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Plants used against diarrheal diseases in traditional African medicine: cross-referencing, pharmaco-chemical for a valorization pedagogical perspective

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Abstract Diarrhoea is a microbial disease that causes several million deaths each year in the world, especially in developing countries. In recent years, there has been a renewed interest in medicinal plants, with a multitude of studies conducted by researchers. To allow a rational exploitation of the conclusions of the various works, a meticulous inventory of the plants with a therapeutic potential has led to a repertoire.
The anti-diarrhoeal species are extracted from ethnobotanical publications available in Africa. Plants with therapeutic potential were identified on the basis of the frequency of citation (Fcr) associated with the convergence of use in at least four countries. Finally, each of these plants was documented phytochemically and toxicologically.
Thirty-three publications from 19 African countries enabled the identification of 258 anti-diarrhoeal species belonging to 196 genera and 79 families. *Psidium guajava* cited in 13 countries with a Fcr of 10.82% is the leading of eight species with therapeutic potential followed by *Mangifera indica*.
These plants are generally non-toxic and all contain alkaloids, flavonoids and tannins which are attributed with anti-diarrhoeal properties.

Keywords Medicinal plants, inventory antidiarrheal, therapeutic potential, toxicity

Introduction

Diarrheal diseases cause several million deaths worldwide each year, especially in third world developing countries where they are the most common causes of mortality and morbidity (Amstrong et al., 1999). In 2006, diarrheal diseases are responsible for nearly one and a half million annual deaths of children under five (Nathanaël, 2014). Since 2000, more than 50% of global cholera cases have been identified in Africa with approximately 100,000 to 200,000 cases annually. In 2010, the cumulative number of cholera cases increased by 43% compared to 2009. Of the 32 countries reporting cholera deaths, 20 were on the African continent and had 3,397 deaths, or 45% of the global total suggesting that diarrheal diseases have a strong correlation with underdevelopment, the scarcity of drinking water in this case.

Like any developing country, the burden of diarrhea remains high in Benin. Every year, Benin loses 52 billion XOF because of poor sanitation. These losses are related to diarrhea: premature death of children under 5 years; loss of productivity during illness access to health care; the costs of outbreaks; funeral etc. (WSP, 2012). Cholera epidemics are frequent in Benin, particularly in Cotonou, where 642 cholera cases reported in Benin in 2014, Cotonou recorded 9 deaths (WHO, 2015).

Several etiological agents are present; however, bacteria predominate because they represent 50 to 60% of microorganisms isolated during acute diarrhea episodes (Medeiros et al., 2001, Torres et al., 2001). Enteropathogenic *Escherichia coli* represent 20-40%, *Campylobacter jejuni* 10-18%, *Shigellaspp* and *Salmonella spp*, 5% each. Similarly, 80% of microorganisms isolated during diarrheal episodes of travelers to developing countries are of bacterial origin, with *E. coli* at the top of the list in 20-75% of cases (Farthing, 2000).

Several treatments are envisaged among which, among others, the oral rehydration by taking electrolytes in the form of solution, the antibiotherapy and the so-called treatment of the retarder of the intestinal transit.

The most used antibiotics, namely sulfonamides, ampicillin and cyclins, are not only expensive, therefore less accessible to the populations, but also are becoming more and more inactive because of the resistance that the germs develop. Indeed, in 1981 strains of *Shigella dysenteriae* were sensitive to nalidixic acid; in 1992, 100% of these strains were resistant (Dosso et al., 1998).

In recent years, medicinal plants have grown significantly in the traditional African environment because of their common use in so-called traditional medicine. This craze can be explained by cultural reasons, the decline in purchasing power, the high cost of conventional drugs, mistrust of so-called modern synthetic products (Calistus et al., 2011).

Ethnobotanical studies carried out in several African countries have shown that several plants are used by the population in the traditional treatment of diarrheal diseases (Bouquet and Debray, 1974, Adjanohoun et al., 1983, Adjanohoun et al., 1989, Ake-Assi 1990, Adjanohoun et al., 1996).

This work published to date includes medicinal recipes or formulas used locally for various diseases; but few studies synthesize the main plants used to treat various diseases in Africa. It has therefore appeared interesting to carry out such a synthesis for the treatment of diarrheal diseases.

The aim is to compile a repertoire of anti diarrhea plants used in various African countries in order to select the most used ones on the basis of frequency of quotation and convergence of employment. For the latter, it is a question of seeing at the level of the literature, the large families of chemical compounds often revealed in their organs, the link between these chemical families and the diarrhea as well as the toxicity of their extracts.

Material and Methods

Ethnobotanical publications with indications of recipes and formulas used for the treatment of diarrheal diseases in Africa have been identified. The antidiarrheal recipes were then extracted from these publications and the information concerning each of them (bibliographic reference, country, family and gender) was recorded in an Excel spreadsheet and then processed. The identification of credible recipes used in the treatment of diarrhea was made after calculating the frequency of citation (Fcr) according to Dassou et al., (2014). The frequency was calculated according to the formula below:

Fcr = Ncr / N x 100 (1)

Ncr: the number of citations of the recipe considered, N: the total number of citations of all recipes or formulas.

Plants with the highest Fcr value associated with utilization convergence in at least four countries were considered the most credible (Bisintdou et al., 1993). Plants that prove to be the most used were documented phytochemically and toxicity.

Results

Synthesis on the plants involved in the treatment of diarrhea

A review of 33 ethnobotanical works from 19 countries identified 258 species involved in the treatment of diarrhoea (Table 1). These species belong to 196 genera and 79 families. Among these families, those represented by the

highest number of species are Leguminosae-Papilionoideae (20 species; 7.81%); Combretaceae (17 species; 6.64%); Euphorbiaceae (16 species; 6.25%), Rubiaceae and Asteraceae (12 species; 4. 68%) each; Anacardiaceae (11 species; 4.29%); Apocynaceae (10 species; 3.90%); Malvaceae (8 species; 3.12%); Leguminosae-Caesalpinioideae and Leguminosae-Mimosoideae (7 species; 2.73%) each; Moraceae (6 species; 2.34%); Poaceae, Annonaceae and Amaranthaceae (5 species; 1.95%) each (figure 1).

