

An ethnobotanical survey of medicinal plants commercialized in the markets of La Paz and El Alto, Bolivia

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Abstract

An ethnobotanical study of medicinal plants marketed in La Paz and El Alto cities in the Bolivian Andes, reported medicinal information for about 129 species, belonging to 55 vascular plant families and one uncertain lichen family. The most important family was Asteraceae with 22 species, followed by Fabaceae s.l. with 11, and Solanaceae with eight. More than 90 general medicinal indications were recorded to treat a wide range of illnesses and ailments. The highest number of species and applications were reported for digestive system disorders (stomach ailments and liver problems), musculoskeletal body system (rheumatism and the complex of contusions, luxations, sprains, and swellings), kidney and other urological problems, and gynecological disorders. Some medicinal species had magic connotations, e.g. for cleaning and protection against ailments, to bring good luck, or for Andean offerings to *Pachamama*, 'Mother Nature'. In some indications, the separation between medicinal and magic plants was very narrow. Most remedies were prepared from a single species, however some applications were always prepared with a mixture of plants, e.g. for abortion, and the complex of luxations and swellings. The part of the plant most frequently used was the aerial part (29.3%) and the leaves (20.7%). The remedies were mainly prepared as a decoction (47.5%) and an infusion (28.6%). Most of species were native from Bolivia, but an important 36.4% of them were introduced from different origins. There exists a high informant consensus for species and their medicinal indications. The present urban phytotherapy represents a medicinal alternative to treat main health problems and remains closer to the cultural and social context of this society.

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1. Introduction

Nearly 80% of the world population use traditional medicine, mainly medicinal plants, to cure illnesses and ailments (UICN et al., 1993). In developing countries and rural societies, the use of medicinal plants is both a valuable resource and a necessity, and furthermore it provides a real alternative for primary health care systems (e.g. Alexiades and Lacaze, 1996; Lozoya, 1996; Robineau and Soejarto, 1996; Buitrón, 1999). Official medical attention is usually based

on commercial drugs that have to be purchased with money, while a traditional medical consult in these countries has a much lower cost, including the consumption of the medicinal plants required (Naranjo, 1995).

In Bolivia there are 31 indigenous groups and many mestizo communities living in different natural areas of the country, as Altiplano, Yungas, Chaco or lowlands (Diez-Astete and Riester, 1996). Each ethnic culture has its own relationship with the environment and a medical knowledge that uses specific medicinal species. This cultural richness involves a valuable use and management of these different habitats, their species, and therefore their medicinal resources. Today, medicinal plants are still widely used in the countryside, but

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also in the main cities, e.g. Cochabamba, La Paz, Potosí or Sucre, as an important part of their populations came from Aymara and Quechua peasant communities and maintain much of their own cultures (Authors, personal observations). In all main cities, there are specific stalls for medicinal plants and even small ‘markets’ dedicated to this activity. People use medicinal plants as curatives or palliatives of main health problems according to their cultural background, and because plants were and still are a recognized traditional way to treat ailments and diseases (Vandebroek et al., 2003).

Some general studies have been carried out on useful plants, including specific studies on Bolivian folk medicine, mainly from the Andean region (e.g. Cárdenas, 1943, 1989; De Lucca and Zalles, 1992; Oblitas, 1992). Since remote times, the majority of the indigenous cultures in this country live in the eastern part of the Andes, so most ethnobotanical studies of medicinal plants were carried out in collaboration with several of these ethnic groups, including those in the tropical rain forest lowlands (Boom, 1985, 1987; Moretti et al., 1990; Hinojosa, 1991; Vargas, 1997; Bourdy et al., 2000; Vargas and Jordán, 2003; Macía, 2004), the dry region of Chaco (Bourdy et al., 2004), and the semi-deciduous forests of Chiquitania (Birk, 1995; Toledo, 1996). Traditionally, some of these widely used medicinal plants have also been used in the Andean region, and today we can find them in the medicinal plants markets of the main cities (this study). In the highlands there are mainly two indigenous cultures, the Aymara and the Quechua, both with a great knowledgeable background on medicinal plant species and their habitats (Salcedo, 1986; Fisel, 1989; Torrico et al., 1994; Pestalozzi, 1998; Arrázola et al., 2002; Fernandez et al., 2003; Vandebroek et al., 2003). Probably the best well-known healers in Bolivia and some of the most appreciated in South America were the Kallawayas (also named as Quollahuaya), from the region of Apolobamba, that healed hundreds of people in Bolivia and other countries in South America (Bastien, 1982, 1983; Girault, 1987; Oblitas, 1992).

Today, the cities of La Paz and particularly El Alto are rapidly growing urban populations, where people originated mainly from Aymara rural-peasant communities coming from La Paz and Oruro Departments. Most of them maintain their mother language and their own cultural traditions, e.g. their annual feasts are celebrated with great devotion, and also their rites and offerings to *Pachamama*, a myth who represents ‘Mother Nature’ for Aymara and Quechua cultures, and who protects people from illnesses and brings good luck. The notable use and commercialization of medicinal plants to alleviate and cure health problems and ailments in both cities, points out the importance of this natural resource in the folk medicine and culture of these people. The concept of Andean illnesses and their treatment may have different interpretations, and some of the ways to heal and the remedies used with medicinal plants are sometimes influenced by magic (Bastien, 1982; Girault, 1987; Vandebroek et al., 2003). Furthermore, plants with magic and superstitious connotations are also sold in the markets.

The objectives of the present study are four-fold: (1) to document the medicinal and magic uses of plants commercialized in the markets of the cities of La Paz and El Alto; (2) to gather information on vernacular names, plant parts used, mode of preparations, and ways of remedy administration; (3) to assess knowledge consensus among informants; (4) to study the original habitats and ecological status of these species.

2. Methodology

In the city of La Paz, along Calle Santa Cruz and Calle Linares are located the most important medicinal and magic plant sellers, in around 15 non-permanent stalls or *hierberías* of an uncovered ‘market’. In the city of El Alto, the sellers are located in the sector La Ceja, at Avenida Raúl Salmón and Calle #1, in 15–20 stalls. All sellers were women belonging to the Aymara culture, bilingual, but some of them could not speak the Spanish language. Following a semistructured interview (see Alexiades, 1996 for details), we asked them detailed information about all the plant species they sell in the stalls, including: (a) vernacular names according to Spanish, Aymara or other languages; (b) remedies and medical purposes for both medicinal indications and/or magic applications; (c) plant parts used, mode of preparation, and administration for each case; (d) specific complementary for the preparations of species and remedies. In some cases, when some plants were not found in the stalls, we asked their medicinal use from their vernacular names.

During the years 2001 and 2002, we interviewed nine women sellers in La Paz and 12 in El Alto, from 1 to 4 times each, in order to gather information on medicinal species that were seldom found in the market. We bought the medicinal specimens in order to collaborate economically with their time and to gain their confidence. Finally these plants represented our voucher specimens that are deposited in the Herbario Nacional de Bolivia (LPB) and the herbarium MA at Real Jardín Botánico de Madrid (Spain), acronyms according to Holmgren et al. (1990). The writing of vernacular names in Aymara and Quechua languages are based on Girault (1987) and De Lucca and Zalles (1992). For the family analysis, the species belonging to the legume family have been grouped as Fabaceae s.l. (including Mimosoideae and Papilionoideae subfamilies).

