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Full Length Research Paper

Comparative phytochemical and ethnomedicinal survey of selected medicinal plants in Nigeria

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Phytochemical screening and ethnomedicinal survey of twenty-two medicinal plants distributed in fifteen different families were carried out in order to know the distribution of secondary metabolites and the diseases being treated with these plants. It was discovered that alkaloids, tannins and saponin were present in all. Flavonoid was absent only in *Peperomia pellucida*; five out of these plants lack terpene, ten of them have steroid; eleven of them have cardiac glycosides while only four of these twenty-two have phlobatannin. The ethnomedicinal survey revealed a wide range of human ailments being treated with these plants, ranging from eye infections, respiratory infections, inflammations, urinary diseases, jaundice, anaemia, arthritis to diabetes and dysentery. This study therefore, justifies the ethnobotanical significance of the plants by the presence of secondary metabolites, which if extracted, can be of significant medicinal usefulness in the synthesis of bioactive drugs. Therefore, the findings of this study are recommended for further screening to identify specific photochemical compounds of medicinal significance for bioprospecting and pharmaceutical production.

Key words: Phytochemical, ethnomedicinal, medicinal plants, secondary metabolites.

INTRODUCTION

Since time immemorial, man has used various parts of plants in the treatment and prevention of many ailments (Chah et al., 2006). According to the World Health Organization (WHO, 1977), a medicinal plant is any plant which contains substances that can be used for the therapeutic purposes in one or more of its organ or substances which are precursors for the synthesis of useful drugs. Medicinal plants are further defined as plants that have at least one of their parts (leaves, stem, barks or roots) used for therapeutic purposes (Bruneton, 1993). A plant becomes a medicinal plant only when its biological activity has been ethnobotanically reported or scientifically established (Elujoba, 1997).

Plants provide a source of medicines, which are useful in treatment of various categories of human ailments and conditions. The World Health Organization (WHO) has estimated that up to 80% of the world's population rely on plants for their primary health care (BCGI, 1995), while in Nigeria, a WHO survey estimated that up to 75% of the population patronize traditional medicine (Omoseyindemi, 2003). More importantly, plants have been the main source of medicine for man before the advancement of Science and Technology (Schmelzer and Omino, 2003). Plants are significant sources of medicines that are used in the treatment of various categories of human diseases.

Historically all medicinal preparations were derived from plants, whether in the simple form of plant parts or in the more complex form of crude extracts, mixtures, etc. Today a substantial number of drugs are developed from plants which are active against a number of diseases. The majority of these involve the isolation of the active ingredient (chemical compound) found in a particular medicinal plant and its subsequent modification. In the developed countries 25% of the medical drugs are based on plants and their derivatives (Principe, 2005) and the

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use of medicinal plants is well known among the indigenous people in rural areas of many developing countries.

In the past, our ancestors made new discoveries of the healing power of plants through trial and error. Although, some of the therapeutic properties attributed to plants have proven to be erroneous, medicinal plant therapy is based on the empirical findings of hundreds and thousands of years (Gurib-Fakim, 2006).

Phytochemical are chemical compounds formed during the plants' normal metabolically processes (Okigbo et al, 2009). These chemicals are often referred to as secondary metabolites of which there are several classes including alkaloids, flavonoids, coumarins, glycosides, gums, polysaccharides, phenols, tannins, terpenes and terpenoids (Okwu, 2004). In contrast to synthetic pharmaceuticals based upon single chemicals, many medicinal plants exert their beneficial effects through the additive or synergistic action of several chemical compounds acting at single or multiple target sites associated with a physiological process (Okigbo et al, 2009).

Some of the means of sustenance of man in plants have been identified and elucidated, and these range from carbohydrates, terpenoids, alkaloids, carotenoids, proteins (including amino acids), anthocyanins, purines and nucleic acids, vitamins, antibodies and plant pigments (Finar, 2001). In modern medicine, plants are used as sources of direct therapeutic agents, as models for new synthetic compounds, and as a taxonomic marker for discovery of new compounds. They serve as a raw material base for the elaboration of more complex semi synthetic chemical compounds (Akerele, 1992). The synthesis of bioactive compounds is chemically difficult, because of their complex structure and high cost (Shimomura et al., 1997). Wide variations in medicinal quality and content in phytopharmaceutical preparations have been observed. These are influenced mainly by cultivation period, season of collection, plant-to-plant variability in the medicinal content, adulteration of medicinal preparations with misidentified plant species, a lack of adequate methods for the production and standardization of the crop, a lack of understanding of the unique plant physiology or efficacy with human consumption and consumer fraud (Nalawade and Tsay, 2004).

