

MEDICINAL PLANTS SOLD IN YAOUNDÉ MARKETS, CAMEROON

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ABSTRACT A total of 35 medicinal plants were obtained from 18 sellers at the Yaoundé markets in March 2000. The plant species comprised 35 genera and 19 families. Malaria, lumbago, and male sexual impotence appear to be the prevailing diseases in terms of the number of references made by these sellers. An index of performance (*Ip*) is proposed for each plant species, based on its number of references and according to an arbitrary scale which ranges from 0 to 3. Some plants used for treating certain diseases are widely used in African countries in similar ways. There are also plants of which their effectiveness is confirmed in the literature with their biological activity relating to the specific disease.

Key Words: Medicinal plants; Performance index (*Ip*); Yaoundé markets; Citations.

INTRODUCTION

Cameroon is located in central Africa. Because of the economic crisis, which attacked the country in the late 1980s, both rural and city populations are increasingly dependent on medicinal plants for the treatment of diseases. This paper describes the medicinal plants sold at Yaoundé markets, and analyses their use and relative importance.

The city of Yaoundé, Central Province, is the political capital of Cameroon. It belongs to the Equato-Guinean, sub-equatorial climate (Moby-Etia, 1979; Trochain, 1976). Yaoundé (Fig. 1) is situated in the rain forests of Cameroon of the semi-deciduous foliated species (Letouzey, 1985). Yaoundé has a population of 1 million. While all ethnic groups found in Cameroon are represented in Yaoundé, the major one is the "Ewondo" ethnic group, which belongs to the large category of "Pahouin" group (Cousteix, 1961).

METHODS

I. Survey

An ethnobotanical survey was conducted in March 2000 at five markets in Yaoundé city. The survey aimed to identify plant parts, which were sold at the markets for their medicinal purpose. For this study, Yaoundé city, the political capital, is

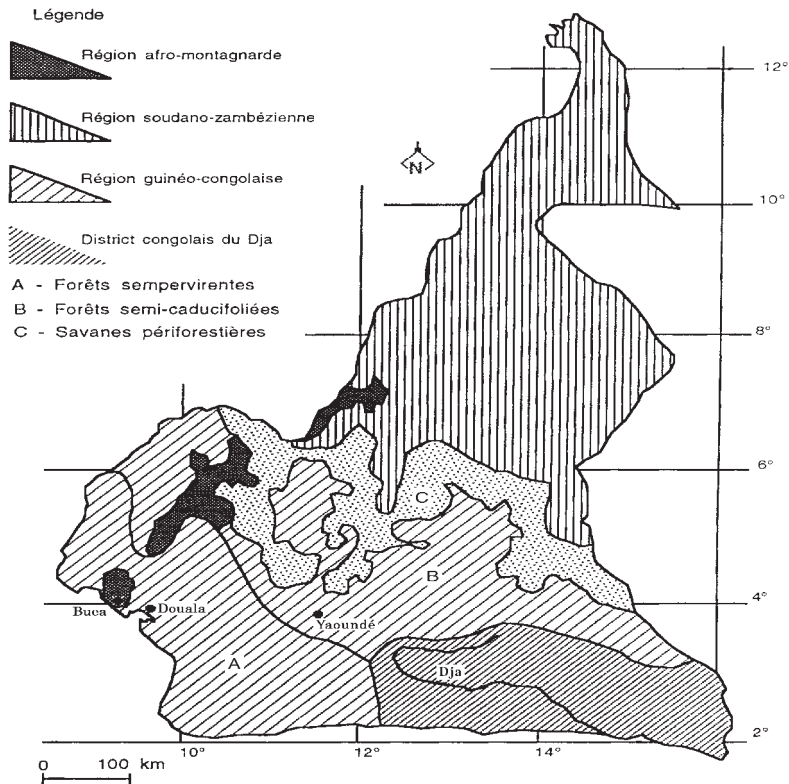


Fig. 1. Location of Yaoundé in a Climate-Vegetation Map of Cameroon (after Letouzey 1985).

more suitable than Douala, the economical capital, because of its location in the rain forest area of Cameroon, and because previous studies by the ECOFAC program (program of conservation and rational utilisation of tropical ecosystems in central Africa) identified Yaoundé as the principal center of trade for NTFP (Non-Timber Forest Product) in Cameroon, mainly in the Center, South and East Provinces (Debroux & Dethier, 1993; Betti *et al.*, 1999). The data collected can easily be compared with the previous data collected in the three provinces. For any plant species sold at the markets, the vernacular names of the plant and the name, gender, and the ethnic group of the seller were recorded. Then, we asked the seller questions concerning plant parts used and their therapeutic indications. These indications were made on a specific disease, a symptom or a physiological effect. The plant parts were then weighed and the prices were recorded. We bought one sample of the plant parts for information set and from each seller. The plant species were then identified at the Cameroon National Herbarium with the help of Mr. Koufani. The diseases and other health problems were identified as indicated in the "PHARMEL" database sheets (Adjahoun *et al.*, 1989; 1994). To classify our data according to the world system, the health problems were classified into groups based on the previous classification proposed by the World Health Organisation (WHO, 1994) and adapted by

the African Unity Organisation (AUO) for the Cameroonian pharmacopoeia (Adjanohoun *et al.*, 1996).

II. Performance Index of Medicinal Plants

For analysing the data, “specific flora” is defined as the list of plants cited for treating a specific disease, symptom or physiological effect. The “global flora” is defined as the total list of plants recorded in the markets for all diseases.

For the relationship between the “specific flora” and the “global flora”, a null hypothesis is tested, that the “specific flora” for a given disease is randomly selected from the “global flora”. The proportion of citations (records) for a specific disease to the total number of citation is considered as a theoretical proportion (P2). This proportion is compared to the proportion of observed number of citation of a plant for a specific disease to the total number of citations for the same plants for all diseases (P1). The difference (D) between the two proportions is then used to define a performance index (I_p), which ranges from 0 to 3 according to the following scale.

- if $P1 - P2 < 0$, $I_p = 0$: the plants concerned are rejected, not significant;
- if $0 < P1 - P2 \leq 1/3$, $I_p = 1$: average performance;
- if $1/3 < P1 - P2 \leq 2/3$, $I_p = 2$: high performance;
- if $P1 - P2 > 2/3$, $I_p = 3$: very high performance.

