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Traditional use of medicinal plants in the town of Mbanga (Littoral- Cameroon)

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Abstract

The present ethnobotanical study is being carried out in the town of Mbanga on the use of plants in the traditional pharmacopoeia. Its major concern is to document medicinal plants and therapeutic recipes which will serve as a database for the population. To do this, an ethnobotanical survey was conducted in September and October 2011 and completed in August 2020. It collected a certain amount of information relating to the use of medicinal plants as an alternative to primary health care. This study, conducted with two hundred and fifty-five (255) respondents, identified eighty (80) cases of health problems, some of which are only symptoms of illnesses. Three hundred and thirty-nine (339) therapeutic recipes involving one hundred and eighteen (118) medicinal plants belonging to fifty-five (55) botanical families have been indicated as entering into their treatment. The therapeutic recipes are made up of either a single plant or a combination of several plants. Only species that have been mentioned at least twice have been taken into account. *Cymbopogon citratus* has the highest used specialization index, 0.35; it is the species mostly used in therapeutic recipes. Acute illnesses are the most common groups. The plants are well used by the people of Mbanga in the treatment of various diseases because the exploitation index is 4.23. The plant species used in the treatment of diseases in Mbanga are mostly reported in other parts of Cameroon and the world in the treatment of the same diseases.

Keywords: Ethnobotany; Medicinal plants; Mbanga; Therapeutic recipes; Diseases

1 Introduction

The use of plants in primary health care is very old for humans, but also for animals who use them instinctively. Over time, humans have integrated these plants into their daily lives to the point of being totally dependent on them. In Cameroon and like everywhere else in Africa, more than 80% of the population uses traditional medicine and plants for their primary health care (WHO, 1999). Faced with the lack of satisfaction with modern medicine and with poverty, the African populations and those of Mbanga in particular are forced to resort to traditional medicine. Given the interest aroused by the importance of medicinal plants, many researchers have invested in the promotion of traditional medicine through numerous scientific works. Beyond these different works, the study carried out in the city of Mbanga is interested in the method of statistical analysis of ethnopharmacological data which makes it possible to collect data in a format to facilitate the comparison of studies from other regions (Bruni & al., 1997). Mbanga does not have a collection of herbal monographs. The locality has eight (8) health centers for 35,415 inhabitants (Anonymous, 2011), it means one health center for approximately 4,427 inhabitants. These figures show a lack of support in hospital care.

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Some people refuse to go to the hospital out of education or religious belief. Also in the area, it is reported that for certain ailments such as fibroma, cataracts, cancer, sinusitis, the care is surgical and for others such as viral hepatitis, glaucoma, the hospital does not provide any treatment. For certain diseases such as lithiasis, asthma, research shows the effectiveness of certain medicinal preparations. To improve health coverage, it is proposed to upgrade primary health care through the pharmacopoeia. The present work aims to document medicinal plants and therapeutic preparations as used in the treatment of diseases that plague the locality of Mbanga.

2 Material and methods

2.1 Study area

The town of Mbanga stretches on either sides of the national road N° 5 Douala - Bafoussam. The city is located at $9^{\circ} 34' 05''$ East longitude and $4^{\circ} 30' 33''$ North latitude. It is the capital of the district from which it bears the name. It covers an area of 483 km² and is a component of the Moungo division, one of the divisions in the Littoral region. The district of Mbanga is limited to the north by the district of Njombe and Momo, to the south by the district of Dibombari, to the west by the Moungo River, to the east by the district of Solé (Fig. 1)

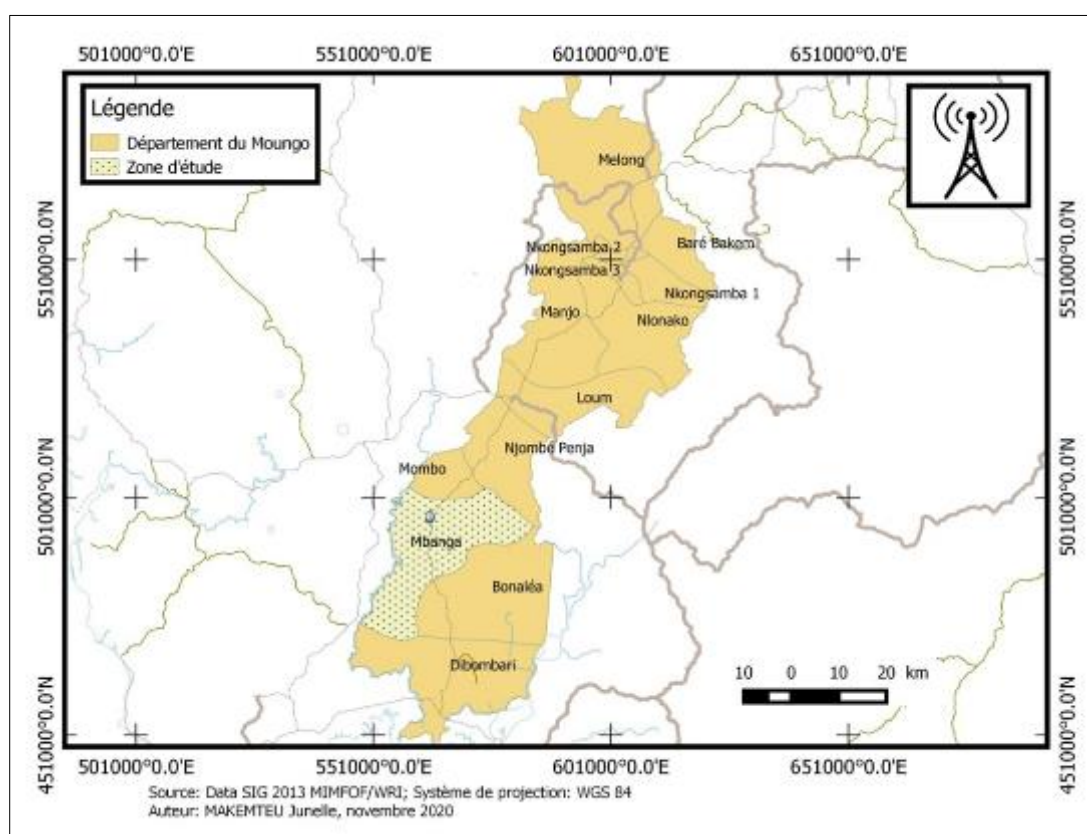


Figure 1 Location of the study area

The town of Mbanga has 35,415 inhabitants (BUCREP, 2010). Its density is 73.3 inhabitants per km². The population is unevenly distributed in the 16 districts which compose it. Agriculture is practiced by 80% of the population and constitutes the bulk of its economy. Cocoa, coffee, oil palm, fruit trees: cola trees, safout trees and food crops constitute the bulk of agriculture. These different products are intended for trade and consumption. French, English and "pidgin" are the languages spoken there. The population is very heterogeneous; we find the following communities: Along the natives, Bamileke, Bassa, Beti, Yabassi, Peulh, Mbo and the English-speaking communities which are non-natives. Travel around the city is by motorcycle taxi. Mbanga belongs to the volcanic zone in the center of the Moungo department. The land is flat and rises to an altitude of 20 m (Anonymous, 2009). The Mbanga hydrographic network is made up of the Moungo River which has its source in the Mont Manengouba massif; it is the natural border between the South-West region and Mbanga. The Abo has its source in Mbanga and waters the northern part of the Dibombari district before flowing into the Nkam (Anonymous, 2009).

