



Inventory and Identification of Plants Used in the Treatment of Diabetes in Douala Town (Cameroon)

**N. Din¹, S. D. Dibong^{2,3,4*}, E. Mpondo Mpondo², R. J. Priso¹,
N. F. Kwin¹ and A. Ngoye⁴**

¹*Department of Plant Biology, Faculty of Science, University of Douala, P.O. Box 24157, Douala Cameroon.*

²*Department of Pharmaceutical Sciences, Faculty of Medicine and Pharmaceutical Sciences, University of Douala, P.O.Box 2701, Douala Cameroon.*

³*Institute of Fishery Sciences, P.O. Box 2701, The University of Douala, Cameroon.*

⁴*Institut de Recherche d'Ecologie Tropicale (IRET), CENEREST, Libreville, Gabon.*

Research Article

Received 24th April 2011
Accepted 2nd June 2011
Online Ready 6th June 2011

ABSTRACT

Currently, the International Diabetes Federation estimates that 194 million people live with diabetes worldwide are 5.1% of the adult population and this number is estimated at 333 million in 2025. In Africa, there are about 13.6 million people suffering from diabetes. Despite many discoveries made about his treatment, cost of drug prescriptions is very high to justify the continued inaccessibility to medicine for the population living below a dollar daily income per person. The use of medicinal plants is accessible to all strata of society contributing to health for all. This study focuses on the inventory, identification and use of medicinal plants in the treatment of diabetes in Douala town. The ethnobotanical survey conducted in 2009 has enabled the identification of 41 plant species belonging to 36 genera and grouped into 26 families. These plants have led to the establishment of 47 medicinal recipes and some of which have already been cited by other authors. Ten species are common for the treatment of diabetes. These are: *Alluim cepa*, *Aloe vera*, *Alstonia boonei*, *Catharanthus roseus*, *Costus afer*, *Cassia occidentalis*, *Ceiba pentandra*, *Citrus limon*, *Mangifera indica* and *Persea americana*. The recipes which are more effective to apply every day are: one to two glasses of juice of *Brassica oleracea* L., a half glass of juice *Phaseolus vulgaris* L., three glasses of juice made from one to two handfuls of dry beard *Zea mays* L. boiled in

*Corresponding author: Email: didierdibong@yahoo.fr;

a liter of water for 15 minutes and two glasses of boiled water with *Eucalyptus sailgna* Smith. Decoction and maceration are the main modes of preparation and oral mode is the only administration way met. The plants most used are harvested in forests, home gardens or crops and the organs used are the bark or leaf. Woody plants are most prevalent. Some plants are not recommended for pregnant women: *Gynostemma pentaphyllum*, *Mormodica charantica*, *Panax ginseng*, *aloe vera* because of the risk of miscarriage.

Keywords: *Ethnobotany; Brassica oleracea; Phaseolus vulgaris; Diabetes; Medicinal plants; Cameroon;*

1. INTRODUCTION

After a period of brilliant scientific progress, where the therapeutic, healing science has placed its hopes in laboratories and sophisticated high-tech devices, there is renewed interest in simple remedies offered by nature: not only plants but also water (hydrotherapy), sun (light therapy) or curative land (fangotherapy) (Pamplona et al, 1999). Traditional medicine, like modern medicine aims at restoring and improving the health contributing to social welfare. Treatment plant-based herbal medicine also known as a science, a set of practical measures and physical interventions which enable man to prevent or fight against the disease through the plants (Hans and Blindanda, 1993).

Diabetes is a metabolic disorder characterized by the presence of chronic hyperglycemia resulting from a deficiency of insulin secretion, abnormalities of insulin action on target tissues, or combining the two (Grimaldi, 2005 cit. Tedong, 2006). It is a disease that occurs when the pancreas produces little or no insulin. An abnormal blood sugar level in blood reflects an imbalance between the inputs of glucose in the body and good use by the cells of various organs.

We meet the immuno-dependent diabetes or Type I Diabetes: Here, the pancreas produces more insulin. It is an auto immune disease characterized by selective destruction of insulin secreting beta cells of islets of Langerhans. Type II Diabetes is a metabolic disorder resulting from the inability of the body to produce enough insulin. There is also Gestational Diabetes, a disorder of carbohydrate tolerance diagnosed during pregnancy. It is temporary, the frequency of the DG is 6% of pregnancies (Ada, 2003 cit. Tedong, 2006). Diabetes insipidus is a sugarless polyurine due to defective secretion of ADH.

