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RESEARCH ARTICLE

Ethnotherapy study, phytochemical screening and antioxidant activity of *Antrocaryon klaineanum* Pierre and *Anthocleista nobilis* G. Don. Medicinal plants from Gabon

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Abstract

Medicinal plants, used by more than 80% of the population in Africa, have a significant role in the systems of public health. They constitute a complement or even an alternative to conventional drugs. In this work, we were interested in the validation of the use of some medicinal plants in traditional pharmacopeia. The detection and the identification of the natural compounds being of therapeutic interest were carried out. Six extracts (water, water-ethanol and water-acetone) from *Antrocaryon klaineanum*; *Anthocleista nobilis*, were evaluated for ethnotherapy study, phytochemical and antioxidant activities. The powdered plants samples were analyzed for the phytochemical screening using standard laboratory methods. The total phenols, flavonoids, proanthocyanidins and antioxidant activities were evaluated with methods Folin-Ciocalteu, Aluminium chloride, HCl-butanol hydrolysis and Antioxidant Activity Index (AAI) assay, respectively. From the results, polyphenols, flavonoids, tannins gallic and triterpenoids were revealed to be present in the two plants. The phytochemical analysis highlights the presence of total polyphenols, flavonoids and proanthocyanidins in the extracts of *Antrocaryon klaineanum* compared to the extracts of *Anthocleista nobilis*. Water, water-ethanol and water-acetone extracts of *A. klaineanum* showed a strong antioxidant activity (AAI_{WE}=3.26; AAI_{WEE} = 7.86; AAI_{WAE} = 4.13). The extracts of *A. nobilis* present weak antioxidant activity compared to the extracts of Vitamin C and BHA (AAI values of 7.02 and 7.58, respectively). The use of these plants in traditional medicine is justified and they constitute a source for other traditional investigations.

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INTRODUCTION

In the world, most of the populations in underdeveloped countries still rely on traditional medicine practitioners and local medicinal plants for primary health care (WHO, 1995). Nevertheless, some clinicians remain very sceptical about the use of herbs in traditional medicine in developed countries and this may be due to a number of reasons including lack of proof of efficacy by well controlled clinical trials and the undoubted toxic effects of some herbs (Phillipson, 1999). However, the use of ethnopharmacology has led to the discovery of molecules of therapeutic importance (quinine, vinblastine, artemisinin...). The importance of protective defense systems in living cells,

against damages caused by reactive oxygen, is well known. Free radicals and other oxidants are of great importance in the mechanism of action of many toxins. Their involvement in the aging process and diseases has been documented (Bruneton, 2009). Gabon, with an exceptional biodiversity partially described and little or no study constitutes a vast reservoir of unexplored potential active molecules if one considers that a species can produce alone hundreds of molecules. With an aim of developing the ethnotherapeutic and antioxidant potentialities of the Gabonese flora, an ethnopharmacologic approach was carried out. Two plants were selected for this study, among which barks of *Antrocaryon klaineianum* (Anacardiaceae) and *Anthocleista nobilis* (Loganiaceae). The powder of the bark of *Antrocaryon klaineianum* is employed against the diseases of the liver (Walker and Sillans, 1976). The decoction of the bark of *Anthocleista nobilis* is employed in rectal injections or in sitzbaths against the colics and the crises of belly (Walker and Sillans, 1976). In Gabon, few works were devoted to the studies of antioxidant activity of the extracts *Antrocaryon klaineianum* and *Anthocleista nobilis*. Taking into account all these considerations, we undertook the study of the antioxidant activity of two Gabonese plants.

MATERIAL AND METHODS

Ethnobotanical study

The research was approved by the Research Laboratory in Biochemistry (LAREBIO) and Laboratory of Natural Substances and Organometallic Synthesis (LASNSOM), University of Science and Technical of Masuku (USTM). The survey was performed using to interview on selected local people during 2013–2014. The study was realized in June 2014 near Oyem, in the Woleu-Ntem Province, Northern of Gabon. The information were collected from traditional healers, village dwellers, herbalists and experienced people from herbal medicine practitioners, maydays and their traditional healers following the method (Edwards et al., 2005). Information was collected through cards of question, bilateral discussion and open ended interviews on plants used by population for treatment of pathologies. A total 25 informants have been interviewed on random basis. Information about the family, botanical name of species, local name, plant parts used, plant crude drug preparation, mode of applications, dosage and duration were documented (Kokwaro, 1976; Walker and Sillans, 1961) and medicinal uses, plant parts that were identified as having use in ethnotherapy were collected. The choice of this two plants species study was based by lack of data on pharmacological activity.

