Pharmaceutical Biology

ISSN: 1388-0209 (Print) 1744-5116 (Online) Journal homepage: http://www.tandfonline.com/loi/iphb20

Ethnopharmacological inventory of plants used in Coronel Portillo Province of Ucayali Department, Peru

Lucie Polesna, Zbynek Polesny, Mirella Z. Clavo, Anders Hansson & Ladislav Kokoska

To cite this article: Lucie Polesna, Zbynek Polesny, Mirella Z. Clavo, Anders Hansson & Ladislav Kokoska (2011) Ethnopharmacological inventory of plants used in Coronel Portillo Province of Ucayali Department, Peru, Pharmaceutical Biology, 49:2, 125-136, DOI: 10.3109/13880209.2010.504927

To link to this article: http://dx.doi.org/10.3109/13880209.2010.504927

Pharmaceutical Biology, 2011; 49(2): 125–136

ISSN 1388-0209 print/ISSN 1744-5116 online
DOI: 10.3109/13880209.2010.504927

informa
healthcare

RESEARCH ARTICLE

Ethnopharmacological inventory of plants used in Coronel Portillo Province of Ucayali Department, Peru

Lucie Polesna[1], Zbynek Polesny[1], Mirella Z. Clavo[2], Anders Hansson[3], and Ladislav Kokoska[1,4]

[1]Department of Crop Sciences and Agroforestry, Institute of Tropics and Subtropics, Czech University of Life Sciences, Prague, Czech Republic, [2]Herbario Regional de Ucayali, Instituto Veterinario de Investigaciones Tropicales y de Altura, Universidad Nacional Mayor de San Marcos, Pucallpa, Peru, [3]Ametra-Ucayali, Pucallpa, Peru, and [4]Department of Zoology and Fisheries, Faculty of Agrobiology, Food and Natural Resources, Czech University of Life Sciences, Prague, Czech Republic

Abstract

Context: Despite a rich tradition of folk medicinal usage of plants in the Peruvian Amazon, no studies documenting ethnobotanical information of Coronel Portillo Province of Ucayali Department have been published at an international level.

Objective: This field research documented traditional ethnobotanical knowledge related to the local use of medicinal plants.

Materials and methods: Ethnobotanical data were collected in native communities around Pucallpa city (Coronel Portillo Province of Ucayali Department, Peru) and in the city itself during the period June-October 2007. The data were collected through direct interviews with 23 people.

Results: Uses of 30 plant species belonging to 18 families in traditional medicine are described in this article. Botanical and vernacular names, plant part used, popular medicinal use, forms of preparation and applications of the herbal remedies for each species are reported.

Discussion and conclusion: Among investigated species, *Brunfelsia grandiflora* D. Don (Solanaceae), *Calycophyllum spruceanum* (Benth.) K. Schum. (Rubiaceae), *Naucleopsis glabra* Spruce (Moraceae), *Phthirusa pyrifolia* Eichler (Loranthaceae) were identified to be widely used in the studied area. However their beneficial health properties have not been well studied.

Keywords: Ethnobotany, ethnopharmacology, medicinal plants, Peru, Ucayali Department

Introduction

It has been estimated that the flora of Peru represents 10% of the global plant diversity (De-la-Cruz et al., 2007), and about 20,000 species or 8% of the total number of plants that exist in the world can be found in the Peruvian Amazon (Desmarchelier & Schaus, 2000). The richness of this diversity is reflected also in its use; for most people in Peru, it constitutes the prime resource for food, medicine, energy, craft, dye, fiber, art, ritual, and symbolic human activities (De-la-Cruz et al., 2007). Several ethnic groups that have lived in the Peruvian Amazon for centuries, such as the Shipibo-Konibo, Ashaninka, Cashibo-Cacataibo, Amuesha, Matsiguenka, have developed a deep knowledge of the ecosystems they inhabit (Collado-Panduro et al., 2004; Salick, 1989; Wezel & Ohl, 2005). The large number of Amazonian ethnics have practiced consistent application of different plant species for various ailments for millennia, and have transmitted this long-term experience from one generation to the next (Desmarchelier & Schaus, 2000). Among them, the people

Address for Correspondence: Z. Polesny, Department of Crop Sciences and Agroforestry, Institute of Tropics and Subtropics, Czech University of Life Sciences Prague, Kamycka 129, 165 21 Prague 6-Suchdol, Czech Republic. Tel.: +420 224382167. Fax: +420 234381829. E-mail: polesny@its.czu.cz

(Received 22 March 2010; revised 12 June 2010; accepted 25 June 2010)

of the Shipibo-Konibo tribe also developed their own conceptions of wellness and illness and built up ethnomedical systems including therapies based on medicinal plants (Foller, 1995; Lenaerts, 2006). Nonetheless, indigenous peoples are not the only ones who have a detailed knowledge of the local Amazonian ecosystems in which they live. The long-term residents of Amazonia (e.g., mestizos) do as well (Dufour, 1990). Many Amazonian mestizo communities are dependent on traditional medicine as their only source of health care, because of its tradition and lower price than the cost of western therapy. Also, mobility is not unusual among Amazonian mestizos and internal migration has enriched traditional knowledge in their communities, thereby Amazonian mestizos have a large repository of traditional knowledge which may have been adopted from extinct or endangered indigenous cultures (Jovel et al., 1996).

Despite a rich tradition of folk medicinal usage of plants in Peruvian Amazon and certain ethnobotanical studies published (Luna, 1984; Phillips & Gentry, 1993a, 1993b; Jovel et al., 1996), no studies documenting ethnobotanical information of Coronel Portillo Province of Ucayali Department have been published at an international level. Therefore, the purpose of this paper is to document indigenous information on traditional use of medicinal plants and thus help to conserve the rapidly disappearing ethnobotanical knowledge in Coronel Portillo Province of Ucayali Department in Peru.

