PHYTOCHEMICAL AND GCMS ANALYSES OF MEDICINAL PROPERTIES OF ETHANOL EXTRACT OF *Gossypium barbadense* LEAVES

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ABSTRACT

Medicinal plants are sources of important therapeutic aīds for alleviating human ailments. The traditional use of medicinal plants leaf extract for diseases is quite common in developing countries like Nigeria. This research work is carried out to analyze major bioactive compounds present in the leaf extract of *Gossypium barbadense.* The Phytochemical analysis carried out indicated the presence of Terpenoids, Steroids, Saponins, Cardiac Glycosides and Flavanoids while the Gas Chromatography-Mass Spectrometer Analysis indicated twenty-eight compounds which possess many biological properties among which are Squalene(4.43%), Phytol(17.38%) and 9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z) (13.34%). The presence of some of these constituents in the plant extract may be responsible for the antimicrobial, anti-tumor, and antioxidant properties of the leaf. Therefore, the leaf is a good source of active phytochemicals and can be used for clinical trials which may produce positive results in future.

Key words: Medicinal Anti-microbial
Gossypium barbadense
Phytotherapy

INTRODUCTION

Traditional medicine is "the knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures, used in the maintenance of health and in the prevention, diagnosis, improvement

or treatment of physical and mental illness" (WHO, 2010). There are many different systems of traditional medicine, and the philosophy and practices of each are influenced by the prevailing conditions, environment, and geographic area within which it first evolved (WHO, 2005), however, a common philosophy is a holistic approach to life, equilibrium of the mind, body, and the environment, and an emphasis on health rather than on disease. Generally, the focus is on the overall condition of the individual, rather than on the particular ailment or disease from which the patient is suffering, and the use of herbs is a core part of all systems of traditional medicine. (Engebretson 2002; Conboy *et al*. 2007),

Over the past 100 years, the development and mass production of chemically synthesized drugs have revolutionized health care in most parts of the word. However, large sections of the population in developing countries still rely on traditional practitioners and herbal medicines for their primary care. In Africa up to 90% and in India 70% of the population depend on traditional medicine to help meet their health care needs. In China, traditional medicine accounts for around 40% of all health care delivered and more than 90% of general hospitals in China have units for traditional medicine (WHO, 2005).

Gossypium barbadense commonly called Cotton is the most important group of fibre plants in the world. The main fibres of cotton

plants are the longer seed hairs ('lint'), used for making yarn to be woven into textile fabrics, alone or in combination with other plant, animal or synthetic fibres. Cotton lint is also made into other products including sewing thread, cordage and fishing nets. The lint of *Gossypium barbadense* is especially valued for use in high-quality textiles, luxury fabrics, yarns and sewing thread. (Todou and Konsala, 2011).

Gossypium barbadense is widely used in African traditional medicine. In West Africa countries like Nigeria, Côte d'Ivoire, Senegal and Benin a leaf infusion is used as eyewash for the treatment of eye affections and wound dressing. In Mali the leaf juice diluted with water is used as eye drops for the treatment of conjunctivitis. The leaf juice is taken for the treatment of cough, dystocia and vertigo, and a decoction of the leaves with those of *Pergularia daemia*is taken against convulsions. In Cameroon a leaf decoction is taken for the treatment of jaundice, pounded leaves are used in poultices against stomach-ache and constipation, and seed oil is used against otitis. In Gabon, the leaf maceration is taken against gonorrhoea and as an emetic, while the sap is considered emollient and externally applied against itch. In Congo the leaf sap is instilled in the ear for the treatment of otitis, leaf decoctions are drunk against cough, the leaf is rubbed on the body to cure scabies. The leaf infusion is usually drunk for the treatment of colds, bronchitis, rheumatism and haemorrhoids. It is also kept in the mouth to treat dental caries and gingivitis. Pounded leaves are applied on cuts, abscesses and used for the treatment of leprosy. Pulped young shoots are used against palpitations, and the fibre in dressings on wounds. In Kenya the lint is used as dressing on sores. (Todou and Konsala, 2011).

