Original Research Article

Ethnobotanical Studies of Plants with Antihypertensive Properties in the City of Nkongsamba, Cameroon

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Abstract

The use of plants to treat chronic diseases such as high blood pressure is part of ancient African traditions. Many authors have placed an emphasis on the study of plants through the ethnobotanical approach and the results obtained in different regions have shown that the use of plants to treat chronic diseases is very widespread. Ethnobotanical surveys aiming at identifying plants with antihypertensive properties were carried out in the city of Nkongsamba, Littoral Region, Cameroon, with traditional health practitioners in markets and associations. The data analysis focused on determining, for each species, the frequency of citation (CF), the confirmation or consensus index of informants (ICs), the frequency of use (FU) and contribution to the constitution of revenue (Cpr). A total of 35 people were interviewed as part of this survey: 24 men and 11 women. The distribution of respondents by age group showed that the group [41-60] is the most represented. People from the Cameroon West Region were the most represented among respondents. The distribution of respondents according to profession showed that traditional healers were more represented. The distribution of respondents according to religion showed that Christians were more represented. The distribution of respondents by level of study showed that respondents who dropped out of secondary school were more represented. The floristic inventory identified 55 species divided into 50 genera and 33 families. The most cited species was *Alium sativum*. The flora of Nkongsamba therefore contains an important diversity of plants with antihypertensive properties widely used by traditional therapists.

Keywords: Ethnobotanical surveys, plants with antihypertensive properties, city of Nkongsamba.

INTRODUCTION

It is currently recognized that over 80% of rural populations in Africa rely on medicinal plants for their health care and livelihood [1, 2]. Plants are a precious resource for the majority of these populations. The products obtained from plants ensure the subsistence of mankind and eventually guarantee an income [3]. The art of healing with plants has been known and practiced in Africa for a long time because it exploits the knowledge transmitted orally from one generation to another, by initiated individuals such as traditional healers and herbalists [4]. The World Health Organisation (WHO) defines traditional medicine as the body of knowledge, skills and practices based on the theories, beliefs and experiences that different cultures use to maintain health as well as to prevent, diagnose, alleviate or cure physical and mental illnesses [5]. This medicine occupies a prominent place in Cameroon,

partly due to its rich and diverse flora. Medicinal plants constitute invaluable resources for the pharmaceutical industry and their best exploitation requires ethnobotanical studies which make it possible to draw up a non-exhaustive list of plant species used in traditional medicine by populations [6]. Scientific investigations are increasingly carried out on secondary metabolites which have been isolated and characterized in certain medicinal plants. The use of plants to treat chronic diseases such as high blood pressure is part of ancient African traditions. Many authors put an emphasis on the study of plants by the ethnobotanical approach and the results obtained in different regions have shown that the use of plants to treat chronic diseases is very widespread [7-12]. Faced with the spread of these diseases, the WHO encourages ethnobotanical studies and pharmaceutical research for the development of improved traditional medicines. The aim is to promote their optimal uses in health care

delivery systems [13]. This is how several medicinal plants for the treatment of high blood pressure have been identified during ethnobotanical surveys. These plants include: Picralima nitida, Catharanthus roseus, Senna occidentalis, Rauwolfia vomitoria, Tamarindus indica, Picralima nitida, Guiera senegalensis, Euphorbia hirta, Allium sativum, Hibiscus sabdarifa [14-16]. The list being non-exhaustive, an issue arises. There is a need to update the data for a better use in traditional medicine. In Cameroon, traditional medicine constitutes the third sub-sector of the health sector, despite not being regulated [17]. However, with the aim to promote this medicine, numerous State actions have been observed, such as the creation of a service in charge of traditional medicine at the Ministry of Health and the creation of a research center on medicinal plants and traditional medicine (CRPMT / IMPM) [17]. Nearly 25% of modern medicines are developed from plants [18]. The general objective of this study was to inventory medicinal plants with anti-hypertensive properties in the city of Nkongsamba, Cameroon, and to characterize the florula and the uses of the inventoried species.

MATERIAL AND METHODS

Method of investigation

Ethnobotanical surveys were carried out in the city of Nkongsamba, Cameroon, with traditional health practitioners in markets, associations and homes. The size of the sample was determined using Dagnelie's formula [19] and stopped at 35 respondents.

The semi-structured questionnaires aimed to assess the knowledge of practitioners of traditional medicine on hypertension and the different herbal recipes used by them to treat this disease [20]. The questions mainly focused on the knowledge of plants with anti-hypertensive properties, the parts used, the preparation method, the solvent used, the quantities per solvent volume, the route of administration, the dose, the duration of the treatment, the method of conservation and other associated plants. For each therapeutic indication, the details of the recipe were carefully noted, the medicinal plant was observed and a picture was taken [21]. The priority given to traditional healers is justified by their ability to provide more specifications on the recipes. A total of 35 people were interviewed. The survey was conducted from June 4 to September 18, 2016. Access to respondents was facilitated by the investigators' sincerity about the merits of the study and the fact that the participation of a third party in this study was at their own will. The snowball method was used at the level of traditional healers working in their homes. At the end of each interview, each traditional healer was asked to direct the investigators towards one or more other trusted traditional healers of their choice. In this case, his word

to approach the other traditional healers mentioned was very necessary.

Information provided in vernacular languages was translated by an indigenous guide. However, most traditional healers would communicate in English or french [22].

Identification methods

Most plants were identified on site. Those that were unknown were collected for later identification. The identification was made by simple comparison of the vernacular, commercial or both names of the samples of the control herbarium with the data available in the literature and the reference material available at the Laboratory of Biology and Physiology of Plant Organism, University of Douala, Cameroon. The Cameroon National Herbarium and the Plant Museum located in the city of Douala, Cameroon, were also consulted.

DATA ANALYSIS

Data from the survey allowed drawing up a list of plant species with anti-hypertensive properties. The morphological types, the biological types, as well as the types of phytogeographic distribution as defined by Betti [23] made it possible to characterize the florule. Digital data analysis focused on determining, for each species, the frequency of citation (CF), the confirmation or consensus index of informants (ICs), the frequency of use (FU) and the contribution to the constitution of receipts (Cpr) [24, 25]. The histograms were produced using the Graphpad Prism 7 software.

RESULTS

Sociodemographic characterization of the respondents

Distribution of respondents by gender

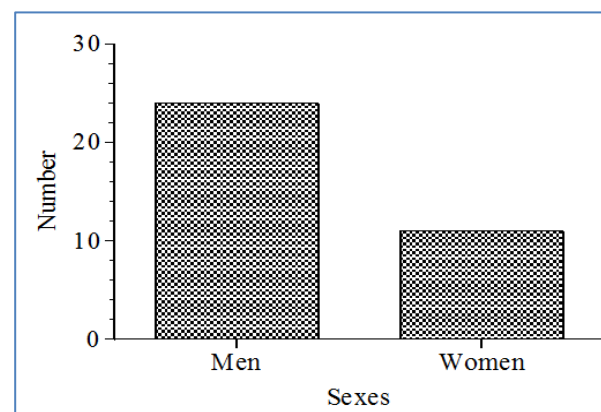A total of 35 people were interviewed for this survey: 24 men (68.57%) against 11 women (Figure 1).

