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THE ETHNOPHARMACOLOGICAL STUDY OF MEDICINAL PLANTS USED BY SPECIALIST THERAPISTS OF THE KOM-MENGAME FOREST CONSERVATION COMPLEX, SOUTH CAMEROON

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ABSTRACT

Since time immemorial, medicinal plants have been widely used for primary health care by human communities and the associated knowledge was transmitted through generations. But the medicinal knowledge and practices that traditional societies have accumulated are rapidly disappearing as traditional cultures and knowledge weaken with modern society homogenization. The undertaking of this study was to identify medicinal plants and to document their traditional uses in the Kom-Mengame forest conservation complex (South Cameroon). To achieve this objective we carried out an ethnobotanical survey during 45 days in the forest where semi-structured interviews were conducted with local therapists. A total of 47 informants including 2 Baka hunter-gatherers and 45 Fang participated in the survey. The informant consensus was calculated to evaluate the variability of the use of medicinal plants and to determine whether plants are of particular interest in the research of bioactive ingredients. Relative importance index of the use of plant species was also evaluated by calculating the Medicinal Importance (MI). The Informants' Consensus Factor (F_{ICF}) ranged between 0.25 and 1.0, revealing a high homogeneity in the majority of the reported illness categories. The highest values of informant consensus factor were obtained for hemiplegia and ears' diseases. A total of 40 plants used by local specialist therapists known very well in the community were recorded. The present set of ethnobotanical information is important with regards of the potential development of cheaper and more available drugs for various diseases.

KEYWORDS: Medicinal plants, informant consensus factor, Medicinal important index, ethnopharmacological detailed preparation of herbal medicines, need of medicinal plants conservation.

INTRODUCTION

For thousands of years, traditional societies have used plants to ease their pains, cure their ailments and heal their wounds. From generation to generation, they have transmitted their knowledge and their experiences, mainly through unstable tradition. Thus even now, despite the progress of pharmacology, the therapeutic use of medicinal plants is very present in Central Africa and represents an effective alternative to the absence of inadequacy of modern medical systems, particularly in rural areas. More globally Martins Ekor [1] estimates that 80% of the world's population uses plants for their health problems. About 8000 people live in the 35 surrounding villages of Kom-Mengamé forest conservation complex and comprising Boulou, Fang and Baka hunter-gatherers as main ethnic groups. In this Kom-Mengame forest reserve, indigenous medical knowledge stills more important because of lack of health facilities. Additionally, the knowhow on medicinal plants is currently held by only few people and knowledge on plant uses and practices are orally transmitted from generation to generation [2-3]. It becomes crucial to identify and document important medicinal plants of Kom-Mengame forest conservation complex, for sustainable exploitation.

A floristic survey was conducted within the reserve using 56 transects covering 68.3 ha [4]. Ethnopharmacological data collection was conducted simultaneously with this floristic inventory of the complex. During field works, semi-structured interviews were conducted with local therapists serving as field guides, which are knowledgeable native informants. A total of 47 informants including of 2 Baka hunter-gatherers and 45 Fang participated in the survey. Information regarding plants, plant parts used, mode of preparation and administration were documented. Plant species were identified using floras of vascular plants of Cameroon and other central African countries [5-9]. Voucher specimens of unknown species were collected and preserved using standard herbarium techniques, and their identification was confirmed at the National Herbarium of Cameroon.

Data analysis

Determination of informant consensus factor

The ethnopharmacological data were assigned into 29 categories of illnesses and the homogeneity on the informants' knowledge was assessed by calculating the Informants' Consensus Factor (F_{ICF}) [10] using the following formula:

$$F_{ICF} = \frac{Nur - Nsp}{Nur - 1}$$

Where Nur is the number of use reports for a particular illness category and Nsp is the number of species cited for the same particular illness category by all informants. F_{ICF} values range between 0 and 1, where '1' indicates the highest level of consensus. Thus, high F_{ICF} can be used to identify important plant species for search of novel bioactive compounds.

To determine which medicinal plants are culturally most important for the native community, the Index of Medicinal Importance (MI) which is a relative importance index of the use of plant species was calculated by dividing the number of use reports cited for a specific disorder or ailment category by the number of species which have this use [11].

