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PHYTOCHEMICAL PROFILE OF SELECTED MORPHOLOGICAL ORGANS OF *COCOS NUCIFERA L.*

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ABSTRACT
Cocos nucifera is a fascinating plant with different uses ranging from domestic to therapeutic. Its therapeutic properties can however not be untraced to its phytochemical profile. In this experimental study, the presence of tannin, phenol, flavonoid, saponin, alkaloid and volatile oil was determined in the endosperm (coconut meat), endocarp (coconut hard shell) and leaf extracts of *Cocos nucifera* at 1, 2, 3, 4, 5 % concentrations of aqueous, ethanol, methanol and ethylacetate solvents. This qualitative analysis reveals that all tested phytochemicals are present in the selected morphological organs of the plant. However, their presence is not proportional. Volatile oil was only present in the endocarp extract at 1, 2 % ethylacetate and 5% ethanol concentrations. In the same vein, phenol was only found present in endocarp extract of the plant. Alkaloid and flavonoid were identified in the leaf extract of the plant only. The presence of tannin and saponin were confirmed in all considered organs of the plant. We therefore conclude that the presence of certain phytochemicals in all selected morphological organs of *Cocos nucifera* shows that the considered organs might be of therapeutic use.

KEYWORDS: *Cocos nucifera*, coconut hard shell.

INTRODUCTION
Cocos nucifera L., popularly known as coconut or coconut palm has been described as the "tree of life" or "tree of heaven" and an indispensable gift to man because each part of tree is valuable.[1] It is a dominant type tree belonging to the Family arecaceae (palm), Order arecales and it is the sole species of the Genus cocos.[2] The coconut palm is monoecious, (female and male flowers on the same inflorescence) called a spadix, which develops within a woody sheathe or spathe. At flowering, the woody sheathe splits lengthwise to expose the spadix. Every spadix comprises of a principle hub 1–1.5 m (3.3–5 ft) long with 40–60 branches or spikelets bearing the blossoms. Under ideal developing conditions, first blossoming happens around 4–5 years subsequent to planting.[1]

Figure 1: Coconut tree.

The multipurpose coconut fruit comprises an outer epicarp, a mesocarp, and an inner endocarp. The epicarp (the outer skin of the fruit), and the mesocarp, (the heavy, fibrous, and tanned when dry) have many industrial uses. The endocarp is the hard dark core. Inside is a solid white albumen (solid endosperm) of varied thickness, depending on the age of the fruit, and with an oily pulp consistency and a liquid albumen

(liquid endosperm) called coconut water that is thick, sweet, and slightly acidic.[3, 4]

Figure 2: Coconut solid endosperm.

Figure 3: Coconut endocarp.

Coconut has been reported to have diverse medicinal use both in traditional and modern medicine. For example it is used as antitumors[5], antihelmintic, antidotal, antiseptic, astringent, bactericidal, diuretic, purgative, vermifuge, stomachic and supportive substance.[6] It's also been identified to cure common diseases such as abscesses, asthma, bronchitis, cold, constipation, cough, earache, fever, flu, gingivitis, jaundice, nausea, rash, scabies, scurvy, sore throat, toothache, tuberculosis, typhoid and veneral diseases.[7] It's effectiveness in treating and preventing chronic diseases such as heart disease, chronic fatigue syndrome, osteoporosis, gall bladder disease, Crohn's disease, prostate enlargement and cancer because of its composition and high medium chain fatty acid content has been reported[8] In modern medicine, coconut is said to boast infant's immune system[9], aids nutrients digestion and absorption, prevents obesity, regulates thyroid function, boosts energy and fights fatigue.[10,11,12] It also stimulates thyroid and insulin hormones secretion.[13,14] These therapeutic properties are however a function of the various phytochemicals present in the plant. Dyana JP and Kanchana G (2012) reported the presence of the following phyto-constituents in various extract of coconut leaf: alkaloids, flavanoids, tannins and carbohydrates (chloroform extract); alkaloids, flavanoids, phenols, carbohydrates and aminoacids (methanol extract), phytosterols and tannins (ethanol extract), flavanoids, phenols, tannins, carbohydrates (hydroalcoholic extract), alkaloids, flavanoids, phenols, tannins and carbohydrates (aqueous extract).[15] The phytochemical analyses on the endosperm of coconut palm also showed the presence of alkaloids, tannins and resins (high concentration); saponins and glycosides (moderate concentration); Terpenoids and steroids (least concentration).[16] In this research work, qualitative phytochemical profiling was done to determine the presence of tannin, phenol, flavonoid, saponin, alkaloid and volatile oil in 1, 2, 3, 4, 5 % concentrations aqueous, ethanol, methanol and ethylacetate extract of the solid endosperm (coconut meat), endocarp (hard shell) and leaf of *Cocos nucifera L.*