Fig-1: Distribution of respondents by gender
Distribution of respondents by age group

The age of the respondents was generally between 24 and 78 years old. The distribution by age group showed that the group [41-60] was the most represented with a workforce of 20 people (57.14%), followed by the segment [20-40] with a workforce of 11 people (31.43%), then the group [61-80] with 4 people (Figure 2).
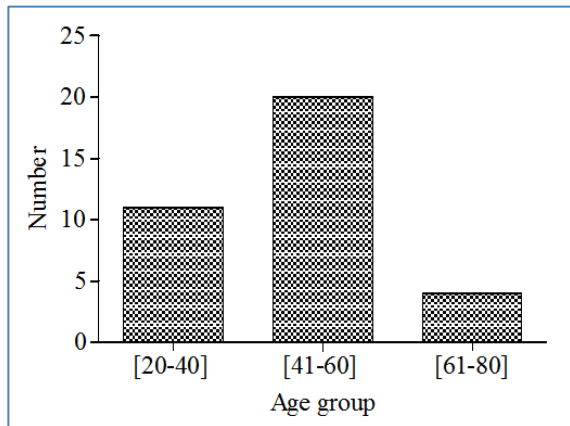

Fig-2: Distribution of respondents by age group

Distribution of respondents according to their region of origin

The people interviewed during this study were from 4 distinct regions in Cameroon. The Western region was the most represented with a staff of 27 interviewees (77.14%), while the Northern region was the least represented with a single respondent (Figure 3).
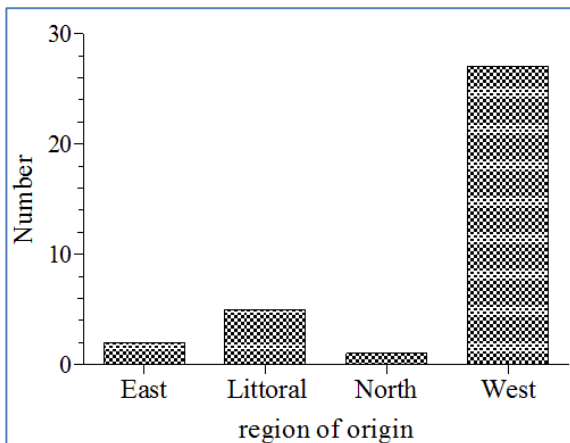

Fig-3: Distribution of respondents according to their region of origin

Distribution of respondents by profession

The distribution of respondents by profession made it possible to distinguish traditional healers, naturopaths and sellers. However, traditional healers were the most represented with a staff of 28 (80%), followed by naturopaths with a staff of 5 people (14.29%) and sellers (Figure 4).
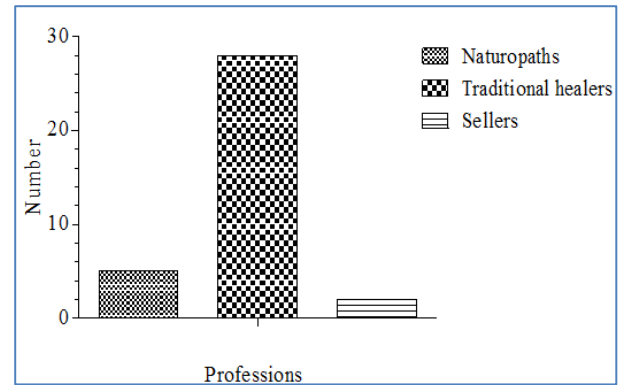
Fig-4: Distribution of respondents by profession

Distribution of respondents by religion

During this study in the city of Nkongsamba, four religions practiced by the respondents were identified. Christianism was the most represented (57.14%) while polytheism was the least represented (2.86%). Animists and Muslims were also represented (Figure 5).
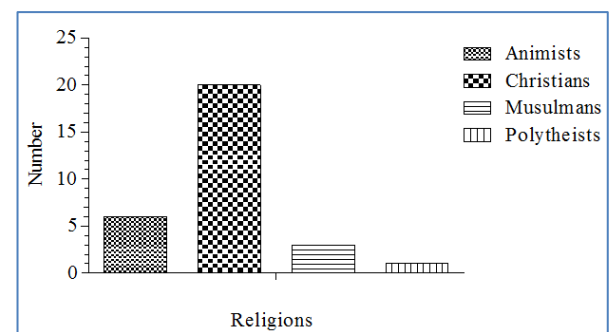
Fig-5: Distribution of respondents according to religion

Distribution of respondents by level of study

The distribution of respondents according to level of study made it possible to identify 3 levels of study. Most respondents (51.43%) had stopped at secondary level, followed by those who had stopped at primary level (45,71%). Only one respondent (2.86%) did not attend school (Figure 6).

Fig-6: Distribution of respondents according to level of study

Floristic inventories and florule characterization of plants with antihypertensive properties in the city of Nkongsamba

The floristic inventory in the city of Nkongsamba identified 55 species belonging to 50 genera and 33 families. The Asteraceae family was the most represented with 7 species (12.73%)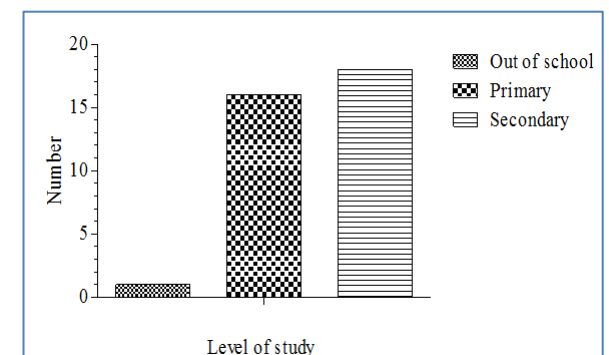, followed by Apocynaceae which totaled 5 species (9.09%), while Agavaceae, Amaranthaceae, Anacardiaceae, Annonaceae, Bromeliaceae, Caparidaceae, Caricaceae, Cecropiaceae Clusiaceae, Costedaceae, Dennstiaceae, Gluttiferaceae, Lamiaceae, Lauraceae, Loranthaceae, Mirtaceae, Moringaceae, Pinaceae, Poaceae, polypodiaceae, Solanaceae, Sterculiaceae, Urticaceae and Zingiberaceae were each represented by 1 species (1.82%).