3. Results and discussion

Some women sellers of medicinal plants were harvesting the species in the field and later selling them in their own stalls, but usually they are just intermediaries who buy the plants from other people that collect in the wild or cultivate them. Other species are imported by different middlemen. The standard prices for each plant specimen var-

ied between 0.5 and 1 Bs. (0.07 and 0.13 US \$) for a small bunch.

3.1. Plant species and their medical applications

A total of 129 species distributed in 110 genera, belonging to 55 vascular plant families and one uncertain lichen family, were reported as medicinal and magic plants in the markets of La Paz and El Alto, Bolivia (Table 1). One voucher specimen was unidentified. The family with the largest number of plant species was by far Asteraceae with 22 species, followed by Fabaceae s.l. with 11, and Solanaceae with eight. The families Cactaceae, Lamiaceae, and Rosaceae had seven species each. These six families represented 48.1% of the total species found. The remaining plant families had between 1 and 4 species. Other Bolivian highland medicinal plants studies also recorded Asteraceae as the family with the highest number of medicinal species, and Solanaceae, Lamiaceae, and Fabaceae were also among the most important families (e.g. Bastien, 1983; Pestalozzi, 1998; Arrázola et al., 2002; Fernandez et al., 2003).

All medicinal plants were recorded with at least one vernacular name, except for three different seed specimens. The 56.6% of these popular names came from the Spanish language, while 26.5 and 15.1% were Aymara and Quechua, respectively (Table 1). Most species were mainly named with just one vernacular name, which was widely used among all informants. This uniformity of vernacular names used by all medicinal plant sellers is probably an indication that these species are generally well known as remedies.

More than 90 different medicinal indications were recorded to heal or alleviate a wide range of illnesses and pains (Table 1). The highest number of species (36) that represented 27.9% of total species, were used to cure digestive system disorders, mainly stomach ailments and pains, including ulcers, with 15 species reported; also for liver pains and swelling, eight species, and for bile and vesicle problems, five species. The use of medicinal plants for gastrointestinal disorders is also the most important category in other rural societies in Bolivia (e.g. Bourdy et al., 2000, 2004; Arrázola et al., 2002). Despite many medicinal plants have been reported to cure diarrhea in Bolivia, in this study we only found three species.

Twenty-seven species (20.9%) were used for musculoskeletal system problems. The highest number of species was recorded for various traumas, such as contusions, luxations, sprains, swellings, and even bone fractures (10 species used), frequently some of them applied in a mixture. Nine species were used to treat specifically rheumatic pain, and three more were reported to alleviate general body joints pain. All these species were administered externally with the exception of *Allium* sp. that was only administered internally. Most of these species have previously been recorded in the literature for the same remedies (Girault, 1987; De Lucca and Zalles, 1992; Oblitas, 1992).

Kidney ailments and pains were treated with 19 species (14.7%), and the combination of kidney and vesicle problems, including vesicle stones, with four species. For the urological system complex, eight species were used as a diuretic and six other for prostate disorders.

A fair number of medicinal species were also found for gynecological disorders, with nine species used to cure menstruation problems and four more for uterus ailments and swelling. For pregnancy and puerperium disorders, 14.7% of the species were used. Nine species were utilized for abortion, some of them prepared in a mixture, and five other for problems and pains following childbirth.

The main application for respiratory system problems was the treatment of cough with 11 species (8.5%) used. Six other species were used as a remedy for colds, seven for fever, and two of them to treat 'arrebato'. This disease, named in local Spanish, is a sudden strong fever that may be caused by a physical strain with general body pain and weariness. The only way of remedy administration is in the bath, but particularly if *Brassica rapa* is used, the bath is always applied to the feet.

In circulatory system problems, six species were used for hypertension and another five for heart ailments and pain. For injuries, six species were used as a vulnerary. Seven species were used for the illness complex of dizziness and headaches, and another five as a nervous tranquilizer. Swellings caused by freezing cold were treated with six different species. Intestinal parasite infections were treated with six species, one of them (*Solanum nitidum*) was only applied to children. Five species were used for the treatment of diabetes.

Aire is an illness difficult to define and place medically that has been reported in many studies, mainly in the Andean region (e.g. Salcedo, 1986; Girault, 1987; Oblitas, 1992). It may be caused by strong changes in body temperature, by physical weakness, and may produce some kind of face or body paralysis. Four plant species have been reported to treat this disease. The way of administration of the different parts of the plant is always external, sometimes inhaling the smoke after burning dried latex or flowers (in Spanish 'sahumar').

The fact that such high number of species are used to treat many different medical problems and have so many therapeutic applications can be explained because rural and peasant people living in these cities may consider the treatment with medicinal plants closer to or within their own traditional culture. Furthermore, they can convey their problems to the women sellers in their mother language, as some diseases have specific Aymara names. Even problems that are rather a social taboo (e.g. abortion or the death of a foetus during pregnancy) may be easier to confide to a woman seller than in the surgery. On the other hand, the good reputation that maintains the Kallawayas healers today (e.g. Girault, 1987; Oblitas, 1992), undoubtedly helps to consider the consumption of medicinal plants as significant remedies.

Table 1
Medicinal plants commercialized in the markets of La Paz and El Alto, Bolivia