Plant material

The bark of *Antrocaryon klaineianum* and *Anthocleista nobilis* were collected in Oyem (Northern of Gabon) in June 2014. Identification of the species was carried out at the National Herbarium of IPHAMETRA, Libreville (Gabon). Voucher specimens have been deposited in the Herbarium of IPHAMETRA and at Laboratory of Natural Substances and Organometallic Synthesis (LASNSOM) at Department of Chemistry-Biochemistry, Faculty of Sciences of USTM in Franceville.

Preparation of plant extract

Water-ethanol (30/70, v/v) extract, water-acetone (30/70, v/v) extract and water (100%) extract were prepared from dry powder. 25 g of powder from each sample were soaked with 250 mL of the appropriate solvent mixture and left under shaking conditions at room temperature (25 to 30 °C) for 24 h. Water extract was prepared by decoction mixing 25 g of powder to 250 mL of distilled water. The mixture was boiled for 1 h. Each extract was filtered using Whatman N°1 filter paper and solvents were completely removed at low pressure with a rotary evaporator (BÜCHI, Labortechnik, Switzerland). The extracts were then concentrated, freeze-dried and stored at 4°C until analysis.

Phytochemical screening

Each extract was then tested for the presence of flavonoids, coumarins, tannins, total phenolic, saponosids, triterpenoids, alkaloids and anthracenosids as described elsewhere (Ciulei, 1964).

Phenolic content

The total phenolic contents of the different extracts were determined according to the Folin-Ciocalteu Method (Vernon et al., 1999) with minor modifications as described by Zongo (2010) using gallic acid as standard. The absorbance was measured at 735 nm using a multiwell plate reader (μ Quant Bio-Tek Instrument, Inc, USA). All analyses were done in triplicate and results (average of triplicate analysis) were expressed as gallic acid equivalent per gram of lyophilized sample.

Flavonoid content

Total flavonoid contents were determined by the aluminum chloride ($AlCl_3$) colorimetric assay method (Quartier–Deleu et al., 2000) adapted to 96 well-plate, using quercetin as a standard (Nsi et al., 2013). The total flavonoid contents were expressed as quercetin equivalents in milligrams per gram sample (average of the triplicate analysis).

Tannins content

The reference method of European community was used to measure total amount of tannins (1994).

Proanthocyanidins (PAs) content

The method consists on the hydrolysis of proanthocyanidins in a hot acid-alcohol medium into anthocyanidins. This method allows taking into account all the units of flavans-3-ols constituting the polymers (Prigent, 2005). The assay is performed by mixing 50 μL of the extract with 700 μL of 30% HCl-butanol solution (v/v). The mixture was put in tightly closed 1.5 mL Eppendorf tube and vortexed for 1 min. Subsequently, the tube was heated at 100°C for 2 h and after cooling, 200 μL aliquots were put in triplicate into a 96-well plate and the absorbance were read at 550 nm. Apple procyanidins (DP \approx 7.4) treated as aforementioned were used as a standard. Results were expressed as apple procyanidins equivalent (APE).