In recent times, there has been an urgent need to develop safer and less expensive drugs for the treatment of various ailments. Hence, there is a growing interest in the pharmacological evaluation of various plants used in traditional systems of medicine. This research work is therefore carried out to elucidate the chemical composition of *Gossypium barbadense* to reveal its therapeutic properties which can be utilized in the development of modern drugs.

MATERIALS AND METHODS

Fresh leaves of *Gossypium barbadense* obtained from owu-ikija area in ogun state, Nigeria were cut and washed with water to remove all contaminants after being identified and authenticated at the department of Plant Science and Animal Physiology, Olabisi Onabanjo University, Ogun State. They were air dried under room temperature and ground to powder. The powdered leaves were extracted with ethanol using soxhlet extractor.

Phytochemical Screening:

Phytochemical compositions of the leaves were determined using the methods variously described by Trease and Evans (1996) and Sofowora (1993).

Gas Chromatography Mass Spectrometer (GC-MS) Analysis.

The plant powder was extracted with ethanol and analyzed using GC-MS analyzer. The data were obtained on an Elite-1(100% Dimethyl poly siloxane) column (300.25mm 1umdf). Helium (99.999%) was used as the carrier gas with flow rate of 1ml/min in split mode (10:1). An aliquot of 2ul of ethanol solution of sample was injected into the column with the injector temperature at 250^{o} C.GC oven temperature stared at 110^{o}C and holding for 2mins and it was raised to 200^{o}C at

the rate of 10oc/min, without holding. Holding was allowed at 280^{o}c for 9mins with program rate of 5oc/min. The injector and detector was temperature was set at 250^{o}c and 280^{o}c respectively. Ion source temperature was maintained at 200^{o}c. The mass spectrum of compounds in sample was obtained by electron ionization at 70ev and the detector was operate in scan mode from 45-

459amu (atomic mass units). A scan interval of 0.5seconds and fragment from 45to 450 Da was aintained. The total running time was 27 minutes.

RESULT AND DISCUSSION

Table 1: Phytochemical Analysis of the ethanolic Extract of *Gossypium barbadense* Leaves

Tannins	–
Saponins	+
Flavonoid	+
Alkaloids	–
Steroids	+
Glycosides	–
Cardiac glycoside	+
Terpenoids	+