The proportions used here are calculated from the ratios of number of citation for diseases. A citation for each record is shown in Appendix 2.

To illustrate this, an example is given for the performance index of a plant, *Hexalobus crispiflorus*, used for the treatment of gonorrhoea.

C1 = number of citations of *Hexalobus crispiflorus* for treating gonorrhoea = 1;

C2 = number of citations of *Hexalobus crispiflorus* in the global list (all diseases) = 2;

C3 = total number of citations of the gonorrhoea = 4;

C4 = total number of citations for all diseases = 155.

P1 (observed) and P2 (theoretical) are defined as follow:

$$P1 = C1/C2 = 1/2 = 0.5$$

$$P2 = C3/C4 = 4/155 = 0.02$$

$$D = P1 - P2 = 0.5 - 0.02 = 0.48$$

$1/3 < D = 0.48 \leq 2/3$, this gives an $I_p = 2$, high performance.

RESULTS

I. Ethnic Composition of the Sellers at the Markets

A total of 18 sellers of medicinal plants belonging to 7 ethnic groups were interviewed at 5 markets in Yaoundé. Table 1 shows the sellers, their ethnic groups and native provinces in Cameroon, the market where they are based, and the code used in Appendix 2. The “Ewondo” ethnic group forms a largest portion, the half of the total number of sellers.

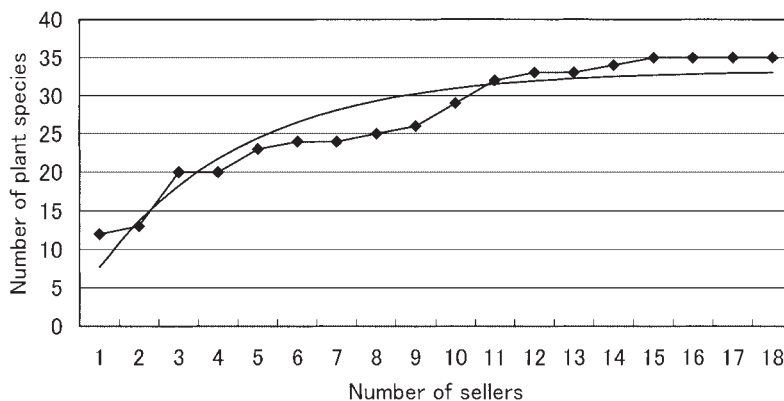
Table 1. List of Sellers Interviewed.

Ethnic group (native province)	Name	Code used	Market
Bamenda (North-west)	Hei Pius	Hei	Elig-Edzoa
Bamiléké (West)	Djopkam Seraphin	Djo	Central Post
"	Magne	Mag	Mvog-mbi
"	Siebatcheu	Sie	Central Post
Bamoun (West)	Aladji	Ala	Elig-Edzoa
"	Moulioum Philip	Mou	Central Post
Bassa (Litoral)	Mbieng Félix	Mbi	Central Post
Batanga (South)	Yeng Hervé	Yen	Nfoundi
Eton (Centre)	Mama Jeanne	Jea	Nfoundi
Ewondo (Centre)	Bilo'o	Bil	Central Post
"	Hervé	Her	Longkak
"	Mama Elise	Eli	Mokolo
"	Mama Généviève	Gén	Mokolo
"	Mama Joséphine	Jos	Mvog-mbi
"	Mama Martha	Mar	Mokolo
"	Mama Thérèse	Thé	Mokolo
"	Mengué Elisabeth	Men	Mokolo
"	Ngon Marie	Ngo	Mokolo

II. List of Medicinal Plants

A total of 35 plant species were collected for which a total of 155 citations were made on 37 diseases and other health problems. To investigate if the collected plants were representative of the medicinal plants sold at the markets, I counted the cumulative number of plants sold by additional number of sellers. The sellers were chosen randomly without replacement. The change in the number of plant species to the number of sellers is illustrated in Fig. 2. The curve can best be approximated equation:

$Y = 33.34(1 - 0.768^x)$; Y is the number of plants species, X is the number of sellers.

**Fig. 2.** Cumulative Number of Medicinal Plants to the Number of Sellers Interviewed.

The examination of the figure shows that an increasing number of sellers does not contribute to increasing the number of medicinal plants beyond a certain point. But this may only be true for the new sellers belonging to the same ethnic groups with the sample, mainly composed of the “Ewondo” ethnic group.

III. The Relative Importance of Diseases Indicated

1. *Groups of diseases*

The importance of diseases is evaluated based on the number of citations made by the sellers for each disease. The 37 diseases (health problems) recorded are classified into 13 broad categories. These diseases are listed in Appendix 1.

Fig. 3 illustrates the relative importance of the 13 groups of diseases. The digestive system group appears to be the most important one (21.9% of citations), followed by various specific symptoms (16%).