Antioxidant Activity Index

The Antioxidant Activity Index (AAI) was assessed according to the method described by Scherer and Godoy (2009). This method is based on the DPPH radical test. Briefly, the working reagent was prepared by dissolving 10 mg of DPPH in 100 mL ethanol. Graded concentrations of extracts ranging from 0.781 to 100 $\mu\text{g}/\text{mL}$ obtained by two-fold dilutions were prepared and 100 μL of each dilution were mixed with 100 μL of the working solution of DPPH in a 96-well plate. Absorbencies were measured at 517 nm after 15 min incubation at room temperature in the dark. Ascorbic acid (Vitamin C) and Butylated Hydroxyanisole (BHA) were used as references. The ability to scavenge DPPH radical was calculated by the following equation:

$$\% \text{RSA} = [(A \text{ control} - A \text{ sample}) / A \text{ control}] \times 100.$$

A = Absorbance at 517 nm

The IC₅₀ (concentration providing 50% inhibition) of extracts and standards was determinate using regression curves in the linear range of concentrations. The AAI was then calculated as follows:

$$\text{AAI} = [\text{DPPH}] (\mu\text{g.mL}^{-1}) / \text{IC}_{50} (\mu\text{g.mL}^{-1})$$

[DPPH] is the final concentration of DPPH.

We considered criteria of Scherer and Godoy (2009) according to which plant extracts show poor antioxidant activity when AAI < 0.5, moderate antioxidant activity when AAI between 0.5 and 1.0, strong antioxidant activity when AAI between 1.0 and 2.0, and very strong when AAI > 2.0.

Statistical analysis

Experimental results were expressed as mean \pm standard deviation. All measurements were duplicated three times. The IC₅₀ values were calculated using linear regression analysis from the graph of scavenging effect percentage against extract concentration.

RESULTS

Ethnobotanical survey

The results for the listed of twenty plants and their therapeutic indications are shown in table 1. Different parts of the plant (Bark, root, oleoresin and leaves) are used in medicinal preparations (Maceration, decoction, lotion, prepare a mixture, chewing, pomade, infusion and fumigation). Trunk barks are the part of the plant the more used (75%).

Phytochemical screening

The phytochemical screening of the extracts was first performed to detect the major chemical groups occurring in the extracts. In view of the results in table 2, it appears that two plants studied *Antrocaryon klaineanum* and *Anthocleista nobilis* contain polyphenols, flavonoids, tannins gallic and triterpenoids. In addition to these compounds, *Antrocaryon klaineanum* contains tannins with very abundant catechin tannins in water-acetone and water extracts. There is also a high presence of coumarins, especially in water-acetone extract. *Anthocleista nobilis* shows a presence of the coumarins in all extracts whereas the saponosides are abundant only in water-acetone extract.

Totals phenolic, flavonoid, tannins and proanthocyanidins contents

The contents of total phenolic, total flavonoids, total tannins and total proanthocyanidins of extracts from *Antrocaryon klaineanum* and *Anthocleista nobilis* are presented in table 3. The contents of total phenolic in terms of gallic acid equivalent (standard curve equation: $Y = 0.0012X - 0.0004$, $R^2 = 0.9902$; Abdoul-latif et al., 2012) ranged from 1023.11 ± 33.70 to 9300.88 ± 15.92 mg GAE/100 g of drug. Total flavonoids (standard curve equation: $Y = 0.0032X + 0.0077$, $R^2 = 1$) were abundant in water-acetone extracts than water-ethanol and water extracts. Levels of tannins were expressed in terms of tannic acid equivalent (TAE). The equation of the right-hand side of the proportioning of the total tannins by the reference method of European Community (1994) gave $Y = 0.0009X + 0.2088$ with $R^2 = 1$. Levels of proanthocyanidins were expressed in terms of apple proanthocyanidins equivalent (APE). The equation of the right-hand side of the proportioning of the proanthocyanidins by the HCl-Butanol method gave $Y = 0.0006 X + 0.0024$ with $R^2 = 0.986$.

Antioxidant Activity Index

The antioxidant activities of the extracts are pointed out in table 4. As it can be seen in this table, the AAI of the extracts from *Antrocaryon klaineianum* ranged from 3.26 to 7.86 and can be compared to AAI of Vitamin C and BHA (AAI values of 7.02 and 7.58 respectively) while those of *Anthocleista nobilis* ranged from 0.32 to 0.42.