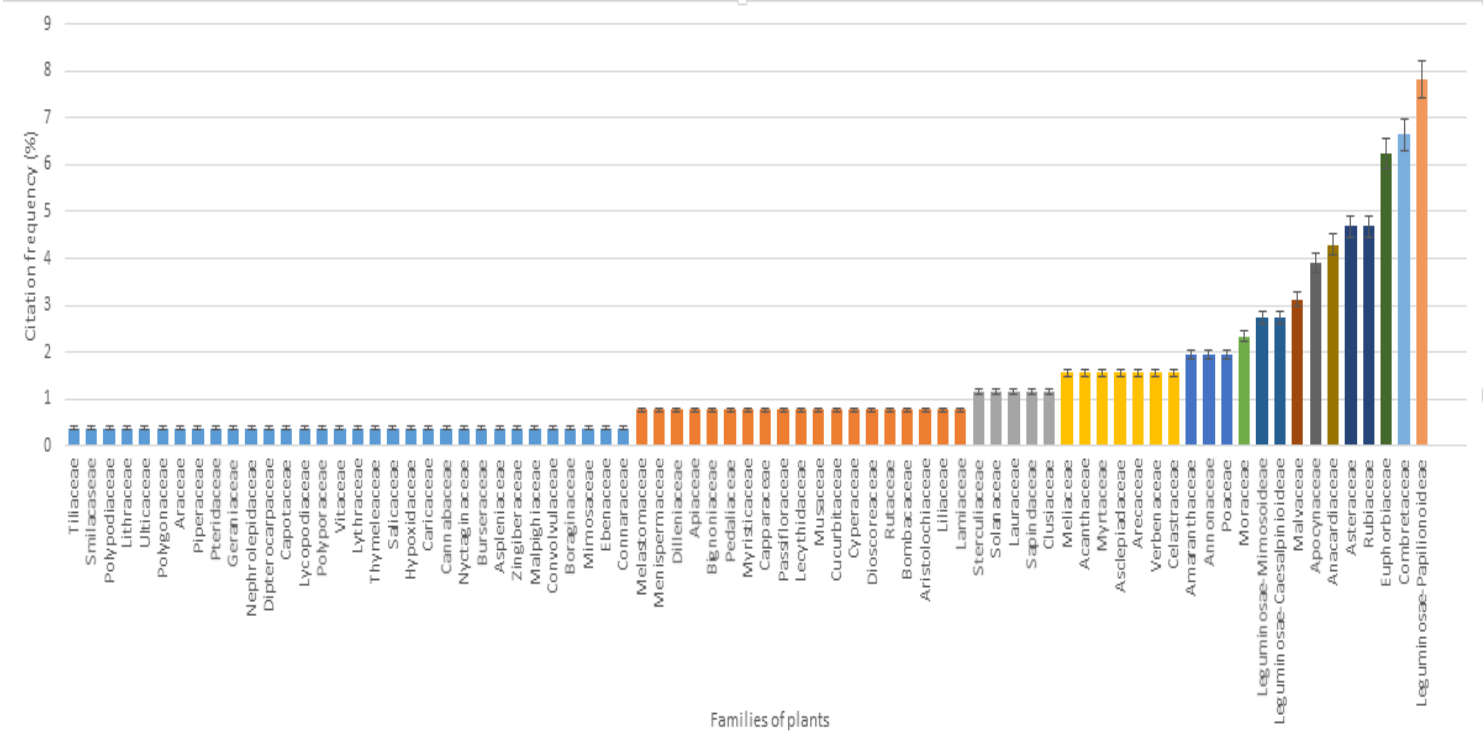

Figure 1: Frequency of citation of species within medicinal plant families

Antidiarrheal herbs most cited

Table 2 presents the plants listed in at least 4 African countries. Of the 258 species involved in the treatment of diarrhea identified, only 8 (3.10%) are the most common medicinal plants.

Of the species most cited and most geographically widespread in these studies, three belong to less representative families in cash. This are: *Psidium guajava* (Myrtaceae); *Harungana madagascariensis* (Clusiaceae / Hypericaceae); and *Ocimum gratissimum* (Lamiaceae) according to our results.

Species such as *Psigium guajava* and *Euphorbia hirta* from the repertoire are widely used and well known both for their chemical and pharmacological properties (Galvez et al., 1993, Salgado et al., 2016, Omodamiro and Ibeh, 2014, Kamgang et al., 2001; Linfanget al., 2012). Others, such as *Cajanus cajan*, *Piliostigma thonningii* ... are less so and virtually no publications proving their antidiarrheal properties have been found.Some of these species such as Psigium guajava and Euphorbia hirta from the widely used repertoire are well known for their chemical and pharmacological properties (Vikrant et al., 2012; Kangogo et al., 2014; Etuk et al., 2003; Linfang et al., 2012; Gopinath et al., 2012; Chitra et al., 2011). The other plants, on the other hand, are less so and practically no publications proving their anti-diarrhoeal properties have been found. Furthermore, the phytochemical data of the most cited plants in the treatment of diarrhoea are summarised in Table 3.

Toxicity of plants

Table 4 presents the results of investigations on the toxicity of the plants most used in the treatment of diarrhea in the literature. Investigations into credible plant toxicity have shown that extracts from most of these plants are nontoxic to brine larvae. However, some of them, such as *Euphorbia hirta* and *Ageratum conyzoides* have toxic

properties and deserve to be handled with caution (Mohammad et al., 2010). Indeed, the aqueous extracts of the leaves of *Euphorbia hirta* can be slightly toxic (Adedapo et al., 2003). According to these authors, oral administration at 400 mg / kg aqueous extract of the leaves of *Euphorbia hirta* causes disorders in testicular and accessory organs in male rats. The aqueous extract of the leaves, roots and bark of the same plant, has a potent mollucid activity with an LC_{50} ranging between 40 to 80% (Sunil et al., 2005). Extracts from all parts of the plant with the exception of flowers have an LC_{50} on brine shrimp almost equal to 1000µg/ml. According to the work of Fatema et al., (2013), *Ageratum conyzoides*, has a remarkable cytotoxic property with LC_{50} of 1.32 µg/ml on shrimp larvae.

Discussion

The bibliographic research reveals that many ethnobotanical and botanical surveys have been carried out in different countries for the knowledge of plants used in the treatment of diarrhoea. The original articles consulted in the framework of this work, showed that in different forms of pharmaceutical preparation, i.e. triturated, decocted, macerated, infused, different organs (leaves, barks, roots, stems, seeds) of plants are used for the treatment of diarrhoea. The main route of administration of extracts of these plants was per-gold and water was the most used solvent in the preparation. A total of 258 species involved in the treatment of diarrhoea are recorded from about 19 countries, namely Benin, Burkina Faso, Burundi, Cameroon, Comoros, Congo, Côte d'Ivoire, Gabon, Guinea, Madagascar, Mali, Mauritius, Nigeria, Rwanda, Senegal, Seychelles, Togo, Uganda, and Zimbabwe. This interest in finding cures for diarrhoeal diseases may be related to the fact that they are the second most common cause of morbidity in children under five in Africa (Koné et al., 2021). Whether the diarrhoea is microbial, viral, allergic, or other, several plants have been tested in previous work and found to consistently contain certain families of chemical compounds including alkaloids, flavanoids, sponosides and tannins, which are known to have anti-diarrhoeal properties (Serm et al., 2008; Bruneton, 2009, Abubakar et al., 2015; Bolou et al., 2011; Ighodaro et al., 2012; Luba et al., 2015; Etsuyankpa et al., 2013; Akinpelu et al., 2006; Bolou et al., 2011, Ighodaro et al., 2012; Jimoh et al., 2005) It is important to recognise that despite this diversity of chemical groups to which the anti-diarrhoeal activity of plants is related, tannins have a higher reputation. Thus, the recognised anti-diarrhoeal activity of the fruits of Acassia nilotica is linked to its high tannin content (Pousset, 2009). Similarly, the leaves of *M. indica*, which have been extensively studied, contain up to 10% of gall tannins, which are suspected of being responsible for its anti-diarrhoeal activity (Sereme et al., 2008). All these groups of compounds known to be anti-diarrhoeal were found in the organs of all the plants identified as being the most used (Table 4). This may partly justify the enthusiasm of African traditional healers to use these plants for anti-diarrhoeal care. In addition to the valued use of these plants in the traditional treatment of diarrhoeal diseases, the non-toxicity of extracts of the most cited plants was generally mentioned in Table 4. The use of these plants would be a great asset in the fight against antibacterial diseases.

Conclusion

This work shows a tiny part of the potential of African medicinal flora on plants that have antidiarrheal properties. Although limited by the number of ethnobotanical works available, this work constitutes a synthetic approach that can serve as a basis for phytochemists, pharmacognosists and pharmacologists interested in research on antidiarrheal plants. The chemical composition of the plants at the top of the list has also proved that they contain groups of chemical compounds which would be at the origin of their biological antidiarrheal activities. If several investigations to prove the antidiarrheal activities of *Psidium guajava*; *Euphorbia hirta* exist, no publication has been found for this purpose for many other plants in our repertoire. Such a study of two or three little or no studied plants in our repertoire will be the subject of our subsequent work. Most of these herbs used by the population in the treatment of diarrhea present virtually no risk of toxicity in view of the results obtained.

Competing Interests

The authors state that they have no competing interests.

Authors' Contributions

All the authors were involved in various ways in the production of this article. MAA is the principal investigator of this work. He wrote the first draft of the paper. EYL supervised the work from its conception and read the manuscript. PMT, BG, BAK, POA, FMA, and JDG also read and edited the manuscript.