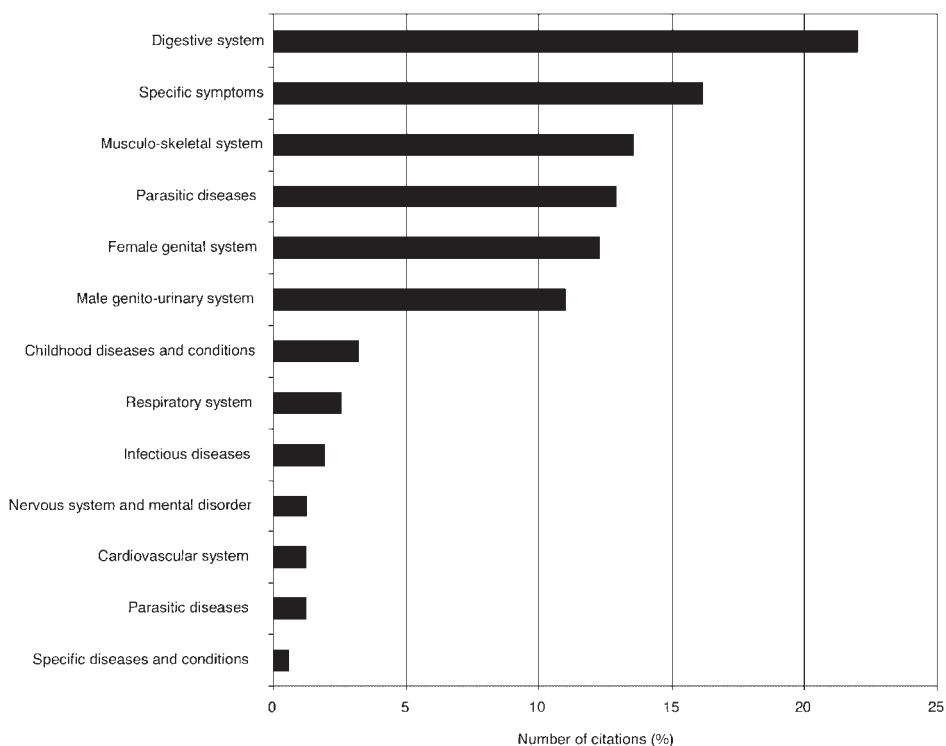


Fig.3. Relative Importance of Groups of Diseases in Terms of their Number of Citations by the Sellers.

2. *Diseases*

The relative importance of specific diseases is illustrated in Fig. 4. Here, only the seven most important diseases are illustrated: malaria (12.9% of citations), lumbago (12.2%), male sexual impotence (8.4%), anaemia (7.7%), female infertility (6.4%), diarrhoea (6.4%), jaundice (5.8%), which were frequently mentioned by the sellers.

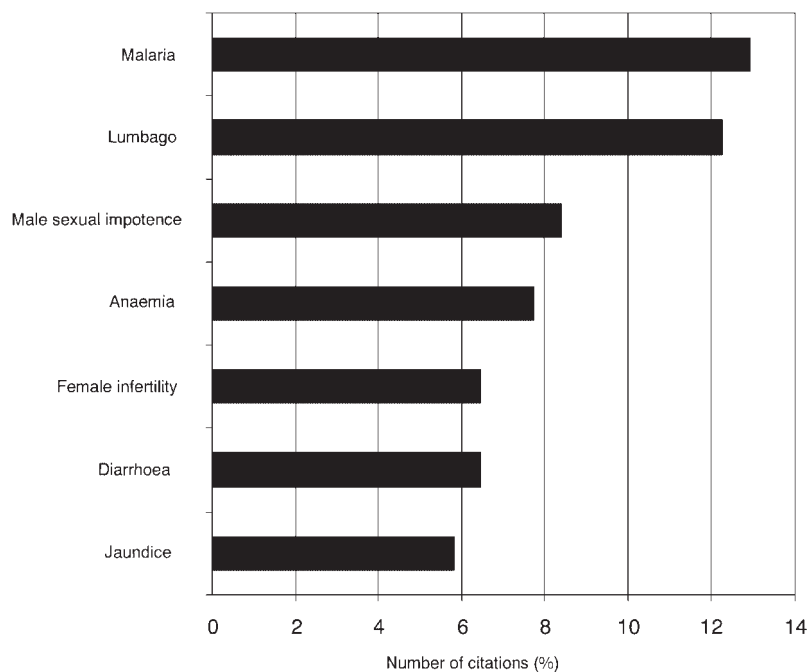


Fig. 4. Relative Importance of Diseases in Terms of Citations by the Sellers.

IV. Relative Importance of Plant Species

1. Prices per gram (*Pg*)

Appendix 2 shows the 155 citations made for the medicinal plants collected at the markets with their respective unit prices. There are considerable differences among different sellers in the prices per gram of the same plant species used for the same diseases. Table 2 shows the quantity of plant parts in gram (*Q*), the total price (*PA*) and the price for a gram (*Pg*) for each plant species (NB: 1 FF = 100 FCFA).

In all, 41.845 kg of plant medicine was bought for the price of 135,650 FCFA. This gives an average price of 3.24 FCFA per gram. The average quantity of plant parts bought per plant species was 1195.57 g, whereas the average price of buying per gram was 5.82 FCFA. The bark of *Baillonella toxisperma* was the most sold (4.73 kg) in quantitative terms, whereas that of *Erythrophleum suaveolens* was the most expensive (54.55 FCFA per gram).

2. Index of performance (*Ip*) of plant species

The 35 plant species belong to 35 genera and to 19 botanical families. The *Annonaceae* (4 plant species), *Mimosaceae* (4), *Caesalpiniaceae* (3), and *Euphorbiaceae* (3) families are more frequently represented than other families. Appendix 3 shows the plant species collected, with their performance index for a specific disease. For example, *Gnetum africanum* and *Ricinodendron heudelotii* are significantly more frequently used ($Ip > 0$) than other medicinal plants for anaemia.

Table 2. Prices of Plant Medicine at Yaoundé Markets.