The soils are of the ferralitic or basic types. These are soils that derive from basalt. They are sandy clay, generally not deep and rejuvenated by erosion (Anonymous, 2009). Regarding vegetation, Mbanga has undergone significant changes in this area. Some vast forest rich in valuable species less than thirty years ago, Mbanga is now considered to be a vast plantation. The vegetation is dominated by large plantations of perennial crops (coffee, cocoa), associated with food crops and other fruit trees. There are industrial plantations of oil palms, rubber trees, and bananas. Notwithstanding this human action, some natural formations or forests persist. There are also secondary and gallery forests, as well as some forest reserves (Anonymous, 2009). Mbanga's climate is found in the Mounjo Division. It is an equatorial Cameroonian-type mountain climate, characterized by two annual seasons: a long eight-month rainy season between March and October and a short four-month dry season between November and February. Annual precipitation is around 2,500 mm and there are between 150 and 200 rainy days per year (Suchel, 1987). Temperatures are generally cooled by altitude and vary between 22 ° and 24 °. The highest are between February and March while the lowest are between July and August.

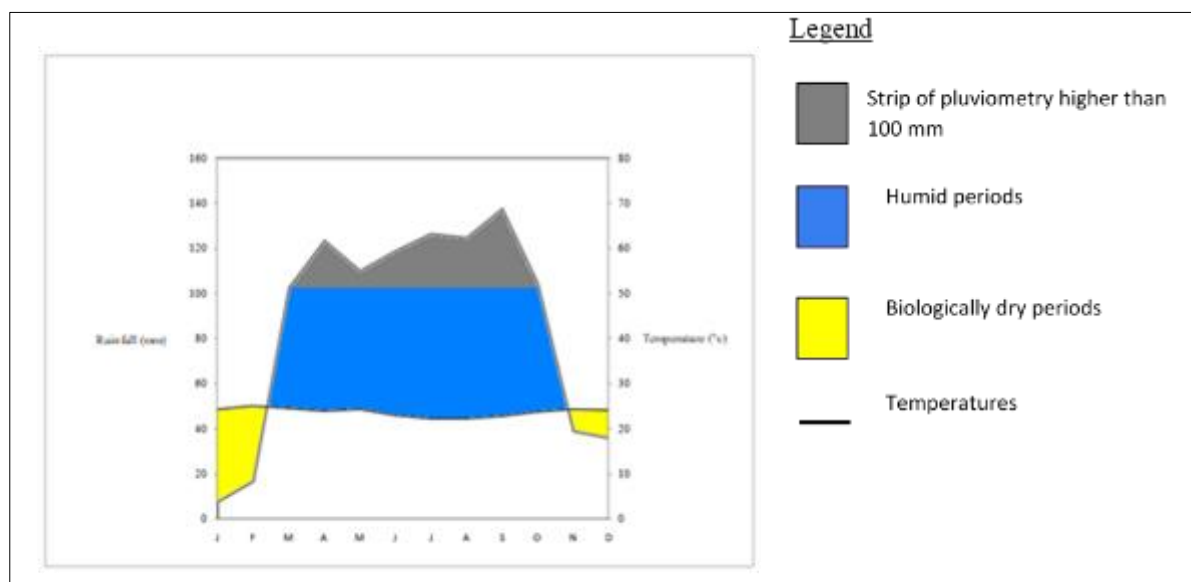


Figure 2 Ombrothermal diagram of Nkongsamba

3 Methodology

Data collection was carried out using an approach based on ethnobotanical surveys. Using survey forms comprising a structured questionnaire and a direct interview, a series of interviews was carried out with 255 respondents (traditional healers, residents) between September and October 2011 and then completed in August 2020. These survey sheets carried information relating to the scientific and vernacular names of plants, the organs used, recipes, etc.... The surveys were carried out in the houses and aimed to enumerate the most recurrent health problems in the city, to identify and collect the plants involved in their treatment. For each respondent questioned and for each disease given, the remedy employed was requested. This could be the doctor (M), the healer (G) or self-medication (A). If herbal self-medication was cited, all information relating to the recipes used was noted. The harvest of the plant material was as complete as possible for easy identification. As some morphological characters are likely to disappear during drying (color, shape), we carefully recorded the related information during harvest and took a photograph of the sample. The labeled specimens were smashed in the field and then dried. The plants thus collected were identified at the Botanical Laboratory of the Higher Teachers 'Training College of Yaoundé I. The 255 records obtained at the end of the investigation were analyzed. The various diseases, the symptoms observed as well as the associated recipes were enumerated. This phase was followed by the encoding of information relating to each herbarium sample in a database in Excel. One-way analysis of variance (ANOVA) was done to show whether there is a significant difference between the numbers of recipes on the one hand and the number of species on the other. Estimating that the Cameroonian flora has about 8,000 plant species (Letouzey, 1979), the percentage of medicinal plants in relation to the flora of Cameroon (% MP) is given by the following formula (Bruni & al., 1997).

$$\% \text{ MP} = \frac{\text{Number of medicinal plants identified in Mbanga}}{8\,000} \times 100$$

The average medicinal preparation per plant AMP (Average medicinal preparation) is given by the following formula

$$AMP = \frac{\text{Number of recipes identified}}{\text{Number of medicinal plants identified}}$$

These two operations make it possible to calculate the exploitation index (EI) for the medicinal flora available in Mbanga: $EI = \% PM \times AMP$

To show the importance of a plant in the treatment of a disease, the use specialization index (ISu) was calculated according to the formula below (Bruni & al., 1997).

$$ISu = \frac{\% Cm \times \% Ct}{100}$$

In this manner, different parameters (i.e. number of uses, number of total citations per plant and per individual use) are linked and referred to 100.

With % Ct the percentage of the total number of citation's per recipe and % Cm the percentage of the total number of most cited therapeutic uses

4 Results

Diversity of identified diseases Surveys carried out in the town of Mbanga have identified 80 cases of health problems. They have been grouped into acute illnesses, chronic illnesses, trauma-related illnesses, symptomatic illnesses, and unclassified illnesses.

4.1 Acute illnesses

These are diseases caused by a pathogen (Fig. 3). This figure illustrates the most frequent acute illnesses in Mbanga. Malaria is the most common disease (15.94%) followed by typhoid fever (11.73%). The high prevalence of malaria is thought to be due to the way of life of the populations. Most of the inhabitants live in precarious conditions, in very unsanitary conditions and sometimes near ponds. This then leads to the multiplication of mosquito proliferation reservoirs. They also do not have impregnated mosquito nets allowing them to protect themselves from mosquito bites. In addition, the proximity to the plantations is at the origin of the proliferation of these mosquitoes. Typhoid fever is linked to poor food hygiene. Latrines, often near wells, are poorly constructed. Untreated wells and water distribution are not easy for the whole population. The cough and bronchitis are said to be due to the dusty and foul environment, in which the climatic conditions are quite harsh. Children play on the floor and are not always provided with appropriate clothing.

