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Proximate Analysis of the Leaves of Landolphia Owerienes (White Vine Rubber) In Southern Nigeria Ecosystems for Nutritional Evaluation

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Abstract- The Online Bookstore is an innovative web-based platform that revolutionizes the book-shopping experience by providing an accessible, convenient, and secure digital solution. Traditional bookstores often pose challenges such as limited accessibility, manual inventory management, stock shortages, and the absence of online ordering and tracking systems. This project effectively addresses these limitations by enabling users to browse a vast collection of books, search for specific titles, add books to a shopping cart, and complete secure transactions seamlessly. The system offers key functionalities, including user authentication, an intuitive book categorization system, a streamlined checkout process, and real-time order tracking, ensuring a hassle-free purchasing experience. Additionally, an admin panel empowers store owners to efficiently manage book inventory, process orders, and oversee customer transactions, reducing manual errors and enhancing operational efficiency. The Online Bookstore is designed with a user-friendly interface, secure payment gateways, and real-time inventory updates, ensuring reliability and ease of use. The project aims to enhance customer satisfaction by eliminating the constraints of physical bookstores while promoting digital transformation in the book industry. Future enhancements, such as mobile applications, AI-powered book recommendations, and multi-vendor support, can further enhance the platform's scalability and engagement. This comprehensive, technology-driven solution ensures a modern, efficient, and customer-centric approach to book purchasing.

Keywords- Online Bookstore, E-commerce, Digital Book Shopping, Book Inventory Management, Secure Transactions, User Authentication Shopping Cart, Order Tracking

I. INTRODUCTION

The study of plant materials, particularly their biochemical composition, plays a crucial role in understanding their potential applications in various fields such as medicine, agriculture, and industry (Obruche et al., 2025). Plants have been sources of valuable compounds for centuries, offering benefits ranging from food and medicine to raw materials for industrial use. Among the wide variety of plant species, those from the Apocynaceae family, such as Landolphia owerienes, have garnered attention due to their versatile applications, especially in the production of rubber.

Landolphia owerienes, commonly known as white vine rubber or by other regional names, is a rubber-producing vine that thrives in tropical environments (Omale & Emmanuel, 2010). It is notable for its potential as a natural rubber source, especially in areas where the traditional rubber tree, Hevea

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brasiliensis, may not be as readily cultivated or as economically viable (Umudi et al., 2025). Proximate analysis, a method used to determine the basic composition of plant materials, is fundamental in assessing their nutritional and chemical profiles (Erienu et al., 2022). This analysis typically includes the quantification of moisture content, crude protein, crude fiber, fats, and ash, which are key indicators of the plant's nutritional value and its potential for further exploitation (Itodo et al., 2021). These components can influence the plant's suitability for various uses, from rubber extraction to medicinal or dietary applications (Obruche et al., 2019). For example, understanding the protein and fiber content of the leaves could be critical for determining its viability as a food or fodder source, while the moisture content is particularly relevant for its preservation and storage.

In the case of Landolphia owerienses, much of the research has focused on its rubber-producing properties, with less attention paid to the biochemical makeup of its leaves (Ekpo et al., 2023). The leaves of rubber-producing plants, while not as economically significant as the latex or sap, can provide valuable insights into the overall ecology of the plant and its potential for other uses. Moreover, the leaves may contain secondary metabolites such as alkaloids, flavonoids, and phenolic compounds, which have been found to have medicinal properties (Umudi et al., 2025). Understanding the proximate composition of these leaves can open doors for further research into their pharmacological potential, sustainability as a source of bioactive compounds, or use as a supplement in animal or human diets (Abeokuta et al., 2025). Given the rising interest in alternative rubber sources and the need for sustainable agricultural practices, this research is particularly timely.

As the global demand for natural rubber continues to increase, alternative sources like Landolphia owerienses offer the potential to diversify rubber production and reduce dependency on traditional rubber plantations (Ogwuche & Obruche, 2020). Understanding the full range of chemical components in Landolphia owerienses could facilitate the development of more efficient processing methods and help identify other beneficial properties that have yet to be fully explored. Therefore, this proximate analysis serves as a crucial first step toward realizing the broader potential of this underexplored species (Owoyele et al., 2022). The proximate analysis of the leaves of Landolphia owerienses is an essential endeavor that extends beyond the traditional focus on latex production. By examining the nutritional and chemical composition of the leaves, this research will contribute to a more comprehensive understanding of the plant's potential uses, whether in rubber production, medicine, or other industries. As the world continues to seek sustainable and alternative sources of raw materials, plants like Landolphia owerienses may offer promising solutions for the future (Obruche et al., 2018).