Pharmacognostic review

The chemical and pharmacological information on the recorded plants was assessed based on previous researches.

RESULTS

Number of local therapists recorded

Our set of local therapists presents 4 categories: people who are known as medical specialists by the community, people who only know few traditional medicines, and people who are specialists in home remedies and who train members of community how to use them and people who perform ritual cleansing ceremonies. These categories are presented in table 1.

Table 1: Distribution of local therapists

Categories of local therapists	Number	Age range	NPCLT
People who are known as medical specialists by the community	20	45-86	40
People who only know few traditional medicines	14	31-50	35
People who are home specialist	11	35-74	80
people who perform ritual cleansing ceremonies	15	40-76	30
Total	60		185 with repeated species

NPCLT: Number of plants per category of local therapists

In the present article we are going to describe only the 40 plants recorded nearby local specialist therapists.

Therapeutic indications

The Informants' Consensus Factor values range between 0 and 1 as illustrated in table 2. The highest values were obtained for hemiplegia and ears' diseases. The numbers of plants per category of uses include the repetitions of some species. Then the exact number of plants recorded is equal to the reported number of plants minus the number of plants' repetitions (table 2).

Table 2: Principal diseases treated and non-medical practices in Kom-Mengame forest conservation Complex.

Indigenous medical uses	Number of plant species (Nsp)	Number of repetitions between uses	Number of uses-reports (Nur)	Informants' consensus factor (F _{ICF})	Medicinal Importance Index
Malaria	10	2	210	0,95	21
Cancer	2		8	0,85	4
Diabetes	8	1	64	0,88	8
Hypertension	9	2	81	0,90	9
Sickle cell disease	5		25	0,83	5
Muscles' diseases	5		30	0,86	6
Madness & Epilepsy	4		12	0,72	3
Skin infections	2		44	0,97	22
Nappy rash (buttock erythema)	2		30	0,90	15
Female Sterility	5		60	0,93	12
Male Sterility	3		45	0,90	15
Sexual transmissible diseases	10	2	70	0,86	7
Infectious diseases	24	8	232	0,90	9,67
Paralysis	3		36	0,94	12
Hemiplegia,	1		33	1	33
Respiratory diseases	12	4	144	0,92	12
Ears' diseases	2		26	0,96	13
Eyes' diseases	2		54	0,98	27
Hepatitis, jaundice	4		5	0,25	1,25
Tuberculosis	2		24	0,95	12
Bone and Joint diseases	4		16	0,80	4
Female and male sexual weakness	5		40	0,89	8
Urological diseases	2		64	0,98	32
Spiritual diseases	2		60	0,98	30
Digestive diseases	6	1	180	0,97	30
Dermatological diseases	3		30	0,93	10
Gynecological diseases/ Andrological diseases	21	5	333	0,93	15,86
Unclassified diseases	13	5	241	0,95	18,54
Other uses or cultural practices	14	5	169	0,92	12,07
Total of plants with repetitions	185	35	2358	0,93	11,81
Total of plants	150				

According to the relative medicinal plant importance index in brackets, table 2 showed significant more culturally used species that include plants for hemiplegia (33), urological diseases (32), spiritual and digestive diseases (30 each), eyes' diseases (27), skin's diseases, and malaria (21). For all these reported illness categories, the Informants' Consensus Factor values range between 0, 95 to 1. These high values are good indication of high informant consensus on the species used in the treatment of categories of illness. There is a

significant correlation between these two indices valuable for such study. Indeed many illness categories have a strong informant consensus factor for a weak medicinal importance value index. This group include the following illness categories with their respective informant consensus factor and medicinal importance index in brackets: madness and epilepsy (0,78; 3), cancer (0,85; 4), bone and joint disease (0,80; 4), sickle cell disease (0,86; 5), muscles' diseases (0,86; 6), sexual transmitted diseases (0,86; 7), diabetes (0,88; 8), female sexual weakness (0,89; 8) and hypertension (0,90; 9).

Medicinal plants diversity and ethno pharmacological preparation

Regarding ethno pharmacological preparation, some 150-plant species were recorded but we are going to describe the 40 species indicated by people who are known as medical specialists in the Kom-Mengame forest conservation Complex (table 3).

