicinal plants and uses: they reported 6.7 (±4.9) species and 7.4 (±5.8) citations, while men 3.8 (±1.6) species and 3.9 (±1.7) citations. In this group, also Hurlbert's PIE was significantly higher in women (0.94729, CI: 0.94414–0.95086) than in men (0.90246, CI: 0.89137–0.92433). As it could be expected, laywomen showed a higher knowledge about plants used to heal children diseases and illnesses related to female sexual system (menstrual cycle and infertility) and to pregnancy, partum and post-partum problems. Men knowledge was higher about plants used to heal venereal diseases and male impotence. Gender is a widely discussed factor in studies on the distribution of traditional knowledge, and in many instances women resulted to know more about medicinal and food plants than men (Voeks, 2007; Camou-Guerrero et al., 2008). In the present study, this connection between gender and knowledge of medicinal plants was not confirmed for the two groups of *curandeiros* and *profetas*, where the acquisition and development of knowledge are not directly linked to everyday family needs but occur through individual aptitude and training carried out by elder teachers, both processes not influenced by gender (see also Pfeiffer, 2002, 2005). Moreover, among healers interviewed in this study no gender difference emerged regarding the kind of problems they treat. As already observed in other studies (Igreja, 2003), both male and female healers deal with children and adult problems and address the same diseases and suffering.

In the laypeople group, it was not possible to pick out any significant relation between religious affiliation and number of plants known by informants. Even if villagers affiliated to the Church "Zione Apostolo de Moçambique" knew a higher number of species (7.31 ± 8.5 species, 8.1 ± 12.4 citations) compared to others (catholics: 5.3 ± 6.1 species, 6.4 ± 6.7 citations; animists: 5.1 ± 6.4 species, 5.9 ± 6.3 citations; other Churches: 6.2 ± 7.3 species, 6.4 ± 6.9 citations), the mean ranks were not significantly different in Kruskal–Wallis test ($H = 3.629$; $P > 0.05$).

3.6.3. Curandeiros, profetas and laypeople

Quantitative analyses showed that there is a statistically significant difference between "professional" healers and laypeople in the knowledge on medicinal plants. Mean number of known species resulted to be higher both for *curandeiros* vs. laypeople (Mann–Whitney, $U = 119.00$, $P = 0.05$) and for *profetas* vs. laypeople (Mann–Whitney, $U = 169.50$, $P = 0.04$). The same is true analyzing the distribution of citations with Hurlbert's PIE (Table 8). On the contrary, no significant difference was observed between the two groups of healers (*curandeiros* vs. *profetas*: Mann–Whitney, $U = 52.00$, $P = 0.88$). This result is rather unexpected because, as noted above, it has been reported that Pentecostal congregations mostly regard knowledge and use of traditional medicinal remedies as something linked to animist religion and somehow forbidden (Pfeiffer, 2005). This statement is possibly true for urban contexts, but is not supported by data collected from the rural communities investigated by us: both lay people adhering to Pentecostal churches and *profetas* appear to know and use medicinal remedies just as do people adhering to different religions. This could be due also to difficulties in obtaining medicines and to a general lack of health infrastructures.

Nevertheless, it must be considered that, given the secretive nature of their activities, it is quite impossible to get a full and thorough information about healers' traditional knowledge. So, the number of species known and used by *curandeiros* and *profetas* is very likely to be understated and differences in knowledge on medicinal plants between healers and laypeople is possibly much higher. This could be particularly true for *curandeiros* who, differently from prophets, heal for money and sometimes appear reluctant to share their own knowledge.

Yet, in Muda even the knowledge held by laypeople appears to be rather relevant. While some studies describe the use of medicinal plants in Africa as a highly specialist activity practiced mainly by herbalists and diviners (Cunningham, 1988; Botha et al., 2007), or anyhow limited to a restricted number of families (Tyiso and Bhat, 1998), our results show that in Muda this knowledge is also widespread among households. Among the 64 species known both by healers and lay villagers, 18 (28.1%) were mentioned by *profetas* and villagers, 10 (15.6%) by *curandeiros* and villagers and 36 (56.2%) by all the three informant groups. These findings indicate that laypeople are not merely the object of local traditional medicine practices, but are also active agents in the healing process.

Laypeople know and use medicinal plants mainly to treat common ailments: digestive troubles, headache, injuries and wounds, cough, venereal diseases, women's troubles related to menstruation, pregnancy or partum and some "natural" childhood diseases. People turn instead to "professional" healers for other illnesses, perceived as more severe and due either to "natural" (e.g. malaria, snake bites, leprosy) or to "unnatural" causes (*cupiranganica*, *chinhamucaca*), as well as for problems with some magical or spiritual implication (e.g., evil spirits). *Curandeiros* deal particularly with misfortune, believed to have spiritual causes requiring a complex treatment (Table 6).

Previous studies carried out in the same province (Pfeiffer, 2005; Chapman, 2006; Pfeiffer et al., 2007) report that even in urban areas sick people turn to *curandeiros* or prophets to resolve spiritual or magical causes believed to underlay specific health problems and

misfortune, while for "natural" diseases they normally address to the hospitals and other health centers.

Our investigation suggests that in Muda the lack of health infrastructures results in a different interaction between lay villagers and healers, as people turn to them even for "natural" but severe ailments. At the same time, the need to cope daily with common mild diseases within the family promotes the acquisition and maintenance by the villagers themselves of some knowledge about medicinal plants and their uses.

4. Conclusions

In our investigation, the use of 198 different medicinal plants has been recorded and a significant number of new medicinal species and uses has been detected, which is to be added to current knowledge on medicinal plants in Africa and particularly Mozambique. More than half of the recorded species have not been previously reported in Mozambican ethnopharmacology and eight of them have proved to be original even for the whole Africa. This means that local ethnobotanical knowledge is still quite rich and alive, even if not evenly distributed. The quantitative processing revealed that only a relatively small number of plants is widely quite known and used, and could be considered as unifying cultural elements with regard to traditional healing practices: *Artabotrys brachypetalus*, *Holarrhena pubescens*, *Ozoroa reticulata*, *Vernonia colorata*, *Ximenia caffra*, *Zanha golungensis*.

On the other side, the large number of plants known only by one or few informants possibly reveals that knowledge about medicinal uses is highly specific, but in the case of "professional" healers (*curandeiros* and *profetas*) this fact can also be explained with some reticence in sharing one's knowledge. Anyhow, traditional knowledge kept alive by one or few informants is to be regarded as highly vulnerable, as it may easily vanish together with its holders.

Our study appears to be the first to document and compare knowledge on medicinal plants between laypeople and traditional healers (*curandeiros* and *profetas*) and also between these two kinds of healers. As it could be expected, "professional" healers know significantly more plants than untrained laypeople; surprisingly, this is true even for *profetas*, despite the fact that many Pentecostal churches to which these healers adhere consider traditional knowledge as a mere expression of a lesser pagan culture.

Yet, even laypeople proved to hold a quite good knowledge about medicinal plants, unlike what is generally the rule in Mozambican urban areas, and especially women use several different plants to heal common diseases of the whole family, mostly for children and female problems. It must be remarked, however, that laypeople turn to traditional self-medication mainly due to lack of health infrastructures and to the high charges demanded by *curandeiros* for their services. Ironically, it could be stated that in the absence of scientific and political projects specifically aimed to documentation, conservation and re-diffusion of traditional knowledge on medicinal plants, its survival in Muda is currently assured mainly by lack of means and of public health structures.

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