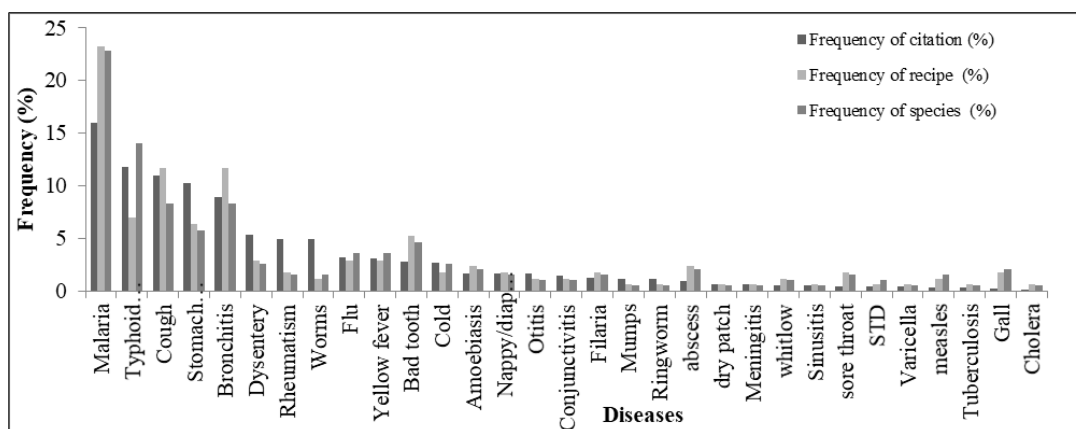


Figure 3 The acute illnesses of Mbanga

4.2 Chronic diseases

These are diseases related to the malfunction of an organ in the body (Fig. 4). Neuralgia is the most common chronic disease (14.23%) followed by kidney disease (13.22%). Cataract is the least mentioned (0.67%). One of the causes of

neuralgia is the poor living conditions of the populations due to poverty. The excessive consumption of alcohol is the cause of many illnesses in Mbanga. Because alcohol accompanies the people of Mbanga on a daily basis. The drink consumed comes from the trunks of palm oil and the price of a liter is within everyone's reach. Neuralgia can also be due to an infection of the teeth, ears. Kidney disease is a disease identified mainly in the elderly. It is often mistaken for back pain hence its high frequency.

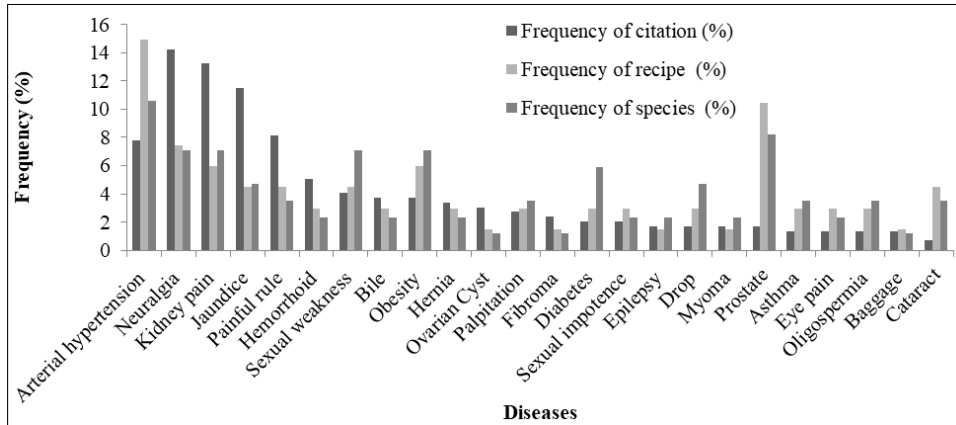


Figure 4 List of chronic diseases in Mbanga

4.3 Symptomatic diseases

These are signs that reveal a pathology and thus allow a diagnosis to be made (Fig. 5). The most frequent symptomatic illnesses in Mbanga are diarrhea (28.61%), abdominal pain (16.76%) and headache (12.13%). Nasal haemorrhage is the least mentioned (0.86%). Diarrhea and abdominal pain are caused by digestive problems linked to poor nutrition as well as food hygiene. The headache is thought to be due to aggravating factors such as stress and ingestion of alcohol, or exposure to extreme temperatures.

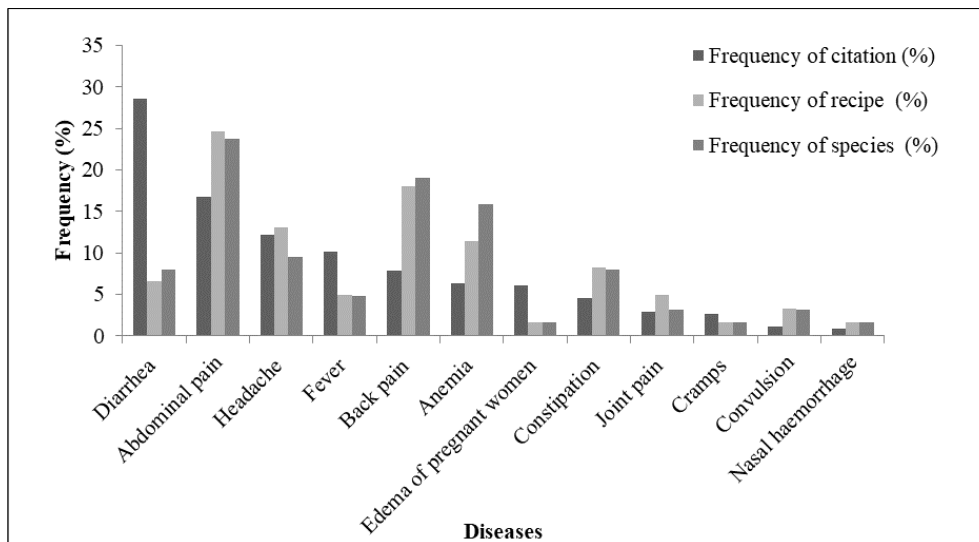


Figure 5 List of symptomatic diseases in Mbanga

4.4 Traumatic illnesses

These are diseases related to physical alterations caused by an external agent (Fig. 6). Injury is the most common trauma in Mbanga (76.53%) followed by sprain (18.36%). Burns are the least cited trauma. The high prevalence rate of the injury is thought to be due to field work. Because it has been identified in most of the elderly. Sprain is much more common among young people. It would therefore be due to games. The burn on the other hand is due to the lack of attention, the negligence of each other.

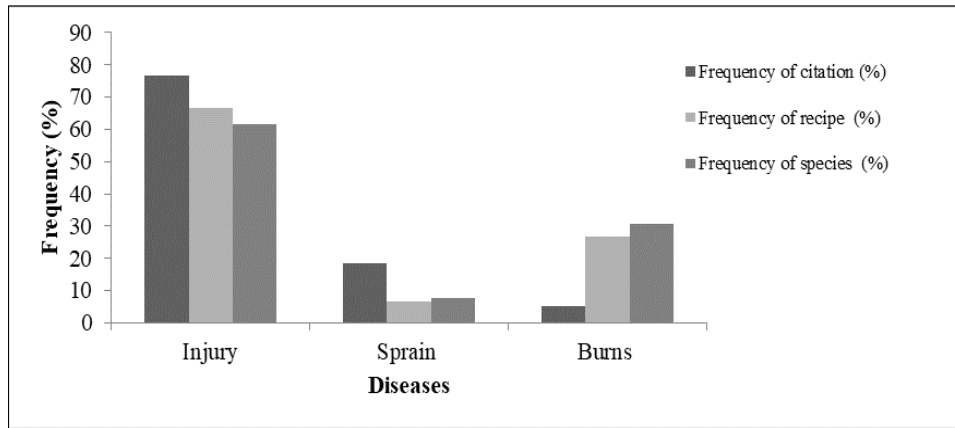


Figure 6 List of traumatic illnesses in Mbanga

4.5 Unclassified diseases

These are diseases whose causes are not clearly defined (fig. 7). Among the unclassified diseases, general fatigue is the most common (29.70%) followed by fontanel depression (19.30%). Enuresis is the least cited (2.47%). General fatigue would be due to field work. Fontanel depression is believed to be due to the precocity of young mothers because most mothers of children are immature young girls, uninformed about the disease and unable to prevent the disease.