Methods

Study area

The study was performed in communities of Amerindians of the tribe Shipibo-Konibo (Yarinacocha, San Francisco, Santa Rosa de Dinamarca and Santa Teresita) around Pucallpa city in the Amazon basin of Peru and with mestizos living in the city itself. Pucallpa is administrative center of Coronel Portillo Province and the capital of Ucayali Department (Figure 1). The city lying on the banks of the river Ucayali is located 860 km from Lima with an altitude of 154 m above sea level, 8°23′ S, and 74°31′ W. Ucayali Department borders Brazil to the east, along an east-west gradient leading to the foothills of the Andes. The area of Ucayali Department is 102,410 sq km (13% of the Amazon basin) and is divided into four provinces: Coronel Portillo, Padre Abad, Atalaya and Purus (Pimentel et al., 2004). Pucallpa is characterized by humid tropical forest cover and by a hot and humid climate that varies only imperceptibly throughout the year. The rainfall ranges from 1800 to 3000 mm per year, and the rainy season is from February to May and from September to December (Fujisaka et al., 2000). The mean annual temperature is 25.7°C, and average annual relative humidity reaches 80% (Lojka et al., 2008).

According to the last published national population census in 1993, the Ucayali Department has 331,824 inhabitants; the largest indigenous ethno-linguistic group living in this region is the Shipibo-Konibo group (Figure 2). The traditional agriculture is the primary livelihood of the village people, for food, fodder, fuels, and medicaments (Pimentel et al., 2004). The Shipibo's traditional subsistence system was based on swidden agriculture, fishing, hunting and then gradually shifted to agriculture, perhaps when hunting and gathering brought in insufficient food to support them (Foller, 1995).

Data collection

In four communities studied, all shamans were contacted and then interviews were performed; all herbalist and healers in Pucallpa markets were contacted, but not all of them were willing to cooperate. Consequently, the information was only obtained from persons who acquiesce in cooperation. Each participating respondent was acknowledged with a package of "mapachos" (cigarettes used for smoking by shamans during healing rituals). The study was undertaken with the participation of 23 individuals (12 women, 11 men) whose ages ranged

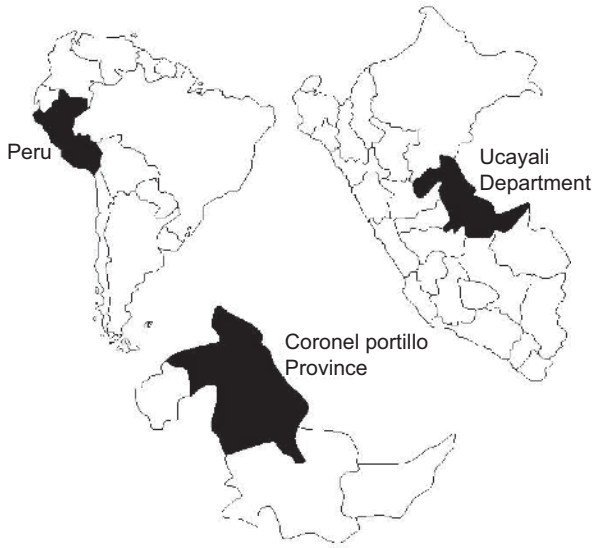

Figure 1. Location of the Coronel Portillo Province and Ucayali Department in Peru.

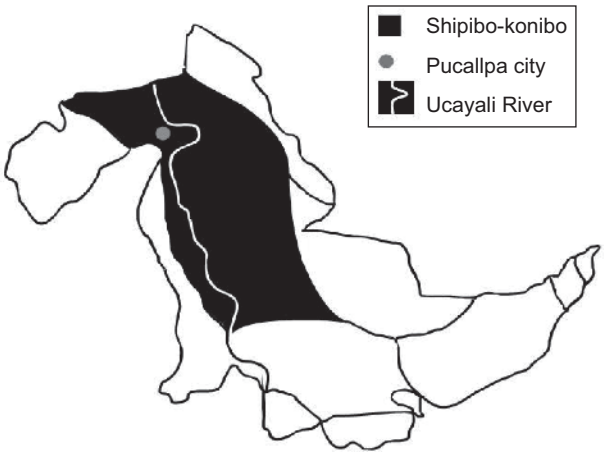

Figure 2. Distribution of Shipibo-Konibo ethnic group in Ucayali Department, Peru (adapted from Pimentel et al., 2004).

from 22 to 78 years in the period June-October 2007. The respondents belonged to two main ethnic groups, 10 were Amerindians of the tribe Shipibo-Konibo and 13 were mestizo people. Since all of the interviewees spoke Spanish or both Spanish and Shipibo-Konibo language, the interviews were conducted in Spanish, to enable them to give accurate information with ease.

The data were collected through a survey employing individual semi-structured interviews (Alexiades & Sheldon, 1996) and a guided open-ended questionnaire (Martin, 2004), using a pre-selected set of reference specimens (Martin, 2004) and free-listing previously used by Quave and Pieroni (2007) and Quinlan (2005). Each questionnaire documented personal data on informants (name, gender, age, ethnicity, linguistic group, occupancy, community of his/her origin, and current settlement) and the ethnobotanical information.

With a view to gathering data especially on prospective species for future biological activity assessment, we have created a pre-selected set of reference specimens (Martin, 2004) based on locally used medicinal plants for which there is a general lack of modern pharmacological studies [e.g., *Calycophyllum spruceanum* (Benth.) K. Schum. (Rubiaceae), *Dracontium loretense* K. Krause (Araceae), *Naucleopsis glabra* Spruce (Moraceae) and *Phthirusa pyrifolia* Eichler (Loranthaceae)]. The preliminary selection of species was based on local available literature focused on medicinal plants used in Ucayali Region (Clavo et al., 2003) or by the Shipibo-Konibo ethnic group (Arevalo, 1994), as well as on ethnobotanical (Duke & Martinez, 1994) or ethnopharmacological literature focused on the Amazon Basin (Desmarchelier & Schaus, 2000). The list of selected species was finalized based on consultations with Anders Hansson and Mirella Clavo, both long-time experienced experts on ethnobotany and ethnopharmacology of medicinal plants traditionally used in the Ucayali Department.