Table 1: Some plants ethnomedicinal used in traditherapy by the Fang people in the north of Gabon to fight against the microbial infections

Species name	Family	Local name	Part used	Preparations	Anti-infective use
<i>Irvingia gabonensis</i> baill	Irvingiaceae	NdÔc	Bark	Maceration	Diarrhea, purgative.
<i>Guibourtia tessmannii</i> J. Léonard	Caesalpinaceae	Oveng	Bark	Decoction	Treatment against blennorrhoea
<i>Antrocaryon klaineianum</i> Pierre.	Anacardiaceae	Osome élé	Bark	Decoction	Diseases of liver.
<i>Cylicodiscus gabunensis</i> Harms	Mimosaceae	Edum	Bark	Decoction / lotion	Purgative / Rheumatism
<i>Cassia occidentalis</i> L.	Caesalpinaceae	Ebessi	Root	Decoction	Fever and blennohoea
<i>Piptadeniastrum africanum</i> Hook.	Mimosaceae	Tôm	Bark	Decoction	Decay dental
<i>Pterocarpus soyauxii</i> Taub	Papilionaceae	Mbeh	Bark	Prepare a mixture	Dysentery ; diarrhea
<i>Anthocleista nobilis</i> G. Don.	Loganiaceae	Ayinebe	Bark	Decoction	Treatment against colics
<i>Englerina gabonensis</i> Engler.	Loganiaceae	Bobetom	Leaves	Friction	Rheumatism
<i>Carapa klaineana</i> Pierre	Meliaceae	Engang	Bark	Decoction	intestinal worms
<i>Musanga cecropioides</i> R. Br	Moraceae	Asèng	Bark	Chewing / Decoction	lung diseases
<i>Coula edulis</i> Baill	Olacaceae	Ewémé	Bark	Prepare a mixture	Treatment against ulcers
<i>Pseudospondias longifolia</i> Engl.	Anacardiaceae	Ofoss	Bark	pomade	treatment of ulcerations
<i>Celtis soyauxii</i> Engler	Ulmaceae	Obeng	Leaves	Lotion	Treatment against cephalgia
<i>Alstonia congensis</i> Engl	Apocynaceae	Ekuk	Bark	infusion	Treatment against blennorrhoea
<i>Sterculia tragacantha</i> Lindl	Sterculiaceae	Ezèlfoe	Bark	Maceration	Pulmonary infection
<i>Pachylobus balsamifera</i> Guillaum.	Burseraceae	Atome	Oleoresin	Friction	healing properties
<i>Erythrophleum ivorense</i> A. Chev	Caesalpinaceae	Elone	Bark	Prepare a mixture	Treatment against chicken pox
<i>Morinda lucida</i> Benth	Rubiaceae	Akeng	Bark	Maceration	Diarrhea, purgative.
<i>Achyranthes aspera</i> L.	Amarantaceae	Koloc	Leaves	fumigation	Treatment against pian

Table 2: Results of the preliminary phytochemical screening

Chemical Groups	<i>Antrocaryon klaineinum</i>			<i>Anthocleista nobilis</i>		
	Water	Water- ethanol	water-acetone	Water	Water- ethanol	water-acetone
Flavonoids	++	++	++	++	+	++
Coumarins	+	+	++	+++	++	++
Tannin gallic	+++	+++	+++	++	++	++
Tannin catechic	++	+	+++	+	-	++
Total phenolic	+++	+++	++	++	++	++
Anthracenosids	++	++	++	+	-	++
Saponosids	+	-	-	+	-	++
Triterpenoids	+++	+++	+++	+++	+++	+++
Alkaloids	-	-	-	-	-	-

+++ = Very abundant; ++ = Abundant; + = not abundant, — = Not Detected.

Table 3: Total phenolic content (TPC), Total flavonoid content (TFC) Total Tannins Content (TTC) and Total Proanthocyanidins Content (TPC) of extracts from *Antrocaryon klaineinum* and *Anthocleista nobilis*