Table 3: Ethnopharmacological preparation of medicinal plants recorded in Kom-Mengame forest conservation Complex used by specialist therapists

Indigenous medical uses	Scientific names of plants	Vernacular names	Ethno pharmacological detailed preparation
Malaria	<i>Panda oleosa</i>	Nkana	Boil 500 g of stem bark in 3 liters of water. Drink 250 ml of decoction 2 times daily for a week against malaria.
	<i>Harungana madagascariensis</i>	Atondo	
	<i>Nauclea diderricii</i>	Monse	
Filariosis	<i>Morinda lucida</i>	Akeng	Boil 300 g of stem bark in 3 l of water and drink 250 ml of decoction 1 -3 times a day to treat fillariosis.
	<i>Symphonia globulifera</i>	Gambi	
	<i>Mitragyna stipulosa</i>	Lagango	Boil 300 g of stem bark in 3 l of water and drink 250 ml of decoction 1 -3 times a day to treat fillariosis.
Cancer	<i>Ficus conrauii</i>	Djolo	Boil 300 g of stem bark in 3 l of water and drink 250 ml of decoction 1 -3 times a day to treat cancer.
Diabetes	<i>Ceiba pentandra</i>	Kulu	Boil 300 g of stem bark in 3 l of water and drink 250 ml of decoction 1 -3 times a day to treat diabetes.
	<i>Tetrapleura tetraptera</i>	Djaga	
Hypertension	<i>Mitragyna stipulosa</i>	Lagango	Boil 300 g of stem bark in 3 l of water and drink 250 ml of decoction 1 -3 times a day to treat diabetes.
	<i>Ceiba pentandra</i>	Kulu	
Sickle cell disease	<i>Manotes pruinosa</i>	Kôta	Grind 500 g of young shoots and put the pasta in 4 liters of water and drink 250 ml of maceration 2 times a day for 7 days
Nappy rash (buttock erythema)	<i>Trichoscypha acuminata</i>	Mongocola Nvout	It is the mother who drinks the decoction: Boil 300 g of stem bark in 3 l of water and drink 250 ml of decoction 1 -3 times a day.
Female Sterility	<i>Diospyros crassiflora</i>	Mbaloa	The decoction of the fruits is purpose at the rate of 2 glasses per day against female sterility.
	<i>Tetrapleura tetraptera</i>	Djaga, Djaba Daga	
	<i>Anthoscleista vogelii</i>	Banga	Boil 300 g of root bark in 3 l of water and drink 250 ml of decoction 1 -3 times a day to treat female sterility. Important purgative action is secondary effect of this recipe
	<i>Uapaca paludosa</i>	Séngi	Boil 500 g of roots and drink 250 ml of decoction 4 times per day for 7 days against women sterility. This treatment is also prescribed for their ovarian disorders and dysentery.
	<i>Celtis adolfi-friderici</i>	Kakala	Boil 300 g of stem bark in 3 l of water and drink 250 ml of decoction 1 -3 times a day.