MATERIALS AND METHODS

Chemical and reagents

Acetone, Methanol, Ethanol-2,2-diphenylpicrylhydazl (by Sigma Aldrich Chemic. Co. Gmbtt Germany), Folin-ciocalteau, Hydrogen peroxide, Sodium hydroxide, Normal Saline, Acidified ferrous ammonium sulfate, 1,10-Phenanthione, ThioBarbituric Acid (TBA), Glacial Acetic Acid (GAA), Heavy $FeSO_4$, Mercury chloride, potassium iodide, hydrochloric acid, Iron (III) chloride, Ethanol, Ethyl acetate, Methanol, sodium bicarbonate, aluminum chloride.

Plant

The three selected morphological parts of *Cocos nucifera L* used for this experimental analysis are leaf, endosperm and endocarp. The considered parts were dried, grinded and soaked separately in 20mls of distilled water, 1% volume per volume (v/v), 2% v/v, 3%v/v, 4%v/v ethylacetate, methanol and ethanol for 24 hours after which they were sieved to obtain aqueous, ethylacetate, methanol, ethanol extracts respectively. The experimental samples used are the collected filtrates.

Test for tannins and phenols

1ml of filtrate was added to 2drops of $FeCl_3$. Green precipitation indicates the presence of Tannin and Deep Bluish green or Dark green color indicate the presence of Phenol.[17]

Test for alkaloids

2 drops Of Mayer's Reagent and 2 drops of 2% v/v HCl were added to 1ml of filtrate. Cream or off white colour indicates the presence of Alkaloid.[16]

Test for flavonoids

3 drops of 20% v/v of NH_3 added to 1ml of extract after which few drops of H_2SO_4 was added. Intense Bright Yellow coloration suggests the presence of flavonoids.[18]

Test for saponin
1ml of distilled water was added to 1ml of the sample. Formation of foam after vigorous shaking for about 20minutes indicates the presence of Saponin.[19]

Test for volatile oil
In the test for volatile oil, 0.2mls of 1% w/v NaOH was added to 1ml of Sample. Presence of Precipitate indicate presence of Volatile Oil.

RESULTS AND DISCUSSION

Table 1: Phytochemical screening of *Cocos nucifera* Leaf.

Extracts	*Cocosnucifera*(Leaf)					
	Alkaloid	Volatile oil	Saponin	Phenol	Tannin	Flavonoid
Aqueous	_	_	_	_	_	_
1% Ethyl acetate	_	_	++	_	+++	++
2% Ethyl acetate	_	_	+	_	++	++
3% Ethyl acetate	_	_	_	_	+++	+++
4% Ethyl acetate	_	_	_	_	+	_
5% Ethyl acetate	_	_	_	_	++	++
1% Ethanol	++	_	_	_	_	_
2% Ethanol	+	_	++	_	_	_
3% Ethanol	_	_	_	_	_	++
4% Ethanol	_	_	+	_	_	_
5% Ethanol	_	_	_	_	_	+
1% Methanol	++	_	++	_	_	+++
2% Methanol	++	_	+	_	_	++
3% Methanol	_	_	+	_	_	+
4% Methanol	_	_	+	_	_	++
5% Methanol	_	_	_	_	_	++

The phytochemical profiling of Cocos nucifera leaf as shown in table 1 reveals that alkaloid was present in 2% ethanol and moderately present in 1% ethanol, 1,2 % methanol extracts. Volatile oil and Phenol was absent at all concentrations of the extracts (i.e. distilled water, ethyl acetate, ethanol, methanol extracts) of Cocos nucifera leaf. Saponin was moderately present in 1% ethylacetate, 2% ethanol, 1% methanol and present in 2% ethyl acetate, 4% ethanol and 2, 3 and 4% methanol extracts. Tannin was highly present in 1 and 3% ethyl acetate, moderately present in 2 and 4% and present in 5% ethyl acetate. Flavonoids was detected in moderate amount in 1, 2 and 5% ethyl acetate, 3% ethanol and 2, 4, 5% methanol extracts but highly present in 3% ethyl acetate and 1% methanol extracts. It was present in 3 % methanol and 5% ethanol.