According to Heldt (2005), most of these phytochemical are produced through biosynthesis in the metabolic pathways. The primary metabolites are of major importance to plants (Trease and Evans, 1989). The secondary metabolites are medicinal value to man and these can equally be obtained from various anatomical structures of plants (Fahn, 1974). Plants are so diverse in West Africa to the extent that hardly could there be any disease that cannot be tackled by these plants (Hutchinson et al., 1963). Therefore, plants, especially the higher ones have been described as the sleeping giants of drug and development and these medicinal plants have been screened for their chemicals that are potentially potent (Fahnsworth, 1988). Many of the medicinal plants, especially in Nigeria have been documented (Gill, 1992). The importance of medicinal plants, and the contribution of phytomedicine to the well-being of a significant number of the world's population, has attracted interest from a variety of disciplines (Biapa et al, 2007).

The tropical rainforest, of which Nigeria is a part, has been described by Sofowora (1993) as a reservoir of phytomedicines. This work, therefore, is aimed at elucidating the phytochemicals in these selected tropical plants and knowing more about these biomedicinals, thereby promoting bioprospecting of the medicinal plants.

MATERIALS AND METHODS

Collection of information and plant samples

Semi-structured interviews and discussions with selected informants were adapted according to Martin (1995); Omotayo (2000). Participatory rural appraisal (PRA) method was used to ascertain the information provided (Balick and Cox, 1996). Additional ethnomedicinal information about the plants was collected from literature studies. Two methods or techniques namely a modified Whitetaker Nested-Quadrant method (Stohgren et al., 1994) and normal field techniques for plant collections and herbarium development were used for vegetation sampling and plant collections for this study.

The plants used for the study are *Spondias mombin, Cissus aralioides, Combretum racemosum, Combretum sp., Cucurbita pepo, Momordica foetida, Ipomoea batatas, Merremia aegyptia, Ficus exasperata, Ficus thonningii, Myrianthus arboreus, Boerhavia diffusa*, *Tetracera potatoria, Harungana madagascariensis, Rauvolfia vomitoria, Passiflora foetida, Parquetina nigrescens, Piperomia pellucida (syn. Piper pellucidum), Spermacoce verticillatus (syn. Borreria verticillata), Spermacoce ocymoides (syn. Borreria ocymoides), Lapportea aestuans (syn. Fleurya aestuans),* and *Poulzolzia guineensis*.

The fresh leaves of the plant materials used in the work were simultaneously collected from forest, abandoned farms, cultivated farms and the open field in Southern part of Nigeria. The plants were identified in their fresh state, and authenticated by the author, who also is the Herbarium Curate of Department of Plant Science Herbarium (UHAE) in University of Ado-Ekiti, Ekiti State. The leaves were then cut into bits, and air dried for two weeks, after which they were grinded into powder, using a warring mechanical blender before being subjected to phytochemical screening. Duplicate samples of these plants were prepared and registered in the Herbarium of the Department of Plant Science Herbarium (UHAE) in University of Ado-Ekiti, Ekiti State.

Phytochemical screening

The extracts were examined for the presence of the following phytochemicals: alkaloids, tannins, saponin, steroid, terpenes, flavonoids, phlobatannin and cardiac glycosides, as follows:

Alkaloids

Drangendoff's reagent was used and the method described by Harborne (1973) was adopted. Leaves powdered (0.2 g) were extracted with 95% ethanol and 30 ml boiling water respectively in

a Sohlet extractor for six hours and the extract evaporated to dryness using a vacuum evaporator. The residue was redissolved in 5 mL of 1% HCl and 5 drops of Drangendoff's reagent were added. The formation of orange precipitate indicates the presence of alkaloids.