Information on vernacular names, plant part used, popular medicinal use, forms of preparation and applications of the herbal remedies on each selected species was requested. At the end of the questionnaire the interviewees had time for free-listing of species (Quave & Pieroni, 2007) which have medicinal importance for them and were not included in the list. The enquiry on preparation of medicaments was completed by observation of participants (Martin, 2004). The information was immediately registered in field notebooks. The interview prompts were requested, e.g., local counterparts were asked to show the plant species on site. Photographs and voucher specimens of studied plants were prepared according to Alexiades and Sheldon (1996) to document the identity of plant material. All plant material was collected by L. Polesna and subsequently authenticated in cooperation with M. Clavo. Voucher specimens are deposited at the herbarium of the National University of Ucayali in Pucallpa, Peru. The International Plant Names Index (2008) database was used to determine the correct scientific names of studied plant species. The translation of folk names of illnesses to English was consulted with A. Hansson.

Results

The uses of 30 medicinal plants belonging to 18 families are reported in Table 1, in which the plant species are listed in alphabetical order. For each species, the following ethnobotanical and pharmacognostic elements are provided: botanical name, local names, parts used, preparations, ailments treated, total number of reports, and relevant percentage of citations. The most represented families are Euphorbiaceae (4 species), Fabaceae (4), Solanaceae (4), and Rubiaceae (3). These four families together represent 50% of total number of medicinal plants studied. The remaining 50% of species belong to 14 families, each represented by one or two species. According to the number of citations (20 and more) reporting species used in folk medicine *Brunfelsia grandiflora* D. Don (Solanaceae), *C. spruceanum, Croton lechleri* Müll. Arg. (Euphorbiaceae), *Euterpe precatoria* Mart. (Arecaceae), *Jatropha gossypiifolia* L. (Euphorbiaceae), *Maytenus macrocarpa* Briq. (Celastraceae), *N. glabra, P. pyrifolia, Phyllanthus niruri* L. (Euphorbiaceae), *Uncaria guianensis* J.F.Gmel. (Rubiaceae), and *U. tomentosa* D.C. (Rubiaceae) were identified as the most popularly used plants in Coronel Portillo Province of Ucayali Department by both shamans of Shipibo-Konibo communities and herbalists on the markets. Interestingly, although *Equisetum giganteum* L. (Equisetaceae) and *Caesalpinia spinosa* (Molina) Kuntze (Caesalpiniaceae) were observed to be popularly sold by mestizos herbalists on Pucallpa markets and almost all respondents were able to describe indications of these species, there is no cultural tradition in Shipibo-Konibo communities in medicinal treatment by either of these species. The highest number of studied plants (44%) used for medicinal properties of total species are trees, followed by shrubs and herbs represented by 23% and 17%, respectively. Three climbers, one epiphyte and one palm were also identified among investigated species.

The whole aerial part, bark, entire plant, fruits, latex, leaves, mixtures (bark with leaves, bark with leaves and fruits or flowers with leaves), resin, roots, sap, seeds, trunk, and tuber were found to be plant parts used for medicinal properties, whereas the bark of the trunk was the most frequently utilized material (36%), followed by the entire plant (14%). Standard methods of preparation of remedies were observed to be decoction (plant material boiled in water), tincture (plant material soaked in alcohol), infusion (extract in hot water), macerate (extract in cold water), fresh material or cataplasm.

A total of 108 ailments were reported to be treated by the studied plant species, of which 53% were recommended for rheumatism, 50% were described as healing agents for wounds, and 39% are used for kidney disorders. Arthritis, diabetes, prostate problems and stomach ache are cured by 11 species (35%) each. Kidney disorder

was the most often cited health problem by informants (87), followed by wounds (52). The decoction prepared from roots of *E. precatoria* was recommended for kidney disorders by 18 respondents (78%), *M. macrocarpa* and *P. niruri* by 16 (70%) each, and *E. giganteum* by 15 (65%). *C. lechleri* was indicated for wound healing with the highest number of citations (>60%). Eighteen respondents (78%) described cataplasm from *P. pyrifolia* for treatments of fractures. Though all respondents described identical indications for both studied *Uncaria* species, *U. tomentosa* is markedly more used in Coronel Portillo Province. From all ailments described, 19 (18%) were mentioned only once. All of the studied species were described to have multiple uses.

The ethnomedicinal indications were mentioned by more than half of the total number of respondents for 79% of plant species pre-selected by the authors [*B. grandiflora, C. spinosa, C. spruceanum, D. micrantha* Harms (Fabaceae)*, Dipteryx loretense, E. giganteum, Erythrina edulis* Triana (Fabaceae)*, M. macrocarpa, N. glabra, P. pyrifolia, P. niruri, Piper aduncum* Vell. (Piperaceae)*, Solanum mammosum* L. (Solanaceae)*, U. guianensis* and *U. tomentosa*)]. Although for all pre-selected species some ethnopharmacological data were recorded, some plants selected by their medicinal properties and abundance in studied region are used as remedies less frequently [*Pterocarpus rohrii* Vahl. (Fabaceae), *Solanum sessiliflorum* Dunal (Solanaceae)*, Tabebuia chrysantha* G. Nicholson (Bignoniaceae) and *Terminalia catappa* L. (Combretaceae)]. The medicinal properties of *T. catappa* were mentioned by the fewest number of local counterparts.