Extracts	TPC (mg GAE/ 100 g of drug)	TFC (mg QE/ 100 g of drug)	TTC (mg ATE/ 100 g of drug)	TPC (mg APE/100 g of drug)
Ak WAE	9214.22 ± 5.74	1000.37 ± 6.87	1569.77 ± 27.77	4388.44 ± 11.67
Ak WEE	9300.88 ± 15.92	802.46 ± 3.47	1866.07 ± 11.66	3061.77 ± 10
Ak WE	6459.77 ± 2.5	618.71 ± 3.26	1594.96 ± 10.86	1870.66 ± 21.67
An WAE	1723.11 ± 31.25	780.79 ± 4.65	393.48 ± 7.9	324 ± 31.11
An WEE	1023.11 ± 33.70	459.54 ± 1.73	175.70 ± 7.16	261.78 ± 15.18
An WE	1615.33 ± 2.08	539.54 ± 0.139	227.55 ± 1.48	464 ± 31.11

Nd = not determined; Ak = *Antrocaryon klaineinum*; An = *Anthocleista nobilis*; WAE = water-acetone extract; WEE=water-ethanol extract; WE= water extract.

Table 4: Antioxidant activity of *A klaineinum*; and *A nobilis* extracts by DPPH free radical scavenging method.

Extracts	Regression curve's equations	R ²	CI ₅₀ (µg.mL ⁻¹)	AAI
Ak WAE	Y = 3.644X + 5.912	0.952	12.09 ± 0.8	4.13
Ak WEE	Y = 6.92X + 5.961	0.946	6.36 ± 0.3	7.86

Ak WE	$Y = 3.028X + 3.627$	0.989	15.31 ± 1	3.26
An WAE	$Y = 0.349X - 3.926$	0.972	154.25 ± 1.25	0.32
An WEE	$Y = 0.436X - 1.385$	0.995	117.61 ± 0.35	0.42
An WE	$Y = 0.331X + 3.28$	0.997	141.08 ± 0.56	0.35
Vit C	$Y = 6.76X + 2.03$	0.989	$7,12 \pm 0.6$	7.02
BHA	$Y = 3.32X + 28.12$	0.950	6.59 ± 0.3	7.58

Ak = *A. klaineianum*; An = *A. nobilis*; WAE = water-acetone extract; WEE=water-ethanol extract; WE= water extract.

DISCUSSION

Ethnobotanical survey

These results are similar to those obtained during various ethnomedicinal investigations (Ouattara, 2006; N'Guessan et al., 2009; Nunkoo and Mahomoodally, 2012) at Bétés of Issia (Côte-d'Ivoire). The decoction constitutes the mode of preparation frequently used (40%) by the aforesaid population. The decoction is indicated more in 30% of preparation (Nsi et al., 2013).

Phytochemical screening

The phytochemical analysis shows that the two plants (*Antrocaryon klaineianum* and *Anthocleista nobilis*) are rich in secondary metabolites. Abundance of compounds polyphenols, flavonoids, tannins gallic and triterpenoids justifies the use of these plants in Gabonese traditional medicine (Oloyed, 2005; Andzi et al., 2015). Indeed, several studies have shown that compounds such as polyphenols and flavonoids have therapeutic properties such as antimicrobial, antiparasitic, antidiarrhea and healing (Karou et al., 2005; Vyas et al., 2010; Sivananthan and Elamaran, 2013). Several studies have shown that flavonoids and saponins possess antimotility and antisecretory activity on gastrointestinal tract (Galvez et al., 1991; Agbor et al., 1999; Oben et al. 2006). In addition, the abundance of biologic antioxidant compounds such as phenol compounds, flavonoids and tannins suggests that these species may have a preventive effect on diseases like cancer, cardiovascular diseases and diabetes. Antioxidants are compounds that protect cells against the damaging effects of reactive oxygen species, such as singlet oxygen, super oxide, peroxy radicals, hydroxyl radicals and peroxy nitrile. Antioxidants induce balance between antioxidants and reactive oxygen species results in oxidative stress, protecting to cellular damage (Burlon and Ingold, 1984; Tchiagam et al., 2012). All of these bioactive secondary metabolites identified in the various drugs have many pharmacological properties assigned to them (Bruneton, 2009). These properties from compounds found in the extracts of the two plants suggest that they can be used in pharmaceuticals.