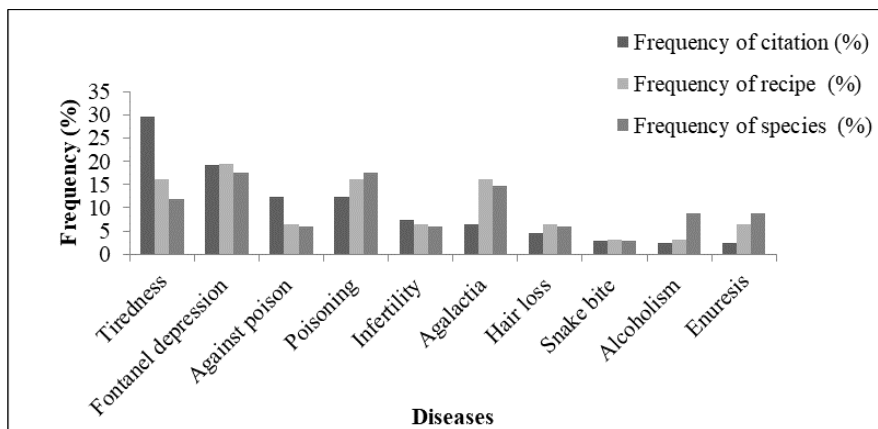


Figure 7 List of unclassified diseases in Mbanga

4.6 Distribution of diseases by group

The various health problems identified in Mbanga are divided by group (fig. 8). Analysis of this figure reveals that among the different groups of diseases identified, the group of acute diseases (38.75%) is the most frequent, followed by that of chronic diseases (30%). The high frequencies of acute and chronic diseases are thought to be due to the living conditions of the populations. Most of those surveyed report that they drink alcohol on a daily basis. Improper treatment of an illness can make the illness chronic or lead to complications of the illness with alcohol consumption. In addition, young people of puberty are not concerned about their state of health. It's everyone who wants to express themselves sexually. The group of traumatic diseases (3.75%) is the least common. The present cases generally concern children of school age because very few children at this age are at high risk.

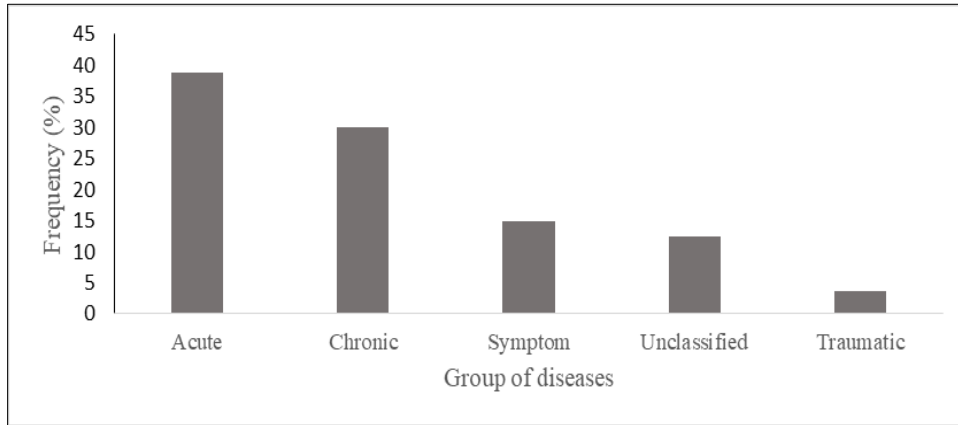


Figure 8 Distribution of diseases by group in Mbanga

4.7 Quantitative study of recipes and plant species identified in Mbanga

The different groups of diseases identified in Mbanga are distributed according to the number of recipes identified. (Fig. 9.). This figure shows that the acute disease group has the highest number of revenue (172) followed by chronic disease (67). Traumatic illnesses is the group with the smallest number of recipes (15). Analysis of the average revenue by disease group shows that there is no significant difference between the different values (Fig. 10).

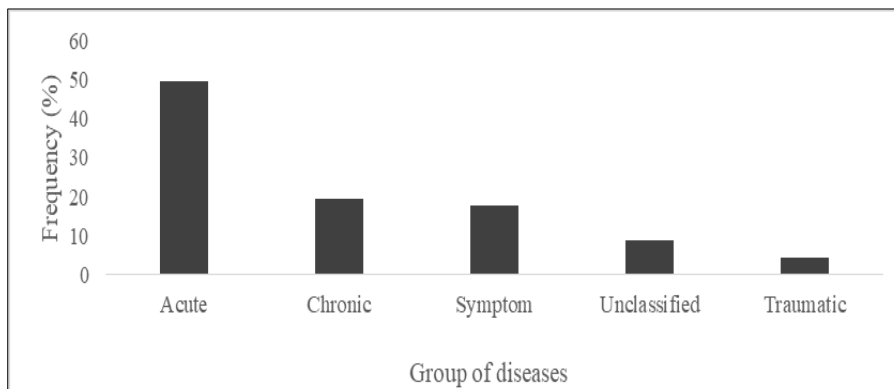


Figure 9 Distribution of recipes used in different disease groups in Mbanga

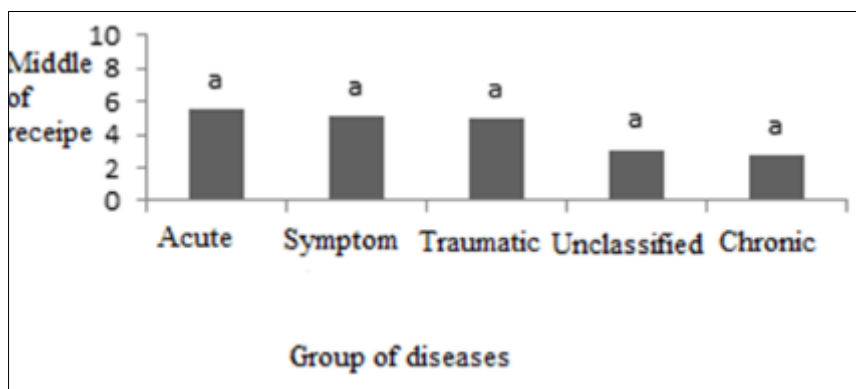


Figure 10 Average values of income by group of diseases in Mbanga.

The number of plant species used according to the disease groups identified in Mbanga is distributed (Fig. 11).

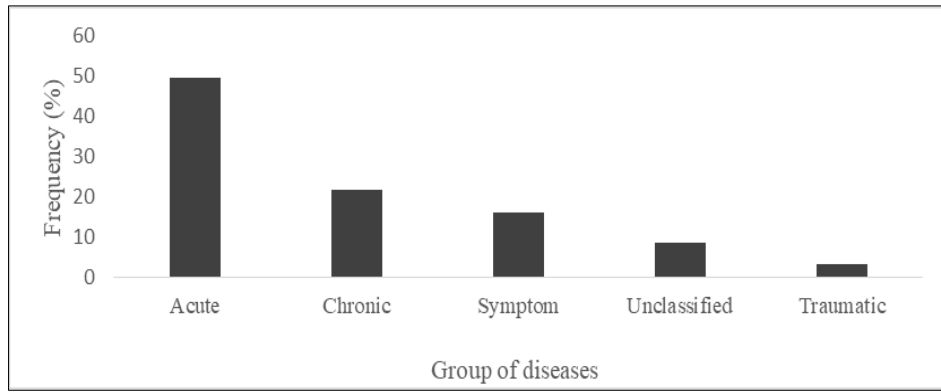


Figure 11 Distribution of plant species in the different disease groups in Mbanga

Acute diseases represent the group of diseases that use the largest number of plant species (193) followed by chronic diseases. Traumatic illnesses are the group with the fewest plant species (13) in their therapeutic recipes. Statistical analysis around the means of these species by disease group shows that there is no significant difference between the different values (Fig. 12).

