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Phytocompound Profile, Antioxidant Property and Proximate Content of *Morinda lucida* Leaf Extract

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ABSTRACT
Morinda lucida is a flowering plant called brimstone tree in English. Different parts of the plant are extensively used in treating different kind of ailments. The study was aimed at profiling phytocompounds, antioxidant property and proximate content of *M. lucida* leaf extracts. The plant was sourced, identified and extracted using maceration method with aqueous and ethanol as solvent. Phytocompound analysis of extracts was determined using standard protocol. Antioxidant property was determined using DPPH method. Proximate content was also evaluated using the method described by Association of Official Analytical Chemists. *M. lucida* leaf physical property revealed dark greenish colour, glittering/shiny texture with 13.4 and 12.06%. Qualitative analysis results revealed the presence of saponins, terpenoids, flavonoids, tannins, phenols, coumarins, phlobatannins, flavones, chalcones and alkaloids while vitamin A, cardiac glycoside, anthraquinones and amino acid were absent in both extracts. The quantitative analysis for both solvent reflects Phenols had the highest concentration (7.24 ± 1.32-6.73 ± 1.25), followed by Flavonoids (3.14 ± 1.20-3.22 ± 1.05). Tannins (2.68 ± 0.94), Saponins (2.56 ± 1.14) (aqueous), Saponins (2.03 ± 1.14), Terpenoids (2.02 ± 1.04) (ethanol), respectively. Antioxidant activity revealed lC_{50} values of 38.74µg/ml. This value indicates strong antioxidant activity. Additionally, the proximate content showed high percentage of carbohydrates 44.32%, followed by protein 17.80%, fat 16.1%, crude fiber 11.46%, ash content 9.87% and moisture content 8.75% respectively. Results of this study demonstrated that *M. lucida* possess important bioactive compounds, antioxidant property and nutritional values; which probably be utilized nutraceutically and pharmacologically by industries and the general public.

Keywords: *Morinda lucida*, Antioxidant, phytochemical, Proximate, Nutritional

INTRODUCTION

Morinda lucida Benth is a member of the Rubiaceae family (Achukwu *et al*., 2024). It goes by the names brimestone tree (English), Erhan Ikpanro (Benin), Huka, Eze Ogu (Igbo), and Oruwo (Yoruba) (Imoisi *et al*., 2021). Diabetes, hypertension, cerebral congestion, diarrhea, stomach pain, ulcers, leprosy, and gonorrhea are among the conditions for which *M. lucida* is utilized. It is primarily used in Nigeria in treating fever; in Cote d'Ivoire, a bark or leaf decoction is used to treat jaundice; and in the Democratic Republic of the Congo, it is mixed with powdered root bark to treat ringworm and itching (Ajenu *et al*., 2021). The stem is useful for managing piles (Imoisi *et al*., 2023). Additional uses for *M. lucida* include stimulants, sedatives, rheumatism, arthritis, pulmonary issues, vermifuges, laxatives, kidneys, diuretics, cutaneous and subcutaneous parasite infections, veneral disorders, febrifuges, leprosy, yaws, tumors, and malignancies (Okhale *et al*., 2021).

Plants are essential to human existence; they can be used as foods that are beneficial to general well-being and nutrition. Likewise, their medicinal properties have been acknowledged. Humanity has long utilized medicinal plants as a source of pharmaceuticals. For thousands of years, human being used plants as pharmaceuticals since the individual were entirely reliant on them for his requirements in terms of preventive, therapeutic, and other forms of drug therapy (Josiah *et al*., 2023).