Table 2: Phytochemical screening of *Cocos nucifera* endocarp.

Extracts	*Cocosnucifera*(Endocarp)					
	Alkaloid	Volatile oil	Saponin	Phenol	Tannin	Flavonoid
Distilled water	_	_	_	++	_	_
1% Ethyl acetate	_	+	++	++	++	_
2% Ethyl acetate	_	_	++	+++	+	_
3% Ethyl acetate	_	_	_	++	_	_
4% Ethyl acetate	_	+	++	++	+	_
5% Ethyl acetate	_	_	++	+	+	_
1% Ethanol	_	_	_	_	_	_

2% Ethanol	_	_	+	+++	+++	_
3% Ethanol	_	_	+	++	++	_
4% Ethanol	_	_	+	+	_	_
5% Ethanol	_	+	+	+	_	_
1% Methanol	_	_	+	+	++	_
2% Methanol	_	_	+	+	+	_
3% Methanol	_	_	_	+++	++	_
4% Methanol	_	_	+	+++	+++	_
5% Methanol	_	_	+	+	+	_

Table 2 is the phytochemical profiling result of Cocos nucifera endocarp. Alkaloid and flavonoids were absent in all the extracts (distilled water, ethyl acetate, ethanol and methanol) at all chosen concentrations. Volatile oil was present in 1, 4% ethylacetate and 5% ethanol. Saponin was moderately present at all concentrations of ethylacetate extracts except 3% concentrations where it was absent and present at all tested concentrations of ethanol and methanol except 1% ethanol and 5% methanol where it was absent. Phenol was moderately present in distilled water, 1, 3 and 4% ethylacetate and 3% ethanol extracts, highly present in 2% ethyl acetate, 2% ethanol and 3, 4% methanol extracts and present in 5% ethyl acetate, 4,5 % ethanol and 1, 2, 5 % methanol extracts. Tannin was present at 2,4,5 % ethylacetate and 2,5 % methanol extracts, moderately present at 1% ethylacetate, 3% ethanol and 1,3 % methanol extracts and highly present in 2% ethanol and 4% methanol extracts.

Table 3: Phytochemical screening of *Cocos nucifera* endosperm.

Extracts	***Cocosnucifera*(Endosperm)**					
	Alkaloid	**Volatile oil**	**Saponin**	**Phenol**	**Tannin**	**Flavonoid**
Distilled water	_	_	_	_	_	_
1% Ethyl acetate	_	_	+	_	_	_
2% Ethyl acetate	_	_	++	_	_	_
3% Ethyl acetate	_	_	+++	_	_	_
4% Ethyl acetate	_	_	++	_	_	_
5% Ethyl acetate	_	_	+	_	_	_
1% Ethanol	_	_	+	_	_	_
2% Ethanol	_	_	_	_	_	_
3% Ethanol	_	_	+	_	_	_
4% Ethanol	_	_	+	_	_	_
5% Ethanol	_	_	_	_	_	_
1% Methanol	_	_	+	_	++	_
2% Methanol	_	_	++	_	+	_
3% Methanol	_	_	+	_	+	_
4% Methanol	_	_	+	_	+	_
5% Methanol	_	_	+	_	+	_

Table 3 is the phytochemical result of Cocos nucifera endosperm. The result revealed that alkaloid, volatile oil, tannin and flavonoids were absent in all the extracts of Cocos nucifera endosperm at all concentrations. Saponin was present in all extracts (except aqueous extract) and at al1concentrations except (2,5 % ethanol extracts); highly present in 3% ethylacetate extract and moderately present in 2,4 % ethylacetate and 2% methanol extracts.

Tannin was only detected in the methanol extract; moderately present in the 1% methanol.

KEY:
_: Absent
+: Present
++: Moderately present
+++: Highly present

Previous experimental studies have shown *Cocos nucifera* to be rich in certain phytochemicals and are thus a therapeutic agent. This experimental study on phytochemical profiling of *Cocos nucifera L.* reveals the presence of tannin, phenol, saponin, alkaloids, flavonoids and volatile oil in the plant; a result in alignment with the report of Dyana JP and Kanchana G (2012). However, the presence of the tested phytochemicals is not proportional in the selected concentrations of the leaf, endosperm and endocarp extracts of the plant moreover, some phytochemicals are absent in certain extracts of the plant.