Scientific name (voucher ^a)	Vernacular name (language ^b)	Medicinal indication	Part used	Preparation	Administration	Frequency of citation
Uncertain lichen family						
<i>Thamnolia vermicularis</i> (Sw.) Ach. ex Schaerer (MM7081)	Wari kunka (a)	Cough, hoarseness	Whole plant	Infusion	Oral	6
Anacardiaceae						
<i>Schinus molle</i> L. (MM7138)	Molle (s)	Andean offerings	Leaves	Included in <i>mesa de challa</i>	None	5
		Dead of a foetus during pregnancy	Leaves	Decoction	Bath	2
		Rheumatism, body joints pain	Leaves	Macerated in alcohol/decoction	Rubbing/bath	8
Apiaceae						
<i>Foeniculum vulgare</i> Mill. (MM7092)	Hinojo (s)	Galactogenous	Aerial part	Infusion	Oral	10
		Kidney ailments	Aerial part	Infusion	Oral	2
<i>Mulinum spinosum</i> (Cav.) Pers. (MM7078)	Choke kalla (a)	Cough, hoarseness	Whole plant	Decoction	Oral	8
<i>Pimpinella anisum</i> L. (no voucher collected)	Anís (s)	Diarrhea	Seeds	Decoction	Oral	6
		Stomach ache	Seeds	Decoction	Oral	6
Arecaceae						
<i>Oenocarpus bataua</i> Mart. (no voucher collected)	Unknown	Andean offerings	Seeds	Included in <i>mesa de challa</i>	None	9
Asteraceae						
<i>Ambrosia arborescens</i> Mill. (MM7162)	Altamisa, marco (s); markju (a)	Abortion	Aerial part	Decoction	Oral	2
		Menstrual retardation	Aerial part	Decoction	Oral	2
		Rheumatism, body joints pain	Aerial part	Decoction	Bath and vaporization	7
<i>Artemisia absinthium</i> L. (MM7090)	Ajenjo, ruda macho (s); ajinju (a)	Intestinal parasites	Aerial part	Infusion	Oral	6
		Stomach ache	Aerial part	Infusion	Oral	2
		Diabetes	Aerial part	Infusion	Oral	8
<i>Baccharis genistelloides</i> (Lam.) Pers. (MM7104)	Carqueja (s); charara (q); kimsa kkuchu (a)	High blood pressure	Aerial part	Infusion	Oral	6
		Contusions, luxations, sprains	Leaves	Mashed, and heated with urine	Cataplasm	10
		Abortion	Aerial part	Decoction	Oral	2
<i>Baccharis latifolia</i> (Ruiz & Pav.) Pers. (MM7064)	Chilca (s); chilka (a)	Depurative during menstruation	Aerial part	Decoction	Oral	2
		High blood pressure	Aerial part	Decoction	Oral	3
		Rheumatism	Aerial part	Decoction	Bath	4
<i>Chrysanthemum coronarium</i> L. (MM7184)	Santa María (s)	Bile and vesicular disorders	Inflorescence and leaves	Liquidized decoction (juice)	Oral	6
		Vesicular stones	Leaves	Decoction	Oral	2
		<i>Maldición</i> , clean ailments	Branch apex	Decoction	Bath	3
<i>Cynara cardunculus</i> L. (MM7079)	Alcachofa (s)	To bring good luck	Branch apex	Decoction	Scrub the floor	3
		Bone fractures, luxations	Aerial part	Mashed	Cataplasm	8
		Cough	Aerial part	Decoction	Oral	7
<i>Eupatorium azangaroense</i> Sch. Bip. ex Wedd. (MM7150)	Mankapaki (q)	Contusions, luxations	Leaves	Mashed, and heated with urine	Cataplasm	10
		Andean offerings	Branch apex	Included in <i>mesa de challa</i>	None	5
		<i>Maldición</i> , clean ailments	Branch apex	Decoction	Bath	3
<i>Gnaphalium cheiranthifolium</i> Lam. (MM7077)	Wira wira (a, q)	Andean offerings	Flowering tops	Included in <i>mesa de challa</i>	None	4
		Colds, cough	Flowering tops	Infusion	Oral	4
		Gum swelling	Flowering tops	Decoction	Gargles	2
<i>Grindelia boliviana</i> Rusby (MM7067)	Chili chili (a)	Stomach ache	Flowering tops	Infusion	Oral	8
		Vulnerary	Flowering tops	Infusion	Bath	4
		Dizziness	Flowering tops	Decoction	Oral	5
<i>Loricaria thuyoides</i> (Lam.) Sch. Bip. (MM7146)	Kili k'hoa (a)	Headache	Flowering tops	Decoction	Oral	7
		Kidney ailments	Flowering tops	Infusion	Oral	2
<i>Matricaria recutita</i> L. (MM7052)	Manzanilla (s)					
<i>Mutisia acuminata</i> Ruiz & Pav. (MM7080)	Chinchirkuma (q)					

Table 1 (Continued)

<i>Mutisia orbignyana</i> Wedd. (MM7139)	Kutu kutu (a)	Anti-inflammatory	Leaves	Decoction	Bath	3		
		Dead of a foetus during pregnancy	Leaves	Decoction	Bath	2		
		Rheumatism	Leaves	Decoction	Bath	4		
<i>Senecio cf. canescens</i> (Bonpl.) Cuatrec. (MM7099)	Khea khea (a)	Strong cough	Whole plant	Infusion	Oral	7		
		<i>Senecio graveolens</i> Wedd. (MM7193)	Chachakoma (a)	Stomach ache	Leaves	Infusion	Oral	3
<i>Senecio smithioides</i> Cabrera (MM7196)	Lampazo (s)	Back ache	Leaves	Mashed, and heated with urine	Cataplasm	6		
<i>Sonchus oleraceus</i> L. (MM7126)	Janapakho (a)	Bile and vesicular disorders	Whole plant	Infusion	Oral	6		
<i>Tagetes terniflora</i> Kunth (MM7151)	Chijchipa (a, q)	Liver pain	Whole plant	Infusion	Oral	3		
		Pains after childbirth	Aerial part	Infusion	Oral	7		
<i>Taraxacum officinale</i> Weber (MM7127)	Achicoria, diente de león (s)	Bile and vesicular disorders	Aerial part	Infusion	Oral	3		
		Depurative	Leaves	Crude	Eaten as salad	2		
		Kidney pain	Aerial part	Infusion	Oral	3		
		Liver pain	Aerial part	Infusion	Oral	2		
		Stomach ulcer	Aerial part	Infusion	Oral	3		
		<i>Werneria villosa</i> A. Gray (MM7072)	Jankko warmi (a, q)	Andean offerings	Whole plant	Included in <i>mesa de challa</i>	None	2
				Blood circulation	Whole plant	Decoction	Oral	3
General body pain	Whole plant			Decoction	Oral	4		
<i>Xanthium spinosum</i> L. (MM7148)	Amor seco (s), anuch'api (a)	Uterus swelling	Whole plant	Decoction	Oral	2		
		Blood depurative	Aerial part	Infusion	Oral	2		
		Chickenpox, measles	Aerial part	Decoction	Oral	2		
		Fever	Aerial part	Decoction	Oral and bath	7		
		<i>Maldición</i> , clean ailments	Aerial part	Decoction	Bath	3		
		To bring good luck	Aerial part	Decoction	Scrub the floor	3		
		Boraginaceae						
<i>Borago officinalis</i> L. (MM7142)	Borraja (s)	Cough, hoarseness	Aerial part	Infusion	Oral	6		
Brassicaceae								
<i>Brassica rapa</i> L. (MM7130)	Mostaza (s)	Fever, headache, <i>arrebato</i>	Aerial part	Decoction	Bath in the feet	11		
<i>Capsella bursa-pastoris</i> (L.) Medik. (MM7108)	Bolsa bolsa, bolsa de pastor (s)	Kidney swelling	Whole plant	Infusion	Oral	2		
<i>Lepidium cf. bipinnatifidum</i> Desv. (MM7120)	Anuk'ara (a)	Urine disorders	Whole plant	Infusion	Oral	5		
		<i>Matthiola incana</i> (L.) R.Br. (MM7124)	Alelí (s)	Intestinal parasites	Whole plant	Infusion	Oral	7
Bromeliaceae	Algarrobo, espino (s)	Andean offerings	Aerial part	Included in <i>mesa de challa</i>	None	3		
		Eczemas	Aerial part	Decoction	Bath	4		
<i>Puya</i> sp. (MM7173)		<i>Maldición</i> , clean ailments	Leaves	Decoction	Bath	5		
Buddlejaceae	Kiswara (a, q)	To bring good luck	Aerial part	Decoction	Scrub the floor	5		
		Diuretic	Leaves	Decoction	Oral	7		
<i>Buddleja coriacea</i> Remy (MM7058)		Prostate disorders	Leaves	Decoction	Oral	10		
Burseraceae								
<i>Protium cf. alstonii</i> Sandwith (MM7152)	Copal (s), kopal (q)	<i>Aire</i>	Dried latex	Aromatic smoke (<i>sahumar</i>)	Inhalation	6		
Cactaceae	Espino (s); sijosilla (a)	Swellings by freezing cold	Dried latex	Mashed and decoction	Cataplasm	2		
		<i>Maldición</i> , clean ailments	Stem apex	Decoction	Bath	3		
<i>Austrocylindropuntia exaltata</i> (A. Berger) Backeb. (MM7176)		To bring good luck	Stem apex	Decoction	Scrub the floor	3		
<i>Corryocactus melanotrichus</i> (K. Schum.) Britton & Rose (MM7198)	Espino (s)	<i>Maldición</i> , clean ailments	Stem apex	Decoction	Bath	4		
		To bring good luck	Stem apex	Decoction	Scrub the floor	4		
<i>Echinopsis pachanoi</i> (Britton & Rose) Friedrich & G.D. Rowley (no voucher collected)	San Pedro (s)	Hallucinogenic (sold for foreigners)	Stem apex			4		
		Mumps	Stem apex	Mashed and heated	Cataplasm	3		