Due to their cost, accessibility, ease of use, low toxicity, rapid decomposition, and environmental friendliness, plant-derived compounds are commonly acknowledged as preferable alternatives (AlSheikh, 2020). Compounds called phytocompounds, which are present in plants and have therapeutic qualities, improve human health and ward off disease (Adetuyi *et al*., 2022 and Mlozi, 2022). Phytotherapy, commonly referred to as ethnopharmacology, is the use of plants for pharmacological and therapeutic purposes to manage diseases and improve human well-being (Shakya, 2016). Medicinal plants that are commonly used are great sources of safe, naturally occurring chemicals (Manandhar *et al*., 2019). In our body, antioxidants are chemicals that combat free radicals. High levels of free radicals can be detrimental to our body. Foods like fruits, vegetables, plant-based foods contain antioxidants. *M. lucida* contains important phytocompounds with significant antioxidant and nutritional value. Therefore, this study aimed to evaluate phytocompounds, antioxidant property and proximate content of *M. lucida* leaf extract.

MATERIALS AND METHODS

Plant Sample Collection

Morinda lucida was collected from Pharmaceutical garden at Kaduna State University, Kaduna, Nigeria (KASU). The plant was identified and authenticated by a taxonomist with voucher number NDA/BIOH202668 in the Department of Biological Sciences, Nigeria Defence Academy, Kaduna State, Nigeria.

Preparation Plant Sample for Phytocompounds

The plant was thoroughly washed using tap water and rinsed with distilled water and then air dried at room temperature. Then dried plant was grinded into a powder using a dry blender. The powder sample was kept until they are required for additional usage in an airtight container.

Extraction of Plant

The powder of the leaves was extracted using maceration method with aqueous and ethanol as solvent (Hassan *et al*., 2021). This was carried out by soaking 100g each of the finely grinded leaves in 300ml of aqueous and ethanol for 72 hours, with vigorous agitation; the extracts was decanted and evaporated to dryness in a water bath. The crude extracts was then kept in a sterile container and stored in the refrigerator at 40^{o}C for further analysis.

Phytochemical Screening

Qualitative and quantitative analysis were done using standard protocols described by Ali *et al*., 2018. Determination of antioxidant activity by DPPH method test was conducted in accordance with the protocols described by Brand-Willim *et al*., (1995).

Proximate Analysis of Plant

The procedure outlined by the Association of Official Analytical Chemists (AOAC) was used to perform proximate analysis (AOAC, 2012). Using the approach outlined by, the amount of carbohydrates was calculated by deducting the total amount of ash, crude fiber, crude protein, moisture, total fatty acid, and carbohydrates from 100% (Horwitz, 2003 and Hussain *et al*., 2011).

RESULTS AND DISCUSSION

A wide range of compounds that are produced by primary and secondary metabolic processes have been identified to be present in plants. The investigation on physical analysis of *M. lucida* aqueous and ethanolic leaf extracts revealed dark greenish colour, glittering/shiny texture with 13.4% and 12.06% respectively as depicted in Table 1. Similar result was reported by Ugwu *et al*., (2020), Achukwu *et al*., (2024) 13.32% and 30.3% in *M. lucida.* This present report contradict the report by Okhale *et al*., (2024) where their report on phytochemical and synergistic antimicrobial effects of *Morinda lucida, anogeissus leiocarpus* and *Sarcocephalus latifolius* leaf extract had yield 3.3%. This discrepancy could be due to the solvent that was used for the extraction.

Table 1: Percentage Yield and Physical Analyses of Ethanolic and Aqueous Plants Extract

Plant	Solvent	IWPM(g)	Total Yield(g)	Yield (g)	Colour	Texture
M. lucida	ethanol	500	65.02	13.04	dark greenish	glittering/shiny
M. lucida	aqueous	500	60.03	12.06	dark greenish	glittering/shiny

Table 2: Qualitative and Quantitative Analyses of *Morinda lucida* Aqueous Leaf Extracts

S/N	Phytochemicals	Leaf Extract Qualitative	(mg/gdry) Quantitative
1	Vitamin A	-	ND
2	Triterpenoids	+	ND
3	Phytosterols	-	ND
4	Cardiac glycoside	-	ND
5	Saponins	+	2.56 ± 1.14
6	Terpenoids	+	3.14 ± 1.20
7	Flavonoids	+	2.68 ± 0.94
8	Tannins	+	7.24 ± 1.32
9	Phenols	+	ND
10	Anthraquinones	-	1.14 ± 0.89
11	Coumarins	+	ND
12	Phlobatannins	+	ND
13	Flavones	+	ND
14	Anthocyanins	-	ND
15	Quinones	+	ND
16	Chalcones	+	ND
17	Amino acids	-	ND
18	Resins	-	±1.12
19	Alkaloids	+	2.42