Four morphological types were identified in this study. Herbs were the most represented morphological type with 30 species (54.54%), while woody epiphytes were the least represented morphological type, with only 1 species (1.82%).

Four biological types were obtained at the end of this ethnobotanical investigation: chamephytes, phanerophytes, cryptophytes and hemicryptophytes. Chamephytes were the most represented biological type with 26 species (42.27%) while hemicryptophytes were the least represented biological type with only 1 species (1.82%).

Finally, 8 phytogeographic types were summarized at the end of this study. The Tropical African type was the most represented with 18 species (32.73%), followed by the Pantropical type with 12 species (21.82%), the African-American type with 7 species (12.73%), the Guinean-Congolese and Afro-Asian types with 5 species (9.09%) each, the Cosmopolitan type with 4 species (7.27%), the Afro-Malagasy type with 2 species (3.64%) and the Afro-European type with only 1 species (Table 1).

Table-1: Floristic characterisation of plants with antihypertensive properties in the city of Nkongsamba, Littoral Cameroon

N°	Family	N°	Plant Species	Common names	Vernacular names	Morphological types	Biological types	Phytogeographic types
1	Acanthaceae	1	*Acanthus montanus* T. Anderson	Acanthus	Njasoa massonga (Douala)	Herbaceous	Chamephyte	Tropical africa
		2	*Eremomastax speciosa* (Hochst.) Cofod.	Red one side	Dibokuboku di mole (Douala), pag jep cheuc (Bazou)	Herbaceous	Chamephyte	Tropical africa
		3	*Justicia secunda* Vahl		Crehe diep (Balengou)	Herbaceous	Chamephyte	Tropical africa
2	Agavaceae	4	*Aloe vera* L.	Aloe vera	Aloe vera	Herbaceous	Chamephyte	Afro-asian
3	Amaranthaceae	5	*Cyathula prostrata* (L.) Blume	Lizard tail	Kolokosi (Douala)	Herbaceous	Chamephyte	Tropical africa
4	Amaryllidaceae	6	*Alium cepa L.*	Onion	Agnosi (Douala, Bazou, Baffoussam)	Herbaceous	Cryptophyte	Afro-asian
		7	*Alium sativum L.*	Garlic	Ail	Herbaceous	Cryptophyte	Afro-asian
5	Anacardiaceae	8	*Mangifera indica L.*	Mango	Mangoulouc (Bafoussam, Bamena)	tree	Phanerophyte	Afro-américan
6	Annonaceae	9	*Annona muricata L.*	soursop		Tree	Phanerophyte	Afro-américan
7	Apocynaceae	10	*Alstonia boonei* De Wild	*Alstonia*	Kokmord (Bassa, Bakoko)	Herbaceous	Phanerophyte	Guinean-congolese
		11	*Cataranthus roseus (L.) G. Don.*	Madagascar periwinkle		Herbaceous	Chamephyte	pantropical
		12	*Picralima nitida* (Stapf.) Th. & H. Dur. Syll. Fl.Cong.	Yellow fruit or Quinqueliba	Tortorcreuhe (Bangangté)	Tree	Phanerophyte	Tropical africa
		13	*Rowolfia vomitoria* Afz.	Nivaquine	Tetacha (Balengou)	Tree	Phanerophyte	Tropical africa
		14	*Voacanga africana* VO.	Voacanga	wacanga (Balengou)	Tree	Phanerophyte	Afro-american
8	Asteraceae	15	*Acmela caulirhiza* Delile	Hen's eye	Miac guep (Bangangté), Ndonga balemba (Douala)	Herbaceous	Chamephyte	Tropical africa
		16	*Ageratum conyzoides* L.	King of herbs	Tchouctou (Bazou), Ewuda nyo na nyo (Douala)	Herbaceous	Chamephyte	Tropical africa

		17	*Artemesia annua* L.	Artemesia		Herbaceous	Chamephyte	Afro-malagasy
		18	*Emilia coccinea* *Emilia coccinea* (Sims) G.Don.	Rabbit grass	Toi la mbo (Douala)	Herbaceous	Chamephyte	Tropical africa
		19	*Erigeron floribundus* (Kunth) Sch.Bip.	vergerette		Herbaceous	Chamephyte	Guinean-congolese
		20	*Vernonia amygdalina* Del.	Ndole or vernonie	Ndole	shrub	Phanerophyte	Tropical africa
		21	*Vernonia guineensis* Benth.	Ginseng	Ginseng	Herbaceous	Chamephyte	Tropical africa
9	Bromeliaceae	22	*Ananas comosus* (L.) Merr.	pineapple	La'ac (Balengou)	Herbaceous	Chamephyte	Afro-american
10	Caparidaceae	23	*Cleome ciliata* Schumach. & Thonn.	*Cleome*	Mbango (Douala)	Herbaceous	Chamephyte	Tropical africa
11	Caricaceae	24	*Carica papaya* L.	Papaya		Herbaceous	Phanerophyte	pantropical
12	Cecropiaceae	25	*Musanga cecropioides* R.Br.	américan parassolier		Tree	Phanerophyte	Afro-american
13	Clusiaceae	26	*Garcinia kola Heckel*	Bitter cola	Wè (Bassa), Onié (Boulou, Ewondo), Ngbwel (Pygmée Baka).	Tree	Phanerophyte	Tropical africa
14	Costaceae	27	*Costus afer* Ker gawl.	Twins cane	Mwandando (Douala), Nwandi ou Linwandi (Bassa) Mian (Ewondo, Boulou),	Herbaceous	Phanerophyte	Tropical africa
15	Dennstaedtiaceae	28	*Pteridium aquilinum* Kuhn	Fern-eagle		Herbaceous	Cryptophyte	Cosmopolitan
16	Euphorbiaceae	29	*Alchornea cordifolia* Schumach. & Thonn.) Müll.Arg.			shrub	Phanerophyte	Tropical africa
		30	*Euphorbia hirta L.*	Pill-bearing spurge		Herbaceous	Chamephyte	Tropical africa
		31	*Jatropha gossypiifolia* L.	Red doctor		shrub	Chamephyte	pantropical
17	Fabaceae	32	*Desmodium adcendens* *Desmodium adcendens* (Swartz) DC.			Herbaceous	Chamephyte	pantropical
		33	*Guibourtia tessmanii* (Harms) J.Léonard	Bubinga ou Kevazingo	Essingang (Ewondo, Bassa)	Tree	Phanerophyte	Guinean-congolese
		34	*Senna alata* (L.)Roxb.	Date		shrub	Phanerophyte	Afro-american
		35	*Senna occidentalis* (L.) Link	Red terrier		shrub	Phanerophyte	pantropical
18	Gluttiferaceae	36	*Arungana madagascariensis* Lam. Ex Poir.	Harongue wood	Tolongo (Douala), Lindongo (Bakoko), Atondok (Boulou), Andwe (Ewondo),	shrub	Phanerophyte	Afro-malagasy
19	Lamiaceae	37	*Ocimum gratissimum* L.	False basil	Masep (Bassa, Ewondo), Masepu (Douala).	Herbaceous	Chamephyte	Cosmopolitan
20	Lauraceae	38	*Persea americana* L.	Avocado tree	Pià (Dschang)	Tree	Phanerophyte	Afro-american
21	Loranthaceae	39	*Phragmenthera capitata* (Sprengel) Balle	African mistletoe	Quetchouc (Balengou, Bazou)	Hemiparasitic woody epiphyte	Chamephyte	Tropical africa
22	Malvaceae	40	*Hibiscus sabdarifa* L.	Guinea sorrel	Foléré (Foufoulbé),	Herbaceous	Chamephyte	Afro-asian
		41	*Hibiscus surratensis* L.	*Hibiscus*		Herbaceous	Chamephyte	Afro-asian
23	Mirtaceae	42	*Eucalyptus globulus* Labill	Blue gum tree	Theue mequet (Balengou)	Tree	Phanerophyte	Cosmopolitan