Table 1 (Continued)

Scientific name (voucher ^a)	Vernacular name (language ^b)	Medicinal indication	Part used	Preparation	Administration	Frequency of citation
<i>Echinopsis</i> sp. (MM7182)	Espino (s)	<i>Maldición</i> , clean ailments	Stem apex	Decoction	Bath	4
		To bring good luck	Stem apex	Decoction	Scrub the floor	4
<i>Lobivia</i> sp. (MM7200)	Cuerpoespín, espino (s)	<i>Maldición</i> , clean ailments	Stem apex	Decoction	Bath	3
		To bring good luck	Stem apex	Decoction	Scrub the floor	3
<i>Opuntia ficus-indica</i> (L.) Mill. (MM7180)	Penca, tuna (s)	Burns	Stem apex	Mashed for juice	Direct application	6
		Hair	Stem apex	Mashed for juice	Bath as shampoo	10
		Kidney pain	Stem apex	Crude and heated	Direct application	4
		<i>Maldición</i> , clean ailments	Stem apex	Decoction	Bath	4
		To bring good luck	Stem apex	Decoction	Scrub the floor	4
		<i>Opuntia soehrensii</i> Britton & Rose (MM7178)	Airampu (a, q); espino (s)	Chickenpox, measles	Seeds	Decoction
Fever		<i>Maldición</i> , clean ailments	Seeds	Decoction	Oral	4
			Stem apex	Decoction	Bath	3
			Stem apex	Decoction	Scrub the floor	3
			Stem apex	Decoction	Scrub the floor	3
Caprifoliaceae						
<i>Sambucus peruviana</i> Kunth (MM7091)	Khojla (q); saúco (s)	Contusions, swellings	Leaves	Mashed, and heated with urine	Cataplasm	9
Caryophyllaceae						
<i>Dianthus caryophyllus</i> L. (MM7062)	Clavel, clavel blanco (s)	Headache, dizziness	Flower	Infusion	Oral	5
<i>Dianthus plumarius</i> L. (MM7160)	Clavel, clavel blanco, clavel rojo, clavilina (s)	Andean offerings	Petals	Included in <i>mesa de challa</i>	None	4
Eyes problem, cataract		Heart pain	Petals	Infusion	Dripping in the eyes	2
			Flower	Infusion	Oral	6
			Flower	Infusion	Oral	6
Chenopodiaceae						
<i>Chenopodium ambrosioides</i> L. (MM7057)	Paico (s); paikko (a)	Bile and vesicular disorders	Aerial part	Infusion/juice	Oral	7
Stomach pain	Aerial part	Decoction	Oral	6		
<i>Chenopodium quinoa</i> Willd. (no voucher collected)	Quinoa, quinua (s)	Contusions, luxations	Aerial part	Mashed	Cataplasm	5
Clusiaceae						
<i>Clusia</i> cf. <i>lechleri</i> Rusby (MM7195)	Incienso (s)	<i>Susto</i> of babies	Dried latex	Aromatic smoke (<i>sahumar</i>)	Inhalation	5
To bring good luck			Dried latex	Aromatic smoke (<i>sahumar</i>)	Inhalation	3
Crassulaceae						
<i>Echeveria</i> sp. (no voucher collected)	Congona (s)	Ear pain, otitis	Aerial part	Mashed and heated	Dripping in the ear	7
Cupressaceae						
<i>Cupressus sargentii</i> Jeps. (MM7094)	Pino (s)	Cough	Branch apex	Decoction	Oral	9
Cyperaceae						
sp. (MM7133)	Chinchi chinchi (a)	Andean offerings	Root	Included in <i>mesa de challa</i>	None	3
<i>Susto</i>			Root	Decoction	Oral	2
Ephedraceae						
<i>Ephedra americana</i> Humb. & Bonpl. ex Willd. (MM7054)	Cola de caballo hembra (s)	Kidney swelling	Stem apex	Decoction	Oral	6
Urine disorders			Stem apex	Decoction	Oral	6
<i>Ephedra rupestris</i> Benth. (MM7188)	Sanu sanu (a, q)	Abortion	Branch apex	Decoction	Oral	2
Depurative			Branch apex	Decoction	Oral	3
Diuretic			Branch apex	Decoction	Oral	3
Menstrual retardation			Branch apex	Decoction	Oral	2
Equisetaceae						
<i>Equisetum giganteum</i> L. (MM7053)	Cola de caballo macho (s)	Andean offerings	Aerial part	Included in <i>mesa de challa</i>	None	2
Diuretic			Aerial part	Decoction	Oral	11
Kidney swelling			Aerial part	Decoction	Oral	9

Table 1 (Continued)