Plant species	Family	Q (g)	PA (FCFA)	Pg (FCFA)
<i>Aframomum melegueta</i> K. Schum.	Zingiberaceae	125	100	0.80
<i>Alstonia boonei</i> De Wild.	Apocynaceae	1155	1850	1.60
<i>Anonidium mannii</i> (Oliv.) Engl. & Diels	Annonaceae	1385	3000	2.17
<i>Antrocaryon klaineianum</i> Pierre	Anacardiaceae	3000	12000	4.00
<i>Baillonella toxisperma</i> Pierre	Sapotaceae	4730	16500	3.49
<i>Ceiba pentandra</i> (L.) Gaertn.	Bombacaceae	1050	3000	2.86
<i>Cylicodiscus gabunensis</i> Harms	Mimosaceae	1740	3500	2.01
<i>Drypetes gossweileri</i> S. Moore	Euphorbiaceae	925	5000	5.41
<i>Elaeis guineensis</i> Jacq.	Arecaceae	1320	800	0.61
<i>Enantia chlorantha</i> Oliv.	Annonaceae	4275	9950	2.33
<i>Erythrophleum suaveolens</i> (Guil. & Perr.) Brenan	Caesalpinaceae	55	3000	54.55
<i>Garcinia cola</i> Heckel	Clusiaceae	150	300	2.00
<i>Gnetum africanum</i> Welw.	Gnetaceae	250	200	0.80
<i>Guarea thompsonii</i> Sprague & Hutch.	Meliaceae	660	3000	4.55
<i>Guibourtia tesmannii</i> (Harms) Léonard	Caesalpinaceae	4665	16900	3.62
<i>Hexalobus crispiflorus</i> A. Rich.	Annonaceae	1000	3000	3.00
<i>Irvingia gabonensis</i> (Aurey-Lecomte ex O'Rorke) Baill.	Irvingiaceae	650	1800	2.77
<i>Isolona hexaloba</i> (Pierre) Engl. & Diels	Annonaceae	350	500	1.43
<i>Klainedoxa gabonensis</i> Pierre	Irvingiaceae	255	2500	9.80
<i>Mammea africana</i> Sabine	Clusiaceae	2400	9500	3.96
<i>Milicia excelsa</i> (Welw.) Berg.	Moraceae	60	2500	41.67
<i>Mitragyna stipulosa</i> (DC.) O. Kuntze	Rubiaceae	575	1000	1.74
<i>Nauclea diderrichii</i> (De Wild.) Merrill	Rubiaceae	1200	4000	3.33
<i>Oldfieldia africana</i> Benth. & Hook. f.	Euphorbiaceae	75	500	6.67
<i>Pachyelasma tessmannii</i> (Harms) Harms	Caesalpinaceae	250	800	3.20
<i>Pentachlethra macrophylla</i> Benth.	Mimosaceae	920	3000	3.26
<i>Picralima nitida</i> (Stapf) Th. Dur.	Apocynaceae	555	2400	4.32
<i>Piptadeniastrum africanum</i> (Hook. f.) Bren.	Mimosaceae	3315	7350	2.22
<i>Pycnanthus angolensis</i> (Welw.) Excell	Myristicaceae	755	7000	9.27
<i>Raphia mombutorum</i> Drude	Arecaceae	660	400	0.61
<i>Ricinodendron heudelotii</i> (Baill.) Pierre ex Heckel.	Euphorbiaceae	1310	3300	2.52
<i>Sacoglottis gabonensis</i> (Baill.) Urban	Humiriaceae	150	500	3.33
<i>Staudtia kamerunensis</i> Warb.	Myristicaceae	900	1500	1.67
<i>Tetrapleura tetraptera</i> (Schum. & Thonn.) Taub.	Mimosaceae	200	500	2.50
<i>Zanthoxylum heitzii</i> (Aubr. & Pell.) Waterman	Rutaceae	780	4500	5.77

DISCUSSIONS

I. The Problem of Sampling

The samples collected for ethnobotanical survey are often very poor. The number informants may not even reach one percent (1%) of the total number of persons

(sellers in this case) found in the study site (Höft *et al.*, 1999). This is partly because informants are often reluctant to provide information. This problem is more crucial in surveys of medicinal plants. To examine the validity of the samples, I examined the representativeness of the sample through a regression curve of the number of plant species/number of sellers. Fig. 2 shows that the plants sample recorded in this study are quite representative of all that are sold at the Yaoundé markets. In fact almost all the medicinal plants sold at the Yaoundé markets were collected. The distribution of sellers to different markets or to different ethnic groups shows a considerable imbalance (Table 1). At Mokolo and the Central Post markets, more than 5 sellers each were interviewed. Among the total 18 sellers, the “Ewondo” group was the major ethnic group comprising 9 sellers. The “Ewondo”, which belong to the largest category of “Pahouin”, is the most typical and most numerous ethnic group of the Yaoundé region (Cousteix, 1961).

The major consequence of such an imbalance in relative number of sellers by location and by ethnic group is that, an intergroup comparison would not make sense. A comparison of the total samples collected in the area with those in other regions of Africa would be more fruitful.

II. Relative Importance of Diseases

In terms of the number of citations for medicinal uses, the diseases related to digestive system are more important, followed by the specific symptoms. The same results are mentioned in the report of Cameroonian pharmacopoeia (Adjanohoun *et al.*, 1996). Around the Dja biosphere reserve in south-east Cameroon (Betti, 1994; Betti & Lejoly, 1999), malaria is the most frequently cited disease. This reflects the importance of malaria in Cameroon, which is located in the high risk area of malaria, zone C according to WHO. According to the map drawn by the National Center of Chemical Sensitivity of Malaria based at Paris, Cameroon is situated in the area of high level prevalence of chloroquin-resistant type of malaria. Beside these, male sexual impotence also comprises an important problem in the traditional medicines of the Ewondo (Cousteix, 1961).

III. Relative Importance of Medicinal Plants

Even for the same plant species used for the same disease, the price per gram (Pg) varied from one seller to another. For example, the price per gram for *Guibourtia tessmannii* to treat “convulsions” ranged from 1.25 FCFA (at seller, Moulioum Philip) to 4.8 FCFA (Ngon Marie); to treat diarrhoea, price per gram ranged from 3.4 FCFA (for Hervé) to 5 FCFA (for Hei Pius); to treat lumbagos, it ranged from 2.5 FCFA (for Mama Génévieve) to 8 FCFA (for Mengué Elisabeth); and then to treat malaria, it varied from 1.25 FCFA (for Moulioum Philip) to 6.6 FCFA (for Yeng Hervé). The factors influencing these variations are not clear, but it may be due to the manner in which the plant parts are obtained from the local collectors. I conclude that it is not meaningful to link the importance of a plant to its price in the markets. The importance can only be expressed by the performance index (*Ip*).

Some plant species more frequently used for a specific disease (with higher value

for *Ip*) are widely known in the literature for their similar usages. Following are four examples of such plants widely used in Africa: *Aframomum melegueta*, *Alstonia boonei*, *Baillonella toxisperma*, *Enantia chlorantha*.

(1) *Aframomum melegueta* (Zingiberaceae) was recorded only for its use against male sexual impotence; with *Ip* of 3. The plant is used by Ewondo traditional healers (Cousteix, 1961) and by specialised traditional healers based in the Dja Biosphere Reserve (Betti, 1996). In Bipindi-Akom II region in south Cameroon, the local Bulu, Fang and Bagyeli Pygmies grow *A. melegueta* in their farms and home gardens and use them against male sexual impotence (van Dijk, 1999). The same usage is also reported in the Cameroon pharmacopoeia (Adjanohoun *et al.*, 1996) and in Congo-Brazzaville country (Diafouka, 1997).