24	Moringaceae	43	*Moringa oleifera* Lam.	Moringa	Moringa	Tree	Phanerophyte	pantropical
25	Pinaceae	44	*Pinus montana* Mill.	pin	sapin	Tree	Phanerophyte	Afro-european
26	Poaceae	45	*Cymbopogon citratus* DC. Stapf	lemongrass	Fiper grass (Bangangté)	Herbaceous	Chamephyte	Cosmopolitan
27	polypodiaceae	46	*Platicerium bifurcatum* (Cav.) C.Chr.	Deer horn		Herbaceous	Chamephyte	pantropical
28	Rubiaceae	47	*Diodia scandens* SW.			Herbaceous	Chamephyte	pantropical
		48	*Pausinistalia yoyimbe* (K. Schum.) Pierre ex Beille	Yoyimbe		Tree	Phanerophyte	Guinean-congolese
29	Rutaceae	49	*Citrus aurantifolia* (Christm.) Swingle	Small lime	Lamasi (Balengou)	Tree	Phanerophyte	pantropical
		50	*Citrus limon* (L.) Burm. f.	lemon lemon	Kohoc Lamasi (Balengou)	Tree	Phanerophyte	pantropical
		51	*Fagara macrophylla* (Oliv.) Engl	*.Fagara*		Tree	Phanerophyte	Guinean-congolese
30	Solanaceae	52	*Solanum torvum* Sw.	Wild eggplant	Ndosi (Douala), Ozong (Ewondo, Boulou)	shrub	Chamephyte	pantropical
31	Sterculiaceae	53	*Theobroma cacao* L.	Cacaoyer	Cacao (Douala, Dschang, Bassa)	shrub	Phanerophyte	pantropical
32	Urticaceae	54	*Laportea ovalifolia* (Schumach. & Thonn.) Chew	Orti	Mbapbap (Balengou), Tolobanji (Douala), Disanla (Bassa), Sas zok (Ewondo)	Herbaceous	Chamephyte	Tropical africa
33	Zingiberaceae	55	*Curcuma longa* L.	Curcuma	Djindja pak (Bazou)	Herbaceous	Hmicryptophyte	pantropical

Characterization of the uses of the inventoried species in the city of Nkongsamba

The most cited species during this survey in the city of Nkongsamba was Alium sativum with 16 citations for a respondent consensus factor of 45.7% and a citation frequency of 7.11%. This was followed by Annona muricata and Persea americana, each with 15 citations for a common respondent consensus factor of 42.9% and a common citation frequency of 6.67%. The species Picralima nitida totaled 13 citations for a respondent consensus factor of 37.1% and a citation frequency of 5.78%. The least cited species in this study each recorded one citation for a respondent consensus factor of 2.9% and a citation frequency of 0.44%.

The number of uses and frequency of use of each species were determined. The most used species in this study were Annona muricata and Persea americana with 13 uses each for a common use frequency of 8.2%. These were followed by Alium sativum which totaled 12 uses for a use frequency of 7.59%. The species Picralima nitida had a total of 8 uses for a use frequency of 5.1%. The species having been the least used for the constitution of the recipes were used only once for a common use frequency of 0.6%.

The contribution to the preparation of recipes for each species was determined by the number of recipes in which the species was cited. The most cited species in the recipes in this study were Annona muricata and Persea americana, each with 13 recipes for a contribution to the preparation of the common recipes of 24.5%. They were followed by Alium sativum and Picralima nitida with respectively 12 and 8 recipes, and a contribution of 22.6 and 15.1% to the preparation of the recipes, respectively. The species that contributed the least to recipes preparation were used in a single recipe for a contribution to recipe preparation of 1.9%.

Beside hypertension which was the health problem on which the investigations were directed, many other health problems were indicated by the respondents relating to the inventoried species, including nerve pain, headaches, vertigo, male infertility, nausea, malaria, jaundice, bleeding, persistent sores, muscle pain, bloating, diabetes, typhoid, viral hepatitis, convulsion, hernia, anemia, boils, vascular thrombosis, hyperthermia, hemorrhoids, hyperglycemia, general fatigue, a cold, cough, influenza mystical illnesses.

The selling prices of species on the market varied from 0.2 CFA franc per gram, or 200 CFA francs per kilogram for the cheapest, to 3.7 CFA franc per gram, or 3,700 CFA francs per kilogram for the most expensive. The price per gram of Alium sativum material was 1.5 CFA francs, or 1,500 francs per kilogram. The price per gram of Picralima nitida material was 1.5 CFA francs, or 1,500 francs per

kilogram. The selling price of a gram of Garcinia cola material was 3.7 Francs, or 3,700 francs per kilogram.

In addition to the use of plants identified in traditional human medicine, respondents indicated other categories of use, namely: herbs, fodder plants, food plants, ornamental plants, veterinary medicine, lumber, craft wood and firewood.

The main plant organs used in this study were leaves, whole plants, leafy twigs, bulbs, pods, bark and roots (Table 2).