Totals phenolic, flavonoid, tannins and proanthocyanidins contents

Levels of phenolic content were expressed in terms of gallic acid equivalent (GAE). The equation of the right and side of the proportioning of total phenolic content by the method of Folin-Ciocalteu gave $Y = 0.0012 X - 0.0004$ with $R^2=0.9902$. It appeared that water-acetone extract (WAE) of *Antrocaryon klaineianum* had the highest content of phenolic compounds (9300.88 ± 15.92 mg GAE/100 g of drug) and bark water-ethanol extract (WEE) of *Anthocleista nobilis* had the lowest content (1023.11 ± 33.70 mg GAE/100 g of drug). Water-ethanol extract (9214.22 ± 5.74 mg GAE/100 g of drug) and water extract (6459.77 ± 2.5 mg GAE/100 g of drug) of *A. klaineianum* present good contents compared to the water-ethanol extract (1723.11 ± 31.25 mg GAE/100 g of drug) and water extract (1615.33 ± 2.08 mg GAE/100 g of drug) of *A. nobilis*. The phytochemical screening had indicated that the extracts of *A. klaineianum* had a total polyphenol abundance compared to the extracts of *A. nobilis*, the study quantitative of polyphenols confirm them results. Phenolic substances have been suggested to play a preventive role in the development of chronic diseases such as cancer and heart disease (Njintang et al., 2012). They are also known to possess antibacterial, antiviral, antimutagenic and anticarcinogenic properties (Moure et al., 2001; Manach et al., 2004; Feuya, 2015). Totals flavonoids (standard curve equation: $Y = 0.0032X + 0.0077$, $R^2 = 1$) were more abundant in water-acetone (1000.37 ± 6.87 mg QE/100 g of drug), water-ethanol (802.46 ± 3.47 mg QE/100 g of drug) and water extracts (618.71 ± 3.26 mg QE/100 g of drug) of *A. klaineianum* than water-acetone (780.79 ± 4.65 mg QE/100 g of drug), water-ethanol (459.54 ± 1.73 mg QE/100 g of drug) and water extracts (539.54 ± 0.139 mg QE/100 g of drug) of *A. nobilis*. Among *A. klaineianum* and *A. nobilis* extracts, tannins contents were 1569.77 ± 27.77 mg AT/100 g of drug (*A.k* WAE), 1866.07 ± 11.66 mg AT/100 g of drug (*A.k* WEE), 1594.96 ± 10.86 mg AT/100 g of drug (*A.k* WE), 393.48 ± 7.9 mg AT/100 g of drug (*A.n* WAE), 175.70 ± 7.16 mg AT/100 g of drug (*A.n* WEE), 227.55 ± 1.48 mg AT/100 g of drug (*A.n* WE). The content of proanthocyanidins of water-acetone (4388.44 ± 11.67 mg

APE/100 g of drug), water-ethanol (3061.77 ± 10 mg APE/100 g of drug) and water extracts (1870.66 ± 21.67 mg APE/100 g of drug) of *A. klaineatum* are higher compared to water-acetone (324 ± 31.11 mg APE/100 g of drug), water-ethanol (261.78 ± 15.18 mg APE/100 g of drug) and water extracts (464 ± 31.11 mg APE/100 g of drug) of *A. nobilis*. The HCl/butanol assay used here for the determination of proanthocyanidins is more specific than many other tests such as the vanillin assay (Makkar, 2000; Santos-Buelga and Scalbert, 2000; Nsi et al., 2013). This abundance in phenol compounds would confirm the therapeutic properties that there are assigned in ethnotherapy. Indeed, several works have demonstrated that phenolic compounds confer to the plant several biologic activities.

Antioxidant Activity Index

Plant extracts of *A. nobilis* show poor antioxidant activity (AAI < 0.5). The IAA of extracts of *A. klaineatum* are superiors with 2; that shows that this plant presents a very strong antioxidant activity. These extracts have a potential antioxidant which would enable them to play a beneficial role in terms of very significant preventive actions for human and animal health (Sabu and Kattan, 2002). The antioxidant activity of the plant should be at least partially justified by the presence of totals phenolic highlighted by the phytochemical study (Yokozawa et al., 1999; Bors et al., 1990; Zongo et al., 2010).