(2) *Alstonia boonei* (Apocynaceae) is used by different sellers for treating three different diseases: typhoid fever, jaundice and malaria. The use for malaria is more important (*Ip* = 2). The plant is recorded to be used for malaria or fever in the Cameroon pharmacopoeia (Adjanohoun *et al.*, 1996), by the Ewondo traditional healers (Cousteix, 1961) in the Bipindi-Akom II region (van Dijk, 1999), in the Dja Reserve by mothers (Betti, 1994; Betti & van Esche, 1998; 2001) and traditional healers (Betti, 1996), and is also reported in the popular pharmacopoeia practised in the Mintom region, South-Cameroon (Betti, in press). Similar uses are also known in other African countries, such as Equatorial Guinea (Bitsindou, 1996), Congo-Brazzaville (Diafouka, 1997), Nigeria, Senegal and Togo (Richel, 1995) and the Democratic Republic of Congo (Magilu *et al.*, 1996).

(3) *Baillonella toxisperma* (Sapotaceae), called “moabi”, is used for treating six health problems (anaemia, male sexual impotence, lumbago, female infertility, intestinal worms and as a purgative). For all of these diseases, the performance index is just 1. It is interesting to note that *B. toxisperma* is cited as useful remedy for lumbago by 5 sellers, belonging to 4 ethnic groups in 3 different markets in Yaoundé. The plant is known by both family mothers (Betti, 1994) and traditional healers in the Dja Reserve as the most important medicine for lumbagos. The decoction of the barks is administered through the rectory by all ethnic groups, Baka Pygmies and Bantous peoples living in and around the Dja Biosphere Reserve (Betti, 1996). Such a usage as well as purgative use are also known by the Bulu, Fang and Bagyelu Pygmies living in the Bipindi-Akom II region (van Dijk, 1999) and are mentioned in the Cameroonian pharmacopoeia (Adjanohoun *et al.*, 1996).

(4) *Enantia chlorantha* (Annonaceae) is mentioned to be useful against four types of diseases: anaemia, typhoid fever, jaundice, and malaria. Its performance index is medium level for three of the diseases except for anaemia (*Ip* = 0). *E. chlorantha* is popular among the sellers, but used by one ethnic group (Ewondo) and sold at one market (Mokolo). Its use against jaundice is known by the people in the Dja reserve (Betti, 1994; 1996) and in the Bipindi-Akom II area (van Dijk, 1999). The bark is used in Cameroon for jaundice (Bitsindou, 1996). This usage is also mentioned in the Cameroonian pharmacopoeia (Adjanohoun *et al.*, 1996) as well as in other African areas, such as Congo-Brazzaville (Diafouka, 1997), central Africa (Bitsindou, 1996) and west Africa (Richel, 1995).

Other plant species, which are frequently mentioned by the sellers as being used for specific diseases, are well known in the literature for their active compounds for

the same usage. For example, the seeds of “maniguete”, the popular name of *Aframomum melegueta*, are mentioned in the literature for their aromatic and stimulant character (Anonymous, 1992). The genera *Alstonia* is not effective for malaria (Wright *et al.*, 1993; Makinde & Salako, 1991). But the bark of *A. boonei* (Olajide *et al.*, 2000) has antipyretic properties. These properties were also noted by Oliver-Bever (1986). The antipyretic effect explains the frequent use of this plant species for malaria, jaundice, and typhoid fever. The three diseases are characterised by high fever, which appears to be the most important symptom. The popularity of *E. chlorantha* for treating jaundice could be linked to the yellow colour of its bark. This colour is, according to Pousset (1989), due to the presence of three alkaloids: palmatine, jathrorrhizine and colombine. He confirmed the plant's properties against jaundice. The anti-malarial activity of *E. chlorantha* has also been confirmed against *Plasmodium yoelli nigeriensis* (Agomo *et al.*, 1992).

CONCLUSIONS

Through the ethnobotanical survey conducted in the Yaoundé markets, some plants with higher performance indexes were found to be widely used in other regions of Africa for the same purposes. There are also other plants in the literature known for their effective properties against certain diseases, which lends credibility to the pharmacopoeia presented in the Yaoundé markets, and to the method used in this paper to evaluate the relative importance of the medicinal plant species.

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Appendix 1. Citations of Diseases by the Sellers at the Yaoundé Markets.

Group of diseases	Diseases	Number of citations
Female genital system: obstetrics and gynaecology	Chlamydiae	2
	Lactation failure	4
	White loose (“pertes blanches”)	2
	Female infertility	10
	Vaginalis toilet	1
Male genito-urinary system	Male sexual impotence	13
	Gonorrhoea	4
Childhood diseases and conditions	Convulsion	4
	Food poisoning	1
Specific diseases and conditions	Hernia	1
Infectious diseases	Chicken pox	1
	Syphilis	2
Parasitic diseases (not of the digestive system)	Malaria/fever	16
	Meningitis	1
	Malaria	4
	Scabies	2
Specific symptoms	Anaemia	12
	Asthenia	1
	Wound	3
	Jaundice	9
	Old wound	1
	Haemorrhoid	1
Cardio vascular system	Arterial hypertension	1
	Diarrhoea	10
Digestive system	Amoebic dysentery	1
	Typhoid enteritis	5
	Constipation	3
	Stomach pain	1
	Toothache	1
	Purgative	5
	Intestinal helminthiasis	4
	Vomiting	4
	Lumbago	19
	Rheumatism	2
Nervous system and mental disorders	Neuritis	1
Respiratory system	Asthma	1
	Cough	2
	Tuberculosis	1
Total number of citations		156

Appendix 2. Citations of Medicinal Plants in the Yaoundé Markets.

Legend

Diseases (Dis): Ane: anaemia, Msi: male sexual impotence, Asth: asthma, Wou: wound, Chl: chlamydiae, Con: convulsion, Too: toothache, Dia: diarrhoea or abdominal pain, Lum: lumbago, Dys: amoebic dysentery, Fop: food poisoning, Stp: Stomach pain, Lac: lactation failure, Sca: scabies, Gon: gonorrhoea, Hae: haemorrhoid, Her: hernia, Hyp: arterial hypertension, Jau: jaundice, Cons: constipation, Men: meningitis, Neu: neuritis, Mal/fev: malaria/fever, Mal: malaria, Whi: white loose, Pur: purgative, Rhe: rheumatism, Chi: chi chicken pox, Inf: female infertility, Syp: syphilis, Vag: vaginalis toilet, Cou: cough, Tub: tuberculosis, Typ: typhoid enteritis, Hel: intestinal helminthiasis, Old-wou: old wound, Vom: vomiting.