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Annex

Table 1: Directories of antidiarrheal species, their frequency; the countries where they are quoted and their quotation references

N°	Species	Families	Quotation frequency	Number of countries where the species is used and quoted	Country	References
1	*Euphorbia hirta* L.	Euphorbiaceae	19	15	Cameroon; Bénin; Côte d'Ivoire; Maurice; Burundi; Rwanda; Congo; Comores; Guinée; Mali; Sénégal; Seychelles; Togo; Zimbabwé; Afrique	Adjanohoun et al., 1996; Adjanohoun et al., 1983; Polygenis-Bigendako et Lejoli 1989; Ayobangira et al., 1985; Hulstaert 1966; Lejoly, J., et al., 1992; Adjanohoun et al., 1989; Dupuis (on line); Koné, 2006; Bouquet and Debray, 1974
2	*Psidium guajava* L.,	Myrtaceae	28	13	Congo; Uganda; Cameroon; Gabon; Burundi; Burkina Faso; Comores; Guinée; Madagascar; Togo; Bénin; Afrique; Côte d'Ivoire	Adjanohoun et al., 1998; Adjanohoun et al., 1993; Adjanohoun et al., 1996; Adjanohoun et al., 1984; Polygenis-Bigendako et Lejoli 1989; Hulstaert 1966; Maikere Fanyo et al., 1989; Baerts et al., 1989; Lunini 1990; Kambu et al., 1989; Mabika 1983; Bokdam et al., 1975; Lejoly, J., et al., 1992; de Souza, 2005; P. Zerbo, 2007; Dupuis (on line); Bouquet and Debray, 1974; Caradec, 2005; Mokoso et al., 2012; Koné, 2006

3	*Mangifera indica* L.,	Anacardiaceae	19	11	Congo; Uganda; Burndi; Côte d'Ivoire; Gabon; Mali; RCA; Bénin; Burkina Faso; Afrique	Adjanohoun et al., 1998; Adjanohoun et al., 1993; Hulstaert 1966; Wome 1985; Baerts et al., 1989; Kambu et al., 1989; Dhetchuvi et Lejoi1990; Mabika 1983; Lejoly, J. et al., 1992; de Souza, 2005; Bouquet and Debray, 1974; P. Zerbo, 2007; Dupuis (on line)
4	*Piliostigma thonningii* (Schumach.) Milne-Redh.,	Leguminosae-Caesalpinioideae	6	6	Congo; Bénin; RCA; Sénégal; Togo; Côte d'Ivoire	Dhetchuvi et Lejoi1990; Lejoly, J., et al., 1992; Bouquet and Debray, 1974
5	*Ageratum conyzoides* L.,	Asteraceae	5	5	Nigeria: Cameroon; Maurice; Bénin; Madagascar	Adjanohoun et al., 1983; 1989; 1991; 1996; Caradec, 2005
6	*Harungana madagascariensis* Lam. Ex Poir.,	Clusiaceae/ Hypericaceae	7	4	Cameroon; Rwanda; Congo; Côte d'Ivoire	Adjanohoun et al., 1996; Ayobangira et al., 1985; Maikere Fanyo et al., 1989; Wome 1985; Kambu et al., 1989; Lejoly, J., et al., 1992
7	*Hymenocardia acida* Tul.	Euphorbiaceae	9	4	Congo ; Burundi; Rwanda; Côte d'Ivoire	Adjanohoun et al., 1998; Polygenis-Bigendako et Lejoli 1989; Maikere Fanyo et al., 1989; Baerts et al., 1989; Lunini 1990; Kambu et al., 1989; Lejoly, J., et al., 1992; Koné, 2006; Bouquet and Debray, 1974
8	*Ocimum gratissimum* L.	Lamiaceae	4	4	Nigeria; Cameroon; Bénin; Afrique	Adjanohoun et al., 1991; Adjanohoun et al., 1996; Adjanohoun et al., 1989; Dupuis (on line)
9	*Adansonia digitata* L.	Malvaceae (Bombacaceae)	6	3	Bénin; Burkina Faso et Côte d'Ivoir	de Souza, 2005; Zerbo, 2007; Dupuis (on line); Kone et al., 2002; Koné, 2006
10	*Bidens pilosa* L.	Asrteraceae	4	3	Congo; Maurice; Côte d'Ivoire	Adjanohoun et al., 1983; 1998; Bouquet and Debray, 1974
11	*Heterotis rotundifolia (Sm.) Jacq.-Fél. (syn.:,Dissotis rotundifolia)*	Melastomaceae	4	3	Cameroon; Bénin; Côte d'Ivoire	Adjanohoun et al., 1996; Adjanohoun et al., 1989; Bouquet and Debray, 1974
12	*Guiera senegalensis* J.F.Gmel.	Combretaceae	3	3	Afrique; Côte d'Ivoire; Burkina Faso	Dupuis (on line); Koné, 2006; Zerbo, 2007

13	*Vitex doniana* Sweet, Hort. Brit.	Verbenaceae	4	3	Nigeria; Bénin; Côte d'Ivoire	Adjanohoun et al., 1991; Adjanohoun et al., 1989; de Souza, 2005; Bouquet and Debray, 1974
14	*Waltheria indica* L.	Sterculiaceae	4	3	Bénin; Côte d'Ivoire; Burkina Faso	Adjanohoun et al., 1989; de Souza, 2005; Koné, 2006; Zerbo, 2007
15	*Acacia nilotica* (L.) Willd. ex Delile ssp. *adstringens* (Schumach. & Thonn.) Roberty	Leguminosae-Mimosoideae	3	2	Cameroon	Adjanohoun et al., 1996
16	*Acanthospermum hispidum* DC	Asteraceae	2	2	Congo; Madagascar	Caradec, 2005
17	*Albizia zygia* (DC) J.F.Macbr.	Leguminosae-Mimosoideae	2	2	Cameroon; Bénin	Adjanohoun et al., 1989; 1996
18	*Alchornea cordifolia* (Schumach. & Thonn.) Müll. Arg.	Euphorbiaceae	3	2	Cameroon, Côte d'Ivoire	Bouquet and Debray,1974; Kone et al., 2002
19	*Allium cepa* L. cv	Liliaceae	2	2	Bénin; Nigeria	Adjanohoun et al., 1989; 1991
20	*Annona senegalensis* Pers.	Annonaceae	2	2	Burkina Faso; Côte d'Ivoire	Koné, 2006; Zerbo, 2007
21	*Anogeissus leiocarpus* (DC.) Guill. & Perr	Combretaceae	2	2	Burkina Faso; Côte d'Ivoire	Zerbo, 2007; Koné, 2006
22	*Cajanus cajan* (L.) Millsp.,	Leguminosae-Papilionoideae	2	2	Uganda; Afrique	Adjanohoun et al., 1993; Dupuis (on line)
23	*Senna occidentalis* (L.) Link (syn.:*Cassia occidentalis* L.)	Leguminosae-Papilionoideae	2	2	Bénin; Madagascar	Adjanohoun et al., 1989; Caradec, 2005
24	*Ceiba pentandra* (L.) Gaertn.	Bombacaceae	2	2	Congo; Gabon	Bouquet and Debray, 1974; ABENA A et al., 2008
25	*Citrus aurantifolia* (Christm. & Panzer) Swingle	Rutaceae	3	2	Nigeria; Bénin	Adjanohoun et al., 1989; Adjanohoun et al., 1991
26	*Cnestis ferruginea* Vahl ex DC.,	Connaraceae	3	2	Bénin	Adjanohoun et al., 1989; de Souza, 2005
27	*Combretum micranthum* G.Don	Combretaceae	2	2	Bénin; Burkina Faso	de Souza, 2005; Zerbo, 2007
28	*Desmodium velutinum* (Willd.)DC**.**	Leguminosae-Papilionoideae	2	2	Côte d'Ivoire; Madagascar	Bouquet and Debray, 1974; Caradec, 2005
29	*Diospiros mespiriformis* Hochst. ex A. DC. (syn : *Diospyros sabiensis* Hiern, *Diospyros senegalensis* Perr. ex A. DC)	Ebenaceae	2	2	Côte d'Ivoire; Burkina Faso	Koné, 2006; Zerbo, 2007
30	*Eleusine indica* (L.) Gaertn.,	Poaceae	3	2	Cameroon; Bénin	Adjanohoun et al., 1996; Adjanohoun et al., 1989
31	*Entada africana* GuilI. & Perr. (Syn.: *Entada. sudanica* Schweinf.)	Mimosaceae	2	2	Côte d'Ivoire; Burkina Faso	Koné, 2006; Zerbo, 2007
32	*Eugenia coronata* Sehum. & Thonn.	Myrtaceae	1	2	Bénin; Nigeria	Adjanohoun et al., 1989; Adjanohoun et al., 1991
33	*Ficus sur Forssk* (syn.: F.	Moraceae	3	2	Bénin; Côte d'Ivoire	Adjanohoun et al., 1989;