CONCLUSION

As conclusion, this study confirm the multiple uses of *Antrocaryon klaineatum* and *Anthocleista nobilis* for the treatment of many infectious diseases and place them as candidate for further investigations for enhanced traditional drug utilizable as complementary and alternative medicines development and new active compounds discovery.

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REFERENCES

- Abdoul-latif, F.M., Romaric, G., Bayili, Obame, L.C, Bassolé, H.N. and. Dicko, M.H. (2012): Comparison of phenolic comounds and antioxydant capacities of traditional sorghum beers with other alcoholic beverages. Afr. J. of Biotechnol., 11:14671-14678.
- Andzi, B.T, Massala, K.K, Obame, L.C, Lebibi, J. (2015): Phytochemical studies, total phenolic and flavonoids content and evaluation of antiradical activity of the extracts of the leaves from *Dischistocalyx sp.* (Acanthacées). J. of Pharm and Phytoch., 3(6): 174-178.
- Bors, W., Hester, W., Michel, C., Saran, M. (1990): Flavonoids as antioxydants: determination of radical scavenging efficiencies. Methods of Enzymology, 186: 343-355.
- Bruneton, J. (2009): Pharmacognosie, Phytochimie, plantes médicinales. 4ème édition, Tec & Doc Paris, 233-700.
- Burlon, G.W. and Ingold, K.U. (1984): B-Carotene, an unusual type of lipid antioxidant. J. Sci.; 224-573.
- Cheikna, Z. (2010): Polyphenols Content, Antioxidant and Antimicrobial Activities of *Ampelocissus grantii* (Baker) Planch. (Vitaceae): A Medicinal plant from Burkina Faso. Int. J. of Pharmacology, 6(6): 880-887.
- Ciulei, I. (1964): Practical manuals on the industrial utilization of medicinal and aromatic plants. University of Bucharest, Romania.
- Edwards, S., Nebel, S. and Heinrich, M. (2005): Questionnaire surveys: methodological and epistemological problems forfield-based ethnopharmacologists. J. of Ethnopharm., 100: 30–36.
- Feuya, G.R, Akono, E.N., (2015): Phytochemical analysis, antioxidant evaluation and total phenolic content of the leaves and stem bark of *Musanga cecropioides* R.Br. ex Tedlie (Cecropiaceae), growing in Gabon. J. of Pharm and Phytoch., 3(5): 192-195.
- Karou, D., Savadogo, A., Canini, A., Yameogo, S., Montesano, C., Simpoire, J., Colizzi, V. and Traore, A.S. (2005): Antibacterial activity of alkaloids from *Sida acuta*. Afr. J. of Biotechnol., 4:1452-1457.
- Kokwaro, J.O. (1976): The medicinal plants of East Africa Kampala: East Africa Literature Bureau, 70-76.
- Manach, C., Scalbert, H., Morand C., Rémésy, C., Jiménez L. (2004): Polyphenols in foods and bioavailability. Am. J. Clin. Nutr., 79: 727-747.
- Makkar, H.P.S. (2000): Quantification of tannins in tree foliage a laboratory manual. Fao /iaea Working Document, Vienna, Austria., 26-30.