Veg (Vegetable parts): s-bark: stem barks, lea: leaf, fr: fruit, see: seeds, roo: root, sa: sap (= sève).

Q: quantity (gram), Pb: price of buying (FCFA), Pg: price of the gram.

Diseases	Plant species	Veg	Code of the seller	Qs (g)	Pb	Pg
Ane	<i>Baillonella toxisperma</i>	s-bark	Mou	200	1500	6.82
Ane	<i>Enantia chlorantha</i>	s-bark	Men	210	400	1.90
Ane	<i>Gnetum africanum</i>	lea	Jea	125	100	0.80
Ane	<i>Gnetum africanum</i>	lea	Jea	125	100	0.80
Ane	<i>Guibourtia tesmannii</i>	s-bark	Yen	300	2000	6.67
Ane	<i>Piptadeniastrum africanum</i>	s-bark	Mbi	150	500	3.33
Ane	<i>Piptadeniastrum africanum</i>	s-bark	Gén	250	750	3.00
Ane	<i>Ricinodendron heudelotii</i>	s-bark	Eli	260	500	1.92
Ane	<i>Ricinodendron heudelotii</i>	s-bark	Gén	200	1000	5.00
Ane	<i>Ricinodendron heudelotii</i>	s-bark	Men	250	500	2.00
Ane	<i>Ricinodendron heudelotii</i>	s-bark	Men	250	500	2.00
Ane	<i>Ricinodendron heudelotii</i>	s-bark	Ngo	350	800	2.29
Msi	<i>Aframomum melegueta</i>	fr	Yen	125	100	0.80
Msi	<i>Anonidium manni</i>	s-bark	Mbi	125	500	4.00
Msi	<i>Anonidium manni</i>	s-bark	Bil	250	500	2.00
Msi	<i>Baillonella toxisperma</i>	s-bark	Mbi	300	1000	3.33
Msi	<i>Baillonella toxisperma</i>	s-bark	Eli	650	2000	3.08
Msi	<i>Baillonella toxisperma</i>	s-bark	Gén	250	1000	4.00
Msi	<i>Drypetes gosweileri</i>	s-bark	Mbi	100	500	5.00
Msi	<i>Drypetes gosweileri</i>	s-bark	Yen	125	1000	8.00
Msi	<i>Drypetes gosweileri</i>	s-bark	Eli	100	300	3.00
Msi	<i>Drypetes gosweileri</i>	s-bark	Gén	200	1000	5.00
Msi	<i>Garcinia cola</i>	see	Mag	50	100	2.00
Msi	<i>Zanthoxylum heitzii</i>	s-bark	Yen	300	1500	5.00
Msi	<i>Zanthoxylum heitzii</i>	s-bark	Her	90	750	8.33
Asth	<i>Ceiba pentandra</i>	s-bark	Djo	350	1000	2.86
Wou	<i>Erythrophleum suaveolens</i>	s-bark	Yen	55	3000	54.55
Wou	<i>Milicia excelsa</i>	s-bark	Hei	12	500	41.67
Wou	<i>Piptadeniastrum africanum</i>	s-bark	Mbi	75	750	10.00
Chl	<i>Antrocaryon klaineianum</i>	s-bark	Yen	1000	4000	4.00
Chl	<i>Mammea africana</i>	s-bark	Yen	1000	4000	4.00
Con	<i>Guibourtia tesmannii</i>	s-bark	Mou	400	500	1.25
Con	<i>Guibourtia tesmannii</i>	s-bark	Gén	275	700	2.55
Con	<i>Guibourtia tesmannii</i>	s-bark	Ngo	155	750	4.84
Con	<i>Piptadeniastrum africanum</i>	s-bark	Men	200	500	2.50
Too	<i>Milicia excelsa</i>	s-bark	Hei	12	500	41.67
Dia	<i>Drypetes gosweileri</i>	s-bark	Gén	200	1000	5.00
Dia	<i>Elaeis guineensis</i>	sa	Jos	330	200	0.61
Dia	<i>Garcinia cola</i>	see	Mag	50	100	2.00
Dia	<i>Garcinia cola</i>	roo	Mag	50	100	2.00
Dia	<i>Guibourtia tesmannii</i>	s-bark	Hei	100	500	5.00
Dia	<i>Guibourtia tesmannii</i>	s-bark	Her	145	500	3.45
Dia	<i>Pachyelasma tessmannii</i>	fr	Thé	150	400	2.67

Appendix 2. (continued)