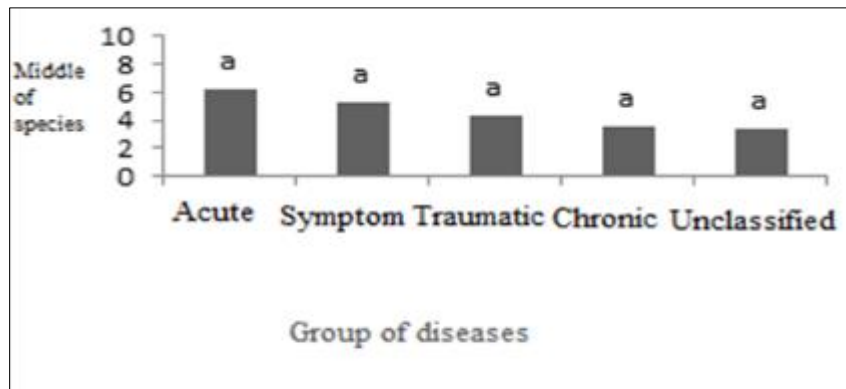
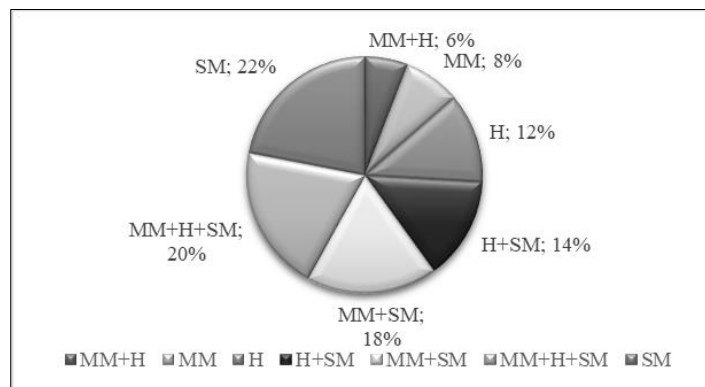


Figure 12 Average values of plant species by group of diseases in Mbanga

4.8 Therapeutic remedies for the various diseases mentioned

We note that populations can use self-medication (SM), healer (H), modern medicine (MM) or combine all the three to relieve their state of health (Fig. 13).



SM: self-medication; MM + SM: Modern medicine + Self-medication by plants; MM + H, Modern medicine + Healer; MM + SM + H, Modern medicine + Herbal self-medication + Healer; MM: Modern medicine; H: Healer; H + SM: Healer + Herbal self-medication.

Figure 13 Different treatment methods used in Mbanga

Figure 13 shows that self-medication with plants is the most popular remedy (22%) by the people of Mbanga. 18% of people surveyed go to the hospital but resort to self-medication by plants, 14% use self-medication and go to the healer, 6% of the population use modern medicine and go to the healer while 12% resort to a healer and 8% to modern medicine. The healer on the one hand and associated with modern medicine and self-medication on the other hand each apply to 20% of populations exclusively. As shown in the figure, these processing modes can be used alone or in combination. The single use of self-medication by plants accounts for 22%.

4.9 Diversity of plants used










		
<i>Bidens pilosa</i> (Asteraceae)	<i>Cymbopogon citratus</i> (Poaceae)	<i>Kalanchoe crenata</i> (Crassulaceae)
		
<i>Aloe barteri</i> (Liliaceae)	<i>Acmella caulirhiza</i> (Asteraceae)	<i>Crinum purpurascens</i> (Amaryllidaceae)
		
<i>Zingiber officinalis</i> (Zingiberaceae)	<i>Eremomastax speciosa</i> (Acanthaceae)	<i>Senna alata</i> (Caesalpiniaceae)

Figure 14 Photographs of some medicinal plants collected in Mbanga; photo MAKEMTEU J.

Table 1 List of plant species used in the treatment of diseases identified in Mbanga

Family of the species	Species	Local names (Balong)	Part of the plant used	Method of preparation	Number of indication (Ct)	Percentage of Ct (% Ct)	Number of diseases treated (U)	Highest number of indication (Cm)	Percentage of Cm (% Cm)	Specialization index of use (ISu)	Main disease treated (Um)
Asteraceae	<i>Acmella caulirhiza</i>		leaves	Poultice, juice	5	2.18	2	3	1.69	0.04	Toothache
Zingiberaceae	<i>Aframomum lestartuanum</i>		seeds	Juice	4	1.75	2	2	1.12	0.02	Bronchitis, cough
Asteraceae	<i>Ageratum conyzoides</i>		leaves, leafy stems	Juice , maceration, decoction	16	6.99	5	4	2.25	0.16	Injury, headache
Liliaceae	<i>Allium porum</i>		leafy stems	Decoction	2	0.87	1	2	1.12	0.01	Infertility
Liliaceae	<i>Aloe barteri</i>	Aloes vera	leaves	Poultice, decoction juice maceration	17	7.42	6	5	2.81	0.21	Malaria
Fabaceae	<i>Arachis hypogaea</i>		seeds	Juice	3	1.31	1	3	1.69	0.02	Prostate
Asteraceae	<i>Aspilia africana</i>		leaves, leafy stems	Poultice, juice , decoction	3	1.31	1	3	1.69	0.02	Injury
Chenopodiaceae	<i>Beta vulgaris</i>		fruits	Juice	3	1.31	1	3	1.69	0.02	Anemia
Asteraceae	<i>Bidens pilosa</i>		leaves, fruits leafy stems	Poultice, decoction , juice	5	2.18	2	3	1.69	0.04	Anemia
Brassicaceae	<i>Brassica oleracea</i>		leaves	Poultice, decoction	2	0.87	1	2	1.12	0.01	Joint pain
Solanaceae	<i>Capsicum frutescens</i>	Dougoua	Fruits, leaves	Juice , Poultice	2	0.87	1	2	1.12	0.01	Fontanelle
Caricaceae	<i>Carica papaya</i>	Pawpaw	Fruits, leaves, seeds, roots, sap	Juice, Poultice, decoction , infusion, maceration	14	6.11	5	5	2.81	0.17	Intestinal worms