Discussion

During our survey we identified several plant species whose local medicinal use against specific health disorders have not been previously verified by modern ethnopharmacological methods. Among them, *B. grandiflora* has been subjected to several phytochemical (Lloyd et al., 1985; Brunner et al., 2000; Fuchino et al., 2008) and biological activity-related studies showing *in vitro* antibacterial (Kloucek et al., 2005) and leishmanicidal (Fuchino et al., 2008) effects of this species. However, despite extensive use of tincture prepared from its root as a popular remedy for rheumatism and arthritis recorded during our study, which is moreover in correspondence with ethnopharmacological indications previously summarized by Desmarchelier and Schaus (2000), we did not find any modern pharmacological reports dealing with evaluation of anti-inflammatory activity of *B. grandiflora*. Similarly, with the exception of papers on antimicrobial (Kloucek et al., 2007) and antioxidant (Svobodova et al., 2007) activities of *N. glabra*, the species for which the frequent use of bark tincture against arthritis and rheumatism was recorded in this study, there are no reports confirming experimentally the anti-inflammatory properties of this plant. In correspondence with previously described traditional uses of *C. spruceanum* for treatment of influenza, mycoses, and other diverse infections in various regions of Amazonia (Zuleta et al., 2003) we observed frequent use of this species against acne, cough, diarrhea, ulcers, and vaginal infections indicating the anti-infective properties of this plant. However, despite solitary reports on *in vitro* antioxidant activity of *C. spruceanum* stem bark extract (Svobodova et al., 2007) and presence of iridoids (Zuleta et al., 2003) the pharmacology and phytochemistry of this species are poorly known; there are no available studies on its potential antimicrobial properties. Similarly, the tubers of *D. loretense* widely used by local healers against rheumatism, snakebites, abdominal pains or gastritis have only poorly been studied for their pharmacological properties (Desmarchelier et al., 1997; Kloucek et al., 2005). In the case of *P. pyrifolia*, which in the region studied is commonly used for treatments of fractures and muscle injuries, modern studies focused on biological effects of the plant are almost completely lacking.

By comparing the data obtained on the ethnopharmacological use of plants in Coronel Portillo Province with those of inventories performed with other mestizo and Quechua communities (Jovel et al., 1996; Sanz-Biset et al., 2009), we find several species reported in our article, such as *B. grandiflora, C. spruceanum, E. precatoria, Hura crepitans* L. (Euphorbiaceae)*, M. macrocarpa, Physalis angulata* L. (Solanaceae)*, Piper peltatum* L. (Piperaceae), *S. mammosum, S. sessiliflorum, U. tomentosa*, and *U. guianensis,* to be also traditionally used in different geographical areas of the Peruvian Amazon; however, the methods of and reasons for their use varied in many recorded cases. For example, in contrast to mestizos from the Suni-Mirano community (Jovel et al., 1996), respondents from Coronel Portillo Province did not mention *P. peltatum* as a plant causing male impotency but they referred to the sap of this species as an agent for the treatment of conjunctivitis. Similarly, some species commonly sold in Pucallpa markets such as *Anacardium occidentale* L. (Anacardiaceae)*, C. spinosa, Cordia alliodora* Cham. (Boraginaceae)*, C. lechleri, E. giganteum, J. gossypiifolia, P. niruri, P. aduncum, S. mammosum,* and *Uncaria tomentosa* were recorded by Bussmann and Sharon (2006) at markets in Northern Peru, but their uses differed in some cases for each compared market place. Based on these facts, we suppose that popular medicinal uses of species mentioned above in several regions of Peruvian Amazon indicate their prospective pharmacological properties and suggest these plants as promising materials for detailed verification of their biological activities and chemical composition.

Conclusions

This report documents ethnobotanical data on 30 medicinal plants traditionally used by shamans of the Shipibo-Konibo tribe and mestizo healers in Coronel Portillo Province of Ucayali Department in Peru. Based

Table 1. Medicinal plants used in Coronel Portillo Province of Ucayali Department.

Botanical name, voucher specimen, family, life form and methodology*	Local names†	Parts used	Uses/ailments treated	Preparations (administration)‡	Citations (*n*)	Citations (%)
Abuta grandifolia (Mart.) Sandwith (Kut 048) Menispermaceae Climber Free-listing	Abuta (S), Nishipacha (Sh)	Bark	Diabetes	Decoction (I)	10	43.5
			Malaria, stomachache, nutritional disorders, hernia	Decoction (I)	2	8.7
			Cancer, blood cleaning, arthritis, premature infant	Decoction (I)	1	4.4
		Trunk	Blood cleaning	Decoction (I)	2	8.7
			Vaginal problems	Decoction (E)	1	4.4
			Diabetes, purgative	Decoction (I)	1	4.4
Amburana cearensis (Fr.Allem.) A.C.Sm. (Kut 029) Fabaceae Tree Free-listing	Ishpingo colorado (S), quinshon (Sh)	Bark	Cold	Decoction (I)	4	17.4
			Diabetes, anemia	Decoction (I)	2	8.7
			After operations, tiredness, cancer, stomachache, vomiting, rheumatism, pain of ovaries, bronchitis, asthma, cough, fever, dysentery, diarrhea, respiratory problems	Decoction (I)	1	4.4
		Resin	Wounds, bites of insect	Decoction (E)	1	4.4
Anacardium occidentale L. (Kut 098) Anacardiaceae Tree Free-listing	Marañón (S), Casho (Sh)	Bark	Diarrhea	Decoction (I)	10	43.5
			Dysentery, hemorrhage, diabetes	Decoction (I)	2	8.7
			Stomach sickness, abdominal pains	Decoction (I)	1	4.4
		Bark and leaves	Diarrhea	Decoction (I)	2	4.4
			Inner injuries	Decoction (I)	1	4.4
		Seeds	Skin infections, skin fungi	Roasted (E)	1	4.4
Brunfelsia grandiflora D. Don (Kut 045) Solanaceae Shrub Predetermined	Chiric-sanango, sanango (S)	Root	Rheumatism	Tincture (I)	7	30.4
			Arthritis	Tincture (I)	4	17.4
			Cold	Decoction (I)	4	17.4
			Tiredness	Decoction (I)	3	13.0
			Pain of ovaries, sexual potency, cold, pain of bones	Tincture (I)	2	8.7
			Rheumatism, laziness, cancer of uterus	Decoction (I)	1	4.4
		Bark	Flu	Decoction (I), tincture (I)	2	8.7
		Leaves	Cold	Decoction (I)	2	8.7
			Rheumatism, arthritis	Decoction (I)	1	4.4
Caesalpinia spinosa (Molina) Kuntze (Kut 049) Caesalpiniaceae Shrub Predetermined	Tara (S)	Fruits	Vocal chord disorders	Decoction (I)	6	26.1
			Neurosis, kidney disorders	Decoction (I)	2	8.7
			Anesthetic, infections, wounds	Tincture (I)	1	4.4
		Flowers and leaves	Fever, vomiting	Infusion (I)	1	4.4
Calycophyllum spruceanum (Benth.) K.Schum. (Kut 039) Rubiaceae Tree Predetermined	Capirona (S)	Bark	Wounds	Decoction (E)	9	39.1
			Burns	Decoction (E)	7	30.4
			Cancer	Decoction (I)	3	13.0
			Pellagra	Bath	3	13.0

Table 1. continued on next page

Table 1. Continued.