Saponin

The persistent frothing test for saponin described by Odebiyi and Sofowora (1978) was used. To 1 g of the extract, 30 mL of tap water was added. The mixture was vigorously shaken and heated to boil. Frothing that persisted for 30 min shows the presence of saponin.

Phlobatannin

The extract (0.2 g) was dissolved in 10 mL of distilled water and filtered. The filterate was boiled with 2% HCl solution. Red precipitate shows the presence of phlobatannin.

Tannins

The method of Trease and Evans (1989) was adopted. 0.5 g powdered crude drug was dissolved in 5 mL of distilled water, then boiled gently and cooled. 1 mL of this solution was put in a test tube and 3 drops of Ferric Chloride solution was added. A deep greenish-black colouration indicates a positive test for tannins.

Terpenes/terpenoids

The Salkowski test was used. 5 mL of each extract was mixed in 2 mL of Chloroform, and 3 mL concentrated sulphuric acid was carefully added to form a layer. A reddish brown colouration of the inter-face was formed to show positive result for the presence of terpenes or terpenoids.

Steroids

2 mL of acetic anhydride was added to 0.5 g ethanolic extract of each sample with 2mL of H_2SO_4. The colour changed from violet to blue, indicating the presence of steroids.

Cardiac glycosides

The Keller-Killani test was used. 5 mL of each extracts was treated with 2 mL of glacial acetic acid, containing one drop of ferric chloride solution. This was underlayed with 1 mL of concentrated sulphuric acid. A browning of the interface indicates a deoxysugar characteristic of 'cardiac glycosides' (cardenolides). Below the 'brown', a violet ring was observed, while in the acetic acid layer, a greenish ring was observed.

Flavonoids

Three methods were used to determine or confirm the presence of flavonoids in the plants' powdered samples (Trease and Evans, 1989). The method adopted for this study is the one in which 5 mL of diluted ammonia solution was added to a portion of the aqueous filtrate of each plant extract, followed by addition of concentrated sulphuric acid. A yellow colouration was observed in each extract, indicating the presence of flavonoids.

RESULTS AND DISCUSSIONS

Table 1 reveals the ethnomedicinal values of the plants used for this particular study. It is quite evident that these medicinal values alleviate the health condition of the users, looking at the values of these medicinal plants. The diseases treated with part of the plants used for this study, as revealed in Table 1 includes arthritis, inflammations, eye problems, respiratory problems, piles, fever, urinary problems, diabetes, sexually transmitted diseases, stomach problems, jaundice and many other numerous human infections and disease conditions. It could also be noted that *S. mombin, F. exasperata* and *F. thonningii* have the widest range of ethnobotanical significance. This is probably due to the fact that they are common tree crop species in the tropics.

Table 2 shows, the scientific basis of these phytochemicals. It reveals the presence of the secondary metabolites, which serve as bioactive agents. *S. mombin* represents the family *Anacardiaceae* and it contains all the phytochemicals, except phlobatannin, terpene and cardiac glycoside. It is interesting to note that *C. aralioides* (*Ampellidaceae*) contains all the eight phytochemicals tested for. The two species of *Combretum* represent the family *Combretaceae*. All the two species contain alkaloid, tannin, saponin and flavonoid. *C. racemosum* contains both terpene and cardiac glycoside in addition, while the other representative lacks them. However, both of them do not have phlobatannin. This information has taxonomic significance in comparing two species belonging to the same genus or family. *I. batatas* and *M. aegyptia* are representatives of the family *Convolvulaceae,* both have all the phytochemicals, except steroid and phlobatannin. However, *M. aegyptia* lacks cardiac glycoside.