Erythroxylaceae						
<i>Erythroxylum coca</i> Lam. (no voucher collected)	Coca (s)	Colds	Leaves	Decoction/chewed	Oral	2
		Headache	Leaves	Chewed	Applied in the forehead	5
		Stomach pain	Leaves	Decoction/chewed	Oral	7
Euphorbiaceae						
<i>Jatropha curcas</i> L. (MM7136)	Piñón (s)	Purge	Seeds	Decoction and mashed	Oral	6
Fabaceae–Mimosoideae						
<i>Anadenanthera colubrina</i> (Vell.) Brenan (MM7190)	Willka (a, q)	Abortion	Seeds	Decoction	Oral	2
		Menstrual retardation	Seeds	Decoction	Oral	3
Fabaceae–Papilionoideae						
<i>Adesmia miraflorensis</i> Remy (MM7174)	Espino (s)	<i>Maldición</i> , clean ailments	Branch apex	Decoction	Bath	3
		To bring good luck	Branch apex	Decoction	Scrub the floor	3
<i>Canavalia</i> sp. (MM7157)	Habilla (s)	Purge	Seeds	Peeled, mashed in hot water	Oral	6
<i>Lupinus bogotensis</i> Benth. (MM7060)	K'ela (a)	Abortion	Aerial part	Decoction	Oral	3
		Depurative during menstruation	Aerial part	Decoction	Oral	3
<i>Medicago sativa</i> L. (MM7083)	Alfa, alfalfa (s)	Diuretic	Whole plant	Infusion	Oral	4
		Kidney and vesicular swelling	Whole plant	Juice	Oral	4
		Lungs ailments	Whole plant	Juice	Oral	7
		Reconstituent	Whole plant	Juice	Oral	2
<i>Mucuna</i> sp. (no voucher collected)	Unknown	Andean offerings	Seeds	Included in <i>mesa de challa</i>	None	5
<i>Myroxylon balsamum</i> (L.) Harms (MM7132)	Kina kina (a, q)	Ear pain	Seeds	Heated	Smoke in the ear	4
<i>Ormosia</i> sp. (no voucher collected)	Unknown	Andean offerings	Seeds	Included in <i>mesa de challa</i>	None	6
<i>Otholobium pubescens</i> (Poir.) J.W. Grimes (MM7123)	Bilia, billa (s); wallakaya (a)	Abortion	Aerial part	Decoction	Oral	3
		Depurative during menstruation	Aerial part	Decoction	Oral	3
		Prostate disorders	Aerial part	Infusion	Oral	3
		Uterus ailments	Aerial part	Decoction	Oral	3
<i>Spartium junceum</i> L. (MM7086)	Retama, ritama (s)	Andean offerings	Branch apex	Included in <i>mesa de challa</i>	None	10
		Heart ailments	Flower	Infusion	Oral	2
		Illness protective	Branch apex	Fresh	Adorn homes	9
		<i>Maldición</i> , clean ailments	Branch apex	Decoction	Bath	10
<i>Vicia faba</i> L. (no voucher collected)	Haba (s)	Cough	Inflorescence	Infusion	Oral	4
Geraniaceae						
<i>Erodium cicutarium</i> (L.) L'Hér. ex Aiton (MM7128)	Aguja aguja (s); yauri yauri (a)	Diuretic	Whole plant	Infusion	Oral	7
		Prostate disorders	Whole plant	Infusion	Oral	5
Iridaceae						
<i>Sisyrinchium</i> sp. (MM7113)	Aika aika (a)	Infantile diarrhea	Whole plant	Infusion	Oral	4
Juglandaceae						
<i>Juglans boliviana</i> (C. DC.) Dode (MM7117)	Nogal (s)	Diabetes	Leaves	Infusion	Oral	7
		Kidney ailments	Leaves	Infusion	Oral	3
		Liver ailments	Leaves	Infusion	Oral	3
Lamiaceae						
<i>Lavandula latifolia</i> Medik. (MM7192)	Alhucema, alusima (s)	<i>Aire</i>	Inflorescence	Aromatic smoke (<i>sahumar</i>)	Inhalation	2
		Pains after childbirth	Inflorescence	Decoction	Aromatic smoke in the vagina	3
		Uterus ailments	Inflorescence	Decoction	Aromatic smoke in the vagina	3
<i>Lepechinia meyenii</i> (Walp.) Epling (MM7185)	Salvia (s)	Pains after childbirth	Aerial part	Infusion	Oral	2
		Rheumatism	Aerial part	Macerated in alcohol	Rubbing	5
<i>Melissa officinalis</i> L. (MM7097)	Toronjil (s)	Heart ailments	Aerial part	Infusion	Oral	8
		Tranquilizer	Aerial part	Infusion	Oral	3
<i>Mentha spicata</i> L. (MM7119)	Hierba buena (s)	Intestinal parasites	Aerial part	Infusion	Oral	6

Table 1 (Continued)

Scientific name (voucher ^a)	Vernacular name (language ^b)	Medicinal indication	Part used	Preparation	Administration	Frequency of citation
<i>Mentha × piperita</i> L. (MM7098)	Menta (s)	Anaemia	Aerial part	Infusion	Oral	3
		Intestinal parasites	Aerial part	Infusion	Oral	2
		Stomach pain and ulcer	Aerial part	Infusion	Oral	3
<i>Rosmarinus officinalis</i> L. (MM7063)	Romero (s)	Andean offerings	Branch apex	Included in <i>mesa de challa</i>	None	9
		Colds, general body pain	Aerial part	Infusion	Oral	5
		General body joints pain	Aerial part	Decoction	Rubbing	5
		<i>Maldición</i> , clean ailments	Aerial part	Decoction	Bath	9
		Pains after childbirth	Aerial part	Infusion	Oral	4
		<i>Susto</i>	Aerial part	Decoction	Oral	2
		Andean offerings	Branch apex	Included in <i>mesa de challa</i>	None	4
<i>Satureja boliviana</i> (Benth.) Briq. (MM7093)	K'hoa (a)	Colds	Aerial part	Decoction	Oral	3
		Diarrhea	Aerial part	Decoction	Oral	10
		Stomach pain	Aerial part	Decoction	Oral	12
		Bile and vesicular disorders	Whole plant	Infusion	Oral	8
		Stomach pain	Whole plant	Infusion	Oral	3
<i>Stachys cf. pusilla</i> (Wedd.) Briq. (MM7186)	Verbena (s)	Vesicular stones	Whole plant	Infusion	Oral	6
		Liliaceae				
		<i>Allium</i> sp. (MM7110)	Ajo macho (s)	Diabetes	Root	Decoction
High blood pressure	Root			Decoction	Oral	2
Illness protective during trips	Root			Crude	In the pocket	2
Rheumatism	Root			Decoction	Oral	4
<i>Aloe vera</i> (L.) Burm. f. (no voucher collected)	Sábila (s)	Acne	Leaves	Mashed for juice	Direct application	5
		Contusions	Leaves	Mashed for juice	Cataplasm	6
		Feet varices	Leaves	Mashed for juice	Direct application	2
		Hair, dandruff	Leaves	Mashed for juice	Bath as shampoo	10
		Kidney ailments	Leaves	Juice in hot water	Oral	3
		Stomach ulcer	Leaves	Crude and heated	Direct application	3
		Vulnery	Leaves	Mashed for juice	Direct application	6
		Linaceae				
<i>Linum usitatissimum</i> L. (no voucher collected)	Linaza (s)	Fever	Seeds	Grinded and decoction	Oral	2
		Kidney ailments	Seeds	Grinded and decoction	Oral	2
		Stomach ailments	Seeds	Grinded and decoction	Oral	4
Loranthaceae						
<i>Tripodanthus acutifolius</i> (Ruiz & Pav.) Tiegh. (MM7111)	Jamillo, jamillu (a)	Luxations, sprains	Whole plant	Mashed	Cataplasm	13
Malvaceae						
<i>Malva parviflora</i> L. (MM7076)	Malva (s)	Anti-inflammatory	Aerial part	Infusion	Oral	8
		Colds	Aerial part	Infusion	Oral	5
		Fever, headache, <i>arrebato</i>	Aerial part	Decoction	Bath	8
		Vulnery	Aerial part	Infusion	Bath	2
Monimiaceae						
<i>Peumus boldus</i> Molina (MM7085)	Boldo (s)	Kidney swelling	Leaves	Infusion	Oral	8
		Liver swelling	Leaves	Infusion	Oral	12
Moraceae						
<i>Ficus carica</i> L. (MM7115)	Hoja de higo (s)	Abortion	Leaves	Decoction	Oral	4
		Menstrual retardation	Leaves	Decoction	Oral	3