Sexually transmitted diseases	<i>Cylicodiscus gabunensis</i>	Adoum	Boil 300 g of stem bark in 3 l of water and drink 250 ml of decoction 1 -3 times a day.
	<i>Mitragsma stipolosa</i>	Lagango	
	<i>Eribroma oblongum</i>	Eboyo	
	<i>Petersianthus macrocarpus</i>	Abing Baso	
	<i>Anthoscleista vogelii</i>	Banga	Boil 300 g of root bark in 3 l of water and drink 250 ml of decoction 1 -3 times a day to treat vaginal infections. Important purgative action is secondary effect of this recipe
	<i>Manotes pruinosa</i>	Kôta	Grind 500 g of young shoots and put the pasta in 4 liters of water and drink 250 ml of maceration 2 times a day for 7 days to treat gonorrhoea
	<i>Myrianthus arboreus</i>	Ngata	Drink 250 ml de juice of root against Gonorrhoea
Paralysis	<i>Zanthoxylum heitzii</i>	Bolongo	Drink 250 ml de juice of root for longtime
	<i>Calpocalyx dinklagei.</i>	Pandako	
	<i>Barteria fistulosa</i>	Fambo	Roast and pound the bark of <i>Barteria fistulosa</i> and mix the powder with that of the stem of <i>Ageranthus brunneus</i> and apply the mixture on scarifications against neuropathy, chest pains and paralysis of the legs.
Hemiplegia,	<i>Ceiba pentandra</i>	Kulu	Boil 200 g of trunk bark in 2 liters of water. Drink 250 ml of decoction twice a day for 10 days to treat convulsive coughing cough and gastrointestinal pain.
Respiratory diseases	<i>Dialium pachyphyllum</i>	Mbaso	Eat the young leaves with rock salt to cure cough.
	<i>Distemonanthus benthamianus</i>	Sélé	To treat bronchial disorders and child fever, the patient takes bath and the bath of vapor of a decoction of mixture of bark, lemongrass, <i>Lantana camara</i> and papaya roots
	<i>Myrianthus arboreus</i>	Ngata	Drink 250 ml de juice of root against cough.
	<i>Discoglypreuna caloneura</i>	Njila	Boil 200 g of trunk bark in 2 liters of water. Drink 250 ml of decoction twice a day for 10 days to treat convulsive cough and gastrointestinal pain.
	<i>Uapaca paludosa</i>	Séngi	As an expectorant, in the treatment of nasopharyngeal or pulmonary conditions, boil 500 g of roots and drink 250 ml of decoction 4 times per day for 7 days.
Ears' diseases	<i>Irvingia gabonensis</i>	Ndo'o	The juice of fruits is inserted in the nose against the headache and in the ear against otitis.
	<i>Tetrapleura tetraptera</i>	Djaga, Djaba Daga	
	<i>Manotes pruinosa</i>	Kôta	Grind 250 g of young shoots and put the pasta in 2 liters of water and instill 3 drops per an ear to treat otitis
Eyes' diseases	<i>Lannea welwitschii</i>	Kwa	Grind 250 g of young shoots and put the pasta in 2 liters of water and instill 3 drops
	<i>Manotes pruinosa</i>	Kôta	

	<i>Tetrapleura tetraptera</i>	Djaga, Djaba Daga	per eye to treat conjunctivitis. The juice of fruits is inserted into the eye against ophthalmia and filariasis,
Hepatitis, jaundice	<i>Pentaclethra macrophylla</i>		Boil 200 g of trunk bark in 2 liters of water. Drink 250 ml of decoction twice a day for 10 days. Boil 200 g of trunk bark in 2 liters of water. Drink 250 ml of decoction twice a day for 10 days.
Tuberculosis	<i>Mitragyna stipulosa</i>	Lagango	
	<i>Dialium dinklagei</i>	Kombé	
	<i>Dialium zenkeri</i>	Kombé	
	<i>Petersianthus macrocarpus</i>	Abing Baso	
Bone and Joint diseases	<i>Mostuea batesii</i>	Tépé	Pile the plant and mix the paste obtained with the palm kernel oil. Apply the product to the sprain or fracture.
	<i>Gambeya lacourtiana</i>	Mubambu	The steam bath of decoction treats rheumatism, kidney ailments and febrile aches. The powder of bark is applied on wounds.
	<i>Uapaca paludosa</i>		Boil 500 g of roots and drink 250 ml of decoction 4 times per day for 7 days against rheumatism. In steam bath this decoction treats rheumatism and edema.
Female and male sexual weakness	<i>Xylopiya staudtii</i>		Sexual weakness:chew root bark and swallow the juice.
	<i>Panda oleosa</i>	Nkana (Baka)	Boil 500 g of stem bark in 3 liters of water. Drink 250 ml of decoction 2 times daily for a week against frigidity and sexual weakness.
Urological diseases	<i>Myrianthus arboreus</i>	Ngata	Drink 250 ml de juice of root against hematuria. Drink 250 ml de decoction of 500 g of fruits boiled in 4 liters of palm vine or red vine against kidney stone.
	<i>Keayodendron bridelioides</i>	Mbando	Carbonize the bark on the corrugate iron, pound and mix with the palm oil; apply the paste on the skin scarified against kidney ailments.
Spiritual diseases	<i>Tetrapleura tetraptera</i>	Djaga, Djaba Daga	Boil the bark in water and drink 0.5l per day. It is also possible to introduce this decoction in the child by scarification to drive out evil spirits.
Hemorrhoids	<i>Parinari excels</i>		Boil 500 g of stem bark in 3 liters of water. Drink 250 ml of decoction 2 times daily for a week against hemorrhoids.
	<i>Panda oleosa</i>	Nkana '(Baka)	
Digestive tract diseases	<i>Mitragyna stipulosa</i>	Lagango	Boil 500 g of stem bark in 3 liters of water. Drink 250 ml of decoction 2 times daily for a week against amibiiasis.
	<i>Desplatsia dewevrei</i>		
	<i>Pentaclethra macrophylla</i>		
	<i>Pycnanthus angolensis</i>		Boil 500 g of stem bark in 3 liters of water. Drink 250 ml of decoction 2 times daily for a week against worms.
	<i>Sapium ellipticum</i>		
	<i>Desbordesia glaucescens</i>	Méléa Alep	Boil 500 g of stem bark in 4 liters of water for 25 mn. Drink 250 ml, three times daily with the consumption of cassava, for a week against tummy pain. This treatment is also aphrodisiac for some informants
	<i>Myrianthus arboreus</i>	Ngata	Drink 250 ml de decoction of 500 g of stem bark boiled in 4 liters of water against dysentery.