Botanical name, voucher specimen, family, life form and methodology*	Local names†	Parts used	Uses/ailments treated	Preparations (administration)‡	Citations (*n*)	Citations (%)
			Cicatrizing	Decoction (E)	3	13.0
			Acne	Decoction (E)	3	13.0
			Hemorrhage, ulcers, inner injuries	Decoction (I)	2	8.7
			Cough, asthma, vaginal hemorrhage, abdominal pains	Decoction (I)	1	4.4
			Scars, vaginal infections, hemorrhoids	Decoction (E)	1	4.4
Cordia alliodora Cham. (Kut 050) Boraginaceae Tree Free-listing	Ajos-quiro (S)	Bark	Pain of bones	Tincture (I)	3	13.0
			Rheumatism, cold	Tincture (I)	2	8.7
			Bronchitis, prostate	Tincture (I)	1	4.4
			Rheumatism	Cataplasm	1	4.4
			Inflammation, arthritis	Decoction (I)	1	4.4
		Bark and leaves	Cold	Bath	3	13.0
			Rheumatism	Bath	2	8.7
		Roots	Arthritis, rheumatism	Cataplasm	2	8.7
Croton lechleri Müll. Arg. (Kut 046) Euphorbiaceae Tree Free-listing	Sangre de grado (S), himimosho (Sh)	Resin	Wounds	Fresh (E)	14	60.9
			Ulcers	Fresh (I)	11	47.8
			Gastritis, cancer	Fresh (I)	5	21.7
			Inner injuries, hemorrhage	Fresh (I), macerate (I)	4	17.4
			Vaginal infections	Fresh (E)	4	17.4
			AIDS, after operations, stomach ulcers	Fresh (I), macerate (I)	2	8.7
			Gonorrhea, diarrhea, cancer of uterus, pancreas, tuberculosis, abdominal pains, cold, flu, bronchitis	Fresh (I), macerate (I)	1	4.4
Dipteryx micrantha Harms (Kut 027) Fabaceae Tree Predetermined	Shihua-huaco (S)	Bark	Cold	Decoction (I), Tincture (I)	5	21.7
			Rheumatism, arthritis, sexual potency	Tincture (I)	3	13.0
			Tiredness	Decoction (I)	3	13.0
			All illnesses, prostate	Decoction (I)	1	4.4
			Conjunctivitis	Decoction (E)	1	4.4
Dracontium loretense K.Krause (Kut 026) Araceae Herb Predetermined	Jergón-sacha (S), rununguro (Sh), shengo (Sh)	Tuber	Abdominal pains	Decoction (I)	7	30.4
			Rheumatism, snake bites	Cataplasm	4	17.4
			Gastritis	Decoction (I)	2	8.7
			Wounds, nicks, pains, inflammations	Cataplasm	1	4.4
			Injuries, hemorrhage, kidney disorders, tumors, rheumatism, hernia	Decoction (I)	1	4.4
			Depressions, sexual potency	Tincture (I)	1	4.4

Table 1. continued on next page

Table 1. Continued.

Botanical name, voucher specimen, family, life form and methodology*	Local names†	Parts used	Uses/ailments treated	Preparations (administration)‡	Citations (*n*)	Citations (%)
Equisetum giganteum L. (Kut 025) Equisetaceae Herb Predetermined	Cola de caballo (S)	Entire plant	Kidney disorders	Decoction (I)	15	65.2
			Prostate	Decoction (I)	5	21.7
			Vesicles	Decoction (I)	4	17.4
			Liver disorders, diuretic, urinal infections, kidney stones	Decoction (I)	1	4.4
Erythrina edulis Triana (Kut 077) Fabaceae Tree Predetermined	Amasisa (S), casho (Sh)	Bark and leaves	Inflammation	Decoction (I)	4	17.4
			Fever	Decoction (I)	3	13.0
			Wounds	Decoction (E)	2	8.7
			High blood pressure, tumors, diarrhea, rheumatism	Decoction (I)	1	4.4
		Leaves	Fever, body cleaning, headache	Bath	2	8.7
			Burns, vaginal problems	Bath	1	4.4
		Bark	Malaria, intestinal parasites	Tincture (I)	1	4.4
Euterpe precatoria Mart. (Kut 070) Arecaceae Palm Free-listing	Huasaí (S)	Roots	Kidney disorders	Decoction (I)	18	78.3
			Prostate, liver disorders	Decoction (I)	3	13.0
			Hemorrhage	Decoction (I)	2	8.7
			Hernia, stomach sickness, fever, urinal infections, malaria, diuretic, hepatitis, kidney stones, diabetes	Decoction (I)	1	4.4
		Seeds	Diarrhea	Decoction (I)	1	4.4
Hura crepitans L. (Kut 065) Euphorbiaceae Tree Free-listing	Catahua (S), ana (Sh)	Latex	Bites of spiders, pains	Fresh (E)	2	8.7
			Intestinal parasites	Tincture (I)	3	13.0
			Tumors	Tincture (I)	2	8.7
			Skin fungi, leprosies, pain of bones	Tincture (E), fresh (E)	1	4.4
			Cold, lack of appetite, tremble, cancer	Tincture (I)	1	4.4
			Constipation	Decoction (I)	1	4.4
		Leaves	Cold, parasites, inner injuries, rheumatism, AIDS, all illnesses	Infusion (I)	1	4.4
		Bark	Snake bites, wounds	Tincture (E)	2	8.7
Jatropha gossypiifolia L. (Kut 024) Euphorbiaceae Shrub Free-listing	Piñón Colorado (S)	Sap	WoundsVaginal infections	Fresh (E)	6	26.1
				Macerate (E)	3	13.0
		Leaves	Headache, Constipation, Body cleaning, fever, pain of bones, Inflammation of digestive system, intestinal problems	Bath	5	21.7
				Macerate (I)	3	13.0
				Bath	3	13.0

Table 1. continued on next page

Table 1. Continued.