Table 1 (Continued)

Myristicaceae						
<i>Myristica fragrans</i> Houtt. (MM7194)	Amosmoscada, nuez moscada (s)	<i>Aire</i>	Seeds	Mashed	Cataplasm	4
Myrtaceae						
<i>Eucalyptus globulus</i> Labill. (MM7082)	Eucalipto, iucalipto (s)	Cough	Branch apex	Infusion	Oral	9
		Flu	Leaves	Decoction	Inhalation	6
<i>Myrtus communis</i> L. (MM7145)	Arrayán (s)	Gum swelling	Leaves	Decoction	Gargles	7
Oxalidaceae						
<i>Hypseocharis</i> cf. <i>pimpinellifolia</i> J. Rémy (MM7129)	Wachanka (q)	Purge	Root	Mashed	Oral	11
		To leave drinking alcohol	Root	Mashed	Oral	2
Papaveraceae						
<i>Bocconia integrifolia</i> Bonpl. (MM7170)	Amakari (q)	General body joints pain	Leaves	Decoction	Bath	2
		<i>Maldición</i> , clean ailments	Leaves	Decoction	Bath	2
		Mumps	Leaves	Burned and decoction	Cataplasm	3
		Swellings by freezing cold	Leaves	Burned and decoction	Cataplasm	2
		To bring good luck	Leaves	Decoction	Scrub the floor	2
Passifloraceae						
<i>Passiflora mollissima</i> (Kunth) L.H. Bailey (MM7100)	Tumbo (s)	Diabetes	Flower	Infusion	Oral	4
Piperaceae						
<i>Piper elongatum</i> Vahl (MM7106)	Matico (s); matiku (q)	Colds	Leaves	Infusion	Oral	2
		Kidney swelling	Leaves	Infusion	Oral	6
		Liver swelling	Leaves	Infusion	Oral	6
		Rheumatism	Leaves	Decoction	Bath	3
		Urine disorders	Leaves	Infusion	Oral	4
Plantaginaceae						
<i>Plantago major</i> L. (MM7055)	Llantén, llantina (s)	Kidney swelling	Whole plant	Infusion	Oral	9
		Liver swelling	Whole plant	Infusion	Oral	5
		Urine disorders	Whole plant	Infusion	Oral	7
Poaceae						
<i>Cortaderia</i> sp. (MM7189)	Sewenka (a)	Abortion	Leaves	Decoction	Oral	6
		Diuretic	Leaves	Decoction	Oral	2
		Menstrual retardation	Leaves	Decoction	Oral	4
<i>Cymbopogon citratus</i> (DC.) Stapf (MM7089)	Hierba Luisa (s)	Stomach pain	Leaves	Decoction	Oral	3
		Swellings by freezing cold	Leaves	Decoction	Oral	2
		Tranquilizer	Leaves	Decoction	Oral	5
<i>Zea mays</i> L. (MM7095)	Pelo de choclo (s)	Diuretic	Styles and stigmata	Decoction	Oral	8
		Kidney ailments	Styles and stigmata	Decoction	Oral	6
Polemoniaceae						
<i>Cantua buxifolia</i> Juss (MM7159)	Cantuta (s); kantuta (a)	Andean offerings	Flower	Included in <i>mesa de challa</i>	None	4
		Cough	Flower	Infusion	Oral	5
		Rheumatism	Flower	Decoction	Bath	2
		To bring good luck	Flower	Decoction	Bath	4
Polygonaceae						
<i>Rumex cuneifolius</i> Campd. (MM7167)	K'entu (a)	Feet swellings by freezing cold	Leaves	Macerated in alcohol	Rubbing	3
		Vulnerary	Leaves	Mashed	Cataplasm	5

Table 1 (Continued)

Scientific name (voucher ^a)	Vernacular name (language ^b)	Medicinal indication	Part used	Preparation	Administration	Frequency of citation
Rosaceae						
<i>Kageneckia lanceolata</i> Ruiz & Pav. (MM7112)	Lloke (q)	Intestinal parasites	Bark	Decoction	Oral	5
<i>Lachemilla pinnata</i> (Ruiz & Pav.) Rothm. (MM7084)	Sillu sillu (q)	Kidney swelling	Whole plant	Decoction	Oral	7
		Liver swelling	Whole plant	Decoction	Oral	5
		Urine disorders	Whole plant	Decoction	Oral	7
<i>Lachemilla</i> sp. (MM7141)	Pimpilina, pimpiniña (s)	Anaemia	Whole plant	Infusion	Oral	4
		Dizziness, headache	Whole plant	Infusion	Oral	7
		Heart ailments	Whole plant	Infusion	Oral	2
<i>Rosa</i> sp. 1 (MM7125)	Rosita blanca, rosa (s)	Dizziness	Flower	Infusion	Oral	2
		<i>Maldición</i> , clean ailments	Flower	Infusion	Oral	4
<i>Rosa</i> sp. 2 (MM7087)	Rosa (s)	Heart ailments	Flower	Infusion	Oral	6
<i>Rubus boliviensis</i> Focke (MM7070)	Khari khari (q)	To start talking faster children	Leaves and fruits	Decoction	Oral and eat the fruits	7
		Cough	Leaves	Decoction	Oral	5
<i>Rubus megalococcus</i> Focke (EG4881)	Khari khari (q)	Cough	Leaves	Decoction	Oral	4
		Diarrhea	Leaves	Decoction	Oral	2
Rubiaceae						
<i>Coffea arabica</i> L. (MM7171)	Sultana (a, q)	Diabetes	Fruits	Decoction	Oral	6
		High blood pressure	Fruits	Decoction	Oral	3
<i>Relbunium</i> sp. (EG4882)	Chape, chapi (a)	Cough	Root	Decoction	Oral	2
		Uterus swelling	Root	Decoction	Oral	2
Rutaceae						
<i>Citrus sinensis</i> (L.) Osbeck (MM7102)	Flor de azahar, naranja (s)	Abortion	Flower	Infusion	Oral	3
		Menstrual retardation	Flower	Infusion	Oral	2
		Tranquilizer	Leaves	Infusion	Oral	2
<i>Ruta chalepensis</i> L. (MM7088)	Ruda (s)	<i>Aire</i>	Leaves	Heated	Direct application	9
		Headache	Aerial part	Decoction	Bath	2
		<i>Maldición</i> , clean ailments	Aerial part	Decoction	Bath	6
		Stomach pain	Aerial part	Infusion	Oral	2
Santalaceae						
<i>Quinchamalium chilense</i> Molina (EG4880)	Kinchamali, mali-mali (a)	Kidney ailments	Aerial part	Decoction	Oral	2
		Lungs ailments	Aerial part	Decoction	Oral	2
Sapindaceae						
<i>Dodonaea viscosa</i> Jacq. (MM7068)	Chakhataya (a)	Luxations, sprains	Leaves	Mashed	Cataplasm	12
		Uterus ailments	Leaves	Infusion	Oral	4
Scrophulariaceae						
<i>Calceolaria buchtieniana</i> Kraenzl. (MM7163)	Amay sapatu (q); zapato-zapato (s)	Cystitis	Aerial part	Infusion	Oral	4
		Kidney and vesicular ailments	Aerial part	Infusion	Oral	5
		Pains after childbirth	Aerial part	Infusion	Oral	2
		Prostate disorders	Aerial part	Infusion	Oral	5
Smilacaceae						
<i>Smilax</i> sp. (MM7071)	Wila layu (a); zarzaparrilla (s)	Acne	Root	Decoction	Oral	2
		General body pain	Root	Decoction	Oral	6
		High blood pressure	Root	Decoction	Oral	3
Solanaceae						
<i>Brugmansia arborea</i> (L.) Lagerh. (MM7137)	Flurifundio (s)	Dead of a foetus during pregnancy	Flower	Decoction	Bath	4
		<i>Maldición</i> , clean ailments	Flower	Decoction	Bath	5
		Swellings by freezing cold	Flower	Decoction	Bath	2