	Capensis)					Laurant Ake Assi, 1990
34	*Heliotropium indicum* L.	Boraginaceae	2	2	Bénin; Côte d'Ivoire	Adjanohoun et al., 1989; Bouquet and Debray, 1974
35	*Holarrhena floribunda* (G. Don) Durand &Schinz	Apocynaceae	2	2	Afrique; Côte d'Ivoire	Dupuis (on line); Bouquet and Debray, 1974
36	*Hoslundia opposita* Vahl	Lamiaceae	2	2	Bénin; Côte d'Ivoire	Adjanohoun et al., 1989; Bouquet and Debray, 1974
37	*Ipomoea batatas* (L.) Lam.	Convolvulaceae	2	2	Uganda; Cameroon	Adjanohoun et al., 1993; Adjanohoun et al., 1996
38	*Jatropha eureas* L.	Euphorbiaceae	2	2	Côte d'Ivoire; Madagascar	Bouquet and Debray, 1974; Caradec, 2005
39	*Khaya senegalensis* (Desr.) A.Juss.	Meliaceae	2	2	Bénin; Côte d'Ivoire	Adjanohoun et al., 1989; Koné, 2006
40	*Lannea acida* A.Rich. s.l.	Anacardiaceae	2	2	Côte d'Ivoire; Burkina Faso	Koné, 2006; Zerbo, 2007
41	*Gymnosporia senegalensis* (Lam.) Loes. (syn. : *Maytenus senegalensis*)	Celastraceae	3	2	Bénin; Côte d'Ivoire	Adjanohoun et al., 1989; Konéet al., 2002; Koné, 2006
42	*Sarcocephalus latifolius* (Sm.) E.A.Bruce Syn.: *Nauclea latifolia (*Sm.,)	Rubiaceae	2	2	Congo; Côte d'Ivoire	Adjanohoun et al., 1998; Bouquet and Debray, 1974
43	*Petersianthus macrocarpus* (P. Beauv.) Liben (Syn: *Combretodendron africanum* (Welw. ex) Benth.; *Combretodendron macrocarpum* (P.Beauv.))	Lecythidaceae	2	2	Cameroon; Côte d'Ivoire	Adjanohoun et al., 1996; Koffi N'GUESSAN etal 2009
44	*Pseudarthria hookeri* Wight &Am. var. *argyrophylla* Verde.,	Leguminosae-Papilionoideae	2	2	Uganda; Côte d'Ivoire	Adjanohoun et al., 1993; Bouquet and Debray, 1974
45	*Pterocarpus erinaceus* Poir.,	Leguminosae-Papilionoideae	2	2	Bénin; Burkina Faso	Adjanohoun et al., 1989; Zerbo, 2007
46	*Pycnanthus angolensis* (Welw.) Warb.	Myristicaceae	2	2	Cameroon; Côte d'Ivoire	Adjanohoun et al., 1996; Bouquet and Debray, 1974
47	*Sida acuta* Burm.f. ssp. *carpinifolia* (L.f.) Borss.Waalk.,	Malvaceae	4	2	Cameroon; Côte d'Ivoire	Adjanohoun et al., 1996; Kone et al., 2002; Koné, 2006
48	*Solanum incanum* L.	Solanaceae	1	2	Uganda; Côte d'Ivoire	Adjanohoun et al., 1993; Bouquet and Debray, 1974
49	*Terminalia catappa* L.	Combretaceae	1	2	Cameroon; Maurice	Adjanohoun et al., 1983; Adjanohoun et al., 1996
50	*Terminalia superba* Engl. & Diels	Combretaceae	3	2	Congo; Côte d'Ivoire	Bouquet and Debray, 1974; Adjanohoun et al., 1998
51	*Uvaria chamae* P. Beauv.	Annonaceae	3	2	Nigeria; Bénin	Adjanohoun et al., 1991; de Souza, 2005; Adjanohoun et al., 1989

52	*Abutilon guineense* (Schumach.) Baker f. & Exell	Malvaceae	1	1	Uganda	Adjanohoun et al., 1993
53	*Abutilon mauritianum* (Jacq.) Medik.	Malvaceae	1	1	Bénin	Adjanohoun et al., 1989
54	*Acacia dudgeonii* Craib ex Holland	Leguminosae-Mimosoideae	1	1	Burkina Faso	Zerbo, 2007
55	*Acalypha villicaulis* Hochst. ex A.Rich.	Euphorbiaceae	1	1	Uganda	Adjanohoun et al., 1993
56	*Acridocarpus congolensis* Sprague	Malpighiaceae	2	1	Congo	Adjanohoun et al., 1998
57	*Aframomum melegueta* (Roscoe) K.Schum. (Syn.: *Amomum melegueta* Roscoe, Monandr.*)*	Zingiberaceae	1	1	Bénin	Adjanohoun et al., 1989
58	*Alhizia lehheck* (L.) Benth.,	Leguminosae-Mimosoideae	1	1	Madagascar	Caradec, 2005
59	*Alchornea laxiflora* (Benth.)Pax & K. Hoffm.	Euphorbiaceae	1	1	Cameroon	Adjanohoun et al., 1996
60	*Aloe vera* (L.) Burm. f.	Liliaceae	1	1	Cameroon	Adjanohoun et al., 1996
61	*Alternanthera pungens* Kunth (Syn.: *Alternanthera. repens* (L.))	Amaranthaceae	1	1	Côte d'Ivoire	Koné, 2006
62	*Alternanthera nodiflora* R.Br.	Amaranthaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
63	*Anacardium occidentale* L.	Anacardiaceae	1	1	Madagascar	Caradec, 2005
64	*Annona murieata* L.	Annonaceae	1	1	Madagascar	Caradec, 2005
65	*Antirhea verticilata* (Lam.) DC (Syn : *Antirheaborbonica* J.F. Gmel. var. borbonica)	Rubiaceae	1	1	Maurice	Adjanohoun et al., 1983
66	*Aristolochia albida* Duch. (Syn.: *Aristolochia ledermannii* Engl.)	Aristolochiaceae	1	1	Benin	Adjanohoun et al., 1989
67	*Artocarpus heterophyllus* Lam.	Moraceae	1	1	Madagascar	Caradec, 2005
68	*Asplenium monanthes* L.	Aspleniaceae	1	1	Congo	Mokoso et al., 2012
69	*Aristolochia ringens* Vahl	Aristolochiaceae	1	1	Nigeria	Adjanohoun et al., 1991
70	*Aucoumea klaineana* Pierre	Burseraceae	1	1	Gabon	Adjanohoun et al., 1984
71	*Azadirachta indica* A. Juss.	Meliaceae	1	1	Madagascar	Caradec, 2005
72	*Baphia nitida* Lodd.	Leguminosae-Papilionoideae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
73	*Boerhavia diffusa* L.	Nyctaginaceae	1	1	Côte d'Ivoire	Koffi N'GUESSAN et al., 2009
74	*Spermacoce verticillata* L.	Rubiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
75	*Bridelia atroviridis* Müll. Arg.	Euphorbiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
76	*Bridelia ferruginea* Benth.	Euphorbiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
77	*Bridelia grandis* Pierre ex Hutch.	Euphorbiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974