Table 3: Qualitative and Quantitative Analyses of *Morinda lucida* Ethanolic Leaf Extracts

S/N	Phytochemicals	Leaf Extract Qualitative	(mg/gdry) Quantitative
1	Tannins	+	1.51 ± 0.09
2	Alkaloids	+	1.26 ± 0.12
3	Phenols	+	6.73 ± 1.25
4	Saponins	+	2.03 ± 1.14
5	Terpenoids	+	2.02 ± 1.04
6	Flavonoids	+	3.22 ± 1.05

S/N	Phytochemicals	Leaf Extract Qualitative	(mg/gdry) Quantitative
7	Phytosterols	+	ND
8	Vitamin A	-	ND
9	Cardiac glycoside	-	ND
10	Anthraquinones	-	ND
11	Anthocyanins	+	ND
12	Phlobatannins	+	ND
13	Flavonols/flavones	+	ND
14	Coumarins	+	ND
15	Quinones	-	ND
16	Resins	+	ND
17	Amino acids	-	ND
18	Chalcones	+	ND
19	Triterpenoids	-	ND

= not detected, + = detected, Values are presented as means ± Standard deviation

High levels of free radicals can be detrimental to our body. The protective biochemical mechanism of natural antioxidants found in plant-based medicines is gaining attention as there is growing evidence that antioxidants obtained from native plants could potentially be beneficial in reducing oxidative stress. In this study, antioxidant activity test of *M. lucida* revealed lc_{50} values of 38.74µg/ml (Table 4). Similar result was observed by Akinmoladun *et al.*, (2020). Also, Adesokan *et al*., (2020) and Odeyemi and Afolayan, (2023) showed notable antioxidant activity in *M. lucida.* This report of ABTS and DPPH signifies the plant possess strong antioxidant property that could protect the body from free radicals. Antioxidants can prolong the shelf life of food items by hindering the oxidation of lipids and oils. Furthermore, compared to synthetic antioxidants, antioxidants derived from plants are frequently thought to be healthier and more organic in nature.

Table 4: Antioxidant Activity Test of *M. Lucida*

Test Sample	IC50±SD (µg/ml)	(λ = 517 nm)
Negative Control	*Cucumis sativus* extract	371.30 ± 2.86
Positive Control	Ascorbic acid	7.11 ± 1.20
Plant Extract	*Morinda lucida*	38.74 ± 1.32

Proximate analysis of *M. lucida* leaf revealed abundance of carbonhydrate (44.32%), fat (16. 1%), crude fiber (11.46%), ash (9.87%), moisture content (8.75%), and protein (17.80%) respectively (Table 5). This is similar to the report by Osuntokun *et al*., (2016). Several studies demonstrated similar findings Ezeigwe and Okoye, (2021), Akinmoladun *et al*., (2022) and Achukwu *et al*., (2024). The proximate components found in *M. lucida* leaves can be utilized for both medicinal and functional food preparation. It might be a significant source of trace elements, nutrient content, and renewal.

Table 5: Proximate Analysis of *M. lucida* in Percentage

Sample	Composition
Carbohydrate	44.32
Fat	16.1
Crude Fiber	11.46
Ashe	9.87
Moisture Content	8.75

CONCLUSION

The findings of this study showed that *M. lucida* leaves have a variety of phytocompounds as well as nutritional and pharmacological qualities. Its significant antioxidant qualities promote their efficacy as a nutraceutical in combating and curing illnesses linked to oxidative stress, and potential rich phytocompounds and proximate content verify their therapeutic use as functional food. The results support *M. lucida* traditional use and highlight its significance in the development of medications and nutraceuticals.

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