Table-2: Usage of inventories plant species in the city of Nkongsamba, Littoral, Cameroon

No	Family	N°	Plant species	NC	IC (%)	FC (%)	NU	FU (%)	NRC	Cpr (%)	APS	PMGO (FCFA)	ACU	OrgU
1	Acanthaceae	1	Acanthus montanus	1	2,9	0,44	2	1,3	1	1,9	47, 99.	0,3	IV, V.	fe, plten
		2	Eremomastax speciosa	8	22,9	3,56	6	3,8	6	11,3	2, 6, 8, 12, 13, 17, 18, 19, 21, 23, 30, 32, 37, 59.	0,45	II, V.	fe, rf, plten
		3	Justicia secunda	4	11,4	1,78	2	1,3	2	3,8	6, 13, 17, 20, 22, 91.	0,35	II, IV, V.	rf, plten
2	Agavaceae	4	Aloe vera	2	5,7	0,89	1	0,6	1	1,9	14, 15, 29, 52, 87.	0,7	V.	fe, plten
3	Amaranthaceae	5	Cyathula prostrata	4	11,4	1,78	2	1,3	2	3,8	1, 6, 10, 12, 14, 21, 29, 30, 32, 37, 41, 89.	0,4	II.	fe, plten
4	Amaryllidaceae	6	Alium cepa	4	11,4	1,78	1	0,6	1	1,9	1, 2, 23, 25, 26,	0,8	I, V.	blb
		7	Alium sativum	16	45,7	7,11	12	7,59	12	22,6	1, 2, 10, 23, 24, 25, 26, 30, 34, 37, 43,	1,5	I, V.	gse
5	Anacardiaceae	8	Mangifera indica	3	8,6	1,33	1	0,6	1	1,9	1, 3, 5, 6, 13, 14, 17,	0,4	II, III, V.	fe, écr
6	Annonaceae	9	Annona muricata	15	42,9	6,67	13	8,3	13	24,5	1, 2, 3, 6, 10, 12, 53, 60, 69, 72, 88, 95.	0,8	III, V.	fe, écr
7	Apocynaceae	10	Alstonia boonei	5	14,3	2,22	4	2,5	4	7,5	6, 7, 13, 15, 20,	1,1	V, VIII.	écr, fe.
		11	Cataranthus roseus	5	14,3	2,22	5	3,2	4	7,5	8, 9, 10, 12, 67.	0,6	II, IV.	rf, fe.
		12	Picralima nitida	13	37,1	5,78	8	5,1	8	15,1	5, 6, 7, 12, 13, 14, 20, 22, 25,	1,5	V, VIII.	écr, fe, frt.
		13	Rowolfia vomitoria	11	31,4	4,89	7	4,4	7	13,2	5, 6, 7, 11, 12, 13, 14, 15, 30, 33, 37.	0,8	V, VIII.	écr, fe
		14	Voacanga africana	3	8,6	1,33	1	0,6	1	1,9	6, 7, 13, 19, 30, 38.	1,1	II, V, VIII.	écr, fe, frt
8	Asteraceae	15	Acmela caulirhiza	2	5,7	0,89	1	0,6	1	1,9	1, 8, 9, 17, 30, 43, 44, 79,	0,25	II, V.	fe, plten
		16	Ageratum conyzoides	3	8,6	1,33	1	0,6	1	1,9	1, 2, 4, 6, 8, 9, 16, 27.	0,65	II, V.	fe, plten
		17	Artemesia annua	1	2,9	0,44	1	0,6	1	1,9	6, 13, 14, 26, 49,	2,5	II, V.	fe, plten
		18	Emilia coccinea	2	5,7	0,89	1	0,6	1	1,9	1, 8, 9, 10.	0,28	II, III, V.	fe, plten
		19	Erigeron floribundus	1	2,9	0,44	1	0,6	1	1,9	1, 10, 23, 85, 86,	0,65	II.	fe, plten
		20	Vernonia amygdalena	9	25,7	4	2	1,3	2	3,8	5, 6, 8, 9, 10, 11, 12, 13, 14, 20, 21, 22, 30, 33.	0,3	II, III, V.	fe, rf, rac
		21	Vernonia guineensis	4	11,4	1,78	4	2,5	4	7,5	21, 23, 36, 47.	1	II, V.	rac
9	Bromeliaceae	22	Ananas comosus	1	2,9	0,44	1	0,6	1	1,9	22, 48.	0,4	III, IV.	frt
10	Caparidaceae	23	Cleome ciliata	1	2,9	0,44	1	0,6	1	1,9	63, 64.	0,36	II, III.	fe, plten
11	Caricaceae	24	Carica papaya	4	11,4	1,78	4	2,5	3	5,7	1, 6, 10, 11, 12, 13, 18, 21, 30,	0,3	III, V.	fe, rac.
12	Cecropiaceae	25	Musanga cecropioides	4	11,4	1,78	1	0,6	1	1,9	3, 4, 6, 12, 17, 22, 23, 25, 27.	0,7	VII, VIII.	fe, écr,
13	Clusiaceae	26	Garcinia cola	2	5,7	0,89	1	0,6	1	1,9	36, 48, 49,	3,7	II, V.	écr, fe, frt.
14	Costaceae	27	Costus afer	2	5,7	0,89	2	1,3	2	3,8	2, 27, 31, 45.	0,2	V.	fe, tg,