Botanical name, voucher specimen, family, life form and methodology*	Local names†	Parts used	Uses/ailments treated	Preparations (administration)‡	Citations (*n*)	Citations (%)
Maytenus macrocarpa Briq. (Kut 028) *Celastraceae* Tree Predetermined	Chuchu-huasi (S)	Bark	Cold	Tincture (I), Decoction (I)	16	69.6
			Diarrhea		4	17.3
			Arthritis, rheumatism	Tincture (I)	3	13.0
			Anemia	Tincture (I)	2	8.7
			Wounds, bites of insect	Decoction (E)	2	8.7
			All illnesses, impotency, menstrual pains, tremble, ulcers, asthma, bronchitis, colic	Tincture (I)	1	4.4
			Blood cleaning, immunity, pains, stomachache, ulcers	Decoction (I)	1	4.4
Naucleopsis glabra Spruce (Kut 078) Moraceae Tree Predetermined	Tamamuri (S), shana (Sh)	Bark	Arthritis	Tincture (I)	8	34.8
			Rheumatism	Tincture (I)	5	21.7
			Pain of bones, cold	Decoction (I)	3	13.0
			Menstrual problems, diarrhea	Tincture (I)	2	8.7
			Hemorrhage, cough, anemia, dysentery, colic, abdominal pains, prostate	Tincture (I)	1	4.4
			Injuries, kidney disorders, infections, cancer	Decoction (I)	1	4.4
Petiveria alliacea L. (Kut 047) Phytolaccaceae Herb Free-listing	Mucura (S), boanis (Sh)	Aerial part	Bad mood	Bath	8	34.8
			Prevention of flu	Bath	5	21.7
			Headache, chill	Bath	2	8.7
			Fever, rheumatism, arthritis, pain of bones	Bath	1	4.4
Phthirusa pyrifolia Eichler (Kut 096) Loranthaceae Epiphyte Predetermined	Suelda con suelda (S)	Entire plant	Fracture	Cataplasm	18	78.3
			Muscle injuries	Cataplasm	8	34.8
			Hernia, prostate, kidney disorders	Decoction (I)	1	4.4
Phyllanthus niruri L. (Kut 092) Euphorbiaceae Herb Predetermined	Chanca-piedra (S)	Entire plant	Kidney disorders	Decoction (I)	16	69.6
			Gall bladder problems	Infusion (I)	4	17.4
			Ulcers	Decoction (I)	3	13.0
			Liver inflammation, stomachache, diuretic, pancreas disorders	Decoction (I)	2	8.7
			Pains, heart problems, syphilis, colic, kidney stones, rheumatism, sexual potency, cholesterol, abdominal pains, vaginal problems	Decoction (I)	1	4.4
Physalis angulata L. (Kut 040) Solanaceae Herb Free-listing	Bolsa-mullaca (S), shimon (Sh)	Leaves	Skin fungi, wounds	Cataplasm, fresh juice (E)	3	13.0
			Gall bladder problems	Decoction (I)	3	13.0
			Allergy, bronchitis, pellagra, diabetes	Decoction (I), infusion (I)	1	4.4
			Bites of insect, scabies	Cataplasm	1	4.4

Table 1. continued on next page

Table 1. Continued.

Botanical name, voucher specimen, family, life form and methodology*	Local names†	Parts used	Uses/ailments treated	Preparations (administration)‡	Citations (*n*)	Citations (%)
Piper aduncum Vell. (Kut 035) Piperaceae Shrub Predetermined	Matico (S), yaushijotonte (Sh)	Leaves	Kidney disorders	Decoction (I)	5	21.7
			Vaginal infections	Decoction (E)	4	17.4
			Inflammation, stomachache	Decoction (I)	3	13.0
			After operations, pains, prostate, cold, bronchitis	Decoction (I), Infusion (I)	2	8.7
			Wounds, blisters	Decoction (E)	1	4.4
			Menstrual pains, gastritis	Decoction (I)	1	4.4
Piper peltatum L. (Kut 036) Piperaceae Shrub Free-listing	Santa maria (S)	Sap	Conjunctivitis	Macerate (E)	6	26.1
			Fever	Macerate (I)	2	8.7
		Leaves	Abdominal pains	Decoction (I)	4	17.4
			Inflammations, rheumatism	Infusion (I)	2	8.7
			Abdominal pains, neurosis, urinal problems	Infusion (I)	1	4.4
Pterocarpus rohrii Vahl. (Kut 044) Fabaceae Tree Predetermined	Yahaur-caspi (S)	Bark	Rheumatism	Decoction (I)	3	13.0
			Cold	Tincture (I)	2	8.7
			All illnesses, arthritis, anemia, gastritis, osteoporosis, stomach sickness	Decoction (I)	1	4.4
			Chill	Cataplasm	1	4.4
Solanum mammosum L. (Kut 031) Solanaceae Shrub Predetermined	Chuco de vaca (S), tinctona (S), topopo (Sh)	Fruit	Skin fungi	Cataplasm	14	60.9
			Infertility	Decoction (I)	2	8.7
			Skin infections	Cataplasm	2	8.7
			Bites of insect, wounds	Cataplasm	1	4.4
Solanum sessiliflorum Dunal (Kut 033) Solanaceae Shrub Predetermined	Cocona (S), popo (Sh)	Fruit	Burns, wounds	Fresh juice (E)	4	17.4
			Diabetes	Tincture (I), decoction (I)	3	13.0
			Diarrhea, blood pressure, neurosis	Tincture (I), decoction (I)	1	4.4
			Snake bites, skin infections	Cataplasm	1	4.4
Tahuarí G. Nicholson (Kut 043) Bignoniaceae Tree Predetermined	Tahaurí (S)	Bark	Diabetes	Decoction (I)	3	13.0
			Arthritis, impotency, cold	Tincture (I), decoction (I)	2	8.7
			Aphrodisiac, rheumatism, tuberculosis	Tincture (I), decoction (I)	1	4.4
Terminalia catappa L. (Kut 023) Combretaceae Tree Predetermined	Almendra (S), Anacota (Sh)	Leaves	Diabetes, women sterility	Infusion (I)	2	8.7
			Blood pressure, blood cleaning, cholesterol, liver problems, gall bladder problems	Infusion (I)	1	4.4
		Bark	Kidney disorders, inner injuries	Decoction (I)	1	4.4