This study aims to conduct a proximate analysis of the leaves of Landolphia owerienses, providing essential data on the chemical and nutritional composition of this plant.

II. MATERIALS AND METHOD

Collection of Sample and Identification

The method of sample collection and identification was carried out according to the procedures described by (Obruche et al., 2019 and Umudi et al., 2025) with minor modifications to the method used. The leaves of the plant were collected from bushes around Likoro village in Zaria Kaduna State and identified in the Herbarium of the Biological Sciences Department, Ahmadu Bello University with verification number ABU01761 under the supervision of Mallam Namadi Sunusi. July 10th 2025. The leaves were air-dried at room temperature and grinded using Mechanical grinder to obtain dry powdery material and stored in polythene bag until when needed.

Methods

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The methods of analysis were similar to those of Umudi et al. (2018) and Ekpo et al. (2025), with a few minor changes. These analyses were carried out in the Biochemical Laboratory of the animal science unit of the Institute for Agricultural Research (IAR) and also in the Main Teaching Laboratory (MTL) Chemistry DepartmentAhmadu Bello University, Zaria.

Moisture content

Crucibles were washed and dried to a constant weight in an oven at 1050C. They were later removed and cooled in a desiccator and weighed (W1). Known weight of the dried powdered sample (landolphiaoweriences leave) was placed in the weighed crucible (W2). The crucible containing the sample was kept in an oven at 1050C for about 3hours, the crucibles were removed and cooled in the desiccator and weighed W3.

$$\% \text{ Fiber} = \frac{\text{C2} - \text{C1}}{\text{W}} \quad X \ 100$$

Where:

W1= Weight of empty crucible
W2= Weight of empty crucible + Sample before drying
W3= Weight of crucible + sample after oven drying

Ash Content

Crucibles were washed and dried in the oven at 1050C, after drying; they were cooled in the desiccator and weighed (W1). 1g of the powdered sample was placed in the crucibles and weighed (W2). They were transferred into the Furnace for about 3hrs at 550oC, then removed and cooled in the desiccator and weighed (W3).

$$\% \text{ FAT} = \frac{\text{W1} - \text{W2}}{\text{W 1}} \quad X \ 100$$

Where:
W1= Weight of empty crucible
W2= Weight of empty crucible + Sample
W3= Weight of empty crucible + sample after ashing

Crude fiber content

Exactly 2g of the sample was weighed and was extracted with ether in a soxhlet apparatus for about 6 hours. The sample was removed and dries for 30mins at 1050C and weighed. 1g of the extracted sample was placed in a beaker containing 1.2ml of conc. H2SO4 per 100ml of solution and boiled for about 30minutes, the residue was filtered and washed with hot water, the residue was transferred to a beaker containing 1.2g of NaOH per 100ml of solution and boiled for another 30minutes. The residue was washed with hot water and dried in an oven and weighed (C1), the weighed sample was incinerated in a Furnace for about 3hrs at 550OC, it was removed, cooled, and weighed (C2).

$$\% \text{ Fiber} = \frac{\text{C2} - \text{C1}}{\text{W}} \quad X \ 100$$

Where:

W1= Weight of sample
W2= Weight of sample+ oven drying

Crude protein content

Digestion

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Exactly 0.25g of sample was weighed into a kjeldahl flask.Catalyst and 25ml conc. Sulfuric Acid (H2SO4) was added.In the fume cupboard, the solution was heated until a green color assumed. Any black particles showed at the mouth and neck of the flask was Cooled and washed down with distilled water. After cooling,the digest was transferred into a 250ml conical flask with several washings with distilled water (Festus-Amadi et al., 2021).

Distillation

Before use, steam through the Nitrogen distillation apparatus for about 15minutes.Under the condenser, a 100ml conical flask was placed which contained 5ml of Boricindicator.Via the small funnel aperture, 5ml of the digest was Pipette into the body of the apparatus, washed down with distilled water followed by 5ml of 60% NaOH (Sodium Hydroxide) solution.