Dermatological diseases or Skin infections	<i>Anthoscleista vogelii</i>	Banga	Boil 300 g of root bark in 3 l of water and drink 250 ml of decoction 1 -3 times a day to treat smallpox. Important purgative action is secondary effect of this recipe
	<i>Distemonanthus benthamianus</i>	Sélé	Wash the wounds with the decoction of bark and then sprinkle these wounds with the bark sprayed to treat parasites, boils, abscesses and chancre.
	<i>Desbordesia glaucescens</i>	Méléa Alep	Mix the stem bark power with palm oil or palm kened oil to prepare an ointment and applied it on the body of person affected by varicella.
	<i>Angylocalyx pynaertii</i>	Bitongo	Grind 25 g of young shoots and put the pasta in 1/4 liter of water and instill 3 drops per ear to treat otitis
	<i>Lannea welwitschii</i>	Kwa	The pulp of the bark is applied as a wet dressing to treat edemas.
Madness & Epilepsy	<i>Pteleopsis hylodendron</i>		The decoction of stem bark is used to reduce epileptic crises by washing patients
	<i>Lannea welwitschii</i>	Kwa	The pulp of the bark in palm wine heals epilepsy.
Gynecological diseases/ Andrological diseases	<i>Homalium letestui</i>		Grind 250 g of young shoots and put the pasta in 2 liters of water and drink 250 ml of red maceration 2 times a day for 7 days to treat dysmenorrhea
	<i>Angylocalyx pynaertii</i>	Bitongo	
	<i>Gambeya lacourtiana</i>	Mubambu	The stem bark in decoction are used as an injection for the treatment of uterine hemorrhage and other vaginal infections
	<i>Celtis mildbraedii</i>	Ngombe	Take by the anus the decoction in water of bark of <i>Celtis mildbraedii</i> , of <i>Amphimas pterocarpus</i> of <i>Uapaca padulosa</i> and of <i>Iringia grandifolia</i> during the painful periods.
	<i>Panda oleosa</i>	Nkana '(Baka)	Boil 500 g of stem bark in 3 liters of water. Drink 250 ml of decoction 2 times daily for a week against gonorrhoea.
Unclassified diseases	<i>Pterocarpus mildbraedii</i>	Ngalé	Pound 500 g of stem bark and put the pasta in 4 liters of water and drink 250 ml of maceration 2 times a day for 7 days to treat anemia
	<i>Amphimax pterocarpoides</i>	Kanga	Pound 500 g of stem bark and put the pasta in 4 liters of water and drink 250 ml of maceration 2 times a day for 7 days to treat anemia
	<i>Anthoscleista vogelii</i>	Banga	Boil 300 g of root bark in 3 l of water and drink 250 ml of decoction 1 -3 times a day for it haemostatic proprieties. Important purgative action is a secondary effect of this recipe
	<i>Desbordesia glaucescens</i>	Méléa Alep	Mix the stem bark power with palm oil or palm kened oil to prepare pomade that is applied on the temple after scarifications against headaches.
	<i>Manotes pruïnosa</i>	Kôta	Grind 500 g of young shoots and put the pasta in 4 liters of water and drink 250 ml of maceration 2 times a day for 7 days to treat anemia