Manifestations of diabetes varies by topic and are multiples. We cite among other polyurine of night due to hyperglycemia, thirst, a PolyMag (DID) (eats constantly), fatigue, weight loss, neck pain, wound healing at a very slow, dizziness, weakness in sexual men and frigidity in women. The complications are diverse and deleterious. They can cause myocardial infarction, vasculocerebral accidents, swelling of the arteries causing insensitivity, blindness, kidney failure, peripheral neuropathy, gas gangrene.

Currently, the International Diabetes Federation estimates that 194 million people live with diabetes worldwide are 5.1% of the adult population and this number is estimated at 333 million in 2025. In Africa, there are about 13.6 million people suffering from diabetes. In

Cameroon, the work of Tedong (2006) reported a prevalence of 2.4% against 1.4% population. The overall rate of diabetes patients compared to the total number of patients was 28.3% and 95% of diabetic patients are adults (Statistics from the Laquintinie hospital). For this reason it is imperative to pay special attention to this disease as well as ways and means for its treatment.

Despite many discoveries made about his treatment, cost of drug prescriptions is very high to justify the continued inaccessibility to medicine for the population living below a dollar daily income per person. In the lack of care, in order to recover faster healing and improved health, the population is turning to traditional medicine. The use of medicinal plants is accessible to all strata of society contributing to health for all. However, OMS estimates the number to 80% of people worldwide who use traditional medicine (Rejdali and Birouk, 1996). Over 75% of drugs derived from plants (Fouche and Marquet, 2000). In addition, some 60% of today's diseases are due to chemicals (WHO, 1991).

The goal of this study is to catalogue and identify medicinal plants used in the treatment of diabetes found in Douala town. The descriptions and illustrations permit their recognition in the field for efficient treatment and for harvesting and future use while mentioning practical use. The goal is also to enhancement of the natural resources and the protection, preservation and rational use of plant biodiversity.

2. MATERIALS AND METHODS

The study was conducted in different districts of Douala town (Douala I, Douala, Douala II, Douala III, Douala IV and Douala V). A preliminary investigation of the disease (diabetes) was conducted among diabetogenic doctors counterparts in a dozen specialized centers. Some healers, naturopaths, herbalists and nutritionists have been met. Traditional healers met have permitted to collect and identify methods of preparation and administration of treatments. Some information was gathered from the cultural centers through books and magazines on medicinal plants.

A questionnaire was submitted to traditional healers for information on:

- Name;
- Age of traditional healers;
- The duration of exercise/training method;
- Part of the plant to use;
- The method of preparation and administration;
- The state of the plant before use;
- Biotope of the plant and duration of treatment.

Data collection has been made to traditional healers belonging to the group "GIGTA (International Group of African traditional healers) and men of the pharmacopoeia. In total, 15 have shared their knowledge and expertise on antidiabetic medicinal plants. 33% of traditional healers encountered were women who received traditional knowledge against 66.66% of men who all received knowledge of their ancestors and have undergone initiation. Some samples were collected from different biotopes and following the instructions provided and others with traditional healers. The collection, which took place in the company of traditional healers, has permitted to identify the names of some plants in the national language. The identification of certain species was made on the ground and others throw the laboratory of Botany, Faculty of Science, University of Douala) or by using botany and

systematic manuals. Unidentified samples were dried and taken to the National Herbarium of Cameroon in Yaoundé which their photographs. Some descriptions were completed by data from the literature (Deysson et al., 1964; Priso, 1987; Hans Bindanda, 1993). After this identification, a complete list of plants has been established.

3. RESULTS AND DISCUSSION

A total of 41 species of medicinal plants listed in 36 genera and 26 families were identified and inventoried in Douala town. Field data collected and analyzed (Tables 1, 2 and 3, Figures 1 and 2). It appears from work done on the ground that the biotope is forest (34.09%), followed by home gardens (27.27%) and crops (22.72%). The bark and leaves are organs most used with 36.58% and 34.14% respectively. There are six types of preparations and the main tools used by traditional healers are the decoction and maceration.

We note that the family Rutaceae with the *Citrus* whose species are cultivated is the most met. This species is essential for a power balance in health and nutrition (Pamplona 1999). Among the 41 species used as herbal medicines in the treatment of diabetes, some were already mentioned by other authors (Boiteau and Dietrixt, 2005; Pamplona, 1999). Ten species are common to those cited by Apema et al. (2010). There are: *Allium cepa*, *Aloe vera*, *Alstonia boonei*, *Catharanthus roseus*, *Costus afer*, *Cassia occidentalis*, *Ceiba pentandra*, *Citrus limon*, *Mangifera indica* and *Persea americana*. The forest, home gardens and crops are most biotopes in demand by traditional healers and having kept a close relationship with plants. This result is consistent with that of Umubyeyi, (1994) despite rapid urbanization. Many plants are not used for nutrition, or decoration, nor shade, but only care.