Rutaceae	<i>Citrus aurantisfolia</i>		Fruits, bark, leaves	Infusion, juice , decoction , Poultice	13	5.68	6	3	1.69	0.1	STD
Rutaceae	<i>Citrus grandis</i>		fruits	Juice , decoction	2	0.87	1	2	1.12	0.01	Alcoholism
Rutaceae	<i>Citrus limon</i>		fruits	Poultice, infusion, juice	2	0.87	1	2	1.12	0.01	Conjunctivitis
Rutaceae	<i>Citrus sinensis</i>		fruits	Decoction	2	0.87	1	2	1.12	0.01	Alcoholism
Rutaceae	<i>Clausena anisata</i>		leafy stems, leaves	Decoction , juice	4	1.75	1	4	2.25	0.04	Abdominal pain
Sterculiaceae	<i>Cola acuminata</i>		leaves	Juice	5	2.18	1	5	2.81	0.06	Fontanelle
Sterculiaceae	<i>Cola verticillata</i>		leaves	Poultice	13	5.68	5	4	2.25	0.13	Dysentery
Araceae	<i>Colocasia esculenta</i>	Mbene	Exocarp, leaves	Poultice, decoction	4	1.75	1	4	2.25	0.04	Paronychia
Asteraceae	<i>Conyza floribunda</i>		tubercles	Poultice	2	0.87	1	2	1.12	0.01	Angima
Cucurbitaceae	<i>Cucurbita maxima</i>		fruits	Juice	2	0.87	1	2	1.12	0.01	Prostate
Cucurbitaceae	<i>Cucurbita pepo</i>		fruits	Juice	2	0.87	1	2	1.12	0.01	Prostate
Poaceae	<i>Cymbopogon citratus</i>	Bicobiati	leaves, leafy stems	Decoction , infusion	16	6.99	3	9	5.06	0.35	Edema pregnant women
Burseraceae	<i>Dacryodes edulis</i>	Isso	Bark, leaves, fruits	Juice , decoction	3	1.31	1	3	1.69	0.02	Bite
Ombelliferae	<i>Daucus carota</i>		fruits	Poultice, infusion, juice	2	0.87	1	2	1.12	0.01	Abscess
Dioscoreaceae	<i>Dioscorea sp.</i>		leaves	Decoction	3	1.31	1	3	1.69	0.02	Infertility
Caryophyllaceae	<i>Drimaria cordata</i>		leaves	Juice	4	1.75	2	2	1.12	0.02	Bronchitis, cough
Arecaceae	<i>Elaeis guineensis</i>		leaves	Infusion	3	1.31	1	3	1.69	0.02	STD
Asteraceae	<i>Emilia coccinea</i>		leaves, leafy stems	Juice , Poultice, decoction	2	0.87	1	2	1.12	0.01	Burn
Acanthaceae	<i>Eremomastax speciosa</i>		leaves, leafy stems	Poultice, decoction , juice , maceration	5	2.18	2	3	1.69	0.04	Diaper rash
Cesalpiniaceae	<i>Erythroleum suaveolens</i>		Bark	Decoction	3	1.31	1	3	1.69	0.02	Cholera

Myrtaceae	<i>Eucalyptus citriodora</i>		leaves	Decoction	8	3.49	2	4	2.25	0.08	Bronchitis, cough
Euphorbiaceae	<i>Euphorbia hirta</i>		leaves, sap	Decoction , juice	4	1.75	2	2	1.12	0.02	Amoebiasis, yellow fever
Moraceae	<i>Ficus thonningii</i>		leaves, leafy stems	Decoction , Poultice	3	1.31	1	3	1.69	0.02	Sprain
Clusiaceae	<i>Garcinia kola</i>	Biter kola	seeds	Juice	2	0.87	1	2	1.12	0.01	Constipation
Cesalpiniaceae	<i>Guibourtia tessmanii</i>		Bark, sap	Decoction , infusion	4	1.75	2	2	1.12	0.02	Fibroma, kyst
Acanthaceae	<i>Justicia hypocrateriformis</i>		leafy stems	Decoction	5	2.18	1	5	2.81	0.06	Anemia
Crassulaceae	<i>Kalanchoe crenata</i>		leaves	Juice , decoction	4	1.75	2	2	1.12	0.02	Bronchitis, cough
Anacardiaceae	<i>Mangifera indica</i>	Njangolo	Bark, leaves, roots	Decoction	2	0.87	1	2	1.12	0.01	Diabetes
Euphorbiaceae	<i>Manihot esculenta</i>	Ekwamba	leaves	Decoction , maceration, juice	5	2.18	1	5	2.81	0.06	Anemia
Musaceae	<i>Musa sp.</i>	Picot Ido'o	leaves, spinal cord	Juice , Poultice, decoction	4	1.75	2	2	1.12	0.02	Bronchitis, cough
Solanaceae	<i>Nicotiana tabacum</i>		leaves	Poultice	5	2.18	2	3	1.69	0.04	Hair loss
Lamiaceae	<i>Ocimum basilicum</i>		leaves	Decoction , infusion	3	1.31	1	3	1.69	0.02	Galactogenic
Arecaceae	<i>Cocos nucifera</i>		walnut	Decoction	2	0.87	1	2	1.12	0.01	Oligospermia
Lamiaceae	<i>Ocimum gratissimum</i>	Massep	leaves, leafy stems	Poultice, decoction maceration, juice	7	3.06	2	4	2.25	0.07	Headache
Oxalidaceae	<i>Oxalis corniculata</i>	Kotomajo	leaves, leafy stems	Juice , decoction	4	1.75	2	2	1.12	0.02	Bronchitis, cough
Lauraceae	<i>Persea americana</i>		Bark, fruits, leaves, seeds	Decoction , maceration, juice , infusion	4	1.75	2	2	1.12	0.02	Diabetes, prostate
Apiaceae	<i>Petroselinum crispum</i>		leaves	Decoction	4	1.75	2	2	1.12	0.02	Alcoholism, painful rule
Apocynaceae	<i>Picralima nitida</i>	Kenkeliba	fruits	Decoction	2	0.87	1	2	1.12	0.01	Diabetes
Myrtaceae	<i>Psidium guajava</i>	Goabang	leaves	Decoction , juice	3	1.31	1	3	1.69	0.02	Amoebiasis
Euphorbiaceae	<i>Ricinodendron heudelotii</i>		leaves, seeds	Poultice	6	2.62	1	6	3.37	0.09	Fontanel

Cesalpiniaceae	<i>Scorodophloeus zenkeri</i>		Bark, seeds	Juice , Poullice	3	1.31	1	3	1.69	0.02	Convulsion
Cesalpiniaceae	<i>Senna alata</i>		leaves	Poullice, decoction , maceration	7	3.06	2	4	2.25	0.07	Yellow fever
Loranthaceae	<i>Tapinanthus globiferus</i>		leafy stems	Decoction	2	0.87	1	2	1.12	0.01	Diabetes
Asteraceae	<i>Vernonia amygdalina</i>	Do'o	Bark, leaves	Decoction , Poullice, juice , maceration	5	2.18	2	3	1.69	0.04	Abdominal pain
Araceae	<i>Xanthosoma maffafa</i>	Icao	Tubercle	Poullice	5	2.18	1	5	2.81	0.06	Bile
Poaceae	<i>Zea mays</i>	Kwii	Stigma, flower	Poullice, decoction , infusion	4	1.75	2	2	1.12	0.02	Dysentery, joint pain
Zingiberaceae	<i>Zingiber officinale</i>	Djindja	bulb	Decoction , juice	4	1.75	2	2	1.12	0.02	Bronchitis, cough
	total				229		102	178			

Sprain Constipation Fribrome cyst Acanthaceae *Justicia hypocrateriformis* leafy stems Decoction 5 2.18 1 5 2.81 0.06 Anemia Crassulaceae *Kalanchoe crenata* leaves Juice, decoction 4 1.75 2 2 1.12 0.02
 Bronchitis cough Anacardiaceae *Mangifera indica* Njangolo Bark, leaves, roots Decoction 2 0.87 1 2 1.12 0.01 Diabetes Euphorbiaceae *Manihot esculenta* Ekwamba leaves Decoction, maceration, juice 5 2.18
 1 5 2.81 0.06 Anemia Musaceae *Musa* sp. Picot Ido'o Leaves, spinal cord Juice, poullice, decoction 4 1.75 2 2 1.12 0.02 Bronchitis cough Solanaceae *Nicotiana tabacum* leaves Cataplast 5 2.18 2 3 1.69 0.04
 Hair loss