Other uses/ cultural practices	<i>Manotes pruinosa</i>	Kôta	To be loved by a woman, a man must place on her path, parquet containing fragments of roots and leaves of <i>Manotes</i> . Grind 250 g of young shoots and put the pasta in 2 liters of water and clean wounds one a day for a week.
	<i>Tetrapleura tetraptera</i>	Djaga, Djaba Daga	Juice also serves as a fish poison. To fruits are attributed a magic power and they enter into many ceremonies of exorcism.
	<i>Gilbertiodendron dewevrei</i>	Bambi	For Baka Pygmies, to see you case triumph, you must present yourself before the judge with your forehead induced of a liquid made from the maceration of fruit of <i>Gilbertiodendron dewevrei</i>
	<i>Barteria fistulosa</i>	Fambo	Roast and pound the bark of <i>Barteria fistulosa</i> and mix the powder with that of the stem of <i>Ageranthus brunneus</i> and apply the mixture on scarifications against neuropathy, chest pains and paralysis of the legs.
	<i>Uapaca paludosa</i>	Séngi	Boil 500 g of roots. In steam bath this decoction treats rheumatism and edema. In a mouthwash he treats the toothache, enema, hemorrhoids and ricket. It strengthens the children who do not walk.
	<i>Tetrapleura tetraptera</i>	Djaga, Djaba Daga	Increase the hunting dogs' flair: Macerate the bark and instill a few drops of macerated in the nostrils of the dogs. Condiment: the fruit of this plant is a condiment.

DISCUSSION

It appears that in Kom-Mengame forest conservation complex, people strongly use natural resources for the management of their health as illustrated by table 2. All the informants' consensus factors are gathered between 0.67 and 1, which are the higher values which suggest that plants are known for the treatment of diseases by a large proportion of the population [10, 12]. Many reasons may be pointed out. The reserve is very far from the districts' heads-quarters that include Oveng, Nvangane and Djoum. Poor road conditions and poor standard of living of population is one of the reasons why local population has learned to rely mainly on forest resources.

Previous pharmacological activities of some recorded plant species

Various phytochemical characterization tests have shown that the stem bark of *Petersianthus macrocarpus* contains numerous bioactive principles. The main of these compounds are sterols, polyterpenes, polyphenols, flavonoids, saponosides, catechic tannins and alkaloids [13]. Some of these substances that include sterols, polyterpenes, polyphenols and catechical tannins are known for their bactericidal effects, which would confirm the traditional used of *Petersianthus macrocarpum* against tuberculosis and sexual transmissible diseases. Thus, the empirical use by traditional healers of the maceration of the stem bark of this plant finds a scientific basis [13]. Previous pharmacological studies demonstrated the existence of credence to the uses in traditional medicine of *Tetrapleura tetraptera*'s fruits or stem bark in the management and/or control of type-2 diabetes mellitus in Kom-Mengame forest conservation complex [14]. During the present investigation, it has been noticed that *Lannea welwitschii* stem bark was used in the treatment of skin infections (15). Previous study showed that the aqueous and ethanol extracts from the stem bark of *L. welwitschii* exhibited antibacterial activity against agents isolated from wound infections (15). In addition, the antimicrobial and wound healing effects of the methanol extract from the leaves of *L. welwitschii* was successfully demonstrated (16), justifying its traditional use by the Kom-Men game forest conservation complex inhabitants in the treatment of skin infection [17].

CONCLUSION

In term of this study, 40 plants are used by local specialist therapists very well known in their community. These plants are good sources of herbal medicine for the treatment of several diseases. The importance of these plants needs to be highlighted within drug discovery strategies. The higher values of informant consensus indicate that plants are used by a large proportion of population. Many plant species with a strong informant consensus factor do not have the high important value index in Kom-Mengame forest conservation complex. The long time exploitation of these plants needs the development of good strategies of conservation.

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