CONCLUSION

The presence of certain phytochemicals in all considered morphological organs of *Cocos nucifera* shows that the plant is of therapeutic benefit.

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CONFLICT OF INTEREST

Authors declare no conflicts of interest.

REFERENCES

1. Edward C, Craig R. Elevitch. Species Profiles for Pacific Island Agroforestry, 2006; 1-27.
2. Evans WC. Trease and Evans Pharmacognosy. 15th ed., Elsevier Science limited, New York, 2002; 156-200.
3. Passos EEM. Morfologia do coqueiro. A cultura do coqueiro no Brasil 2nd edn., Brasília: Embrapa - Serviço de Produção de Informação, 1998. [Google Scholar]
4. Andrade AM, Passos PRA, Marques LGC, Oliveira LB, Vidaurre GB, Roch JDS. Pirólise de resíduos do coco-da-baía (*Cocos nucifera* Linn) e análise do carvão vegetal. Rev Árvore, 2004; 28: 707–714. http://www.scielo.br/pdf/rarv/v28n5/23409.pdf [Google Scholar]
5. Hartwell JL. Plants used against cancer. Lloydia Publication, 1967-1971, 30-34.
6. Duke JA. Handbook of Energy Crops, 1983; 1-3. Available at http://www.purdue.edu/newcrop/duke-energy/cocosnucifera.html
7. Duke JA, Wain, KK. Medicinal plants of the World. Harrod and co., Baltimore, 1981; 320-338.
8. Fife B. The Healing Miracles of Coconut Oil. Piccadilly Books Ltd, Healthwise publications, Colorado Springs, Co.; 2000, pp 1-46
9. Enig M. Coconut: In support of good health in the 21ist century, 1999; 1-27. Available at http: www.coconutoil.com/coconut_oil_21st century.htm.
10. Awad AB. Effect of dietary lipids on composition and glucose utilization by rat adipose tissue. J Nutri, 1981; 111: 34-36.
11. Sugano M, Ikeda I. Metabolic interactions between essential and trans-fatty acids. Curr Opinions in Lipidol, 1996; 7: 38-42.
12. Portillo MP, Serra F, Simon E, Del barrio AS, Palou A. Energy restriction with high fat enriched with coconut oil gives higher UCP and lower white fat in rats. Inter J Obesity and Rel Meta Disor, 1998; 22: 974-979.
13. Lita L. Coconut oil-Why is it good for you? 2001, Pp 10-21. Available at www.coconut-info.com.
14. Garfinkel M, Lee S, Opara EC, Akkwari OE. Insulinotropic Potency of lauric acid: a metabolic rational for medium chain fatty acids (MCF) in TPN formulation. J Surg Res, 1992; 52: 328-333.
15. Dyana JP, Kanchana G. Preliminary Phytochemical Screening Of *Cocos nucifera L.* Flowers. International Journal of Current Pharmaceutical Research, 2012; 4(3): 62-63.
16. Obidoa O, Joshua, Parker E, Eze NJ. Phytochemical Analysis of Cocos nucifera L. Journal of Pharmacy Research, 2010; 3(2): 280-286.
17. Malliga E, Dhanarajan MS, Rajalakshmi A, Jayachitra A, Pardhasaradhi M, Narasimharao B. Analysis of Phytochemicals, Antibacterial and Antioxidant activities of *Moringa oleifera* Lam. Leaf extract- an in vitro study. Int. J. Drug Dev. & Res, 2014; 6(4): 173-180.
18. Ayoola GA, Coker HAB, Adesegun SA, Adepoju-Bello AA, Obaweya K, Ezennia EC, Atangbayila TO. Phytochemical Screening and Antioxidant Activities of Some Selected Medicinal Plants Used for Malaria Therapy in Southwestern Nigeria Trop J Pharm Res, 2008; 7(3): 1019-1024.
19. Sabri Fatima Zohra, Belarbi Meriem, Sabri Samira, Alsayadi Muneer. Phytochemical Screening and identification of some compounds from Mallow. J. Nat. Prod. Plant Resour, 2012; 2(4): 512-516.