Table 1 (Continued)

<i>Brugmansia sanguinea</i> (Ruiz & Pav.) D. Don (MM7147)	Flurifundio (s)	Dead of a foetus during pregnancy	Flower	Decoction	Bath	4
		<i>Maldición</i> , clean ailments	Flower	Decoction	Bath	5
		Swellings by freezing cold	Flower	Decoction	Bath	2
<i>Cestrum parqui</i> L'Hér. (MM7166)	Andres wailla (q)	Contusions, swellings	Aerial part	Mashed	Cataplasm	10
		Depurative	Aerial part	Decoction	Oral	8
		Fever	Aerial part	Mashed	Cataplasm	2
		Vulnerary	Aerial part	Mashed	Cataplasm	4
<i>Dunalia brachyacantha</i> Miers (MM7175)	Espino (s)	<i>Maldición</i> , clean ailments	Aerial part	Decoction	Bath	3
		To bring good luck	Aerial part	Decoction	Scrub the floor	3
<i>Solanum marginatum</i> L.f. (MM7164)	Cardo santo, carlosanto (s)	Cough	Aerial part	Infusion	Oral	2
		General body joints pain	Aerial part	Decoction	Bath	3
		<i>Maldición</i> , clean ailments	Aerial part	Decoction	Bath	3
		To bring good luck	Aerial part	Decoction	Scrub the floor	3
<i>Solanum nitidum</i> Ruiz & Pav. (MM7107)	Lharpa, Ñuñumaya (a)	Intestinal parasites in children	Whole plant	Decoction	Bath	3
<i>Solanum palitans</i> C.V. Morton (MM71665)	Kuti kuti (a)	Eye swellings	Fruits	Grinded	Cataplasm	2
		Mumps	Fruits	Grinded and heated	Cataplasm	4
<i>Solanum tripartitum</i> Dunal (MM7140)	Kuti kuti (a)	<i>Maldición</i> , clean ailments	Aerial part	Decoction	Bath	3
Tropaeolaceae						
<i>Tropaeolum tuberosum</i> Ruiz & Pav. (MM7134)	Isaño (q)	Prostate disorders	Root	Decoction and mashed	Oral	7
Urticaceae						
<i>Urtica urens</i> L. (MM7161)	Itapallu (a, q); ortiga (s)	Depurative	Aerial part	Infusion	Oral	3
		Diuretic	Aerial part	Infusion	Oral	2
		Prostate disorders	Aerial part	Infusion	Oral	3
		Rheumatism	Aerial part	Crude	Rubbing	4
Valerianaceae						
<i>Valeriana micropterina</i> Wedd. (MM7096)	Valeriana (s)	Leg cramps	Root	Decoction	Oral	2
		Tranquilizer	Root	Decoction	Oral	6
Verbenaceae						
<i>Aloysia triphylla</i> (L'Hér.) Britton (no voucher collected)	Cedrón (s)	High blood pressure	Aerial part	Decoction	Oral	2
		Stomach pain	Aerial part	Decoction	Oral	4
		Tranquilizer	Aerial part	Decoction	Oral	4
<i>Lampaya castellani</i> Moldenke (MM7135)	Lampaya (a, q)	Kidney ailments	Leaves	Decoction	Oral	5
		Liver ailments	Leaves	Decoction	Oral	2
Viscaceae						
<i>Phoradendron trianae</i> Eichler (MM7065)	Solda que solda, sulta sulta (s)	Andean offerings	Whole plant	Included in <i>mesa de challa</i>	None	8
		Luxations, sprains	Whole plant	Mashed	Cataplasm	10
Not identified specimen (MM7073)	Jentu (a)	Acne	Root	Decoction	Bath	2
		Fever	Root	Decoction	Bath	2
		Vulnerary	Root	Decoction	Bath	3

^a Specimen collected by EG = Emilia García; MM = Manuel J. Macía.

^b Letter in parentheses indicates language: a = Aymara, q = Quechua, s = Spanish.

Among the most versatile species are *Aloe vera*, *Piper elongatum*, and *Taraxacum officinale*, involved in more than five medicinal indications. *Aloe vera* is a worldwide known species used for many different indications, and the uses reported here as a vulnerary and the applications for skin, hair and acne have also been recorded in other Bolivian studies (e.g. De Lucca and Zalles, 1992; Oblitas, 1992; Torrico et al., 1994). The uses of *Piper elongatum* were previously reported by the Kallawayas healers, since this species was one of the most important in their pharmacopoeia (Bastien, 1983; Girault, 1987). *Taraxacum officinale* is a cosmopolitan weed with many uses (e.g. De Lucca and Zalles, 1992; Font Quer, 1995) and in the present study, it was reported for a combination of edible and medicinal uses. Another 10 species were used in four medicinal applications: *Calceolaria buchtieniana*, *Cestrum parqui*, *Chrysanthemum coronarium*, *Ephedra rupestris*, *Malva parviflora*, *Matricaria recutita*, *Medicago sativa*, *Otholobium pubescens*, *Rosmarinus officinalis*, and *Urtica urens*. These species are well-known medicinal plants in South America or the Old World, and all of them were widely used by the Kallawayas healers in Bolivia (Bastien, 1983; Girault, 1987).