The family *Cucurbitaceae* is represented by two different species, namely *C. pepo* and *M. foetida*. The two representative plants contain alkaloids, tannin, saponin, and flavonoid. In addition to this, *C. pepo* lacks steroid and terpene, while *M. foetida* lacks cardiac glycoside, but contains steroid and terpene. The family *Moraceae* is represented by three species: *F. exasperata, F. thonningii and M. arboreus*. All the three species contain alkaloid, tannin, saponin and flavonoid. The two *Ficus* species contain steroid. In addition, while *M. arboreus* lacks it. Both *F. thonningii, M. arboreus* possess terpene, which is observably absent in *F. exasperata*. While, all the three species that represented the family *Moraceae* lacks phlobatannin, *F. exasperata* is the only one among the three that possesses cardiac glycoside. Previous studies revealed that Arjunolic acid and a new triterpene acid, myriantic acid, have also been isolated from the root, wood of *M. arboreus* (Ojinnaka et al., 1984). Similarly, earlier phytochemical studies showed that *F. thonningii* contains tannins, saponin, flavonoids, and anthraquinone glycosides as the active agents (Hutchinson and Dalziel, 1956). *B. diffusa* that represented *Nyctaginaceae* contains all the phytochemicals except steroid and phlobatannin. Investigations on the chemical constituents of *B. diffusa* have indicated the occurrence of two novel alkaloids, Punarnavine-1 and Punarnavine- 2, belonging to the group quinolizidine

Table 1. Ethnomedicinal values of the leaves of the plant representatives.

S/N	Plant Name	Family	Herbarium voucher number	Ethnomedicinal uses
1	*Spondias mombin* L.	Anacardiaceae:	UHAE B024	Leaves used to treat eye problems, cough, fever, yaws and as diuretic; for gastroenteritis. The fruits decoction is drunk as a diuretic and febrifuge, the decoction of the bark and the leaves is used as an emetic, anti-diarrhoea, dysentery recipe and for haemorrhoids as well as for gonorrhoea and leucorrhoea. A tea of the flowers and the leaves is taken to relieve stomachache. The gum is employed as an expectorant and to expel tapeworm (USDA, ARS 2002). Offiah and Anyanwu (1989) have reported the abortifacient activity of the aqueous extract. The fruit juice is drunk as a diuretic and febrifuge. The decoction of the astringent bark serves as an emetic, a remedy for diarrhea, dysentery, haemorrhoids and a treatment for gonorrhoea and leukorrhea.
2	*Cissus aralioides* (Welw ex Bak) Planch	Ampellidaceae	UHAE B025	For treatment of wounds, cuts, internal and external microbial infections. It is also used for treating arthritis, rheumatism, etc.; dropsy, swellings, oedema, gout; fabrifuges; pain-killers; pulmonary troubles while the Sap is used for eye treatments; venereal diseases (Aluka, 2010)
3	*Combretum racemosum* P. Beauv.	Combretaceae	UHAE B026	As anthelminthic, for treatment of wounds, stings, cuts, for cough, different types of fever. Decoction of the roots and leaves used for abortion (Ibe and Nwufo, 2005)
4	*Combretum sp.* Loeft	Combretaceae	UHAE B027	For treatment of different types of fever, for piles

(Nandi and Chatterjee, 1974).

The family *Dilleniaceae* is represented by *T. potatoria* and it contains all the phytochemicals, except steroid and cardiac glycoside. *H. madagascariensis* represents the family *Clusiaceae* and it contains all the phytochemicals, except phlobatannin. *R. vomitoria* (*Apocynaceae*) contains 5 phytochemicals, but lacks steroid, phloba-tannin and terpenoid. Two new indole alkaloids, 3-epi-rescinnamine and 3, 4-dimethoxybenzoyl-reserpic acid methyl ester, are isolated from the root bark of *R. vomitoria* (Orwa et al., 2009). The family *Passifloraceae* is represented by *P. foetida* and it was observed that it possesses seven of the eight phytochemicals, with the exception of cardiac glycoside. This agrees with earlier findings of Dhawan et al. (2004) who reported that *M. foetida* contain alkaloids, phenols, glycoside flavonoids and cyanogenic compounds while Echeverri et al. (2001) further identified passifloricins, polyketides

Table 1 Contd.