Woody plants are dominants. The leaves are the site of numerous syntheses and secondary metabolites produced may be the cause of discovery of new drugs. The organs most used are the leaves and bark. It is important to note that improper use can cause a phytopathology of the species see its disappearance (Betti, 1994). Thus, an efficient use of our plant resources should be advocated. It is difficult to say precisely which method of preparation is effective because it is different from one therapist to another. According to Audrey and Dehin (2004), extraction of active ingredients is made by boiling the plant. But according to Thomson (1981), preparation methods vary depending on the types of plant. Maceration for those containing essential oils like *Eucalyptus* (Myrtaceae), the decoction for those whose active extracted is difficult and infusion for drinking tea.

The mode of administration of these different recipes is the oral route which is the most used not only in traditional medicine but also in modern medicine and by many authors (Pousset, 1989, 2004; Pamplona, 1999; Umubyeyi 1999). These plants can be used isolated or in combination as a concoction. All these recipes are effective despite their mode of preparation.

Some plants are not recommended for pregnant women: *Gynostemma pentaphyllum*, *Mormodica charantica*, *Panax ginseng*, *aloe vera* because of the risk of miscarriage (Anonymous, 1986) and others use both as medicine or food: *Phaseolus vulgaris*, *Brassica oleracea*.

Table 1. List of scientific and common names of various medicinal plants identified in this study

Family	Scientific names	Common names	Vernacular names
Anacardiaceae	<i>Anarcadium occidentale</i> Linn.	Cashew	Pomme cajou
	<i>Mangifera indica</i> Linn.	Mango	Djangolo (Douala)
	<i>Sclerocarya birrea</i> Hochst	Soursop	Saba-saba (Douala)
Annonaceae	<i>Annona miricata</i> Linn.	Bark yellow	Mfô (Ewondo)
Apiaceae	<i>Enantia chlorantha</i> Oliv.	Celer	
	<i>Apium graveolens</i> Linn.	Quinine bush	Bokuka (Douala),
Apocynaceae	<i>Alstonia boonei</i> De Wild.	Madagascar periwinkle	
	<i>Catharanthus roseus</i> (Linn.) G. Don	Quinkeliba	
Araliaceae	<i>Picralima nitida</i> (Stapf) Th & H. Dur.	Ginseng	
Arecaceae	<i>Panax ginseng</i> C. A. Meyer	Coconut	Mbanga pongo (Douala)
Asteraceae	<i>Cocos nucifera</i> Linn.		Ndolé (Douala)
Bombacaceae	<i>Vernonia amygdalina</i> Del.	Cheesemonger	Buma (Douala)
Brassicaceae	<i>Ceiba pentandra</i> (Linn.) Gaerth.	Cabbage	
Bromeliaceae	<i>Brassica oleracea</i> Linn.		Djanga la mukala (Douala)
Cecropiaceae	<i>Ananas comosus</i> Merr.	Pineapple	Asseng (Beti)
Cesalpiniaceae	<i>Musanga cecropioides</i> C. Sm. ex R. Br.	parassolier	Wonda bedimo (Douala)
	<i>Cassia occidentalis</i> Linn.	Caffee negro	Mbanga dibongo (Douala)
Combretaceae	<i>Terminalia catappa</i> Linn.	Costus	Mwandando (Douala)
Costaceae	<i>Costus afer</i> Ker-Gawl.	Melon	
	<i>Cucumis melon</i> Linn.		
Curcubiaceae	<i>Mormodica charantia</i> Linn.	Mormodique	Nyangala nindene (Douala)