Key. + present - Absent

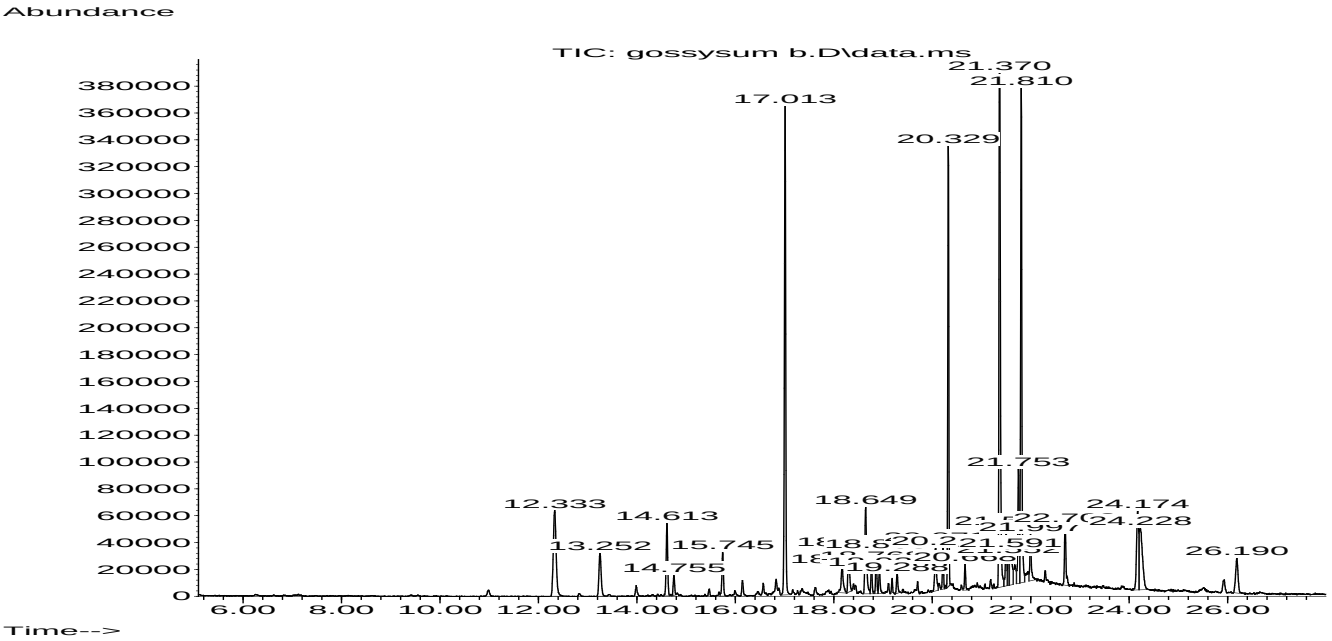

Figure 1: GC-MS Spectra of ethanolic extract *Gossypium barbadense*

The spectra of the Gas chromatography-mass spectroscopy analysis of the ethanolic extract of *Gossypium barbadense* leaves is as shown in figure 1 above. Twenty five bioactive compounds were identified in ethanolic extract of *Gossypium barbadense* leaves**.** The identification of these compounds is based on the Peak Area (%), Retention time (RT), Molecular weight (MW), Molecular formular. The highest peak area(%) of 17.38 was obtained by Phytol with Retention time 21.372 and Lowest peak area (%) of 0.61 was obtained by Tetradecyl-Oxirane with Retention time 19.289.

Table 2: Phytochemical component identified in the ethanolic leaf extract of Gossypium barbadense by GC-MS

S/N	RT	Name of Compound	Molecular Formular	MW	Peak Area %
1	12.331	1,7-Octadiene, 2,7-dimethyl-3,6-bis(methylene)-	$C_{12}H_{18}$	162.27	5.23
2	13.252	.alpha.-Caryophyllene	$C_{15}H_{24}$	204.35	2.08
3	14.614	(Z,Z)-.alpha.-Farnesene	$C_{15}H_{24}$	204.35	2.44
4	14.757	Benzene, 1,4-diethyl	$C_{10}H_{14}$	134.22	0.61
5	15.747	1,3,6-Octatriene, 3,7-dimethyl-, (Z)-	$C_{10}H_{16}$	136.23	1.45
6	17.011	Bicyclo[3.1.1]hept-2-ene,2,6dimethyl-6-(4-methyl-3-pentenyl)-	$C_{15}H_{24}$	204.35	13.70
7	18.173	Cyclopentene, 1-(1-methylethyl)-	C_8H_{14}	110.19	1.25
8	18.305	3-Decen-2-one,3-methyl-	$C_{11}H_{20}O$	168.28	1.54
9	18.648	1,1,3-Trimethyl-1-silacyclo-3-pentene $C_7H_{14}Si$		126.27	3.29
10	18.768	1,1,1,5,7,7,7-Heptamethyl-3,3-bis (trimethylsiloxy)tetrasiloxane	$C_{13}H_{40}O_5Si_6$	444.97	0.83
11	18.865	Bicyclo[3.1.1]heptane, 2,6,6-trimethyl-	$C_{10}H_{18}$	138.25	1.08
12	18.928	Oxirane,[(hexadecyloxy)methyl]-	$C_{19}H_{38}O_2$	298.00	0.77
13	19.289	Oxirane, tetradecyl-	$C_{16}H_{32}O$	240.42	0.61
14	20.073	Phthalic acid, 5-methylhex-2-yl heptadecyl ester	$C_{32}H_{54}O_4$	502.77	1.71
15	20.221	3-Isopropoxy-1,1,1,7,7,7-hexamethyl tris(trimethylsiloxy)tetra siloxane	$C_{18}H_{52}O_7Si_7$	577.20	1.04
16	20.330	Hexadecanoic acid, ethyl ester	$C_{18}H_{36}O_2$	286.00	10.01
17	20.668	1,6,10,14-Hexadecatetraen-3-ol, 3, 7,11,15-tetramethyl-, (E,E)-	$C_{20}H_{34}O$	290.48	0.69
18	21.372	Phytol	$C_{20}H_{40}O$	296.00	17.38
19	21.503	3-Isopropoxy-1,1,1,7,7,7-hexamethyl-3,5,5-tris(trimethylsiloxy)tetra siloxane	$C_{18}H_{52}O_7Si_7$	577.00	1.68
20	21.555	1-Tetradecyne	$C_{14}H_{28}$	196.00	0.87