5	*Cucurbita pepo* L.	Cucurbitaceae	UHAE B028	Leaves used for strengthening the system and as anti-scorbutic. Pumpkin seed has been used as an antihelmintic agent and for supportive treatment in functional disorders of the bladder and for difficulties in urination (Srivastava and Singh, 1967). Childhood *enuresis nocturna* and irritable bladder have been treated successfully with pumpkin seed (Weiss, 1988) it has also been used to eradicate tapeworm (Dreikorn et al., 2002). Pumpkin seeds are considered an alternative treatment for stage I and II benign prostatic hyperplasia and for irritable bladder (Zdunczyk et al., 1999).
6	*Momordica foetida* Schum and Thorn	Cucurbitaceae	UHAE B029	For treatment of diabetes, piles/haemorrhoid, gastroenteritis, snake bites, pregnancy, small pox, stomach ache, dropsy, fever, ear ache; and as anthelmintic, for tumours. Used as antidiabetic agent (Olaniyi, 1980).
7	*Ipomea batatas* (L.) Lam	Convolvulaceae	UHAE B030	Leaves as blood tonic. The leaves are grounded with salt to treat witlow (Oke et al., 1999).
8	*Merremia aegyptia* (L.)	Convolvulaceae	UHAE B031	For treatment of diabetes, wounds, infections and tumors
9	*Ficus exasperata* (Vahl.)	Moraceae	UHAE B032	For treatment of microbial infections, sexually transmitted diseases and gastroenteritis. The leaf extract from *F. exasperata* reported to have diverse uses such as treating hypertensive patients (Buniyamin et al., 2007), heamostative opthalmia, coughs and heamorrhoid (Odunbaku et al., 2008). In Nigeria, young leaves of *F. exasperata* are prescribed as a common anti-ulcer remedy. Various pharmacological actions such as anti-diabetic, lipid lowering and antifungal activities have been reported for *F. exasperata* (Sonibare et al., 2006). The viscid non-milky sap is used for treating sores eye trouble and stomach pains (Burkill, 1997).

Table 1 Contd.

10	*Ficus thonningii* Blume	Moraceae	UHAE B033	For treatment of internal problems and for feeding livestock. For instance, in Nigeria, it is commonly used among the traditional healers for the treatment of diarrhea, cold, sore throat, wounds and for stimulation of lactation in women. The young leaf of *Ficus thonningii* has also been used for the treatment of ulcer in traditional medicine. The bark is important in local medicine, and it is used in treating colds, sore throat, dysentery, wounds, constipation, and nose bleed and to stimulate lactation. Latex is used for wound fever, while an infusion of the root and fibre is taken orally to help prevent abortion. Powdered root is taken in porridge to stop nosebleed; the milky latex is dropped into the eye to treat cataracts (Orwa et al, 2009).
11	*Myrianthus arboreus* P. Beauv.	Moraceae	UHAE B034	For treating boils, swellings, tumors and sore throats. *M. arboreus* has various medicinal uses, including the treatment of dysentery and diarrhoea with bark infusions. Seeds are used for boils. The bark decoction is administered for diabetes. Other medicinal uses are for headaches, swellings and tumours.
12	*Boerhaavia diffusa* L.	Nyctaginaceae	UHAE B035	Useful for treating rheumatism, skin infections and microbial problems. The plant is also reported to be diuretic and laxative and is given for the treatment of anasarca, ascites and jaundice. The roots of *Boerhaavia diffusa* have been found to have antiinflammatory, diuretic, fibrinolytic, nephrotic syndrome and anti-convulsant activities **(**Bhalla et al., 1971).
13	*Tetracera potatoria* Afzel ex G. Don	Dilleniaceae	UHAE B036	For the treatment of back ache, diabetes and as an anti-scorbutic. The leaves of the plant boiled in its own sap are used for the treatment of gastrointestinal sores (Burkil, 1985).

Table 1 Contd.