Curcubiaceae	<i>Gynostema pentaphyllum</i> Blume		
Fabaceae	<i>Phaseolus vulgaris</i> Linn.	Bean	
Lauraceae	<i>Persea americana</i> Mill.	Avocado	
			Djanga la sup Douala)
Liliaceae	<i>Allium cepa</i> Linn.	Onion	
	<i>Allium sativum</i> Linn.	Garlic	
	<i>Aloe vera</i> Linn.	Aloe	
Loganiaceae	<i>Anthocleista vogelii</i> Planch.		Bopolopolo (douala)
	<i>Phragmanthera capitata</i> (Spreng.) S. Balle	Mistletoe	
Loranthaceae	<i>Tapinanthus dodoneifolius</i> (Engler) Danser	Mistletoe	
	<i>Azadirachta indica</i> A. Juss	Margousia	
Meliaceae	<i>Entandrophragma candollei</i> Harms	Kossipo	Moumout (Bassa)
	<i>Entandrophragma cylindricum</i> (Sprague) Sprague	Sapele	Kondjock (Douala)
Mimosaceae	<i>Cylicodiscus gabonensis</i> Harms.	Soap bark	Loum (Bassa)
Myrtaceae	<i>Eucalyptus sailgna</i> Smith.	Eucalyptus	Catousis (Bafou)
Poaceae	<i>Zea mays</i> Linn.	Corn	Mbassi (Douala)
Rubiaceae	<i>Cinchona offinalis</i>	Cinchona	
	<i>Citrus orangifolia</i> (Christm.) Swingle.	Lemon	
	<i>Citrus grandis</i> Osbeck	Grapefruit	
Rutaceae			Epuma essadi (Douala)
	<i>Citrus limon</i> Linn. Burm.	Lemon	
	<i>Citrus sinensis</i> Linn. Osbeck	Orange	Epouma (Douala)

Table 2. List of plants identified by biological types

Families	Scientific names	Woody	Herbaceous
	<i>Anarcadium occidentale</i> Linn.	+	
Anacardiaceae	<i>Mangifera indica</i> Linn.	+	
	<i>Sclerocarya birrea</i> Hochst	+	
Annonaceae	<i>Annona miricata</i> Linn.	+	
	<i>Enantia chlorantha</i> Oliv.	+	
Apiaceae	<i>Apium graveolens</i> Linn.		+
Apocynaceae	<i>Alstonia boonei</i> De Wild.	+	
	<i>Catharanthus roseus</i> (Linn.) G. Don		+
	<i>Picralima nitida</i> (Stapf) Th & H. Dur.	+	
Araliaceae	<i>Panax ginseng</i> C.A. Meyer		+
Arecaceae	<i>Cocos nucifera</i> Linn.	+	
Asteraceae	<i>Vernonia amygdalina</i> Del.	+	
Bombacaceae	<i>Ceiba pentandra</i> (Linn.) Gaerth.	+	
Brassicaceae	<i>Brassica oleracea</i> Linn.		+
Bromeliaceae	<i>Ananas comosus</i> Merr.		+
Cecropiaceae	<i>Musanga cecropioides</i> C. Sm. ex R. Br.	+	
Cesalpiniaceae	<i>Cassia occidentalis</i> Linn.	+	
Combretaceae	<i>Terminalia catappa</i> Linn.	+	
Costaceae	<i>Costus afer</i> Ker-Gawl.		+
Curcubiaceae	<i>Cucumis melon</i> Linn.		+
	<i>Mormodica charantia</i> Linn.		+
	<i>Gynostema pentaphyllum</i> Blume		+
Fabaceae	<i>Phaseolus vulgaris</i> Linn.		+
Lauraceae	<i>Persea americana</i> Mill.	+	
	<i>Allium cepa</i> Linn.		+
Liliaceae	<i>Allium sativum</i> Linn.		+
	<i>Aloe vera</i> Linn.		+
Loganiaceae	<i>Anthocleista vogelii</i> Planch.	+	
Loranthaceae	<i>Phragmanthera capitata</i> (Spreng.) S. Balle	+	
	<i>Tapinanthus dodoneifolius</i> (Engler) Danser	+	
Meliaceae	<i>Azadirachta indica</i> A.Juss	+	
	<i>Entandrophragma candollei</i> Harms	+	
	<i>Entandrophragma cylindricum</i> (Sprague)	+	
Mimosaceae	<i>Cylicodiscus gabonensis</i> Harms	+	
Myrtaceae	<i>Eucalyptus sailgna</i> Smith.	+	
Poaceae	<i>Zea mays</i> Linn.		+
Rubiaceae	<i>Cinchona offinalis</i>	+	
	<i>Citrus orangifolia</i> (Christm.) Swingle.	+	
Rutaceae	<i>Citrus grandis</i> Osbeck	+	
	<i>Citrus limon</i> Linn. Burm.	+	
	<i>Citrus sinensis</i> Linn. Osbeck	+	