15	Dennstaedtiaceae	28	Pteridium acquilinum	1	2,9	0,44	1	0,6	1	1,9	27,51.	0,27	II.	fe
16	Euphorbiaceae	29	Alchornea cordifolia	3	8,6	1,33	2	1,3	2	3,8	6, 10, 13, 14, 17, 23.	0,3	II, V.	fe, rf
		30	Euphorbia hirta	2	5,7	0,89	1	0,6	1	1,9	8, 37.	0,8	II, V.	fe, plten
		31	Jatropha gossypiifolia	2	5,7	0,89	2	1,3	2	3,8	10, 14, 21, 26, 49	2,3	II, V.	fe, rf
17	Fabaceae	32	Desmodium adcendens	2	5,7	0,89	1	0,6	1	1,9	14, 26, 49,	1,1	II, V.	fe, plten
		33	Gilbourtia tesmanii	2	5,7	0,89	1	0,6	1	1,9	3, 6, 13, 21, 27, 28, 29, 31, 36, 37, 42, 45, 50.	2,8	V, VII.	fe, écr, rac.
		34	Senna alata	5	14,3	2,22	4	2,5	4	7,5	2, 6, 7, 17, 18, 20, 21, 30, 52, 60,	0,6	II, V.	fe, rf
		35	Senna occidentalis	1	2,9	0,44	1	0,6	1	1,9	6, 13, 30, 66,	0,5	II, V.	fe, rf
18	Gluttiferaceae	36	Harungana madagascariensis	1	2,9	0,44	2	1,3	1	1,9	6, 37, 65.	0,8	II, III, V.	fe, écr, rf
19	Lamiaceae	37	Occimum gratissimum	1	2,9	0,44	1	0,6	1	1,9	2, 30, 33.	1,2	I, II, III, V.	fe, rf
20	Lauraceae	38	Persea americana	15	42,9	6,67	13	8,3	13	24,5	1, 4, 12, 13, 18, 21, 22, 25, 27, 30, 37, 50, 57, 60.	0,63	V, VIII.	fe, écr, frt
21	Loranthaceae	39	Phragmanthera capitata	7	20	3,11	7	4,4	6	11,3	1, 11, 12, 19, 23, 25, 27, 32, 39, 40, 45, 46, 47, 48, 50.	0,75	II, V.	fe, rf
22	Malvaceae	40	Hibiscus sabdarifa	3	8,6	1,33	1	0,6	1	1,9	6, 2, 8, 12, 15, 17.	0,62	II, III, V.	fe, rf
		41	Hibiscus surratensis	1	2,9	0,44	1	0,6	1	1,9	22.	0,3	II, V.	fe, plten
23	Mirtaceae	42	Eucalyptus globulus	7	20	3,11	7	4,4	7	13,2	1, 10, 11, 14, 23, 25, 38, 40, 46, 50, 53, 75,	0,5	II, IV, V, VIII.	fe , écr
24	Moringaceae	43	Moringa oleifera	6	17,1	2,67	2	1,3	2	3,8	1, 12, 17, 30, 33,	2,3	I, II, III, IV, V.	fe, rf, gr, rac
25	Pinaceae	44	Pinus montana	1	2,9	0,44	1	0,6	1	1,9	1, 2, 22, 23, 25, 30, 48, 65.	0,4	II, IV, V.	rf, écr
26	Poaceae	45	Cymbopogon citratus	6	17,1	2,67	5	3,2	3	5,7	6, 7, 24, 25, 26, 30, 33, 37, 46, 47.	0,7	II, III, V.	fe, plten
27	polypodiaceae	46	Platycerium bifurcatum	1	2,9	0,44	1	0,6	1	1,9	27.	0,6	V.	plten
28	Rubiaceae	47	Diodia scandens	1	2,9	0,44	1	0,6	1	1,9	10, 27.	0,32	II.	fe, plten
		48	Pausinistalia yoyimbe	1	2,9	0,44	1	0,6	1	1,9	6, 36.	2,7	II, V, VI, VIII.	écr
29	Rutaceae	49	Citrus aurantifolia	11	31,4	4,89	6	3,8	6	11,3	1, 6, 7, 10, 11, 14, 17, 23, 24, 25, 26, 30, 31, 33, 34, 40.	0,8	III, VIII.	frt, fe.
		50	Citrus limon	5	14,3	2,22	3	1,9	3	5,7	1, 2, 6, 7, 11, 12, 13, 17.	1,1	III, VIII.	frt, fe.
		51	Fagara macrophylla	1	2,9	0,44	1	0,6	1	1,9	32, 33.	0,8	VIII.	écr, fe
30	Solanaceae	52	Solanum torvum	1	2,9	0,44	1	0,6	1	1,9	10, 23, 27, 12, 28, 61, 80.	0,64	II, III, V.	fe, rf, frt.
31	Sterculiaceae	53	Theobroma cacao	1	2,9	0,44	1	0,6	1	1,9	1, 36, 66.	1,34	III, VIII.	fe, frt
32	Urticaceae	54	Laportea Ovalifolia	1	2,9	0,44	1	0,6	1	1,9	11, 46, 47.	0,74	II, V.	fe, plten
33	Zingiberaceae	55	Curcuma longa	5	14,3	2,22	3	1,9	3	5,7	2, 10, 23, 66, 78, 97.	1,5	I, II, III, V.	rhz

NC = Number of Citations ; CI = Confirmation Index ; FC = Citation Frequency ; NU = Number of Use ; FU = Frequency of Use ; NRC = Number of Recipes Cited ; Cpr = Contribution to the preparation of recipes ; APS = Other Health Problems ; PMGO = Average Price per Gram of Organs ; ACU = Other Categories of Uses. 1 = nervous pain; 2 = headache; 3 = Vertigo: 4 = Male infertility: 5 = vomiting; 6 = Malaria; 7 = Jaundice; 8 = hemorrhages; 9 = persistent wounds; 10 = Muscle pain; 11 = Bloating; 12 = diabetes; 13 = typhoid; 14 = viral hepatitis; 15 = convulsion; 16 = hernia; 17 = anemia; 18 = boils; 19 = vascular thrombosis; 20 = hyperthermia; 21 = hemorrhoids; 22 = hyperglycemia; 23 = general fatigue; 24 = common cold; 25 = cough; 26 = influenza; 27 = mystical illnesses; 28 = painful periods; 29 = purification of blood; 30 = fevers; 31 = scabies, 32 = diarrhea; 33 = stomach ache; 34 = visual disturbance; 35 = delay in walking; 36 = sexual weakness; 37 = amoebic dysentery; 38 = cirrhosis of the liver; 39 = dartre; 40 = cramps; 41 = stroke; 42 = difficult childbirth; 43 = dental pain; 44 = rapid healing; 45 = dermatoses; 46 = obesity; 47 = detoxification; 48 = prostate; 49 = corona; 50 = insomnia; 51 = Epilepsy; 52 = venereal disease; 53 = rheumatism; 54 = female infertility; 55 = child malnutrition; 56 = elephantiasis; 57 = goiter: 58 = degreasing the body; 59 = buttock red; 60 = stiffness; 61 = indigestion; 62 = HIV; 63 = malformation; 64 = sprains; 65 = dewormer; 66 = stress; 67 = IST; 68 = eye pain; 69 = swelling of the feet; 70 = lack of appetite; 71 = fortification of bones; 72 = anti carcinogenic; 73 = hypothermia; 74 = flow of breast milk; 75 = dirty water; 76 = urinary tract infections; 77 = spleen; 78 = kidney toning; 79 = earache; 80 = heart failure; 81 = bad breath; 82 = gastric ulcers; 83 = 200 illnesses; 84 = lung infections; 85 = blood fluidity; 86 = heart disease; 87 = vaginal infections; 88 = sinusitis; 89 = measles; 90 = design issues; 91 = bleeding from the eye; 92 = mumps; 93 = bile; 94 = weight loss; 95 = palpitations; 96 = against poison; 97 = aphrodisiac; 98 = hip pain; 99 = worms of women; 100 = childhood illnesses; 101 = blood cancer; 102 = breast cancer; 103 = fibroids; 104 = antibiotic; 105 = tuberculosis. I = condiment plants ; II = forage plants ; III = food plants ; IV = ornamental plants ; V = veterinary medicine ; VI = lumber ; VII = craft wood ; VIII = firewood : OrgU = Organs Used (fe : leaves, rf : leafy twig, plten : whole plant, frt : fruits, rac : roots, cr : bark, rhz : rhizomes, blb : bilbes, gse : pod, gr : seeds).