14	*Harungana madagascariensis* Lam ex. Poir	Clusiaceae	UHAE B037	For treatment of microbial skin infections, tapeworm and gastroenteritis. Traditionally, the leaves and stem bark are used for the treatment of anaemia, the stem bark is also used for nephrosis, malaria, gastro-intestinal disorders and fever (Erah et al., 2003). Traditionally, the leaves and stem bark are used for the treatment of anaemia, while the stem bark is indicated for nephrosis, malaria, gastro-intestinal disorders and fever.
15	*Rauvolfia vomitoria* Afzel	Apocynaceae	UHAE B038	Leaves for treating yellow fever, internal pains, gastroenteritis, constipation and mental disorder. It is useful in the lowering of blood pressure (Amole, 2003), as an antimalarial (Amole et al., 1993). It also analgesic (Amole et al., 2006). R. vomitoria is used by Nigerian traditional healers to treat psychiatric patients. The bark has purgative and emetic properties. The root extracts have arbotifacient properties.
16	*Passiflora foetida* L.	Passifloraceae	UHAE B039	For the treatment of skin infections, hypertension, fever and asthma. The ethnobotanical views of *P. foetida*, reports the decoction of leaves and fruits to treat asthma and biliousness, leaves and root decoction is emmenagogue, used in hysteria (Ambasta et al., 1983) and leaf paste is applied on the head for giddiness and headache (Chopra et al., 1956).
17	*Parquetina nigrescens* (Afzel) Bullock	Periplocaceae	UHAE B040	Leaves are used an anti-sickling agent and for treating gastroenteritis. The leaves and whole plant are usually used for the treatment of gonorrhoea, jaundice, rickets and asthma (Schlage et al, 1992).
18	*Piperomia pellucida* L.	Piperaceae	UHAE B041	Plants are used as anti-convulsant, for the treatment of insomnia, as poultice for sores, wounds and poisonous bites. The whole plant is used for the treatment of diseases such as diarrhoea, dysentery; naso-pharyngeal affections; paralysis, epilepsy, convulsions, spasm; pulmonary troubles; skin, mucosae; tumours, cancers (Aluka, 2010)

Table 1 Contd.

19	*Spermacoce verticillatus* L.	Piperaceae	UHAE B042	For treatment of skin infections
20	*Spermacoce ocymoides* Burm. F.	Piperaceae	UHAE B043	For treatment of microbial infections. Leaf of this plant, leaf of *Garcinia pictoria* and stem bark of *Syzygium cumini* are mixed, ground into a paste and heated with gingelly oil. The mixture thus obtained is applied topically on affected places to heal wounds (Ayyanar and Ignacimuthu, 2009).
21	*Lapportea aestuans* (L.) Chew.	Urticaceae	UHAE B044	For treating indigestion, gastroenteritis, whitlow, maintenance of pregnancy, liver problems, gingivitis, dressing of burns and wounds and for treating rickets.
22	*Poulzolzia guineensis* Benth.	Urticaceae	UHAE B045	Leaves for wound healing and curing stomach-ache. asthma is treated with a mixture of leaves kneaded with kaolin, leaf sap is taken to treat diarrhoea and dysentery, and a leaf decoction is given by draught against vomiting during pregnancy. A decoction of the whole plant is taken as an aphrodisiac (Bosch, 2004)

Table 2. Phytochemical screening of the 22 plant species selected for the study.

S/N	Plant Name and Family	Alkaloid	Tannin	Saponin	Steroid	Phlobatannin	Terpene	Flavonoid	Cardiac glycoside
1	*Spondias mombin*	+	+	+	+	-	-	+	-
2	*Cissus aralioides*	+	+	+	+	+	+	+	+
3	*Combretum racemosum*	+	+	+	-	-	+	+	+
4	*Combretum sp.*	+	+	+	-	-	-	+	-
5	*Ipomoea batatas*	+	+	+	-	-	+	+	+
6	*Merremia aegyptiaca*	+	+	+	-	-	+	+	-
7	*Cucurbita pepo*	+	+	+	-	-	-	+	+
8	*Momordica foetida*	+	+	+	+	-	+	+	-
9	*Ficus exasperata*	+	+	+	+	-	-	+	+
10	*Ficus thonningii*	+	+	+	+	-	+	+	-
11	*Myrianthus arboreus*	+	+	+	-	-	+	+	-
12	*Boerhavia diffusa*	+	+	+	-	-	+	+	+
13	*Tetracera potatoria*	+	+	+	-	+	+	+	-

Table 2 Contd.

14	*Harungana madagascariensis*	+	+	+	+	-	+	+	+
15	*Rauvolfia vomitoria*	+	+	+	-	-	-	+	+
16	*Passiflora foetida*	+	+	+	+	+	+	+	-
17	*Parquetina nigrescens*	+	+	+	-	-	+	+	-
18	*Piperomia pellucida*	+	+	+	-	-	+	-	+
19	*Spermacoce ocymoides*	+	+	+	+	-	+	+	-
20	*Spermacoce verticillatus*	+	+	+	-	+	+	+	-
21	*Lapportea aestuans*	+	+	+	+	-	+	+	+
22	*Poulzozia guineensis*	+	+	+	+	-	+	+	+

and alpha-pyrones in *P. foetida*.