78	*Bridelia micrantha* (Hochst.) Baill.	Euphorbiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
79	*Bridelia scleroneura* Müll. Arg.	Euphorbiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
80	*Brillantaisia speciosa*	Acanthaceae	1	1	Cameroon	Adjanohoun et al., 1996
81	*Cabucala madagascariensis* (A. DC.) Pichon	Apocynaceae	1	1	Madagascar	Caradec, 2005
82	*Caesalpinia bonduc* (L.) Roxb.	Leguminosae-Caesalpinioideae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
83	*Calotropis procera* (Aiton) W.T. Aiton	Asclepiadaceae	1	1	Côte d'Ivoire	Koné, 2006
84	*Cannabis sativa L.*	Cannabaceae	1	1	Uganda	Adjanohoun et al., 1993
85	*Capsicum annuum* L. Groupe piment oiseau ou piment de Cayenne (Bird PepperGroup) (Syn. *Capsicum frutescens* L)	Solanaceae	1	1	Uganda	Adjanohoun et al., 1993
86	*Cardiospermum grandiflorum Sw. (Syn : Cardiospermum grandiflorumf. elegans* (Kunth) Radlk)	Sapindaceae	1	1	Uganda	Adjanohoun et al., 1993
87	*Carica papaya* L.	Caricaceae	1	1	Cameroon	Adjanohoun et al., 1996
88	*Carissa spinarum* L.	Apocynaceae	1	1	Côte d'Ivoire	Konéet al., 2002
89	*Cassia tora* L.	Leguminosae-Caesalpinioideae	1	1	Bénin	Adjanohoun et al., 1989
90	*Cassytha filiformis* L. (Syn.: C. *guineensis* Thonn.)	Lauraceae	1	1	Bénin	Adjanohoun et al., 1989
91	*Catharanthus roseus* (L.)G.Don	Apocynaceae	1	1	Congo	Adjanohoun et al., 1998
92	*Centaureapraecox* Olîv. & Hiern (Syn.: C. *rhizocephala* Oliv. & Hiem)	Asteraceae	1	1	Bénin	Adjanohoun et al., 1989
93	*Ceratotheca sesamoïdes* Endl. (Syn.: *Ceratotheca melanosperma* Hochst.)	Pedaliaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
94	*Chamaecrista mimosoides* (L.) *Greene*	Leguminosae-Mimosoideae	1	1	Cameroon	Adjanohoun et al., 1996
95	*Chromolaena odorata* (L.) R.M.King**(**Syn.: *Eupatorium odoratum* L)	Asteraceae	1	1	Côte d'Ivoire	N'Guessanet al., 2009
96	*Chrozophora brocchiana* (Vis.) Sch"einf. (Syn.: *Croton brocchianus* Vis.)	Euphorbiaceae	1	1	Bénin	Adjanohoun et al., 1989
97	*Cinnamomum verum* J.S. Presl (Syn.: *Cinnamomum zeylanicum* Blume, Bijdr.)	Lauraceae	1	1	Afrique	Dupuis (on line)
98	*Cissampelos mucronata* A. Rich.	Menispermaceae	1	1	Uganda	Adjanohoun et al., 1993
99	*Citrullus lanatus* (Thunb.) Matsum. & Nakai	Cucurbitaceae	1	1	Nigeria	Adjanohoun et al., 1991

100	*Citrus limon* (L.) Burm	Rutaceae	1	1	Congo	Adjanohoun et al., 1998
101	*Clerodendrum splendens* G.Don	Verbenaceae	1	1	Congo	Adjanohoun et al., 1998
102	*Cocos nucifera* L.	Arecaceae	1	1	Afrique	Dupuis (on line)
103	*Cola nitida* (Vent.) Sebott & EndI.	Sterculiaceae	1	1	Bénin	Adjanohoun et al., 1089
104	*Combretum comosum* G.Don var. *hispidum* (M.A. Lawson) Jongkind (Syn.: *Combretum hispidum* M.A. Lawson,)	Combretaceae	1	1	Cameroon	Adjanohoun et al., 1996
105	*Combretum molle* R.Br. ex G. Don	Combretaceae	1	1	Côte d'Ivoire	Koné, 2006
106	*Combretum mucronatum* Schumach. & Thonn. (Syn.: *Combretum smeathmannii* G. Don,)	Combretaceae	1	1	Bénin	Adjanohoun et al., 1998
107	*Combretum nigricans* Lepr. ex Guill. &Perr. var. *elfiotii* (Engl. & Diels) Aubrév.(Syn.: *Combretum elliotii* Engl. & Diels, Monogr.)	Combretaceae	1	1	Burkina Faso	Zerbo, 2007
108	*Combretum paniculatum* Vent.	Combretaceae	1	1	Uganda	Adjanohoun et al., 1993
109	*Combretum platypterum* (Welw.) Hutch. & Dalziel. (Syn.: *Cacoucia platyptera* Welw.)	Combretaceae	1	1	Congo	Adjanohoun et al., 1998
110	*Combretum racemosum* P. Beauv.	Combretaceae	1	1	Congo	Adjanohoun et al., 1998
111	*Combretum mucronatum* Schumach. &Thonn. (Syn.: *Combretum smeathmannii* G. Don,)	Combretaceae	1	1	Cameroon	Adjanohoun et al., 1996
112	*Crassocephalum crepidioides* (Benth.) *S. Moore*	Asteraceae	1	1	Uganda	Adjanohoun et al., 1993
113	*Crepis cameroonica* Babc. ex Hutch. & Dalziel	Asteraceae	1	1	Cameroon	Adjanohoun et al., 1996
114	*Crescentia cujete* L.	Bignoniaceae	1	1	Côte d'Ivoire	Koné, 2006
115	*Crossopteryx febrifuga* (G. Don) Benth	Rubiaceae	2	1	Côte d'Ivoire	Bouquet and Debray, 1974
116	*Croton penduliflorus* Hutch.	Euphorbiaceae	1	1	Nigeria	Adjanohoun et al., 1991; Konéet al.,2002
117	*Cuminum cyminum* L.,	Apiaceae	1	1	Bénin	Adjanohoun et al., 1989
118	*Curculigo pilosa* (Schumach. & Thonn.) Engl. (Syn.: *Gethyllis pi/osa* Schumach. &Thonn.)	Hypoxidaceae	1	1	Nigeria	Adjanohoun et al., 1991
119	*Cyathula achyranthoides* (Kunth) Moq. (Syn.: *Desmochaeta achyranthoides* Kunth)	Amaranthaceae	1	1	Côte d'Ivoire	Bouquet and Debray,1974