Table 1. continued on next page

Table 1. Continued.

Botanical name, voucher specimen, family, life form and methodology*	Local names†	Parts used	Uses/ailments treated	Preparations (administration)‡	Citations (*n*)	Citations (%)
Uncaria guianensis J.F. Gmel. (Kut 042) Rubiaceae Climber Predetermined	Uña de gato (S)	Bark	Kidney disorders	Decoction (I)	12	52.2
			Cancer	Decoction (I)	9	39.1
			Rheumatism, ulcers, vesicular problems, prostate, inner injuries	Decoction (I)	3	13.0
			Stomachache, wounds, blood cleaning, gastritis, liver disorders, infections	Decoction (I)	2	8.7
			AIDS, arthritis, sexual potency, low blood pressure, urinal infections, intestinal parasites, anemia, diabetes	Decoction (I)	1	4.4
Uncaria tomentosa D.C. (Kut 041) Rubiaceae Climber Predeterninded	Uña de gato (S)	Bark	Kidney disorders	Decoction (I)	12	52.2
			Cancer	Decoction (I)	9	39.1
			Inflammation,	Decoction (I)	4	17.4
			Rheumatism, ulcers, vesicular problems, prostate, inner injuries	Decoction (I)	3	13.0
			Stomachache, wounds, blood cleaning, gastritis, liver disorders, infections	Decoction (I)	2	8.7
			AIDS, arthritis, sexual potency, low blood pressure, urinal infections, intestinal parasites, anemia, diabetes	Decoction (I)	1	4.4

*Methodology: free-listing, predetermined (indicates whether the plants were chosen by authors or added to the list by informants).
†Local names: (S): Spanish; (Sh): Shipibo-Konibo.
‡Way of administration: (E) external use; (I) internal use.

on the results achieved, we can conclude that the frequency of traditional medicinal use in studied area recorded for several species described in this study, namely *B. grandiflora, C. spruceanum, C. lechleri, E. precatoria, J. gossypiifolia, M. macrocarpa, N. glabra, P. pyrifolia, P. niruri, U. guianensis,* and *U. tomentosa* supported by similarities of their popular medicinal uses in different regions of the Peruvian Amazon indicate their significant ethnopharmacological properties. Moreover, the lack of modern scientific data documenting health beneficial effects of several of the above-mentioned species such as *B. grandiflora*, *C. spruceanum*, *N. glabra*, or *P. pyrifolia* suggests these plants as promising materials for detailed evaluation of their chemical and pharmacological characteristics. In addition, we believe that the ethnobotanical information collected in this study may significantly contribute to biodiversity conservation and preservation of traditional knowledge on medicinal plants of the region studied.

Acknowledgments

The authors are very thankful to all informants for sharing their ethnobotanical knowledge.

Declaration of interest

This research was supported by the Czech Republic's Development Cooperation project (23/MZe/B/07-10), the Youth Activity Fund of Explorers Club, the Foundation "Nadani Josefa, Marie a Zdenky Hlavkovych", and the Czech University of Life Sciences Prague (CIGA 20085001).

References

Alexiades MN, Sheldon JW, eds. (1996). *Selected Guidelines for Ethnobotanical Research: A Field Manual*. New York: New York Botanical Garden.

Arevalo GV. (1994). *Medicinal plants and their health beneficial properties: Shipibo-Conibo*. Lima, Peru: Asociación Interétnica de Desarrollo de la Selva Peruana (AIDESEP).

Brunner G, Burger U, Castioni P, Kapetanidis I, Christen P. (2000). A novel acylated flavonol glycoside isolated from *Brunfelsia grandiflora* ssp. *grandiflora*. Structure elucidation by gradient accelerated NMR spectroscopy at 14T. *Phytochem Anal*, 11, 29–33.

Bussmann RW, Sharon D. (2006). Traditional medicinal plant use in Northern Peru: Tracking two thousand years of healing culture. *J Ethnobiol Ethnomed*, 2, 47.

Chen PS, Li JH, Liu TY, Lin TC. (2000). Folk medicine *Terminalia catappa* and its major tannin component, punicalagin, are effective against bleomycin-induced genotoxicity in Chinese hamster ovary cells. *Cancer Lett*, 152, 115–122.

Clavo ZMP, Seijas ZPC, Alegre JO. (2003). *Medicinal plants used by native and mestizo women in the Ucayali Region*. Pucallpa, Peru: IVITA, INIA, ICRAF, Impresiones Full Color SRL.

Collado-Panduro L, Arroyo M, Riesco A, Chavez Servia JL. (2004). Experiences on crop diversity and economic aspects of in situ conservation in the central Peruvian Amazon. In: Chavez-Servia JL, Tuxill J, Jarvis DI, eds. *Management of crop diversity in traditional agroecosystems*. Cali, Colombia: Instituto Internacional de Recursos Fitogenéticos, pp. 188–198.