P. nigrescens contains five of the phytochemicals, while steroid, cardiac glycoside and phlobatannin were absent. *P. pellucida* represents the family *Piperaceae* and it contains five phytochemicals,except steroid, phlobatannin and flavonoid. The family *Rubiaceae* is represented by two plants of the same genus, *S. verticillatus* and *S. ocymoides.* These two plants possess alkaloid, tannin, saponin, flavonoid and terpenoid. In addition, *S. verticillatus* has phlobatannin, but it does not have steroid, while *S. ocymoides* has steroid, but lacks phlobatannin. However, both of them lack cardiac glycoside. Both *L. aestuans* and *P. guineensis* possess seven of the phytochemicals, except phlobatannin.

Despite the fact that, *L. aestuans* and *P. guineensis* were found to be rich in phytochemical compounds, yet little is known or applied about their usefulness in Southwestern Nigeria. Therefore, it is recommended that more intensive ethnobotanical surveys be carried out about the plants within wider scope of human settle-ments. Alkaloid, tannins and saponins seems to be the most common to all of the plants used for this study, being tested present in all of the 22 plants, flavonoids were present in all of the plant samples except *P. pellucida*, while only four plant samples (*C. aralioides*, *T. potatoria, P. foetida* and *S. verticillatus*) possess phloba-tannin, making the secondary metabolite with the least distribution among the 22 plants used for this study.

Conclusions

Phytochemicals, generally have a wide range of pharmacological activities or actions (Trease and Evans, 1989). Most of these phytochemical constituents are potent bioactive compounds found in medicinal plant parts which are precursors for the synthesis of useful drugs (Sofowora, 1993). The synthesis of bioactive compounds is chemically difficult, because of their complex structure and high cost (Shimomura et al., 1997). All plant parts synthesize some chemicals by themselves which metabolize their physiological activities. These phytochemicals are used to cure the disease in herbal and homeopathic medicine. Alkaloids, the most revered of all the phytochemicals, are said to be pharmacologically active and their actions are felt in the autonomic nervous system, blood vessels, promotion of diuresis, respiratory system, gastrointestinal tract, uterus, malignant diseases, infections and malaria (Trease and Evans, 1989). In addition, alkaloids are antispasmodiac, analgesic and also have bactericidal effects (Okwu and Okwu, 2004). Tannins are well known for their anti-oxidant and anti-microbial properties, as well as for soothing relief, skin regeneration, as anti-inflammatory and diuretics (Okwu and Okwu, 2004). Saponins lower the cholesterol level; have anti-diabetic and anti-carcinogenic properties (Trease and Evans, 1989). In addition, Saponins are expectorants, cough suppressants and for haemolytic activities (Sofowora, 1993; Okwu, 2005). Flavonoids are significantly recognized for their anti-oxidant, anticarcinogenic, antimicrobial and antitumor properties (Manikandan et al., 2006), while cardiac glycoside acts on the heart muscles and increase renal flow (diuresis). Terpenes or terpenoids have anti-hepatoxic properties, thus, helping to prevent liver damage (cirrhosis), they equally have anti-microbial or anti-septic properties. Steroids regulate carbohydrate and protein metabolism, and possess anti-inflammatory properties. Phlobatannins on the other hand, have astringent or styptic properties.

These plants have proved to be very important in the medicinal plants' research and because of the phytochemicals that they possess, these plants are useful in drug research and development. Therefore, they are recommended for further studies on the pharmacological significance of the phytochemicals they possess in the body. Further studies are therefore, needed for the isolation and characterization of the specific phytochemical compounds responsible for a particular disease treatment narrated in Table 1. From this, it will be easy to synthesize an effective drug for the treatment of the disease on a large scale.

This study is another confirmation of the earlier stated facts that these plants are good sources of income for individuals, revenue generation and bioprospecting.

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