Table 3. Different recipes using medicinal plants

Sl. No.	Scientific Names	Method of preparation	Method of administration	Observations
1	<i>Allium cepa</i> Linn.	Take 300 g onion. Add 75 cl of white wine and honey and let marinate for 48 h.	Take 2-6 tablespoons per day depending on the seriousness of evil	May be repeated
2	<i>Allium sativum</i> Linn	Soak in lemon juice a handful of garlic for 15 mn then filter	Drink ¼ cup every morning fasting	In hypertension refrain
3	<i>Aloe vera</i> Linn.	Soak the entire plant in water for at least 24 h	Consume a half glass 2 times a day	Check blood glucose after a week
4	<i>Alstonia boonei</i> De Wild.	Maceration for 24 h. Decoction of the bark in 5 l of water and let stand for 3 days. Make a decoction of 4 pieces of bark and leaves in 8 l of water and filters allow 24 hours before consumption	Take 1 glass morning and evening	Extremely bitter. Eliminate a considerable degree of blood sugar in the body
5	<i>Ananas comosus</i> Merr.	Press pineapple and add the lemon juice	Drink a glass 15 minutes before meals	
6	<i>Anarcadium occidentale</i> Linn.	Make a decoction of 4 pieces of bark and leaves in 8 l of water. Filter and allow to wait for 24 hours before consumption	Drink 2 tablespoons 2 times a day for 7 days	To be repeated every 2 weeks and control blood sugar and tension
7	<i>Annona miricata</i> Linn.	Put a handful of dry leaves in 1 l of boiling water. Let steep for 10 minutes and then filter	Drink as much during the day	Doing this every day
8	<i>Anthocleista vogelii</i> Planch.	Marinate 4 pieces of bark into 2 l of water for 3 days	Take 1 glass morning and evening	Bark bitter aids digestion
9	<i>Apium graveolens</i> Linn.	Taken as an extract juice	Drink a glass of juice. Help smell	Help for a proper digestion and reduces blood pressure
10	<i>Azadirachta indica</i> A. Juss	Boil 2 large handfuls of leaves in one liter of water Plant juices and eat as a vegetable	Take 1 glass morning and evening Take ½ or one glass	Associate diet prescribed
11	<i>Brassica oleracea</i> Linn.		(100-200 ml) 3 or 4 times daily before meals	

12	<i>Cassia occidentalis</i> Linn.	Take 300 g of roots. Wash and make a decoction Pour 6 tablespoons of leaves in 1 l of boiling and steep.	Take 1 glass morning and evening Drink ½ cup 2 or 3 times per day and 3-5 cups per day in the day	Half dose should be administered to the child. Toxicity at high doses is remarkable in pregnant women. Do not abuse the honey because the tea is very bitter We can also make a decoction
13	<i>Catharanthus roseus</i> (Linn.) G. Don	Make a decoction for 2-5 mn from 30 to 50 g of leaves per liter of water		
14	<i>Ceiba pentandra</i> (Linn.) Gaerth.	Take a bark about 30 cm to macerate in 1 l Soaked in 3 l for 24 h some bark	Drink one cup every morning Drink one cup morning and evening	
15	<i>Cinchona officinalis</i>	Make juicing	A drink on an empty stomach every day	
16	<i>Citrus grandis</i> Osbeck	Boil 800 g of fresh leaves (decoction) in 3 l of water cool. Filter and mix with honey	Drink one cup on an empty stomach	
17	<i>Citrus limon</i> Linn. Burm.	Soak in lemon or lime juice a handful of garlic for 15 minutes then filter	Drink one cup on an empty stomach	
18	<i>Citrus orangifolia</i> (Christm.) Swingle.	Maceration of the bark of an orange	Drink one cup per day	
19	<i>Citrus sinensis</i> Linn. Osbeck	Calcify the endocarp (the coconut shell). Crush and mix with oil palm	Take one teaspoon per day	
20	<i>Cocos nucifera</i> Linn.	Soak the whole plant for nearly 40 mn in a 10 l of water	Bathing with this preparation	
21	<i>Costus afer</i> Ker-Gawl.	Cook melon	Eat at least one lunch	Diet
22	<i>Cucumis melon</i> Linn.	Soak or make a decoction of the bark	Half a glass 3 times per day	
23	<i>Cylicodiscus gabonensis</i> Harms.	Soak or make a decoction of the bark	Half a glass 3 times per day	
24	<i>Enantia chlorantha</i> Oliv.	Crush 4 pieces of this bark, marinate in 2 l water for 24 h	Drink one cup 3 times per day	Antibiotic, tonic, also cleans the kidney belt
25	<i>Entandrophragma candollei</i> Harms	Crush 4 pieces of this bark and marinate in 2 l water for 24 h	A drink 3 times per day	Antibiotic and tonic. Also clean the kidney belt
26	<i>Entandrophragma cylindricum</i> (Sprague)			

