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DETERMINATION OF CHEMICAL COMPOSITION AND SCAVENGING EFFECTIVENESS OF LEAF EXTRACTS OF TERMINALIA CATAPPA IN GEIDAM LOCAL GOVERNMENT AREA OF YOBE STATE, NIGERIA.

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ABSTRACT

Medicinal plants have been identified and used throughout human history, plants have ability to synthesize a wide variety of chemical compounds. Many of which are efficacious and contain compounds that are potential drugs which require further examinations. Plants are rich in a wide variety of secondary metabolites such as tannins, terpenoids, alkaloids and flavonoids etc., which have been found to possess to antimicrobial properties in vitro. Antioxidants are molecules that inhibit or quench free radical reactions and delay or inhibit cellular damage. Although, almost all organisms possess antioxidant defence and repair systems that have evolved to protect them against oxidative damage, these systems are insufficient to prevent the damage entirely. However, antioxidant

Introduction:

Medicinal plants have been in used throughout human history to treat aliment and diseases. Plants have the ability to synthesize a wide variety of chemical compounds (Lai and Roy, 2004). Many of which are efficacious and contain substances that are potential drugs that require further examinations (Abdulrahman *et al.,* 2007). Plants have evolved with the ability to synthesize chemical compounds that can help them defend against attack from a wide variety of predators such as insects, fungi and herbivorous mammals (Neelavathi *et al.,* 2013). Plants are rich in a wide variety of secondary

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supplements, or foods containing antioxidants, may be used to help human body reduced oxidative damage. Studies on the nutritional value and biological activity of the kernel of Terminalia catappa revealed that it has a good digestibility, exerts a strong antioxidant activity, possesses anti-HIV properties, anti-asthma properties, anti-inflammatory, anti-carcinogenic, antibacterial and hepatoprotective properties. The fresh leaf of Terminalia catappa was air dried under laboratory condition, was ground into fine powder extracted with methanol using cold infusion method and partitioned using solvent of gradient polarities such as n-hexane, ethyl acetate and n-butanol. Methanol crude extract, n-hexane portion, ethyl acetate portion, n-butanol portion and aqueous portion revealed the presence of carbohydrate, cardiac glycoside, flavonoid, terpenoids, saponins, tannins and alkaloid. However, soluble starch, phlabotannins and glycosides were not found in the extracts. The methanol crude extract showed the percentage inhibition of 98.25 at 10ug/ml, 97.40 at 20µg/ml, 96.94 at 30µg/ml, 96.63 at 40µg/ml and 97.10 at 50µg/ml; n-butanol portion showed the percentage inhibition of 95.75 at 10ug/ml, 96.40 at 20µg/ml, 96.15 at 30µg/ml, 96.40 at 40µg/ml and 96.15 at 50µg/ml; n-hexane portion showed the percentage inhibition of 95.50 at 10ug/ml, 95.65 at 20µg/ml, 95.80 at 30µg/ml, 95.75 at 40µg/ml and 95.75 at 50µg/ml; ethyl acetate portion showed the percentage inhibition of 78.35 at 10ug/ml, 87.65 at 20µg/ml, 95.00 at 30µg/ml, 94.75 at 40µg/ml and 94.70 at 50µg/ml and the aqueous portion showed the percentage inhibition of 94.40 at 10ug/ml, 95.10 at 20µg/ml, 96.00 at 30µg/ml, 95.50 at 40µg/ml and 96.05 at 50µg/ml.

Keywords: *Terminalia catappa, Phytochemicals, Proximate analysis, Elemental analysis, Secondary metabolites*

Metabolites such as tannins, terpenoids, alkaloids and flavonoids etc, which have been found in vitro to have antimicrobial properties (Dahanukar, 2000). Terminalia Catappa is a large, deciduous tree with smooth grey bark and whorled branches that form a canopy and is found in tropical and subtropical

regions, it is widely planted throughout the tropics as an ornamental tree for shade for the edible nuts. Terminalia catappa contains hydrolyzable tannins punicalagin (major tannin), punicalin, terflavins A and B, tergallagin, tercatain, chebulagic acid, geraniin, granatin B, corilagin), flavonoids (isovitexin, vitexin, isoorientin, rutin) and triterpenoids (ursolic acid, 2α, 3β, 23-trihydroxyurs-12-en-28 oic acid and asiatic acid) (Liu et al., 1996 and Kinoshita et al., 2007). The leaves, bark and fruit of the tree Terminalia catappa L. (Combretaceae) have been commonly used as a folk medicine for antidiarrhea, antipyretic and haemostatic purposes (Lin, 1992). The leaves of T. catappa have been used for the prevention and treatment of hepatitis and liver-related diseases (Lin and Khan, 1990).Antioxidants are molecules that inhibit or quench free radical reactions and delay or inhibit cellular damage (Young et al., 2001). Although almost all organisms possess antioxidant defence and repair systems that have evolved to protect them against oxidative damage, these systems are insufficient to entirely prevent the damage (Simic, 1988). The aim of this study is to find out chemical composition and scavenging effectiveness of the leaf of Terminalia catappa.

