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Preliminary Screening of Medicinal plants in Nigeria for Phytochemicals and Essential Oils Constituents

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Abstract: Applications of plant extracts for medicinal purpose is based on its phytochemical and essential oil components. Therefore, this study was designed to screen some medicinal plants that are typical to Nigerian environment for their essential oil and phytochemicals constituents. The tests results indicated that methanolic extract of the stem bark/leaves of *Bosweillia dalzielii, Ocimum americanus, Hyptis spicigera, Hyptis suaveolens, Eucalyptus cammaldulensis, vossia cuspidata, Lavandula officinalis, Cinnamondedrone cubenes, D. microcarpun, D. Mespilisformis, Isoberlinia doka, L. korstringi, and K. sengalensis* contain basic metabolite and essential oils. The essential oil content deduced from steam distillation indicated significant concentrations in the studied plants.

Key Words: *Essential oils, phytochemicals, percentage yield, steam distillation*

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1.0 Introduction

Current researches have confirmed that phytochemicals (including essential oils) are significant components of plants because of their medicinal/pharmaceutical values (Edris, 2007). Essential oil is the concentrated hydrophobic liquid from plant that contain volatile components (Tongnuachan, 2014) while phytochemicals are chemicals produced by plants through primary or secondary metabolism in the plant (Kubmarawa, 2007). Several studies have revealed that most phytochemicals and essential oil have biological activities that have great benefits (Kubmarawa *et al*., 2013). Consequently, the valuable components of medicinal plants that provide preference in the management of diseases all over the world are the essential oil and phytochemicals (Emmanuel *et al*., 2015). Metabolites in medicinal plants when harness can serve as precursors for many novel molecules which can be used to alleviate the challenges of antimicrobial resistance microorganisms. Nigeria is endowed with medicinal plants and researches showing proximate, phytochemicals and essential oil constituents of most of these plants as well as their biological activities have been widely reported (Anyanwu and Okoye, 2017). For example, phytochemical screening of the stembark of *Bosweillia dalzielii* was reported by Hassan *et al.* (2009), which revealed the presence of sterols and terpenes, carbohydrates tannins, saponins, flavonoids and cardiac glycosides. Phenols, terpinoids glycosides and carbohydrates were identified in *Ocimum americanus* by Ghani (2003). Studies conducted by Ladan *et al.* (2011) indicated that phytochemical screening on leaf extract of *Hyptis spicigera* showed the presence of alkaloid, glycoside, flavonoids, carbohydrates tannins, steroids, terpenoids, resins, coumarins and quinines. Presence of sterols, flavonoids, tannins in various extracts of *Hyptis Suaveolense* was also confirmed by preliminary phytochemical screening and application of TLC and HPTLC methods (Chitra *et al*, 2009). Saponins were present in leaves, stem-barks, fruits and roots in aqueous extract of *Eucalyptus Comandulensis* and absent in seeds, while in ethanolic extracts of the leaves, fruits and roots were present and in stem-barks and seeds were absent. (Osuagwu, 2008). In another study of the same plant, alkaloids in ethanol extract showed significant concentration in leaves, stem-barks and seeds and absent in fruits and roots of (Hans-Walter, 2005) whereas, flavonoids were present in ethanolic extracts of fruits and roots. Furthermore, leaves, Stem-barks, roots fruits and seeds contain glycoside in aqueous extract (Harborne, 1998). Leaves, stem-barck and roots were rich in steroid but it is absent in fruit in aqueous extract while, in ethanol extract all the sections of the plant contain steroids (Okwu, 2001). Terpenoids were present only in root's

ethanolic extract of *Eucalyptus camaldulensis* (Hans-Walter, 2005).

Bosweillia dalzielii stem bark was reported to be effective in the management of rheumatism, gastrointestinal troubles (Dalziel 1956). The plant is also reported to exhibit anti-ulcer, antispamodic, analgesic anti-diarrhea and other beneficial properties (Chris, 2006; Hassan *et al*., 2009; Kubamarawa *et al*., 2011). An independent study conducted by Yusuf *et al.* (2009) revealed that. *Ocimum americanus* leaf is carminative, diaphoretic and is stimulant and is suitable for use in curing cold, cough, catarrh and bronchitis. The leaf extract was also demonstrated as good for treating dysentery and as a mouth-wash for relieving toothache. *Hyptis spicigera* leaf is reportedly used in Nigeria as drug, insecticide, and even as food stuff, the infusion from the leaf extract are useful against cough bronchitis and headaches (Jerovetz *et al*, 2000) and when mixed with grains it was found to exhibit strong insecticidal and repellent activities against insects (Lambert *et al* 2000). The essential oil obtained from this plant is used in folk medicine as antipyretic (Takayama *et al*, 2012). The leaves of *Hyptis suaveolens* have been utilized as a sudorific, galactogogue and as a cure for parasitic cutaneous diseases (Kingstone *et al* 1979). Toxicity of *Vossia cuspidata* was observed with scouring cattle when moved from the fibrous forest grazing to the rich plain grasses consisting of *Vossia cuspidata*, (Verboom and Brunt 1970). the resinous exudates from the trunk was reported as a cure for bladder infections when taken orally (El-Mahmood, 2010) while decoction of the plant is used to treat enteric infections including diarrhea and dysentery, constipations and other stomach problems, asthma, oral thrush, boils, sores, skin and wound infections, bronchitis, eczema and athletes foot (Bala, 2006; Duke and Ayensu, 1985). Ointments containing eucalyptus are also applied to the nose and chest to relieve congestion (Shagal *et al,* 2012). Aside its popular best use in the fragrance industry, Essential oil from *Lavandula officinalis* has a long history of medicinal use (Catherine and Kathi, 2001).