Diseases	Plant species	Veg	Code of the seller	Qs (g)	Pb	Pg
Dia	<i>Pachyelasma tessmannii</i>	fr	Ngo	100	400	4.00
Dia	<i>Raphia mombuttorum</i>	sa	Mar	330	200	0.61
Dia	<i>Sacoglottis gabonensis</i>	s-bark	Mbi	150	500	3.33
Lum	<i>Anonidium mannii</i>	s-bark	Ngo	355	500	1.41
Lum	<i>Baillonella toxisperma</i>	s-bark	Mou	130	1000	7.69
Lum	<i>Baillonella toxisperma</i>	s-bark	Mbi	300	1000	3.33
Lum	<i>Baillonella toxisperma</i>	s-bark	Yen	750	1500	2.00
Lum	<i>Baillonella toxisperma</i>	s-bark	Eli	650	2000	3.08
Lum	<i>Baillonella toxisperma</i>	s-bark	Bil	300	1500	5.00
Lum	<i>Drypetes gosweileri</i>	s-bark	Mbi	100	500	5.00
Lum	<i>Guarea thompsonii</i>	s-bark	Men	220	1000	4.55
Lum	<i>Guarea thompsonii</i>	s-bark	Men	220	1000	4.55
Lum	<i>Guibourtia tesmannii</i>	s-bark	Yen	300	2000	6.67
Lum	<i>Guibourtia tesmannii</i>	s-bark	Gén	275	700	2.55
Lum	<i>Guibourtia tesmannii</i>	s-bark	Men	250	1000	4.00
Lum	<i>Guibourtia tesmannii</i>	s-bark	Men	250	1000	4.00
Lum	<i>Nauclea diderrichii</i>	s-bark	Eli	300	1000	3.33
Lum	<i>Nauclea diderrichii</i>	s-bark	Eli	300	1000	3.33
Lum	<i>Piptadeniastrum africanum</i>	s-bark	Mbi	150	500	3.33
Lum	<i>Piptadeniastrum africanum</i>	s-bark	Yen	420	750	1.79
Lum	<i>Piptadeniastrum africanum</i>	s-bark	Eli	350	500	1.43
Lum	<i>Piptadeniastrum africanum</i>	s-bark	Ngo	250	300	1.20
Dys	<i>Irvingia gabonensis</i>	s-bark	Yen	325	800	2.46
Fop	<i>Elaeis guineensis</i>	sa	Jos	330	200	0.61
Stp	<i>Milicia excelsa</i>	s-bark	Hei	12	500	41.67
Lac	<i>Elaeis guineensis</i>	sa	Jos	330	200	0.61
Lac	<i>Mitragyna stipulosa</i>	s-bark	Thé	250	500	2.00
Lac	<i>Mitragyna stipulosa</i>	s-bark	Ngo	325	500	1.54
Lac	<i>Raphia mombuttorum</i>	sa	Mar	330	200	0.61
Sca	<i>Anonidium mannii</i>	roo	Eli	100	500	5.00
Sca	<i>Mammea africana</i>	s-bark	Yen	255	1000	3.92
Gon	<i>Cylicodiscus gabonensis</i>	s-bark	Yen	350	1000	2.86
Gon	<i>Hexalobus crispiflorus</i>	s-bark	Gén	500	1500	3.00
Gon	<i>Zanthoxylum heitzii</i>	s-bark	Yen	300	1500	5.00
Gon	<i>Zanthoxylum heitzii</i>	s-bark	Her	90	750	8.33
Hae	<i>Pycnanthus angolensis</i>	s-bark	Yen	155	2500	16.13
Her	<i>Guibourtia tesmannii</i>	s-bark	Mou	400	500	1.25
Hyp	<i>Guibourtia tesmannii</i>	s-bark	Thé	275	750	2.73
Jau	<i>Alstonia boonei</i>	s-bark	Men	250	300	1.20
Jau	<i>Enantia chlorantha</i>	s-bark	Her	260	300	1.15
Jau	<i>Enantia chlorantha</i>	s-bark	Eli	300	350	1.17
Jau	<i>Enantia chlorantha</i>	s-bark	Thé	400	750	1.88
Jau	<i>Enantia chlorantha</i>	s-bark	Men	210	400	1.90
Jau	<i>Enantia chlorantha</i>	s-bark	Ngo	325	500	1.54
Jau	<i>Irvingia gabonensis</i>	s-bark	Yen	325	1000	3.08
Jau	<i>Picralima nitida</i>	fr	Djo	100	500	5.00
Jau	<i>Picralima nitida</i>	fr	Sie	100	500	5.00
Cons	<i>Isolona hexaloba</i>	s-bark	Gén	350	500	1.43
Cons	<i>Pycnanthus angolensis</i>	s-bark	Ala	50	1500	30.00
Cons	<i>Staudtia kamerunensis</i>	s-bark	Ngo	300	500	1.67
Men	<i>Piptadeniastrum africanum</i>	s-bark	Yen	420	750	1.79
Neu	<i>Ceiba pentandra</i>	s-bark	Djo	350	1000	2.86
Mal/fev	<i>Alstonia boonei</i>	s-bark	Gén	400	500	1.25

Appendix 2. (continued)