27	<i>Eucalyptus sailgna</i> Smith.	Make a decoction of the leaves	A drink 3 times per day	
28	<i>Gynostema pentaphyllum</i> Blume	Crush 4 pieces of this bark. Marinate in 2 l water for 24 h	Take one cup for purging	
29	<i>Mangifera indica</i> Linn.	Make a decoction of the leaves	one cup 3 times/ day	
30	<i>Mormodica charantia</i> Linn.	Make an infusion of whole plant and put a cup of boiling water over a spoonful of the plant for 5 mn	Drink in small doses a small cup a day	Can also be used to make douching (pregnant women abstain and not to consume at the same time with alcoholic beverages)
31	<i>Musanga cecropioides</i> C. Sm. ex R. Br.	Decoction of fresh bark to boil in 5 l water	Drink one cup on an empty stomach in the morning	Also regulates blood pressure
32	<i>Panax ginseng</i> C. A. Meyer	Soak the roots in 4.5 l of water and let stand 24 h	Half a glass morning and evening	Also used for fatigue and cleaning
33	<i>Persea americana</i> Mill.	Cut a good amount of young and fresh leaves. Make tea in a liter of water	Drink at will during the day	
34	<i>Phaseolus vulgaris</i> Linn.	Take bark dry beans and cleaned. Cut into powder and take 7 tablespoons. Make a decoction. Take 100 g of pods in decoction in 1 l of water (to be halved). The remaining liquid must be taken every day	Take a drink every morning fasting	Lowers blood sugar dramatically
35	<i>Phragmanthera capitata</i> (Spreng.) S. Balle	Make an infusion of leaves	Drink as you like	
36	<i>Picralima nitida</i> (Stapf) Th & H. Dur.	Cut the fruit into small pieces and soak in a liter of water for 20 h	A cup a day	
37	<i>Sclerocarya birrea</i> Hochst	Make a decoction of the leaves in 3 l of water	Drink a glass on an empty stomach in the morning	
38	<i>Tapinanthus dodoneifolius</i> (Engler) Danser	Make a decoction of the leaves in 2 l of water	Drink a glass 10 mn before lunch	
39	<i>Terminalia catappa</i> Linn.	Boil two large handfuls of leaves in 1 l	Drink a glass on an empty stomach in the morning	Half a glass for child
			and evening	

40	<i>Vernonia amygdalina</i> Del.	Mash three large handfuls of leaves and extract the juice	Drink a glass every morning	
41	<i>Zea mays</i> Linn.	Boil three handfuls of corn beard in 4 cups water	Drink ½ cup 4-8 times daily	Take six months
42	<i>Annona miricata</i> <i>Persea americana</i> , <i>Eucalyptus sailgna</i> <i>Citrus limon</i>	Boil in 6 l of water a handful of leaves of <i>Annona</i> , <i>Eucalyptus</i> , leaves of <i>Persea</i> and 2 lemons and filter	Drink one cup twice a day preferably morning and evening	
43	<i>Anthocleista vogelii</i> <i>Entandrophragma cylindricum</i> <i>Cylicodiscus gabonensis</i> <i>Picalina nitida</i>	Take a piece of bark from each tree and the seeds of the fruit Kinkeliba crushed. Boiled in 6 l of water	Drink one cup morning and evening	Check blood sugar level
44	<i>Allium sativum</i> <i>Panax ginseng</i> <i>Citrus orangifolia</i>	Crush 6 cloves of garlic in half and add water to the ginseng root powder in a spoon. Let stand for 24 h and add the lemon juice	Drink half a glass 2 times a week	Glycemic control after one week
45	<i>Panax ginseng</i> <i>Gynostema pentaphyllum</i> feuilles de lotus	Put a cup of boiling water in the ginseng root, bark and dry leaf of <i>Gynostemium</i> . Steep 10-45 mn	Drink half a glass 2 times a week	Pregnant and l women who lactate children under 12 months refrain
46	<i>Azadirachta indica</i> <i>Citrus limon</i> <i>Terminalia catappa</i>	Boil in 6 l of water a handful of leaves of <i>Terminalia</i> , Mangosier and two lemons and strain	Drink half a glass every morning and evening	
47	<i>Allium sativum</i> <i>Cinchona offinalis</i> <i>Terminalia catappa</i>	Boil in 3 l of water <i>Terminalia</i> leaves, bark of <i>Cinchona</i> and <i>Allium</i> in decoction	Drink one glass twice a day	