3.2. Parts of the plant used, mode of preparation, and administration

Aerial part (29.3%) and leaves (20.7%) were the most frequently used parts of the plant, accounting for 150 indications from a total of 300, followed by whole plant (11.7%), flower (7%), and stem apex (6.3%). There were also other plant parts used in minor percentages such as root, seed, fruits or latex (Table 1). The majority of the commercialized species were fresh plants, but others were dry parts of plants, such as seeds, roots, barks, latexes and resins, marketed only because of their specific medicinal or magic use.

The majority of remedies were prepared from fresh material in the form of a decoction (47.5%) and an infusion (28.6%). According to the informants, usually the harder plant parts must be decocted and the softer prepared in an infusion, but sometimes the differences between both ways of preparation are very small. A 9.1% of the indications were prepared from mashed material and the remaining preparations were used for just a few indications.

The most frequently used mode of remedy administration is oral ingestion (57.5%), followed by baths (15.7%), and cataplasms (7%). Other ways of administration include direct application, such as inhalation, rubbing, or dripping. Today, baths are still an important way of remedy administration to treat some illnesses and pains in Andean societies (e.g. Girault, 1987; Bourdy et al., 2000; Fernandez et al., 2003).

Most diseases and pains were usually treated with a single plant. However, for elaboration of some medicinal preparations a mixture of plants was used. For example, the treatment of luxations, sprains, and even bone fractures was medicated with a mixture that includes *Dodonaea viscosa*, *Phoraden-*

dron trianae, and *Tripodanthus acutifolius*. As an abortive, a decoction that can include until nine different species was elaborated. Furthermore, to alleviate kidney and vesicular disorders, liver ailments, rheumatisms, and an illness complex of colds, fever and coughs, a mixture of several species was also used.

3.3. Medicinal species and their magic applications

A total of 21 species were used as medicinal plants with magic connotations for specific indications, such as an Andean offering (*mesa de challa*), to bring good luck or as a protective against illness or *maldición* (Table 1). Most of these species were well-known by all informants.

Mesa de challa is an Andean offering to *Pachamama* who protects people from illnesses and brings good luck. The species *Loricaria thuyoides*, *Solanum tripartitum*, and the seeds of *Mucuna* sp., *Oenocarpus bataua*, and *Ormosia* sp. were commonly used in the offerings among other different products (colour wools, sweets, plastic or metal figures). Some spiny species, with the generic vernacular name of *espino*, such as *Adesmia miraflorensis*, *Austrocylindropuntia exaltata*, *Corryocactus melanotrichus*, *Dasyphyllum* sp., *Dunalia brachyacantha*, *Echinopsis* sp., *Lobivia* sp., *Opuntia* spp., and *Puya* sp. were always used for *Maldición* and to clean ailments (*limpieza del cuerpo* in Spanish). The Spanish indication *Maldición* means to utter a curse on someone, wishing ailments and pains. Furthermore, some other important species were also used for these indications (e.g. *Rosmarinus officinalis*, *Ruta chalepensis*, and *Spartium junceum*).

For magic remedies, different ways of application have been used, some of them as particular as carrying the specimen in the pocket or scrubbing the floor with a boiled mixture of species. All magic applications were elaborated with a combination of species. For example, to clean ailments and bring good luck, a decoction of 12 spiny species is always used. For Andean offerings to *Pachamama*, a preparation of a variable number of small fragments of plants is the most important material used.

Nowadays, coca (*Erythroxylum coca*) is a very important plant for both magic and traditional medicinal applications, including its social use, divination, or religious practices (Martin, 1970; Duke et al., 1975; Carter, 1996). In La Paz and El Alto, coca leaves are sold in markets and stalls different to those of medicinal plants. All medicinal uses recorded in this study have been previously reported (e.g. Girault, 1987; Oblitas, 1992).

The meaning of magic ethnomedicine to the Andean cultures in Bolivia was not the aim of this article and should be studied more in depth. Some general studies cover this kind of information partially (Bastien, 1982; Salcedo, 1986; Girault, 1987; Oblitas, 1992), but there exists a big lagoon of knowledge about the etiologies of these illnesses and pains (e.g. *aire*, *arrebato*, *limpieza del cuerpo*), and an assessment of their importance in Andean cultures.

3.4. Informant consensus

All species in the present paper are medicinal plants used for a wide variety of purposes, reported by at least six informants (Table 1). All uses reported here were recorded by two or more informants, and in many cases, six or more different people provided remedies for the same indication (Table 1). All species were well-known to all medicinal plant sellers interviewed, and were perfectly recognized by their vernacular names. This means that the medicinal properties of some of these species can seriously be considered for further ethnopharmacological studies, since they are species widely applied by many people and they have been so for a long time.

The majority of medicinal plants were sold in most stalls, but some species were sold at only one place. Despite the women sellers knew most medicinal plants reported here, all species could not be always found in all stalls.

3.5. Origin and status of the species

The majority of species (63.6%) are native from Bolivia, mainly from Andean habitats, although a few species come from tropical montane forests (*Yungas*) or even Amazonian lowlands. An important 36.4% of the species were introduced from different world origins. From our data, 64.3% of the species are wild throughout the country, whereas 35.7% were mostly cultivated in the Andes or *Yungas*. The most frequent plant life forms used for medicinal and magic purposes were herbs (48.1%) and shrubs (34.9%), followed by trees (12.4%), vines or lianas (3.9%), and one species of lichen.

In these markets of La Paz and El Alto, some outstanding wild and cultivated medicinal species from several habitats in Bolivia can be found, offering a fair amount of remedies for an alternative urban phytotherapy. Some alloctonous versatile medicinal species from other American ecosystems, and European or Asian origins, are naturalized or cultivated in the country, and they are now also completely integrated in the Andean phytomedicine.

4. Conclusions

In the two studied markets of La Paz and El Alto, there are medicinal plant remedies to treat a wide spectrum of illnesses and pains, as curatives or palliatives to many health problems. In some cases, the separation between medicinal and magic plant use is very narrow or even non-existing, so frequently some species are used for both purposes (e.g. *Bocconia integrifolia*, *Rosmarinus officinalis*, or *Solanum marginatum*). On the other hand, there exists some species more or less exclusively used for magic purposes (e.g. *Loricaria thuyoides*, *Solanum tripartitum*, and *Spartium junceum*), deeply rooted in the Aymara and Quechua societies.

The informant consensus in the use of many specific remedies is fairly high, what gives an additional validity to this folk

medicine. These Bolivian markets commercialize a great diversity of medicinal plants from different origin, therefore there exists an outstanding herbal pharmacopoeia. The use of medicinal plants is a lower cost natural resource than occidental pharmaceutical remedies (see also Naranjo, 1995), more in accordance with the cultural context of the Andean rural societies where most purchasers come from.

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