21	21.589	1-Methyl-2-methylenecyclohexane	C_8H_{14}	110.00	1.90
22	21.755	9,12-Octadecadienoic acid, methyl ester,(E,E)-	$C_{19}H_{34}O_2$	294.00	3.14
23	21.812	9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-	$C_{19}H_{32}O_2$	292.46	13.34
24	21.995	Octadecanoic acid, ethyl ester	$C_{20}H_{40}O_2$	312.53	1.49
25	24.227	Squalene	$C_{30}H_{50}$	410.00	4.43

DISCUSSION

Plants have provided mankind a large variety of potent drugs to alleviate suffering from diseases in spite of spectacular advances in synthetic drugs in recent years; some of the drugs of plant origin have still retained their importance.

The results obtained for the phytochemicals screening and the Gas chromatography- Mass spectrometer analysis of *Gossypium barbadense* are depicted in table 1 and table 2 above. The result obtained from the phytochemical screening shows the presence of Saponins, Flavonoid, Steroids, Cardiac Glycosides, and Terpenoids while the GC-MS analysis revealed the presence of twenty-five compounds which possess many bioactive properties. Phytol which is the major constituent among the twenty-eight compounds of this present possess some medicinal properties. Okiei *et al*., (2009); Kumar and Basu (1994) have suggested that phytol would be effective as an anti-inflammatory agent in such parts of the human anatomy. A concluding remark in the study states that reactive oxygen species-promoting substances such as phytol constitute a promising novel class of pharmaceuticals for the treatment of rheumatoid arthritis and possibly other chronic inflammatory diseases. It is therefore possible to infer that phytol and its isomers maybe the therapeutic constituent in the essential oil useful for the management of asthma.

Hexadanoic acid, ethyl ester, 9,12,15-Octadecatrienoic acid, methyl ester, Squalene,1-tetradecyne, 1-Methyl-2-methylenecyclohexane,

Bicyclo[3.1.1]heptane, 2,6,6-trimethyl have been reported effective as an anti inflammatory, antioxidant, antibacterial, anti tumor, cancer preventive, hepatoprotective, nematicide, insectifuge, antihistaminic, antieczemic, antiacne, antiandrogenic and antiarthritic. (Devi and Muthu, 2014; Banu and Nagarajan, 2013).

During the past few years, squalene was found by some Researchers to have shownantioxidant and protective activities against several carcinogens. (Gunes ,2013; Kelly 1999)

Experimental studies have shown that squalene can effectively be utilized in cosmetics dermatology. (Zih-Rou *et al*., 2009).

In conclusion, ethanolic extract of *G.barbadense* leaves can be useful medically as an anti-inflammatory, antiezemic, anti tumor and cancer preventive agent. Therefore, leaves of *Gossypium barbadense* are good source of active phytochemicals and can be employed for clinical trials which may generate successful results in future

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