De-la-Cruz H, Vilcapoma G, Zevallos PA. (2007). Ethnobotanical study of medicinal plants used by the Andean people of Canta, Lima, Peru. *J Ethnopharmacol*, 111, 284–294.

Desmarchelier C, Repetto M, Coussio J, Llesuy S, Ciccia G. (1997). Total reactive antioxidant potential (TRAP) and total antioxidant reactivity (TAR) of medicinal plants used in southwest Amazonia (Bolivia and Peru). *Int J Pharmacog*, 35, 288–296.

Desmarchelier C, Schaus FW. (2000). *Sixty Medicinal Plants from the Peruvian Amazon: Ecology, Ethnomedicine and Bioactivity*. Lima, Peru: Neotropico Medicinal Consultants. Cristian Desmarchelier - Fernando Witting.

Dufour DL. (1990). Use of tropical rainforests by native Amazonians. *BioScience*, 40, 652–659.

Duke JA, Martinez RV. (1994). *Amazonian Ethnobotanical Dictionary*. Boca Raton: CRC Press.

Foller ML. (1995). Future health of indigenous peoples: A human ecology view and the case of the Amazonian Shipibo-Conibo. *Futures*, 27, 1005–1023.

Fuchino H, Sekita S, Mori K, Kawahara N, Satake M, Kiuchi F. (2008). A new leishmanicidal saponin from *Brunfelsia grandiflora*. *Chem Pharm Bull*, 56, 93–96.

Fujisaka S, Escobar G, Veneklaas EJ. (2000). Weedy fields and forests: Interactions between land use and the composition of plant communities in the Peruvian Amazon. *Agr Ecosyst Environ*, 78, 175–186.

International Plant Names Index (2008). Available at http://www.ipni.org (accessed 12 December 2008).

Jovel EM, Cabanillas J, Towers GHN. (1996). An ethnobotanical study of the traditional medicine of the mestizo people of Suni Mirafio, Loreto, Peru. *J Ethnopharmacol*, 53, 149–156.

Kloucek P, Polesny Z, Svobodova B, Vlkova E, Kokoska L. (2005). Antibacterial screening of some Peruvian medicinal plants used in Calleria District. *J Ethnopharmacol*, 99, 309–312.

Kloucek P, Svobodova B, Polesny Z, Langrova I, Smrcek S, Kokoska L. (2007). Antimicrobial activity of some medicinal barks used in Peruvian Amazon. *J Ethnopharmacol*, 111, 427–429.

Lenaerts M. (2006). Substances, relationships and the omnipresence of the body: An overview of Ashéninka ethnomedicine (Western Amazonia). *J Ethnobiol Ethnomed*, 2, 49.

Lin CC, Kan WS. (1990). Medical plants used for the treatment of hepatitis in Taiwan. *American Journal of Chinese Medicine*, 18, 38–43.

Lloyd HA, Fales HM, Goldman ME, Jerina DM, Plowman T, Schultes RE. (1985). Brunfelsamidine: A novel convulsant from the medicinal plant *Brunfelsia grandiflora*. *Tetrahedron Lett*, 26, 2623–2624.

Lojka B, Lojkova J, Banout J, Polesny Z, Preininger D (2008). Performance of an improved fallow system in the Peruvian Amazon – Modelling approach. *Agroforest Syst*, 72, 27–39.

Luna LE. (1984). The healing practices of a Peruvian shaman. *J Ethnopharmacol*, 11, 123–133.

Martin GJ. (2004). *Ethnobotany: A Methods Manual*. London: Earthscan.

Morton JF. (1985). Indian almond (*Terminalia Catappa*), salt-tolerant, useful, tropical tree with nut worthy of improvement. *Econ Bot*, 39, 101–112.

Phillips O, Gentry AH. (1993a). The useful plants of Tambopata, Peru: I. Statistical hypotheses tests with a new quantitative technique. *Econ Bot*, 47, 15–32.

Phillips O, Gentry AH. (1993b). The useful plants of Tambopata, Peru: II. Additional hypothesis testing in quantitative ethnobotany. *Econ Bot*, 47, 33–43.

Pimentel LV, Rengifo EB, Portomisnski RL (2004). *The great encyclopedia of the Ucayali Region: Peruvian Amazon: Regional identity*. Lima, Peru: El Comercio.

Quave CL, Pieroni A. (2007). Traditional health care and food and medicinal plant use among historic Albanian migrants and Italians in Lucania, Southern Italy. In: Pieroni A, Vandebroek I, eds. *Travelling Cultures and Plants: The Ethnobiology and*

Ethnopharmacy of Human Migrations. New York: Berghahn Books, 204–226.

Quinlan M. (2005). Considerations for collecting freelists in the field: Examples from ethnobotany. *Field Method*, 17, 1–16.

Salick J. (1989). Ecological bases of Amuesha agriculture, Peruvian Upper Amazon. *Adv Econ Bot*, 7, 189–212.

Sanz-Biset J, Campos-de-la-Cruz J, Epiquién-Rivera MA, Canigueral S. (2009). A first survey on the medicinal plants of the Chazuta valley (Peruvian Amazon). *J Ethnopharmacol*, 122, 333–362.

Schultes RE, Raffauaf RF. (1990). The Healing Forest. Portland, OR: Dioscorides Press.

Svobodova B, Kokoska L, Kutilkova L, Polesny Z. (2007). Antioxidant activity of selected Peruvian medicinal plants used in Calleria District. *Planta Med*, 73, 989.

Wezel A, Ohl J. (2005). Does remoteness from urban centres influence plant diversity in homegardens and swidden fields? A case study from the Matsiguenka in the Amazonian rain forest of Peru. *Agroforest Syst*, 65, 241–251.

Zuleta LMC, Cavalheiro AJ, Silva DHS, Furlan M, Young MCM, Albuquerque S, Castro-Gamboa I, Bolzani VD. (2003). Seco-iridoids from *Calycophyllum spruceanum* (Rubiaceae). *Phytochemistry*, 64, 549–553.