A total of 81 recipes were identified. Analysis of these recipes reveals 59 plant species. The following data for each species used is provided namely the scientific name of the plant, the different parts of the plant used (D), the method of preparation (P), the number of indication (Ct), the percentage of indication (% Ct), the number of diseases treated (U), the highest number of indications (Cm), the percentage of the highest number of indications (% Cm), the specialization index of use of the species and the main disease treated (Table 1). It emerges from this table that *Cymbopogon citratus* (0.35) is the plant species which has the highest used specialization index and edema in pregnant women is the symptom of the disease which uses the lowest number of indications. Malaria is the disease which has the greatest number of plants entering into therapeutic recipes. This is proof that malaria is the disease that affects the most people in Mbanga. These are ruderal plant species that are found all around the habitats, which explains their frequency of use in the treatment of diseases in Mbanga. This shows that the Mbanga populations use the species that are much more familiar to them.

5 Discussion

The 80 cases of health problems identified during this study were grouped into five groups of diseases. Examination of Figure 3 shows that acute diseases is the most represented group, at 38.75%, and which has the largest number of plant species entering into their therapeutic recipes, i.e. 193 plant species. These are diseases that affect all segments of the population. The deplorable living conditions of the populations, who are mostly farmers, and the proximity to the plantations and the geographical location of the area are sources of disease vectors. In addition, alcohol is part of people's daily lives. The high number of plant species in the treatment of these acute diseases is explained by the fact that most of these plants are part of the daily life of populations and therefore the use of a species intervenes in the treatment of one or more diseases at the same time. These are diseases caused by infection. Malaria is the most common disease (15%). It also uses the most recipes (11.56%) and plant species (11.34%). Malaria is a disastrous infectious disease with very high morbidity and unacceptable mortality rates that plague tropical countries. In fact, according to the World Health Organization (W.H.O., 2005), by synergy with other infections and diseases, it indirectly contributes to a large number of deaths, mainly in young children. In endemic African countries, it is responsible for 25 to 35% of outpatient consultations, 20 to 45% of hospitalizations and 15 to 35% of hospital deaths, thus placing a heavy burden on already fragile health systems (WHO / UNICEF, 2003). The population does not seem to be affected by traumatic illnesses. It can also be noted that diseases like typhoid fever and injuries (6.96%); gastritis and high blood pressure (6.32%); odontalgia (5.69%), like their respective frequencies, have very close percentages this could lead us to say that the importance of the disease determines the extent to which populations seek means to remedy it thanks to the use of plants. The treatment of some 20 diseases requires a few recipes and plant species in Mbanga. Indeed, these are diseases that are very little known to the population and which belong to an age group that is poorly represented in the population, thus reducing the number of patients in relation to the total population, the confession of those questioned on the ineffectiveness of the recipes used to relieve their ailments is also a reason for the low number of recipes identified to relieve these ailments. 118 plant species have been identified and grouped into 55 botanical families. *Ageratum conyzoides*, *Bidens pilosa* and *Carica papaya* are the most frequently used and their frequency of use is 6.27%, 5.61% and 5.22%, respectively. *Ageratum conyzoides*, *Bidens pilosa* are ubiquitous spontaneous and ruderal plants, accessible to populations which facilitates their use. *Carica papaya*, *Citrus aurantifolia* are therefore domesticated fruit trees. *Cymbopogon citratus* and *Aloe vera* are easily accessible, which would justify their great intervention in the different recipes. In addition, their effectiveness has been proven thanks to pharmacological studies of some of these plants. This is the case of *Carica papaya* which has anti-icteric (fruits), diuretic (roots and leaves) and deworming (seeds and fruits) and *Cymbopogon citratus* is antibacterial and also analgesic. When we look at the treatment sheet for the various diseases, we see that these plants are used alone or in combination with others. In the latter case, they intervene to alleviate a specific symptom or symptoms. Table 1 shows that *Cymbopogon citratus* is the plant specie most specialized in the treatment of diseases with an index of specialization of use of 0.35. The essential constituent of *Cymbopogon citratus* is an aldehyde with a strong lemony odor, the citral precursor of vitamin A, accompanied by a little free geraniol (Girault, 1984). This plant contains an essential oil with analgesic and antibacterial properties (Kerharo & al., 1974 in Yemdoung, 2003). It also contains an indole alkaloid, myrcene. The number of recipes (339) higher than that of medicinal plants (118) would indicate a better use of therapeutic resources in Mbanga. This result would support the fact that very often a respondent gave more than one use for the same plant; the same plant is sometimes used in several recipes.

The differences noted in the use of the same plant from one region to another could be related to ecological variations. Indeed, climatic and above all edaphic variations influence the chemical composition of plants. Thus, a compound present in a plant in one region would be absent or have a lower content in the same plant in another region. The said chemical composition being responsible for the medicinal properties of plants. These differences could also be explained by the fact that, some species of very similar appearance from one region to another would actually be different species, therefore having compounds with different contents or completely different compounds. It would

therefore be interesting to conduct chemotaxonomic studies on these species in order to certify their identification. The exploitation index for the medicinal flora available in Mbanga is equal to 4.23. This value is higher than that of two regions of Italy (Urzulei and Campiado) respectively equal to 3.66 and 3.32 (Bruni & *al.*, 1997). The therapeutic activities of medicinal plants are revealed by the presence of components, often present in small quantities, but which are an essential element. These components are called active ingredients. The extraction of these principles allowed to test the effectiveness of plants in the treatment of diseases and in the manufacture of drugs. The main active chemical principles of plants are: alkaloids (caffeine, morphine, quinine, etc.) which have effects on consciousness and motor skills and which have antispasmodic, anesthetic, narcotic and mydriatic actions; saponosides which are expectorants; tannins which are astringents; flavonoids which are antispasmodics and anthocyanins which have antiseptic properties. The principles have been identified in several plants thanks to chemical tests and their action on characteristic germs. Thus, the leaves of *Persea americana* contain an essence mainly composed of estragal (Girault, 1984). The extracts of these leaves have an antibacterial action tested on Gram + bacteria (Kerharo & Adams, 1974 in Damesse, 2005). Bouquet et al. (1974 in Yemdoung, 2003) note the presence of alkaloids in the *Carica papaya* plant, in particular carpain and pseudocarpain in the leaves. It also contains papain, an enzymatic complex of peptidase, amylase, pectase and lipase, whose proteolytic action is similar to that of pepsin and trypsin. In addition, three properties have been identified: anti-icteric (fruits), diuretic (roots and leaves) and deworming (seeds and fruits) (Walker, 1961; Kerharo et al. 1974 in Yemdoung, 2003). *Ageratum conyzoides* contains a phenol acid, coumarin (Girault, 1984). The genus Eucalyptus has essential oils such as eucalyptol, terpene compounds, phenolics, flavonoids and wax. These essential oils are antiseptic in vitro. Eucalyptol has an expectorant and mucolytic action on bronchial secretions. *Mangifera indica* contains a lot of tannins, Pousset (1989) in Nzogne (2000) notes that the bark is an antidiarrhoeal and a diuretic. This plant also contains gallic acid and epicatechin which has hypoglycemic properties (Ngueguim, 2001). The rhizomes of *Zingiber officinale* are rich in monoterpenes and sesquiterpenes. It is a stomachic stimulant (Noumi, 1984). This plant has gingirol and volatile oil (Bärtels, 1994). Analysis of variance (ANOVA) has shown that there is no significant difference between different numbers of recipes on the one hand and between different numbers of species on the other. This can be explained by the fact that the sample size is not the same in the different groups of diseases. From the herbal recipes collected during our investigations, we have found that the plants are used individually or in combination with other plants for the treatment of various diseases. The results thus obtained were compared with the results of the work carried out in Cameroon and elsewhere. Thus, to show the effectiveness of the plants used in Mbanga in the treatment of diseases, connections have been made regarding the use of certain plants.