DISCUSSION

A total of 35 individuals were interviewed as part of this survey conducted in the city of Nkongsamba, Littoral, Cameroon. Men accounted for 68.57% of the interviewees, against 11 women (31.43%). This imbalance in the gender of the respondents is due to the fact that male traditional health practitioners are more prone to gather up in associations, unlike females. This survey was conducted largely within recognized and legalized associations of traditional healers, yet women have difficulty engaging in such organizations. They tend to work "solo" in their homes, or in markets where they sell medicinal plants. In addition, this city does not have a real market space dedicated to the sale of medicinal plants like it is the case in some large urban centers in the country. Kidik Pouka et al. [26] in their work, found similar results where 59 vendors were identified in the markets of Douala, Littoral, Cameroon, with 52% being men and 48% women.

The age of the respondents was between 24 and 78 years old. The distribution by age group showed that the group [41-60] is the most represented with a workforce of 20 people corresponding to 57.14% of the people interviewed. This age group was followed by the group [20-40] with a workforce of 11 people are 31.43% of the people interviewed, then the bracket [61-80] with a staff of 4 people or 11.43% of the people interviewed. The use of medicinal plants in the Littoral region is very remarkable with a predominance of the practice of traditional medicine in the age group [41-60] years, for which traditional medicine is still of great interest. It should be noted that the transmission of knowledge about medicinal plants is most often done in a genealogical way, from ascendants to descendants. Thus, the fact that the youngest (under 30 years old) lose interest in the knowledge of traditional medicine for the benefit of their education and various other leisure activities, could lead to a complete loss of the therapeutic uses of medicinal plants at the rural and national levels [3]. Ngoule et al. [27] in their work found that the adult class (30 -59 years) was the most represented.

The people interviewed during this study came from 4 distinct regions. The Western region is the most represented with a staff of 27 people, or 77.14% of those who contributed to the study. These results showed the cosmopolitan aspect and therefore the interculturality of the big cities of Cameroon. Kidik Pouka et al. [26] found that 72% of the respondents were from West Cameroon.

The distribution of respondents by profession in the city of Nkongsamba made it possible to distinguish traditional healers, naturopaths and sellers. However, traditional healers were the most represented with a staff of 28, or 80% of the total number of people who contributed to the study. These results could be explained by the fact of the absence of real market spaces dedicated to the sale of medicinal plants in this city. Here, practitioners of traditional medicine work more in homes and put more emphasis on the title of traditional healer.

Cameroonian flora abounds with an important reserve of plants with edible, ornamental and medical characteristics. According to the latest estimates, these various plant formations contain more than 8,500 species [23]. The floristic inventory in the city of Nkongsamba identified 55 species divided into 50 genera and 33 families. The Asteraceae family was the most represented with 7 species, making up 12.73% of the total number of recent species. Lougbégnon et al. [28] in a survey in the markets of South Benin inventoried a total of 103 species and 59 families. Betti et al. [29], in a survey of plants used in the treatment of malaria in the Dja reserve, found that among the 27

families represented, the most important was that of the Asteraceae. Ladoh-Yemeda et al. [24]. In their work found that the Asteraceae family was the most represented.

Five morphological types were identified in this study. Herbs are the most represented morphological type with 30 species, i.e. 54.54% of the total number of species inventoried. Adamou et al. [30] found opposite results in an ethnobotanical study of medicinal plants sold in the Abomey-Calavi market in Benin, where trees were more represented.

Chaméphytes are the most represented biological type with 26 species, i.e 42.27% of inventoried species, while hemicryptophytes are the least represented biological type with 1 species, i.e 1.82% of the total number of inventoried species.

Eight phytogeographic types were summarized. The Tropical Africa type was the most represented with 18 species, i.e 32.73% of the total number of species obtained. Dibong et al. [31] in their work found 7 phytogeographic types, the Guineo-Congolese being predominant with 37% of citations.

The most cited species during this survey in the city of Nkongsamba was Alium sativum with 16 citations for a respondent consensus factor of 45.7% and a citation frequency of 7.11%. This was followed by Annona muricata and Persea americana each with 15 citations for a common respondent consensus factor of 42.86% and a common citation frequency of 7.11%. The species Picralima nitida totaled 13 citations for a respondent consensus factor of 37.1% and a citation frequency of 5.78%. A high consensus factor value for a plant species, i.e close to 1, testifies to the perpetual use of this plant species for a specific disease, a good knowledge of this plant to treat this disease, a collective knowledge on the use of this plant and potentially, an exchange of information between the respondents.

CONCLUSION

The general objective of this study was to investigate the antihypertensive florule in the city of Nkongsamba. It should therefore be remembered that men are more involved than women in the practice of traditional medicine. People in the age range [41-60] are more interested in traditional medicine. Nationals from the West Cameroon region were the most represented among traditional medicine practitioners in this city and traditional healers were the most presented professional category. Christians were the most represented among those surveyed, most of whom did secondary studies. 55 species divided into 50 genera and 33 families have been identified. Five morphological types, four biological types and eight phytogeographic types were summarized at the end of

this study. The most cited and used species were Alium sativum, Annona muricata and Persea americana.

RÉFÉRENCES

1. Jiofack, T., Fokunang, C., Guedje, N., Kemeuze, V., Fongnzossie, E., Nkongmeneck, B. A., Mapongmetsem, P.M., Tsabang, N. (2010). Ethnobotanical uses of medicinal plants of two ethnoecological regions of Cameroon, International Journal of Medicine and Medical Sciences, 2(3); 60-79.
2. Dibong, S.D., Mpondo Mpondo, E., Ngoye, A., Kwin, M.F., Betti, J.L. (2011). Ethnobotanique et phytomédecine des plantes médicinales de Douala, Cameroun. Journal of Applied Biosciences, 37 ; 2496–2507.
3. Mpondo, Mpondo, E., Ngene, J.P., Mpounze Som, L., Etame, Loe, G. Ngo, Boumsong P.C., Yinyang, J., & Dibong, S.D. (2017). Connaissances et usages traditionnels des plantes médicinales du département du Haut Nyong. Journal of Applied Biosciences, 113; 11229-11245.
4. Sanogo, R., Giani, R. (2006). Rôle des plantes médicinales en médecine traditionnelle 10eme école d'été de l'IEPF et du SIFEE du 06 au 10 Juin.
5. Promotion du role de la medecine traditionnelle dans le systeme de sante. (2009). Strategie de la region africaine, Harare, Zimbabwe, Organisation mondiale de la sante.
6. Ngene, J.P., Ngoule, C.C., Kidik Pouka. .C.M., Ndjib, R.C., Dibong, S.D., & Mpondo Mpondo, E. (2015). Importance dans la pharmacopée traditionnelle des plantes à flavonoïdes vendues dans les marchés den Douala est (Cameroun). Journal of Applied Biosciences, 88; 8194 – 8210.
7. Kouadio, F., Kanko, C., Juge, M., Grinaux, N., Jean, A., N'guessan, Y.T., Petit, J.Y. (2000). Analgesic and antiinflammatory activities of an extracts from Parkiabiglobosa used in traditional medicine in Ivory Coast. Phytother Res, 14; 635 - 637.
8. Jouad, H., Haloui, M., Rhiouani, H., El-Hilaly, J., Eddouks, M. (2001). Ethnobotanical survey of medicinal plants used for the treatment of diabetes, cardiac and renal diseases in the North centre region of Morocco (Fez-Boulemane). Journal of Ethnopharmacology, 77; 175 – 182.
9. Eddouks, M., Maghrani, M., Lemhadri, A., Ouahidi, M. L., & Jouad, H. (2002). Ethnopharmacological survey of medicinal plants used for the treatment of diabetes mellitus, hypertension and cardiac diseases in the south-east region of Morocco (Tafilalet). Journal of ethnopharmacology, 82(2-3), 97-103.
10. Ouedraogo, N. N. A. (2014). L'Hypertension arterielle en milieu urbain ouest africain (Ouagadougou, Burkina Faso): etude transversale

communautaire de la prevalence et des facteurs associes.