The apparatus was steamed through for about 5-7 minutes to collect ammonium sulphate. The receiving flask was removed and the tip of the condenser was washed down into the flask.

Titration

The solution in the receiving flaskwas titrated using 0.02631N hydrochloric acid until the solution turns light pink which indicated the end point. The titre value was then taken. A blank solution was run along with the sample.

$$\% \text{ Nitroge} = \frac{14.007 \text{ X(Titre value for sample} - \text{Titre value for blank)} \; X \; Normality \; of \; HCl}{Weight \; of \; Sample}$$

Where;

14.007 = Relative molecular mass of nitrogen
% Crude protein = %Nitrogen ×6.25
6.25= protein conversion factor

Carbohydrate/Nitrogen Free Extract (NFE)

This was calculated after estimating all other fraction by proximate analysis. This was calculated as;
% Carbohydrate =100 - (% of moisture + % Ash + % fibre + % Protein + % Fat)

III. RESULTS AND DISCISION

Table 1: revels the result of the proximate analysis for the leaves of Landolphia owerienc es

Parameter	% content sample1	% content sample2	% content sample1	%(Mean±S.D)
Moisture	8.29	8.13	7.87	8.09 ± 0.21
Ash	4.59	4.96	4.67	4.74 ± 0.19
Crude fiber	31.19	33.00	33.33	32.51 ± 1.15
Crude protein	14.68	17.51	15.41	15.86 ± 1.46
Crude fat	1.50	0.66	1.05	1.07 ± 0.42
Nitrogen Free Extract (NFE)	39.75	35.74	37.67	37.74 ± 2.01
Soluble carbohydrate	11.00	12.35	11.34	11.59 ± 0.69

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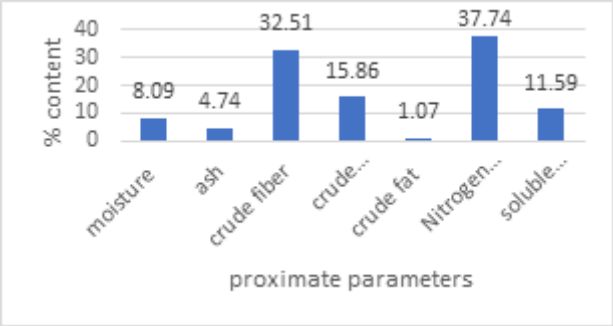

Figure 1: Nutritive Composition of Landolphia Owerienc es Leaves

This section shifts its focus to the presentation and analysis of the results obtained from the experiments. The values of moisture, ash, crude protein, crude fat, crude fiber, NFE (also known as total carbohydrate), soluble carbohydrate are presented in table 1.

IV. DISCUSSION

The results as shown in table 1 revealed that the leaves of Landolphia owerienc es have a moderate moisture (8.09± 0.21) %, protein (15.86±1.46) % content respectively. The ash (4.74±0.14) % and fat (1.07±0.42) % are relatively low while the fiber (32.51±1.15) %, total carbohydrate (nitrogen free extract) (37.74±2.01) % are relatively high. Relatively moderate soluble carbohydrate (11.59±0.69) % content. The relatively high carbohydrate (37.74±2.01) % content makes the leaves of Landolphia owerienc es a good source of carbohydrate, therefore incorporation of the leaves in food will not only serve as flavouring to food but also as a rich source of carbohydrates. The results further show that the leaves are a good source of protein and as it contains a moderately good percentage of protein (15.86±1.46) %. The ash and fat content of the leaves are low (4.74±0.14 and 1.07±0.42) respectively, this shows that the leaves are not rich in fat and this is good because the daily intake of fat as required by the body is supposed to be quite low.

The low percentage of ash content is quite reasonable as generally the ash content of food represents the mineral content of a food and these minerals such as calcium, sodium, phosphorus are needed in small quantities in the body. These results are consistent with the study by Obruche et al., (2019) and Umanah et al., (2025) conducted in the same area. The moisture content (8.09±0.21) % of the leaves is a good indication that the leaves will have a relatively long shelf life as the activity of microorganism would be greatly reduced because of the absence of a favorable environment for them to thrive. It further shows that the leaves contain relatively high amount of fiber (32.51±1.15) % as generally required by the body to enhance digestion and prevent constipation. It can also help to lower the risk of heart diseases, slow down the absorption of sugar and cholesterol, which can help to regulate blood sugar and cholesterol levels. From the calibration curve, the concentration of the unknown was derived which is used to calculate the percentage soluble carbohydrate which were calculated to be (11.59±0.69). These results align with the research conducted by Ugochukwu et al. (2025) on the same proximate analysis.