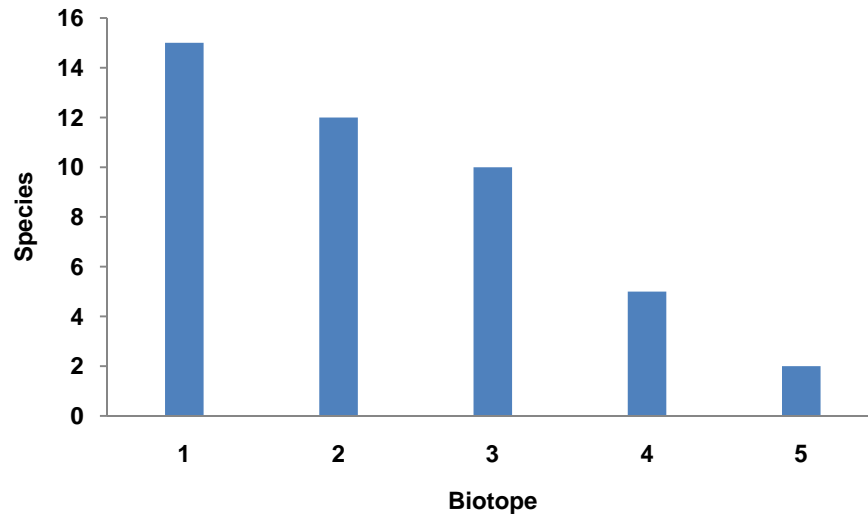


Fig. 1. Number of species recorded as a function of the biotope
1 : Forest ; 2 : Home gardens ; 3 : Crops ; 4 : Ruderal environment ; 5: Fallow

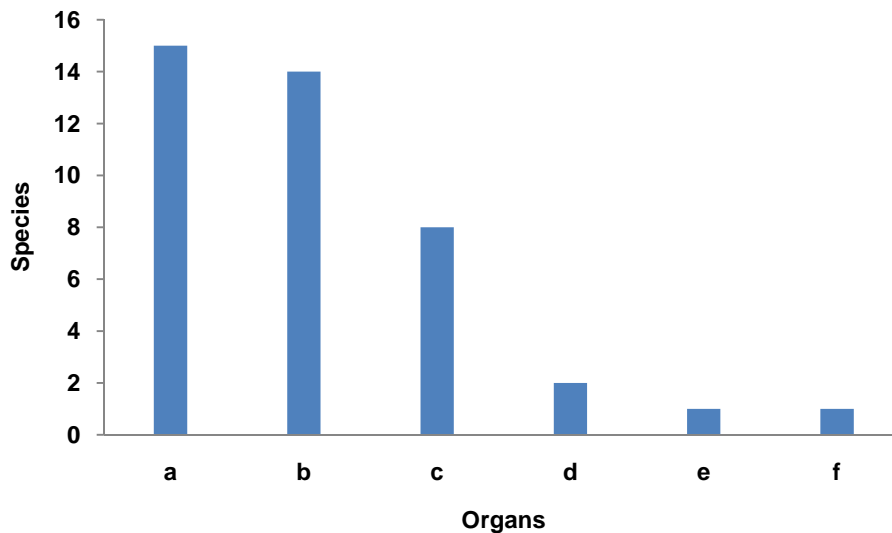


Fig. 2. Distribution of organs (plant parts) used in the preparations.
a: Leaves; b: Bark; c: Fruits; d: Bulbs; e: Seeds; 6: Roots

Moreover, in the treatment of diabetes, several plants identified in Douala town are multipurpose and are used for other treatments in the town and in other regions:

- *Anacardium occidentale* (Anacardiaceae) whose bark is used in Senegal as anti-dysenteric, anti-diarrheal; in Panama and Brazil is used for Diabetes and Hypertension (Tedong, 2006);
- *Allium cepa* (Liliaceae) is used in Chad for cough and typhoid fever;

- *Allium sativum* (Liliaceae) is used against intestinal parasites;
- *Annona miricata* (Annonaceae) is used against cough and bronchitis;
- *Brassica oleracea* (Brassicaceae) is used to treat cancer, anemia and ulcers (Pamplona, 1999);
- *Alstonia boonei* (Apocynaceae) is used for the treatment of genital infections, against the spleen, bronchitis and amoebae;
- *Citrus aurantifolia* (Rutaceae) fight against intestinal parasites;
- *Catharanthus roseus* (Apocynaceae) is used in pharyngitis, laryngitis in Europe;
- *Cinchona officinalis* (Rutaceae) is used to treat malaria and typhoid
- *Persea americana* (Lauraceae) taken in decoction is used in Bafou for the treatment of hypertension; in Reunion Island is used as a sleeping pill (Makueti, 2003) and in Douala against malaria.