11. Balde, M. D., Balde, N. M., Kaba, M. L., Diallo, I., Diallo, M. M., Kake, A., ... & Baldé, M. (2006). Hypertension arterielle: epidemiologie et anomalies metaboliques au Foutah-Djallon en Guinée. Mali Med, 19-22.

12. Tahraoui, A., El-Hilaly, J., Israili, Z. H., & Lyoussi, B. (2007). Ethnopharmacological survey of plants used in the traditional treatment of hypertension and diabetes in south-eastern Morocco (Errachidia province). Journal of ethnopharmacology, 110(1), 105-117.

13. Ghourri, M., Zidane, L., & Douira, A. (2013). Usage des plantes médicinales dans le traitement du Diabète Au Sahara marocain (Tan-Tan). Journal of Animal &Plant Sciences, 17(1), 2388-2411.

14. Isérin, P., Masson, M., & Kedellini, J. P. (2001). Encyclopédie des plantes médicinales, Identifications, Préparations. Soins. Paris: Edition Larousse/VUEF, 335.

15. Diallo, A. (2005). Etude de la phytochimie et des activités biologiques de Syzygium guineense Willd.(Myrtaceae). PhD. of the University Bamako, Mali, 38-47.

16. Guindo, I. (2005). Etude du traitement traditionnel de l'hypertension artérielle au Mali. Bamako: Thèse de pharmacie FMPOS, 126.

17. Bele, M. Y., Focho, D. A., Egbe, E. A., & Chuyong, B. G. (2011). Ethnobotanical survey of the uses Annonaceae around mount Cameroon. African Journal of Plant Science, 5(4), 237-247.

18. Liu, Y., & Wang, M. W. (2008). Botanical drugs: challenges and opportunities: contribution to Linnaeus Memorial Symposium. Life Sciences, 82(9-10), 445-449.

19. Dagnelie, P. (1998). Statistique théorique et appliquée vol. 2. De Boeck et Larcier: Paris.

20. Dibong, S. D., Ottou, P. B. M., Vandi, D., Ndjib, R. C., Tchamaha, F. M., & Mpondo, E. M. (2015). Ethnobotanique des plantes médicinales anti hémorroïdaires des marchés et villages du Centre et du Littoral Cameroun. Journal of Applied Biosciences, 96, 9072-9093.

21. Betti, J. L. (2001). Vulnérabilité des plantes utilisées comme antipaludiques dans l'arrondissement de Mintom au sud de la réserve de biosphère du Dja (Cameroun). Systematics and Geography of Plants, 661-678.

22. Gomez-Beloz, A. (2002). Plant use knowledge of the Winikina Warao: the case for questionnaires in ethnobotany. Economic Botany, 56(3), 231-241.

23. Betti, J. L. (2007). Stratégie, plan d'action pour une meilleure collecte des données statistiques sur les produits forestiers non ligneux au Cameroun et recommandations pour les pays de la COMIFAC. A. el P. d. C. Ministère Fédéral d'Allemagne pour l'Alimentation. Yaounde, Ministère Fédéral d'Allemagne pour l'Alimentation, l'Agriculture et la Protection des Consommateurs, COMIFAC, FAO, 170.

24. Ladoh-Yemeda, C. F., Vandi, T., Dibong, S. D., Mpondo, E. M., Wansi, J. D., Betti, J. L., ... & Eyango, M. T. (2016). Étude ethnobotanique des plantes médicinales commercialisées dans les marchés de la ville de Douala, Cameroun. Journal of Applied Biosciences, 99, 9450-9466.

25. Dassou, H. G., Ogni, C. A., Yédomonhan, H., Adomou, A. C., Tossou, M., Dougnon, J. T., & Akoègninou, A. (2014). Diversité, usages vétérinaires et vulnérabilité des plantes médicinales au Nord-Bénin. International Journal of Biological and Chemical Sciences, 8(1), 189-210.

26. Pouka, M. K., Ngene, J. P., Ngoule, C. C., Ottou, P. M., Ndjib, R. C., Dibong, S. D., & Mpondo, E. M. (2015). Caractérisation des plantes médicinales à flavonoïdes des marchés de Douala (Cameroun). International Journal of Biological and Chemical Sciences, 9(3), 1494-1516.

27. Ngoule, C. C., Ngene, J., Pouka, M. K., Ndjib, R. C., Dibong, S. D., & Mpondo, E. M. (2015). Inventaire et caractérisation floristiques des plantes médicinales à huiles essentielles des marchés de Douala Est (Cameroun). International Journal of Biological and Chemical Sciences, 9(2), 874-889.

28. Lougbegnon, T. O., Nassi, K. M., & Gbesso, G. F. (2015). Ethnobotanique quantitative de l'usage de Chrysophyllum albidum G. Don par les populations locales au Bénin. Journal of Applied Biosciences, 95, 9028-9038.

29. Betti, J. L., Caspa, R., Ambara, J., & Kourogue, R. L. (2013). Ethno-botanical study of plants used for treating malaria in a forest: savanna margin area, East region, Cameroon. Global Journal of Research on Medicinal Plants & Indigenous Medicine, 2(10), 692.

30. Adomou, A. C., Yedomonhan, H., Djossa, B., Legba, S. I., Oumorou, M., & Akoegninou, A. (2012). Etude Ethnobotanique des plantes médicinales vendues dans le marché d'Abomey-Calavi au Bénin. International Journal of Biological and Chemical Sciences, 6(2), 745-772.

31. Dibong, S. D., Ottou, P. B. M., Vandi, D., Ndjib, R. C., Tchamaha, F. M., & Mpondo, E. M. (2015). Ethnobotanique des plantes médicinales anti hémorroïdaires des marchés et villages du Centre et du Littoral Cameroun. Journal of Applied Biosciences, 96, 9072-9093.