In view of the significant importance of several plants that are native of Nigeria and the dependency of their biological activities and other functional properties on phytochemical and essential oil components, this study is aimed at conducting phytochemical screening and test for the presence of essential oils in some medicinal plants that are common in Nigeria.

2.0 Materials and Methods

The collection site of the plant's material was obtained from Girei Local government Area of Adamawa State. The list of plants and their parts used in this research are given in Table 1 below:

Table 1: List of plants materials and their parts

Plants	Plant part used
Anogeissus leiocarpus Guill and Perr	Bark
Boswellia dalzielii Hutch	Bark
Cinnamondedrone cubenes Roxb	Leaf
Comiphora Kerstungii Engl	Bark
Deterium microcarpum Guill and Per	Leaf
Diospyros Mespiliformes Hochst ex.A.Dc	Leaf
Eucalyptus camaldulensis Dehnn	Leaf
Ficus Syconmorus Linn	Leaf
Hiptis spicigera Murubio	Leaf
Hyptis suaveolens Poit.	Bark
Isoberlinia doka Craib and Sapt	Leaf
Khaya Senegalensis A. Juss	Bark
Lannae Kerstingii Engl and K	Leaf
Lavandula officinalis Buscal and Muchl	Leaf
Ocimum americanus Sims.	Leaf
Parkia clapertonia Keay	Leaf
Vitex doniana SWEET	Leaf
Vossia cuspidate Griff.	Leaf

2.1 *Screening the extracts for bioactive componentsh*

Phytochemical screening for major constituents of the plant extracts was carried out using standard qualitative methods as described by various authors (Fadeyi *et al*., 1989; Kubmarawa *et al*., 2007, Odebiyi and Sofowora, 1990)

2.2 Extraction of essential oils

1 kg of the pulverized form of each of the samples was subjected to steam distillation in a steam distiller, according to the method adopted by Runde, *et al*, 2015. The time taken for the isolation of each of the oil was $2\frac{1}{2}$ hours. (Kubmarawa *et al*., 2011). Percentage yield of the essential oils was

determine using the method described by Runde and Kubmarawa, 2015.

3.0 Results and Discussion

Table 1 present information on phytochemicals identified in the studied plant samples. These include their content of saponins, tannins, flavonoids, alkaloids, glycoside and phenols, which are essential and basic phytochemicals. Screening for the presence of essential oil was also carried out and the information obtained are also presented in Table 2. Table 3 presents results for the percentage yield of essential oil in the studied plants

Table 2 Basic Phytochemical screening of some medicinal plants

Plants extract	Plants Parts	Sap	Tan	Fla	Alk	E.os	Gly	Phe
A. Leicarpus	Bark	-	+	+	+	+	+	+
B.Dalziellie	Bark	+	+	+	-	+	+	+
C. Cubenes	Leaf	+	+	+	-	+	-	+
C. Kerstringii	Bark	+	+	+	+	-	+	-
D.mespilisformis	Leaf	-	+	+	-	+	-	-
D. Microcarpun	Leaf	+	+	+	-	+	+	+
E.camaldulensis	Leaf	+	+	-	-	+	-	+
F. Sycomorus	Leaf	+	+	+	-	+	-	+
H.Spicigera	Leaf	-	+	-	-	+	-	-
H. Suaaveolens	Leaf	-	+	+	-	+	+	-
Isoberlinia doka	Leaf	+	-	+	+	-	-	+
K. sengalensis	Bark	+	+	+	+	-	-	+
L. Korstingii	Leaf	+	+	+	+	+	-	+
L. officinalis	Leaf	+	+	-	-	+	+	-
O. Americanus	Leaf	+	+	-	-	+	+	-
P. clapatonia	Leaf	+	+	+	+	-	+	+
V.cuspidata	Leaf	-	+	+	-	+	-	-
V. doniana	Leaf	+	-	+	+	+	+	+

**** Sap = Saponins, Tan = Tannins, Flav = Flavonoids, Alk = Alkaloids, E.os = essential oils, Gly = Glycosides, Phe = P, (+) = compound is present, (-) = compound is absence**

Table 3 Percentage Yield of Essential oils of the various plants

Plants	Plants Part and Form	Volume (ml)	Appearance	% yield (v/w)
B. dalzielli	Dried stem bark	1.2	Colorless	0.12
C. cubenes	Fresh .leaf	1.0	Clear yellow	0.1
E. camaldulensis	Fresh .leaf	1.2	Clear yellow	0.12
H. spicigera	Fresh .leaf	0.8	Colorless viscous	0.08
H. suaveolens	Fresh .leaf	0.8	Light yellow viscous	0.08
L. officinalis	Dried .leaf	0.6	Yellow viscous	0.06
O. americanus	Fresh .leaf	1.6	Light yellow	0.16
V. cuspidata	Fresh .leaf	0.5	Yellow viscous	0.05