The stems, leaves and flowers of *Bidens pilosa* are used in Mbanga for the treatment of malaria, bronchitis, anemia, headache, typhoid fever and gastric ulcers. The leaves are used against headaches in Batcham (Yemdoung, 2003) and Nkongsamba (Mapi, 1988). Its use against malaria is reported in Foto (Kebou, 1993), Nkongsamba (Mapi, 1988) and Fotomena (Tsafack, 2008). This plant is used in the treatment of cough in Foubot (Gnygnypudia, 1998), typhoid fever and malaria in Dschang (Temfack, 1995). In Gabon (Walker & Sillans, 1971) the leaves are used to relieve wounds. The leafy stems and leaves of *Emilia coccinea* used against gastritis ulcers, diaper rash, bronchitis, toothache, malaria, cough, typhoid and Mbanga poison are also used in the treatment of gastritis and cough in Batcham (Yemdoung, 2003). In Congo, Bouquet (1969) reports that leaf juice is administered to ulcerative wounds. The leaves, yellowed leaves, fruits, seeds and roots of *Carica papaya* are widely or not combined with other plants to treat various diseases in Mbanga, including typhoid fever, malaria, abdominal pain, and anemia. *Carica papaya* is used in Bamendjou and Bahouan against malaria, colic and typhoid (Nzogne, 2000). The use of *Carica papaya* against malaria is also reported in Batcham (Yemdoung, 2003), Fotomena (Tsafack, 2008) as well as in Congo Brazzaville (Ongoka & Elanga, 2004). *Cymbopogon citratus* is requested in Mbanga for the treatment of malaria, anemia and typhoid fever as well as in Foto (Kebou, 1993), in Bamendjou and Bahouan (Nzogne, 2000), as well as in Mbomo and Cotovindou in the People's Republic of Congo (Diafouka, 1997). The leafy stems and leaves of *Ageratum conyzoides* are used as a decoction and expression in Mbanga in the treatment of malaria, bronchitis, typhoid fever, injury, headache, abdominal pain, gastric ulcers and poison. This plant has been reported to be used in the treatment of colic and malaria in Batcham (Yemdoung, 2003), in the treatment of colic by the Mpiemo people, from eastern Cameroon and southwestern Central Africa (Thornell & *al.*, 2005). The leaves of *Ageratum conyzoides* are used in the Yaoundé and Obala region to treat headaches, gastritis and wounds (Ghogomu, 1993) as well as in Gabon (Walker & Sillans, 1971). The use of this herb against headaches and gastritis was reported to Fotomena by Tsafack (2008). *Psidium guajava* is used in Mbanga for malaria, typhoid fever, dysentery, and abdominal pain. This plant is used against malaria and colic, in Batcham (Yemdoung, 2003), against colic, dysentery and malaria in Fotomena (Tsafack, 2008), and against typhoid in Bamendjou and Bahouan (Nzogne, 2000). The leaves and bark of *Mangifera indica* are used in Mbanga against malaria, kidney disease and typhoid fever. This species is used in Bamendjou and Bahouan against malaria and typhoid fever (Nzogne, 2000). This species is used in Fotomena (Tsafack, 2008) and Batcham (Yemdoung, 2003) against typhoid and in Cote d'Ivoire (Zirihi, 2004) against malaria. *Zingiber officinale* bulb is used in the treatment of cough in Mbanga. This is the case in Foto (Kebou, 1993), New-Malimba (Dikanda, 2000), Gabon (Walker & Sillans, 1971) and Benin associated with other plants (Adjanohoun & *al.*, 1989). Treatment of cough and bronchitis in Mbanga involves other plants such as *Oxalis corniculata*. This species is also used

in Madagascar (Razafindrmbao, 1971) for the treatment of cough. *Citrus aurantifolia*, as in Mbanga, is used in the treatment of coughs in Benin, associated with other plants (Adjanohoun & *al.*, 1989). The leaves of *Vernonia amygdalina* widely used in Mbanga against abdominal pain are also used in several regions of Cameroon, in particular in Dschang (Temfack, 1995), in New-Malimba (Dikanda, 2000) and in Nkongsamba (Mapi, 1988). The stems and leaves of *Spilanthes filicaulis* are used in Mbanga for headache. In Nkongsamba (Mapi, 1988), they are used in the treatment of dental pain.

Nicotiana tabacum leaves are used in Mbanga for headache, as well as in Dominica (Adjanohoun & *al.*, 1985). Conclusion The knowledge and use of plants in the field of public health are important and the cures they provide are considerable. The plant species used in the treatment of diseases in Mbanga are reported for most of the authors in other parts of Cameroon and the world in the treatment of the same diseases. Dosages and duration of treatment are often arbitrary and presently constitute a problem in the practice of traditional medicine. The number of plants used (118), shows that Mbanga maintains a rich and varied pharmacopoeia. A future work will be to travel during a future survey, the various villages of the district of Mbanga which have not been, and whose goal will be to complete and enrich the list and the directory obtained at the end of the present. job. In addition, it would be wise to organize educational talks with the youth of Mbanga to better inform them of the dangers facing them. We can also contribute to research through chemical tests of the plants listed, to the determination of the active ingredients of the different plants, but above all of their degrees of toxicity and any undesirable effects in order to regulate the concepts of dosage and duration of treatment. The growing interest of populations in the use of plants in therapy is based on the principle that plants are always available. However, no concerted effort has yet been made to ensure this availability in the face of threats posed by the growing demand for a growing population and the extensive destruction of plant habitats very rich in medicinal plants. To overcome this mismanagement, it would be desirable to study the biology and ecology of these plants, and consider continuously monitoring the various cutting techniques practiced in order to establish and popularize rational exploitation standards.

6 Conclusion

The knowledge and use of plants in the field of public health are important and the cures they provide are considerable. The plant species used in the treatment of diseases in Mbanga are reported for most authors in other regions of Cameroon and the world in the treatment of the same diseases. The dosages and duration of treatment are often arbitrary and currently constitute a problem in the practice of traditional medicine. The number of plants used, 118, shows that Mbanga maintains a rich and varied pharmacopoeia. In addition, it would be wise to organize educational talks for the youth of Mbanga to better inform them of the dangers that await them. We can also contribute to research through chemical tests of the plants identified, to the determination of the active ingredients of the different plants, but above all their degree of toxicity and possible adverse effects in order to regulate the notions of dosage and duration of treatment. The increased interest of populations for the use of plants in therapy is based on the principle that plants are always available. However, no concerted effort has so far been made to ensure this availability in the face of threats posed by the growing demand of a growing population and the extensive destruction of plant habitats rich in medicinal plants. To overcome this mismanagement, it would be desirable to study the biology and ecology of these plants, to consider continuous monitoring of the different cutting techniques practiced in order to establish and popularize the standards of rational exploitation.

Compliance with ethical standards

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The authors declared no conflict of interest.

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