Methodology

Sample collection and Preparation

Fresh leaf of *Terminalia catappa* was collected from Geidam local government of Yobe State, Nigeria, and identified by a Plant Taxonomist. The plant leaf material was air-dried in the laboratory at room temperature. The leaf of the plant was ground to fine powder using wooden mortar and pestle and the sample was given a voucher number (TT99), stored in the laboratory Department of science laboratory technology (S.L.T) Mai Idris Alooma Polytechnic Geidam for further analysis.

Sample extraction and Partitioning

The ground leaf material (800g) was extracted with 85% methanol using maceration (cold infusion) method for 72 hours. The crude extract was concentrated under reduced temperature. The crude extract was then stored in a desiccator. The methanol extract of *Terminalia catappa* was

partitioned with n-hexane until exhaustion. The aqueous fraction was partitioned with ethyl acetate and also partitioned exhaustively with n-butanol. The n-butanol portion and the aqueous portion were then evaporated using rotatory oven.

Phytochemical Screening of *Terminalia catappa*

Phytochemical screening was carried out on the methanol crude extract and the partitioned portions of the plant *Terminalia catappa* using standard protocols as described by (Trease and Evans, 2002, Silver *et al*., 1998, Markham, 1987, Brain and Turner, 1975).

Antioxidant Studies

The free radical scavenging capacity of the extracts was determined using 1,1-Diphenyl l,2- Picrylhydrazyl (DPPH) (Li *et al.,* 2001).

Results and Discussion

Table 1: Phytochemical Screening of *Terminalia catappa* Methanol Crude extract, n-Hexane Portion, Ethyl acetate Portion, n-Butanol Portion, and Aqueous Portion.

S/NO.	Test	MCE	NHP	EAP	NBP	AQP
1.	Carbohydrate	+	-	-	+	+
2.	Soluble starch	-	-	-	-	-
3.	Phlabotannins	-	-	-	-	-
4.	Glycosides	-	-	-	-	-
5.	Cardiac glycoside	+	-	-	+	+
6.	Flavonoid	+	-	-	+	+
7.	Terpenoid	+	+	+	-	+
8.	Saponins	+	-	-	-	+
9.	Alkaloid	+	-	-	+	-
10.	Tannins	+	-	-	+	+

Key: MCE = Methanol Crude Extract, NHP = n-Hexane Portion, EAP = Ethyl Acetate Portion, NBP= n-Butanol Portion, AQP = Aqueous Portion, (+) = Present and (-) = Absent.

Methanol crude extract, n-hexane portion, ethyl acetate portion, n-butanol portion and aqueous portion revealed the presence of carbohydrate, cardiac glycoside, flavonoid, terpenoids, saponins, tannins and alkaloid. However, soluble starch, phlabotannins and glycosides were not found in the extracts. The presence of secondary metabolites in the *Terminalia catappa* such as tannins, cardiac glycoside, flavonoid, saponins and Phenolic compound, indicates or implicate the medicinal value of it. These compounds have been reported to have antioxidants property and exhibit a wide range spectrum of medicinal properties such as anti-cancer, anti-inflammatory and anti-diabetes (Odukoya *et al.,* 2005, Abdulrahman *et al.,* 2010).

Table 2: Percentage Inhibition of Standard, Methanol extract, n-Butanol Portion, n-Hexane Portion, Ethyl acetate Portion, and Aqueous Portion of *Terminalia catappa*

S/NO.	Extract	10µg/ml	20 µg/ml	30 µg/ml	40 µg/ml	50 µg/ml
1	VIT C	99.25±0.05000^a	98.95±0.05000^a	98.85±0.1500^a	96.65±1.850^a	98.25±0.250^a
2	ME	98.25±0.1500^a	97.40±0.2000^a	96.94±0.03500^a	96.63± 0.035^a	97.10±0.1000^a
3	NBP	95.75±0.3500^a	96.40±0.3000^a	96.15±0.7500^a	96.40±1.000^a	96.15±1.050^a
4	NHP	95.50±0.9000^a	95.65±1.550^a	95.80±1.700^a	95.75±1.950^a	95.75±2.150^a
5	EAP	78.35±0.95^b	87.65±0.7500^a	95.00±1.200^a	94.75±1.450^a	94.70±0.900^a
6	AQP	94.40±0.0^a	95.10±0.3000^a	96.00±0.1000^a	95.50±0.1000^a	96.05±0.150^a

Key: VIT C = Vitamin C (Ascorbic acid), ME = Methanol extract, NBP = n-Butanol Portion, NHP = n-Hexane Portion, EAP = Ethyl Acetate Portion, and AQP = Aqueous Portion.
a = $P \leq 0.05$ significance across the column
b = $P \leq 0.05$ insignificance across the column

Conclusions

The results of antioxidant evaluation showed that the methanol crude extract as well as the partitioned portions indicates promising antioxidant properties of leaf of *Terminalia catappa,* the reducing power of the extracts compared with the reference standard antioxidant drug (ascorbic acid). The DPPH antioxidant assay is based on the ability of DPPH, a stable free

radical, to decolorize in the presence of antioxidants. This study has already shown that the leaf of *Terminalia catappa* contains many medicinal and important phytochemicals.

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