The use of a recipe or a plant by several persons or people of different cultures and different backgrounds strengthen the credibility of the species in question. Pharmacological studies have been done on some plants in the case of *A. occidentale* whose hexane extract of the nuts is widely used for its molluscidal activity. It has also isolated tannins in the bark revealing anti-inflammatory actions and the hypoglycemic activity of aqueous extract in methanol. Similarly, a study was made on *Cinchona officinalis* and allowed the isolation of alkaloids very important in the treatment of malaria.

4. CONCLUSION

A total of 41 species belonging to 36 genera in 26 families have been collected to prepare 47 recipes for the treatment of diabetes. It is important to note that self-medication is not recommended in both modern and traditional medicine because the dosage must be respected. Considering the space occupied by plants through their roles and desire to preserve plant biodiversity, it would be beneficial to raise awareness for the national integration of herbal therapies in the country, to study the active ingredients of various plants for confirmation of their effectiveness, to popularize the cultivation of medicinal plants among populations, to enable collaboration between traditional healers and medical researchers, to create research centers in the area of medicinal and pharmacological study centers, to educate the public on the rational use of plants.

ACKNOWLEDGMENT

We deeply thank UNESCO program of the University of Douala for their financial support.

REFERENCES

- Anonyme. (1986). Medicinal encyclopaedia of Africa volume 4 Larousse Africa, Belgium, pp. 870-1150.
- Apema, R., Mozouloua, D., Madiapevo S.N. (2010). Preliminary inventory of edible wild fruits sold in Bangui markets, in : Van der Burgt, J. Van der Maesen, Onana J.M. (Eds), Systematics and preservation of the African plants. Royal Botanic gardens, Kew, pp. 313-319.
- Audrey, J., Dehin, R. (2004). Medicinal plants: instructions for use. Reference documents, 4p.

- Bärtels, A. (1994). Guide of the tropical plants. Decorative plants; useful plants, exotic fruits. Ed. Eugène-ulmer, 3^e édition, 384p.
- Betti, J.L. (1994). Contribution to the knowledge of the healing plants of the Dja river. Report, University of Dschang FASA, 117p.
- Betti, J.L. (2002). Medicinal plants sold in Yaoundé markets, Cameroon. African Study Monographs, 23(2), 47-64.
- Boiteau, P., Poiter, P. (1978). Science and life, The vegetable world.
- Dietrixt, Tanda 2005. The nature reveals its secrets. The hundred percent natural medicine. Ed. TDF Collection.
- Deysson, G., Bach, D., Mascre (1964). Organization and classification of vascular plants. Tome II, Sedes Paris, 431p.
- Fouche, J.L., Marquet, A. (2000). Healing plants; from the plant to the medicine. Temporary exhibition.
- Hans, H., Bindanda, M. (1993). The alternative medicine in Africa. How to be cured by the tropical plants. Kinshasa, 143p.
- Kamtchouing, P. (1998). The contribution of *Ceiba pentandra* in the treatment of the Diabetes. Doctoral thesis. University of Yaoundé I, 186p.
- Makueti, J.T. (2003). Contribution to the study of medicinal plants of the Bafou village. Master's thesis. University of Yaoundé I, 92p.
- Pousset, J. (1989). African healing plants: practice use. ACCT, Paris.
- Pousset, J. (2004). Healing plants of Africa how to recognize and to use them? : Secum/Edisud.
- Pamplona, R. (1999). Encyclopaedia life and health.
- Priso, R.J. (1987). Architecture of some herbaceous ruderales plants. Master's Thesis, University of Yaoundé I, pp. 10-40.
- Rejdali, M., Birouk A. 1996. Biological diversity and valuation of medicinal plants. Act, Rabat, 225p.
- Tedong, L. (2006). Improvement of certain complications of the Diabetes by the hexane extract of *Anacardium occidentale* (Anacardiaceées) from the rat. Doctorate/PhD Thesis of University of Yaoundé I, 236 p.
- Thomson, A. (1981). Medicinal plants: botany and ethnology. Berger-leurault, Paris 206 p.
- Umubyeyi, Wabajiji (1994). Contribution to the study of healing plants used in the treatment of the otorhino laryngologie diseases at Kisangani. kisangani report, 40 p.
- WHO. (1991). Traditional medicine and modern health care; progress report of the director general document. N° A44, 110 OMS, Genève.

© 2011 Din et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.