120	*Cyathula prostrate* (L.) Blume (Syn.: *Achyranthes prostrata* L.)	Amaranthaceae	1	1	Congo	Adjanohoun et al., 1998
121	*Cyperus artlculatus* L.	Cyperaceae	1	1	Côte d'Ivoire	Koné, 2006
122	*Dalbergia melanoxylon* Guill. & Perr.	Leguminosae-Papilionoideae	1	1	Burkina Faso	Zerbo, 2007
123	*Desmodium adscendens* Sw.) ne. var. *Adscendens* (Syn.: *Hedysarum adscendens* Sw)	Leguminosae-Papilionoideae	1	1	Cameroon	Adjanohoun et al., 1996
124	*Desmodium gangeticum* L.	Leguminosae-Papilionoideae	1	1	Côte d'Ivoire	Bouquet and Debray ,1974
125	*Desmodium ramosissimum* G. Don,	Leguminosae-Papilionoideae	1	1	Bénin	Adjanohoun et al., 1989
126	*Desmodium repandum* (Vahl) DC.	Leguminosae-Papilionoideae	1	1	Uganda	Adjanohoun et al., 1993
127	*Desmodium salicifolium* (Poir.) DC. (Syn.: *Hedysarum salicifolium* Pair.)	Leguminosae-Papilionoideae	1	1	Gabon	Adjanohoun et al., 1984
128	*Detarium microcarpum* Guill. & Perr.	Leguminosae-Caesalpinioideae	1	1	Côte d'Ivoire	Koné, 2006
129	*Detarium senegalense* J.F. Gmel.	Leguminosae-Caesalpinioideae	1	1	Côte d'Ivoire	Koné, 2006
130	*Diodia sarmentosa Sw. (Syn.: Diodia scandens sensu Hepper)*	Rubiaceae	1	1	Nigeria	Adjanohoun et al., 1991
131	*Dioscorea cayenensis* Lam.(Syn.: *Dioscorea aculeata* Balbis ex Kunth)	Dioscoreaceae	1	1	Bénin	de Souza 2005
132	*Dioscorea dumetorum* (Kunth) Pax (Syn.: *Helmia dumetorum* Kunth)	Dioscoreaceae	1	1	Bénin	Adjanohoun et al., 1989
133	*Discoglypremna caloneura* (Pax) Prain	Euphorbiaceae	1	1	Côte d'Ivoire	Bouquet and Debray,1974
134	*Dyschoriste perrottetii* (Pax) Prain (Syn.: *Alchornea caloneura* Pax)	Acanthaceae	2	1	Bénin	Adjanohoun et al., 1989;
135	*Elaeis guineensis* Jacq.	Arecaceae	2	1	Cameroon	Adjanohoun et al., 1996
136	*Eremomastax speciosa* (Hochst.) Cufod.	Acanthaceae	1	1	Cameroon	Adjanohoun et al., 1996
137	*Eriosema glomeratum* (Guill. & Perr.) (Syn.: *Rhynchosia glomerata* Guill. &Perr.)	Leguminosae-Papilionoideae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
138	*Erythrina abyssinica* Lam. ex DC. (Syn: *Erythrinaabyssinica var. suberifera* (Welw. ex Baker) Verdc.)	Leguminosae-Papilionoideae	1	1	Uganda	Adjanohoun et al., 1993
139	*Erythrophleum ivorense*A. Chev.	Leguminosae-Caesalpinioideae	1	1	Nigeria	Adjanohoun et al., 1991
140	*Eugenia jambolana* Lam.	Myrtaceae	1	1	Madagascar	Caradec, 2005
141	*Euphorbia thymifolia* L.(Syn.: *Euphorbia burmanniana*	Euphorbiaceae	1	1	Madagascar	Caradec, 2005

	J.Gay)					
142	*Fadogia agrestis* Schweinf. exHiern	Rubiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
143	*Ficus ingens* (Miq.) Miq. (Syn.: *Urostigma ingens* Miq.)	Moraceae	1	1	Burkina Faso	Zerbo, 2007
144	*Ficus natalensis* Hochst. (Syn.: *Ficusleprieurii* Miq)	Moraceae	1	1	Uganda	Adjanohoun et al., 1993
145	*Ficus sycomorus* L. *(Ficus gnaphalocarpa* (Miq.))	Moraceae	1	1	Burkina Faso	Zerbo, 2007
146	*Ficus thonningii*Blume(Syn.: *Ficus. iteophylla* Miq)	Moraceae	1	1	Nigeria	Adjanohoun et al., 1991
147	*Fimbristylis hispidula* (Vahl)	Cyperaceae	1	1	Bénin	Adjanohoun et al., 1989
148	*Flacourtia indica* (Burm.f.) Merr. (syn. : *Flacourtia ramontchii*)	Salicaceae	1	1	Madagascar	Caradec, 2005
149	*Funtumia africana* (Benth.) Stapf (Syn.: *Kickxia africana* Benth)	Apocynaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
150	*Funtumia elastica* (Preuss) Stapf	Apocynaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
151	*Galinsoga parvijlora* Cav.	Asteraceae	1	1	Uganda	Adjanohoun et al., 1993
152	*Garcinia afzelii* Engl.	Clusiaceae	1	1	Uganda	Adjanohoun et al., 1993
153	*Garcinia kola* Heckel	Clusiaceae	1	1	Nigeria	Adjanohoun et al., 1991
154	*Garcinia huillensis* Welw. ex Oliv.	Clusiaceae	1	1	Congo	Adjanohoun et al., 1998
155	*Gymnosporia senegalensis* (Lam.) Loes.(Syn.: *Celastrus senegalensis* Lam.)	Celastraceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
156	*Hibiscus acetosella* Welw. ex Hiern	Malvaceae	1	1	Nigeria	Adjanohoun et al., 1991
157	*Hibiscus surattensis* L.	Malvaceae	1	1	Uganda	Adjanohoun et al., 1993
158	*Apodostigma pallens* (Planch. ex Oliv.) *R. Wilczek var. pallens*, (syn.: *Hippocratea pallens* Planch. ex Oliv.)	Celastraceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
159	*Holarrhena congolensis* Stapf	Apocynaceae	1	1	Bénin	de Souza, 2005
160	*Hippocratea myriantha* Oliv.	Celastraceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
161	*Indigofera arrecta*Hochst. ex A.Rich.	Leguminosae-Papilionoideae	1	1	Uganda	Adjanohoun et al., 1993
162	*Indigofera astragalina* DC.	Leguminosae-Papilionoideae	1	1	Bénin	Adjanohoun et al., 1989
163	*Jatropha gossypiifolia* L.	Euphorbiaceae	1	1	Nigeria	Adjanohoun et al., 1991
164	*Landolphia owariensis* P. Beauv.	Apocynaceae	1	1	Côte d'Ivoire	Koneet al.,., 2002
165	*Lannea barteri* (Olïv.) Engl. (Syn.: *L. kerstingii* Eng I. & K. Krause)	Anacardiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
166	*Lannea microcarpa* Engl. &Krause.	Anacardiaceae	1	1	Burkina Faso	Zerbo, 2007
167	*Lannea velutina* A. Rich.	Anacardiaceae	1	1	Côte d'Ivoire	Bouquet and Debray,

						1974
168	*Lannea welwitschii* (Hiem) Engl.	Anacardiaceae	1	1	Nigeria	Adjanohoun et al., 1991
169	*Lasiosyphon decary*	Thymeleaceae	1	1	Madagascar	Caradec, 2005
170	*Lawsonia inermis* L.	Lythraceae	1	1	Bénin	de Souza, 2005
171	*Leea guineensis* G. Don	Vitaceae	1	1	Madagascar	Caradec, 2005
172	*Lentinus tuber-regium* (Rumph. ex Fr.) Singer	Polyporaceae	1	1	Nigeria	Adjanohoun et al., 1991
173	*Lippia multiflora* Moldenke	Verbenaceae	1	1	Uganda	Adjanohoun et al., 1993
174	*Litchi chinensis* Sonn.	Sapindaceae	1	1	Madagascar	Caradec, 2005
175	*Lycopodium clavatum* L.	Lycopodiaceae	1	1	Congo	Mokoso et al., 2012
176	*Maerua angolensis* DC	Capparaceae	1	1	Bénin	Adjanohoun et al., 1989
177	*Pouteria alnifolia* (Baker) Roberty var. Alnifolia (syn.: *Malacantha alnifolia* (Baker) Pierre)	Capotaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
178	*Massularia acuminata* (G. Don) Bullock ex Hoyle	Rubiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
179	*Melinis minutiflora* P. Beauv.	Poaceae	1	1	Cameroon	Adjanohoun et al., 1996
180	*Mitragyna inermis* (Willd.) Kuntze	Rubiaceae	1	1	Côte d'Ivoire	Koné, 2006
181	*Momordica charantia* L. (Momordica thollonii Cogn)	Cucurbitaceae	1	1	Nigeria	Adjanohoun et al., 1991
182	*Mondia whitei* (Hook. f.) Skeels	Asclepiadaceae	1	1	Cameroon	Adjanohoun et al., 1996
183	*Monodora myristica* (Gaertn.) Dunal (Syn.: *Annona myristica* Gaertn.)	Annonaceae	1	1	Bénin	Adjanohoun et al., 1989
184	*Monotes kerstingii* Gilg (Syn.: *Caraipa africana* Oliv)	Dipterocarpaceae	3	1	Côte d'Ivoire	Konéet al., 2002; Koné, 2006
185	*Morinda lucida* Benth.	Rubiaceae	1	1	Congo	Adjanohoun et al., 1998
186	*Mucuna flagellipes* T. Vogel ex Hook.f.	Leguminosae-Papilionoideae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
187	*Musa paradissiaca* L.	Musaceae	1	1	Cameroon	Adjanohoun et al., 1996
188	*Musa sapientum* auct Div.	Musaceae	2	1	Cameroon	Adjanohoun et al., 1996
189	*Napoleonaea vogelii* Hook. & Planch, (Syn.: *Napoleona leonensis* Hutch. & Dalziel)	Lecythidaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
190	*Nephrolepis biserrata* (Sw.) Sebott (Syn.: *Aspidium biserratum* Sw.)	Nephrolepidaceae	1	1	Congo	Mokoso et al., 2012
191	*Parkia biglobosa* (Jacq.) R.Br. ex Benth., (Syn.: *Parkia clappertoniana* Keay,)	Leguminosae-Mimosoideae	1	1	Burkina Faso	Zerbo, 2007
192	*Omphalogonus calophyllus* Baill., (syn. : *Parquetina nigrescens*)	Asclepiadaceae/periploCaceae)	1	1	Bénin	Adjanohoun et al., 1989
193	*Passiflora edulis* Sims	Passifloraceae	1	1	Uganda	Adjanohoun et al., 1993