Diseases	Plant species	Veg	Code of the seller	Qs (g)	Pb	Pg
Mal/fev	<i>Alstonia boonei</i>	s-bark	Men	250	300	1.20
Mal/fev	<i>Enantia chlorantha</i>	s-bark	Her	260	300	1.15
Mal/fev	<i>Enantia chlorantha</i>	s-bark	Gén	250	400	1.60
Mal/fev	<i>Enantia chlorantha</i>	s-bark	Thé	400	750	1.88
Mal/fev	<i>Enantia chlorantha</i>	s-bark	Men	210	400	1.90
Mal/fev	<i>Enantia chlorantha</i>	s-bark	Ngo	325	500	1.54
Mal/fev	<i>Enantia chlorantha</i>	s-bark	Bil	250	500	2.00
Mal/fev	<i>Guibourtia tesmannii</i>	s-bark	Hei	100	500	5.00
Mal/fev	<i>Guibourtia tesmannii</i>	s-bark	Mou	400	500	1.25
Mal/fev	<i>Guibourtia tesmannii</i>	s-bark	Yen	300	2000	6.67
Mal/fev	<i>Guibourtia tesmannii</i>	s-bark	Her	145	500	3.45
Mal/fev	<i>Guibourtia tesmannii</i>	s-bark	Eli	200	1000	5.00
Mal/fev	<i>Guibourtia tesmannii</i>	s-bark	Men	250	1000	4.00
Mal/fev	<i>Picralima nitida</i>	fr	Sie	100	500	5.00
Mal/fev	<i>Picralima nitida</i>	fr	Thé	155	400	2.58
Mal	<i>Pentachlethra macrophylla</i>	s-bark	Eli	195	750	3.85
Mal	<i>Pentachlethra macrophylla</i>	s-bark	Thé	200	750	3.75
Mal	<i>Pentachlethra macrophylla</i>	s-bark	Men	275	750	2.73
Mal	<i>Pentachlethra macrophylla</i>	s-bark	Ngo	250	750	3.00
Whi	<i>Antrocaryon klaineanum</i>	s-bark	Yen	1000	4000	4.00
Whi	<i>Mammea africana</i>	s-bark	Yen	1000	4000	4.00
Pur	<i>Baillonella toxisperma</i>	s-bark	Bil	300	1500	5.00
Pur	<i>Elaeis guineensis</i>	sa	Jos	330	200	0.61
Pur	<i>Guarea thompsonii</i>	s-bark	Men	220	1000	4.55
Pur	<i>Nauclea diderrichii</i>	s-bark	Eli	300	1000	3.33
Pur	<i>Piptadeniastrum africanum</i>	s-bark	Men	200	500	2.50
Rhe	<i>Cylicodiscus gabonensis</i>	s-bark	Ngo	345	500	1.45
Rhe	<i>Klainedoxa gabonensis</i>	s-bark	Eli	255	2500	9.80
Chi	<i>Cylicodiscus gabonensis</i>	s-bark	Ngo	345	500	1.45
Inf	<i>Anonidium manni</i>	s-bark	Thé	200	500	2.50
Inf	<i>Anonidium manni</i>	s-bark	Ngo	355	500	1.41
Inf	<i>Antrocaryon klaineanum</i>	s-bark	Yen	1000	4000	4.00
Inf	<i>Baillonella toxisperma</i>	s-bark	Mou	130	1000	7.69
Inf	<i>Guibourtia tesmannii</i>	s-bark	Her	145	500	3.45
Inf	<i>Mammea africana</i>	s-bark	Yen	145	500	3.45
Inf	<i>Nauclea diderrichii</i>	s-bark	Eli	300	1000	3.33
Inf	<i>Piptadeniastrum africanum</i>	s-bark	Eli	350	500	1.43
Inf	<i>Piptadeniastrum africanum</i>	s-bark	Gén	250	750	3.00
Inf	<i>Piptadeniastrum africanum</i>	s-bark	Ngo	250	300	1.20
Syp	<i>Cylicodiscus gabonensis</i>	s-bark	Yen	350	1000	2.86
Syp	<i>Hexalobus crispiflorus</i>	s-bark	Gén	500	1500	3.00
Vag	<i>Pycnanthus angolensis</i>	s-bark	Mbi	250	750	3.00
Cou	<i>Ceiba pentandra</i>	s-bark	Djo	350	1000	2.86
Cou	<i>Milicia excelsa</i>	s-bark	Hei	12	500	41.67
Tub	<i>Milicia excelsa</i>	s-bark	Hei	12	500	41.67
Typ	<i>Alstonia boonei</i>	s-bark	Thé	255	750	2.94
Typ	<i>Enantia chlorantha</i>	s-bark	Eli	300	3500	11.67
Typ	<i>Enantia chlorantha</i>	s-bark	Gén	250	400	1.60
Typ	<i>Enantia chlorantha</i>	s-bark	Ngo	325	500	1.54
Typ	<i>Picralima nitida</i>	fr	Djo	100	500	5.00
Hel	<i>Baillonella toxisperma</i>	s-bark	Yen	750	1500	2.00
Hel	<i>Drypetes gosweileri</i>	s-bark	Eli	100	700	7.00
Hel	<i>Pycnanthus angolensis</i>	s-bark	Ala	50	1500	30.00

Appendix 2. (continued)

Diseases	Plant species	Veg	Code of the seller	Qs (g)	Pb	Pg
Hel	<i>Staudtia kamerunensis</i>	s-bark	Ngo	300	500	1.67
Old-wou	<i>Oldfieldia africana</i>	s-bark	Eli	75	500	6.67
Vom	<i>Cylicodiscus gabonensis</i>	s-bark	Eli	350	500	1.43
Vom	<i>Pycnanthus angolensis</i>	s-bark	Mbi	250	750	3.00
Vom	<i>Staudtia kamerunensis</i>	s-bark	Ngo	300	500	1.67
Vom	<i>Tetrapleura tetraptera</i>	s-bark	Men	200	500	2.50

Appendix 3. Index of Performance of Medicinal Plants Sold in Yaounde Markets.

	Anaemia	Male sexual impotence	Asthma	Wound	Chlamydiae	Convulsion	Asthenia	Diarrhoea	Annoeic dysentery	Food poisoning	Typoid enteritis	Lactation failure	Gonorrhoea	Scabies	Haemorrhoid	Hernia	Arterial hypertension	Jaundice	Consipation	Lumbago	Neuritis	Stomach pain	Tooth ache	Meningitis	Malaria/fever	Malaria	White loose	Purgative	Rheumatism	Chicken pox	Female infertility	Syphilis	Vaginal toilet	Cough	Tuberculosis	Intestinal helminthiasis	Old wound	Vomiting	Total citations					
<i>Aframomum melegueta</i>	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
<i>Alstonia boonei</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4		
<i>Anonidium mannii</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	
<i>Antrocaryon klaineaum</i>	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	
<i>Baillonella toxisperma</i>	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	
<i>Ceiba pentandra</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
<i>Drypetes gosweileri</i>	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	
<i>Elaeis guineensis</i>	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
<i>Enantia chlorantha</i>	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	
<i>Erythrophleum suaveolens</i>	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
<i>Garcinia cola</i>	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
<i>Gnetum africanum</i>	3	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2		
<i>Guarea thompsonii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
<i>Guibourtia tesmannii</i>	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	
<i>Hexalobus crispiflorus</i>	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2		
<i>Irvingia gabonensis</i>	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
<i>Isolona hexaloba</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
<i>Klainedoxa gabonensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
<i>Mammea africana</i>	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4	
<i>Milicia excelsa</i>	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	5		
<i>Mitragyna stipulosa</i>	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2		
<i>Nauclea diderrichii</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	4		
<i>Oldfieldia africana</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1		
<i>Pachyelasma tessmannii</i>	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2		
<i>Pentaclethra macrophylla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	
<i>Picralima nitida</i>	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	
<i>Piptadeniastrum africanum</i>	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	13		
<i>Pycnanthus angolensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	5			
<i>Raphia mombutorum</i>	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2		
<i>Ricnodendron heudelotii</i>	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5			
<i>Sacoglottis gabonensis</i>	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
<i>Staudtia kamerunensis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	3			
<i>Tetrapleura tetraptera</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1			
<i>Zanthoxylum heitzii</i>	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4		
Total of citations	12	13	1	3	2	4	6	10	1	1	5	4	2	4	1	1	1	9	3	19	1	1	1	1	16	4	2	5	2	1	10	2	1	2	1	4	1	4	4	155				