- Moure, A., Cruz J.M., Franco, D., Dominguez J.M., Sineiro, J., Dominguez, H., Nunez, M.J., Parajo, J.C. (2001): Natural antioxidants from residual sources. *Food Chem.*, 72: 145-171.
- Njintang, Y.N., Tatsadjieu, Ngoune, L., Ngakou A., Danra, D., Tchuenguem-Fohouo, F.N. (2012): Antiradical activity and polyphenol content of ethanolic extracts of Propolis. *Int. J. Biosci.*, 2(4), 56-63.
- N'Guessan, K., Kadja, B., Zirihi, G.N., Dossahoua, T. and Aké-Assi, L. (2009): Screening phytochimique de quelques plantes médicinales ivoiriennes utilisées en pays Kroubo (Agboville, Côte-d'Ivoire). *Sci. and Natr.*, 6: 1-15.
- Nsi, G., Ogame, L.C., Ondo, J.P., Brama, I., Mbading-Mbading, W., Otego, E., Lepengue, N., Souza, A., and Mbatchi, B. (2013): Ethnotherapy study, phytochemical and antiradical activities of *Agelaea pentagyna* (Lam) Baill and *Dialium dinklagei* Harms. Medicinal plants from Gabon. *Int. J. of advanced research*, 8: 246-255.
- Nunkoo, D.H. and Mahomoodally, M.F. (2012): Ethnopharmacological survey of native remedies commonly used against infectious diseases in the tropical island of Mauritius. *J. of Ethnopharm.*, 143: 548-564.
- Oloyed, O.I. (2005): Chemical profile of unripe pulp of *Carica papaya*. *Pak. J. Nutr.*, 4: 379-381.
- Quettier-Deleu C., Gressier, B., Vasseur, J., Dine, T. and Brunet, C. (2000): Phenolic compounds and antioxidant activities of buckwheat (*Fagopyrum esculentum* Moench) hulls and flour. *J. Ethnopharmacol.*, 72: 35-42.
- Ouattara, D. (2006): Contribution à l'inventaire des plantes médicinales significatives utilisées dans la région de Divo (Sud forestier de la Côte-d'Ivoire) et à la diagnose du poivrier de Guinée: *Xylopiya aethiopicum* (Dunal) A. Rich. (Annonaceae). Thèse de Doctorat de l'Université de Cocody-Abidjan (Côte-d'Ivoire), UFR Biosciences, Laboratoire de Botanique., 183-185.
- Phillipson, J.D (1999): New drugs from nature-It could be yew. *Phytother. Res.*, 13: 2-8.
- Prigent, S. (2005): Interactions of phenolics compounds with globular proteins and their effects on food related functional properties. PhD Thesis, Wageningen University, Wageningen, The Netherlands, 131-133.
- Sabu, M., Kattan, R. (2002): Antidiabetic activity of medicinal plants and its relationship with their antioxidant property. *J. of Ethnopharmacology*, 81: 155-60.
- Santos-Buelga, C. and Scalbert, A. (2000): Proanthocyanidins and tannin like compounds nature, occurrence, dietary intake and effects on nutrition and health. *J. Sci. Food Agri.*, 80: 1094-1117.
- Scherer, R., Godoy, H.T. (2009): Antioxidant activity index (AAI) by 2,2-diphenyl-1-picrylhydrazyl method. *Food Chem.*, 112:654-658.
- Tchiagam, J.B., Youmbi, E., Nicolas, Y., Njintang, Y.N., Abatchoua, M.A., Nguimbou, R.M. and Bell, J.M. (2012): Inheritance of phenolic contents and antioxidant capacity of dehulled seeds in cowpea (*Vigna unguiculata* L. Walp.). *Int. J. of Agro. and Agri. Res.*, 2: 7-18.
- Vernon, L.S., Orthofer, R., Lamuela-Raventos, R.M. (1999): Analysis of total phenols and other oxidation substrates and antioxidants by means of Folin-Ciocalteu reagent. *Methods. Enzymol.*, 299:152-178.
- Vyas, N., Tailan, M., Gavatia, N.P., Gupta, B.K. Antioxidant potential of *Psidium guajava* Linn. *Int. J. of Pharm. Tech. Res.*, 2: 417-419.
- Walker, R. and Sillans, S. (1961): *Plantes utiles du Gabon*. Edition Lechevalier, Sepia, 614p.
- WHO (1995): *he World Health Report. Bridging the Gaps*. WHO, Geneva. 1-118.
- Yokozawa, T., Dong, E.B., Kawai, Y., Gemba, M. and Shimizu, M. (1999): Protective effects of some flavonoids on the renal cellular membrane. *Experimental and Toxicologic Pathology*, 51: 9-14.
- Zongo, C., Savadogo, A., Ouattara L., Bassole, I.H.N., Ouattara, C.A.T., Ouattara, A.S., Barro, N., Koudou, J., Traore, A.S. (2010): Polyphenols content, antioxidant and antimicrobial activities of *Ampelocissus grantii* (Baker) Planch. (Vitaceae), a Medicinal Plant from Burkina Faso. *Inter.j. Pharmacol.*, 6(6):880-887.