194	*Passiflora foetida* L.	Passifloraceae	1	1	Congo	Adjanohoun et al., 1998
195	*Paullinia pinnata* L.	Sapindaceae	1	1	Bénin	Adjanohoun et al., 1989
196	*Pelargonium graveolens*l' Hér	Geraniaceae	1	1	Afrique	Dupuis (on line)
197	*Pellaea viridis* (Forssk.) Prantl	Pteridaceae	1	1	Congo	Mokoso et al., 2012
198	*Pennisetum purpureum* Sehumaeh.	Poaceae	2	1	Cameroon	Adjanohoun et al., 1996
199	*Pentadiplandra brazzeana* Baill.	Capparaceae	1	1	Cameroon	Adjanohoun et al., 1996
200	*Persea Americana* Mill.	Lauraceae	1	1	Congo	Mokoso et al., 2012
201	*Phyllanthus amarus* Schumach. & Thonn.	Euphorbiaceae	1	1	Côte d'Ivoire	Koné, 2006
202	*Physalis angulata* L.	Solanaceae		1	Bénin	Adjanohoun et al., 1989
203	*Picralima nitida* (Stapf.) T. & H. Durand	Apocynaceae	2	1	Bénin	Adjanohoun et al., 1989; de Souza, 2005
204	*Piliostigma reticulatum* (DC.) Hochst.	Leguminosae-Caesalpinioideae	1	1	Burkina Faso	Zerbo, 2007
205	*Piper guineense* Schumach. & Thonn.	Piperaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
206	*Pistia stratiotes* L.	Araceae	1	1	Bénin	Adjanohoun et al., 1989
207	*Polygonum poiretii* Meisn.	Polygonaceae	1	1	Maurice	Adjanohoun et al., 1983
208	*Pouzolzia guineensis* Benth.	Ulticaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
209	*Priva cordifolia* (L. f.) Druce	Verbenaceae	1	1	Uganda	Adjanohoun et al., 1993
210	*Prosopis africana* (GuilI. & Perr.) Taub.	Leguminosae-Mimosoideae	1	1	Burkina Faso	Zerbo, 2007
211	*Pseudarthria confertiflora* (A. Rich.) Baker	Leguminosae-Papilionoideae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
212	*Pseudarthria fagifolia* Baker	Leguminosae-Papilionoideae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
213	*Pseudocedrela kotschyi* (Schweinf.) Harms. (Syn.: *Cedrela kotschyi* Schweinf.)	Meliaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
214	*Pteleopsis suberosa* Engl. & Diels	Combretaceae	1	1	Bénin	Adjanohoun et al., 1989
215	*Pterocarpus santalinoides* l'Hér. ex DC.	Leguminosae-Papilionoideae	1	1	Bénin	Zerbo, 2007
216	*Punica granatum* L.	Lithraceae	1	1	Madagascar	Caradec, 2005
217	*Pupalia lappacea* (L.) Juss.	Amaranthaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
218	*Pyrrosia chimperiana* (METT. ex KUHN) ALSTON	Polypodiaceae	1	1	Congo	Mokoso et al., 2012
219	*Raphia farinifera* (Gaertn.) Hyl.	Arecaceae	1	1	Maurice	Adjanohoun et al., 1998
220	*Raphia vinifera* P. Beauv**.**	Arecaceae	2	1	Congo	Adjanohoun et al., 1998
221	*Rhus natalensis* Bernh. ex Krauss	Anacardiaceae	1	1	Uganda	Adjanohoun et al., 1993
222	*Rhus vulgaris* Meikle	Anacardiaceae	1	1	Uganda	Adjanohoun et al., 1993

223	*Rothmannia longiflora* Salisb	Rubiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
224	*Rothmannia whitfieldii* (LindI.) Dandy,	Rubiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
225	*Saba senegalensis* A. DC	Apocynaceae	1	1	Côte d'Ivoire	Koné, 2006
226	*Sarcocephalus latifolius* (Sm.) E.A. Bruce	Rubiaceae	1	1	Burkina Faso	Zerbo, 2007
227	*Scyphocephalium ochocoa* Warb.	Myristicaceae	1	1	Gabon	Adjanohoun et al., 1984
228	*Secamone afzelii* (Schult.) K .Schum. (Syn.: *Ichnocarpus afzelii* Schult.)	Asclepiadaceae	1	1	Côte d'Ivoire	Koné, 2006
229	*Sesamum alatum* Thonn.	Pedaliaceae	1	1	Bénin	Adjanohoun et al., 1989
230	*Sida acuta* Burm.f. ssp. *carpinifolia* (L. f.) Borss. Waalk, (*Sida stipulate* Cav.)	Malvaceae	1	1	Congo	Adjanohoun et al., 1998
231	*Sigesbeckia orientalis* L.	Asteraceae	1	1	Madagascar	Caradec, 2005
232	*Smilax anceps* Willd. (Syn.: *S. kraussiana* Meisn)	Smilacaseae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
233	*Spathodea campanulata* P. Beauv.	Bignoniaceae	1	1	Congo	Adjanohoun et al., 1998
234	*Acmella caulirhiza* Delile (syn.: *Spilanthes filicaulis* (Schumach.) C.D.)	Asteraceae	1	1	Cameroon	Adjanohoun et al., 1996
235	*Spondias monbin* L.	Anacardiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
236	*Steganotaenia araliacea* Hochst. **(**Syn.: *Peucedanum araliaceum* (Hochst.) Benth. & Hook.)	Apiaceae	1	1	Uganda	Adjanohoun et al., 1993
237	*Streptogyna crinite* P. Beauv.	Poaceae	1	1	Congo	Adjanohoun et al., 1998
238	*Struchium sparganophora* (L.) Kuntze,**(**Syn.: *Ethulia sparganophora* L.,)	Asteraceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
239	*syzygium cumini* (L.) Skeels	Myrtaceae	1	1	Maurice	Adjanohoun et al., 1983
240	*Tarrietia utilis* Sprague	Sterculiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
241	*Terminalia avicennioides* Guil. & Perr.	Ccombretaceae	1	1	Burkina Faso	Zerbo, 2007
242	*Terminalia glaucescens* Planch. ex Benth.	Combretaceae	1	1	Nigeria	Adjanohoun et al., 1991
243	*Terminalia laxiflora* Engl.	Combretaceae	1	1	Bénin	Adjanohoun et al., 1989
244	*Tetracera alnifolia* Willd.	Dilleniaceae	1	1	Congo	Adjanohoun et al., 1998
245	*Tetracera arnoldianum* L.	Dilleniaceae	1	1	Congo	Adjanohoun et al., 1998
246	*Thomandersia hensii* De Wild. & T. Durand	Acanthaceae	2	1	Congo	Mabika 1983; Lejoly, J.et al., 1992
247	*Tiliacora dinklagei* Engl.	Menispermaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
248	*Trichilia monadelpha*	Meliaceae	1	1	Congo	Adjanohoun et al., 1998