From Table 2, the result of phytochemical screening of methanolic extract of the stem bark/leaves of the plants revealed that *Bosweillia dalzielii, Ocimum americanus, Hyptis spicigera, Hyptis suaveolens, Eucalyptus cammaldulensis, vossia cuspidata, Lavandula officinalis, Cinnamondedrone cubenes, Deterium microcarpum, Diospyros mespilisformis, Isoberlinia doka, Lannae korstringi, and Khaya sengalensis* have essential oils. All the plants contain tannins except *Vitex doniana* and *Isoberlinia doka*. Phenol is also common in most of the plants especially in those whose stem barks were analyzed. Glycosides is present in extracts from *A. Leic, arpus, B.Dalziellie, C. Kerstringii, D. Microcarpun, H. Suaaveolens L. officinalis, O. Americanus, P. clapatonia and V. doniana.* Saponin is present in 13 out of 18 plants samples while flavonoid is detected in 14, out of the 18 plants. Screening of the stem bark extract of *B. dalziellii* indicated the presence of saponins, tannins, flavonoids, essential oil,

glycoside and phenols while alkaloid is absent. Similarly, *A. leicarpus* stem bark extract does not contain saponins rather it has tanins, flavonoids, alkaloids, essential oils, glycosides and phenols. *L. korstringi* contain all the basic phytochemicals that were investigated.

Other researchers revealed that phenolic compounds such as phenolic acid, flavonoids, tannins, stilbenes, quinines and others have anticarcinogenic and antioxidant activities because they can act as reducing agents (Huang and Cai, 2010) whereas, saponin are reported to have anti-imflamatory, hypocholesterolemic and immune-stimulating properties (Oakenfull, 1996, Yukuyoshi *et al.*, 2012). Therefore, the therapeutic properties of these tested plants is likely linked to the presence of saponins, tannins, flavonoids, alkaloids, essential oils, glycosides and phenols. In respect of the above facts, our work is targeted at relating the presence of essential oil to the acclaim medicinal properties of these plants.

1 kg of each plant material was subjected to steam distillation for extraction of essential oils. The results presented in Table 3 show that *Ocimum americanus* leaves has the highest percentage yield of 0.16 %, followed by *Eucalyptus camaldulensis* and *Bosweillia dalzielii* each with percentage yield of 0.12 %. Other percentage yields include; *Cinnamondedrone cubenes* (0.1 %), the two lamiceae family, *Hyptis spicigera* and *Hyptis suaveolens* (0.08 %) each, *Lavandula officinalis* (0.06 %) and *Vossia cuspidata* (0.05 %).

The yield of essential oils varies with factors like site of collection, time of collection, part and form of plant used and the extraction method employed among others (Baser *et al.*, 2010). Different percentage yield has been reported by other researchers for *Hyptis spicigera* to be 0.2 % obtained from Benin republic, Mali (0.3 %), Cameroon (0.12 %), and Togo (1.2 %) (Kini *et al.,* 1993, Sidibe *et al.*, 2001 Tchoumbougnong *et al*, 2005, Koba *et al.*, 2007, and, Bognonou *et al.*, 2013). On the other hand, the percentage yield of the essential oils of leaves, stem bark and flowers of *Eucalyptus camaldulensis* obtained from Malaysia were 1.4, 0.5 and 0.46 % respectively (Elanaiem *et al.*, 2015). Similar report shows that the percentage yield of *Ocimum gratissimum* a mint plant like *Ocimum americanus* were 0.97 and 0.83 % as reported by Owokotomo *et al.,* 2012 which is higher than 0.16 yield for *Ocimum americanus* obtained from this work. Hydrodistillation of *Boweillia dalzielii obtained* from Nigeria was reported to have yielded 1.25 % essential oil (Kubmarawa *et al.,* 2011) higher than what was obtained in our work. The variation observes in percentage yields as reported by other authors and that of the present work can be attributed to the geographical characteristics of the ecological zone, vegetative state of the plant species as well as the plant part and the method of extraction of the essential oil (Bognonou *et al.*, 2013).

4.0 Conclusion

From the results obtained, it can be concluded all the plants subjected to phytochemical screening showed presence of metabolites. However, only eight (8) plants namely; *Bosweillia dalziellia, Ocimum americanun, Hyptis Spicigera, Hyptis Suaveolens, Vossia Cuspidata, Eucalyptus camaldulensis, Lavandula officinalis*, and *cinnamondedrone cubines* having strong odouring charecterestics, and as such yielded essential oils when subjected to steam distillation process. However, the percentage yield of these plants is within commercial range. Therefore, the result on the yield of essential oil by plant shown in this work is in line with the definition that essential oils are obtained from odoriferous plants (Baser *et al,* 2010).

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