	(Thonn.) J.J.deWilde **(**Syn.: *Trichilia heudelotii* Planch. ex Oliv.)					
249	*Trichoscypha arborea*(A. Chev.) A. Chev.	Anacardiaceae	1	1	Côte d'Ivoire	Bouquet and Debray, 1974
250	*Tristemma virusanum*Juss.	Melastomaceae	2	1	Maurice	Adjanohoun et al., 1983
251	*Triumfetta rhomboidea* Jacq.	Tiliaceae	1	1	Bénin	Adjanohoun et al., 1989
252	*Urena lobata* L.	Malvaceae	1	1	Bénin	Adjanohoun et al., 1989
253	*Vernonia amygdalina* Delile (Syn.: *Gymnanthemum amygdalina* (Delile) Walp.)	Asteraceae	2	1	Uganda	Adjanohoun et al., 1993
254	*Vernonia confertа*Benth.	Asteraceae	*2*	1	Gabon	Adjanohoun et al., 1984
255	*Ximenia americana* L.	Olacaceae	1	1	Burkina Faso	Zerbo, 2007
256	*Xylopia aethiopica* (Dunal) A.Rich.	Annonaceae	2	1	Bénin	Adjanohoun et al., 1989; de Souza, 2005
257	*Xymalos monospora* (Harv.) Baill.	Monimiaceae	2	1	Burundi	Polygenis-Bigendako et Lejoli, 1989; Baerts et al., 1989
258	*Zea mays* L.	Poaceae	1	1	Bénin	Adjanohoun et al., 1989

Table 2: Most quoted plants in at least 4 African countries

Species	**Families**	**Quotation frequency**	**Frequency of quote Fcr in %**	**Number of countries where the species is listed**
Psidium guajava L.	Myrtaceae	28	10.85	13
Euphorbia hirta L.	Euphorbiaceae	19	7.36	15
Mangifera indica L.	Anacardiaceae	19	7.36	11
Hymenocardia acida Tul.	Euphorbiaceae	9	3.48	4
Harungana madagascariensis Lam. Ex Poir.,	Clusiaceae/ Hypericaceaehypericaceae	7	2.71	4
Piliostigma thonningii (Schumach.) Milne-Redh.,	Leguminosae-Caesalpinioideae	6	2.32	6
Ageratum conyzoides L.	Asteraceae	5	1.93	5
Ocimum gratissimum L	Lamiaceae	4	1.55	4

Table 3: The major chemical families identified in the most cited plants

Species	**Families**	**Secondary metabolites present**	**References**
Psidium guajava L.	Myrtaceae	flavonoids, triterpenoid tannins, saponosides, steroles, alkaloids carbohydrates, terpenoidesphenols glycosides, steroids	Vikrant et al., 2012 ; Kangogo et al., 2014.
Euphorbia hirta L.	Euphorbiaceae	flavonoids, terpenoids; phenols; tannins, saponosides,	Linfang et al.,

		quinones; alkaloids; steroids, glycosides, carbohydrates	2012 ; Gopinath et al., 2012; Muhammad et al., 2012 Chitra et al., 2011.
Mangifera indica L.	Anacardiaceae	alkaloids, flavonoids, phenols; tannin saponosides, terpenes; carbohydrates, proteins; Cardiac glycosides anthraquiones	Palombo et al., 2006; Dipali et al., 2013; Salihu et al., 2013; Nwankwoet al., 2014.
Hymenocardia acida Tul.	Euphorbiaceae	alkaloids, glycosides, flavonoids saponosides, tannins; terpenoids; Carbohydrates; cardiac glycosides; resins; steroids; terpenes	Adakoleet al., 2011; Ibrahim et al., 2007.
Harungana madagascariensis Lam. Ex Poir.,	Clusiaceae/ Hypericaceae	flavonoids, alkaloids, saponosides, glycosides, tannins; anthraquinones; reducing compounds; terpenoid sterols; Steroids Terpene cardiac glycosides; Triterpenes; sterols, Phenols,	Moulari et al.,2001 ; Susanet al.,2012 ; Oluwafemiet al.,2012 ; Biapaet al., 2007.
Piliostigma thonningii (Schumach.) Milne-Redh.,	Leguminosae-Caesalpinioideae	Flavonoids, leucoanthocyanins, tannins, saponosides, mono- and polysaccharides, mucilages, sterols; triterpenes, cardiac glycosides; alkaloids, steroids, terpenoids, anthraquinones; glycosides, reducingsugars; carbohydrates, steroids.	Ekoumou et al.,2004; Kwajiet al., 2010; Bello et al., 2013; David et al., 2014.
Ageratum conyzoides L.	Asteraceae	Alkaloids, cardenolides, saponosides, and tannins Anthraquinones (trace); Flavonoids Leucoanthocyanines; Glycosides Steroids Terpenoid Resins Cardenolides Phenols	Agunbiade et al.,2012 ; Amadiet al., 2010.
Ocimum gratissimum L.	Lamiaceae	Carbohydrates; reducing sugars; flavonoids; alkaloids; steroids; tannins; saponins; anthocyanins; leucoanthocyanins, quinone derivatives, triterpenoids, mucilage, coumarins, reducingsugars; oligosaccharides; Anthraquinones TerpenesPhenolCardiac Glycosides	Amadi et al.,2012; Nwezeet al.,2009; Amadi et al.,2010; Kpadonou-Kpoviessiet al.,

2013.

Table 4: Toxicity of plants usually used in the literature

Species	Families	Toxicity according to the authors
Psidium guajava L.	Myrtaceae	The acute toxicity study shows that the aqueous leaf extract is nontoxic in wistar rats at doses of 100-500mg/kg body weight (Etuket al., 2003).
Euphorbia hirta L.	Euphorbiaceae	The aqueous extracts of the leaves may be slightly toxic (Adedapo et al., 2003); oral administration at 400 mg/kg aqueous leaf extract causes disorders in testicular and accessory organs in male rats (Adedapo et al., 2003). The aqueous extract of the leaves, roots and bark has a potent mollucid activity with an LC_{50} ranging from 40 to 80% (Sunil et al., 2005). Extracts from all parts of the plant with the exception of flowers have an LC_{50} on shrimp brine almost equal to 1000µg/ml. Great caution should therefore be observed in the consumption of this plant as a medicinal plant (Mohammad et al., 2010)
Mangifera indica L.	Anacardiacea	The metanolic extract of the leaves is active on shrimp larvae resulting in their death with an LC_{50} of 122 µg/ml (Salihuet al., 2013)
Piliostigma thonningii (Schumach.) Milne-Redh.,	Leguminosae-Caesalpinioideae	Toxic to larvae of Arthemia with a lethal dose of LC_{50} between 63 and 991.3 µg/ml (Mwanzia et al., 2013)
Ageratum conyzoides L.	Asteraceae	Has a remarkable cytotoxic property with LC_{50} of 1.32 µg/ml on shrimp larvae (Fatema et al., 2013)
Ocimum gratissimum L.	Lamiaceae	The leaves extracts are nontoxic on Artemia larvae (LC_{50} between 56 and 179 mg/ml) (Amadi et al., 2000). Although oral administration of the oil may be better tolerated, systemic administration has toxic properties that should not be neglected (Prabhuet al., 2009). The aqueous extract of the leaves has a toxic effect with a lethal LD_{50} dose of 4.5 µg / kg. This toxicity could be attributed to the combined toxicity of phytochemical constituents such as tannins, saponins, glycosides and alkaloids (Ojo et al., 2013)