V. CONCLUSION

From the proximate analysis carried out on Landolphia owerienc es leaves, the percentage moisture content, Ash, Crude fiber, Crude protein, Crude fat, Total carbohydrate (nitrogen free extract) and soluble carbohydrate were found to be 8.09± 0.21, 4.74±0.19, 32.51± 1.15, 15.86± 1.46, 1.07± 0.42,

37.74± 2.01, 11.59± 0.69 respectively. This implies that the leaves of Landolphia owerienceS can be easily preserved after air dried, that is its shelf life would be prolonged and the deterioration due to microbial contamination would be limited due to its relatively moderate moisture, its relatively low ash content implies that it has high organic matter and as this support the relatively high values obtained for the fiber, protein and carbohydrate contents.

Due to the high cardiovascular risk that the fats pose to humans, the relatively low fat content of the leaves of Landolphia owerienceS makes it safe for consumption. The data obtained for the proximate analysis of the leaves Landolphia owerienceS indicates that spices contribute nutrients to food and the public should be advice to consume the leaves.

REFERENCES

1. Abeokuta, O.J, Uriri, S.A, Obruche, E.K, Okurame, O (2025). Hydrochemical Assessment of Borehole Water Quality in Eku, Delta State, Nigeria. Journal of Science, Technology and Environmental Studies,1(2):17-25
2. Ekpo Ekokodu Rose, Erienu Obruche Kennedy, and Abiye Clement. Marcus (2025). Spatial and Temporal Variations in the Concentrations of Polycyclic Aromatic Hydrocarbon, in Ambient Air From Three Different Locations in River State, Nigeria. International Journal of New Chemistry, 12 (4), 567-580
3. Erienu Obruche Kennedy, Itodo Adams, Wuana Raymond and Sesugh Ande (2022). Polycyclic Aromatic Hydrocarbons in Harvested Rainwater in Warri and Agbarho, Nigeria. Bulletin of chemical society of Ethiopia, 36(4): 27-35.
4. Festus-Amadi, I. R, Erhabor, O. D, Ogwuche Christiana E, and Obruche E. K. (2021). Characterization of Contaminated Sediments Containing Polycyclic Hydrocarbons from Three Rivers in the Niger Delta Region of Nigeria. Chemistry Research Journal, 6(3):1-12
5. Itodo, A. U., Wuana, R. A. Erhabor, O. D., Obruche, E. K. and Agbendeh, Z. M.(2021). Evaluating the Effects of Roofing Materials on Physicochemical Properties of Harvested Rainwater in Warri, Delta State, Nigeria. Chemical Society of Nigeria Journal, Kano, 12(1): 234-245
6. Obruche E. K, Emakunu S.O, Ugochukwau G. C (2025). Rainwater Harvesting: Microbial and Chemical Water Quality Assessment in Warri District. Mosogar Journal of Science Education,10(1):36-45
7. Obruche E. k, Erhabor O.D, Itodo A.U and Itopa S.T (2019). Spectrophotometric determination of iron in some commercial iron containinig tablets/capsule. International journal of advanced trends in computer applications, 1(1): 231-235
8. Obruche E. K, Ogwuche C.E, Erhabor O.D and Mkurzurum.C (2018). Evaluation of the inhibitive effect of African Marigold (Tagetes erectal L.) Flower Extracts on the Corrosion of Aluminium in Hydrochloric Acid. International Journal of Advances in Scientific Research and Engineering, 4 (12): 167-177
9. Obruche E. K, Ogwuche C.E, Erhabor O.D and Mkurzurum.C (2019).Investigating Corrosion Inhibition Effects of Tagetes Erecta L. Leaf Extrac on Aluminium in Acidic Medium. Global Scientific Journals, 7 (1): 1-17
10. Ogwuche C.E and Obruche E.K. (2020). Physio-chemical analysis of palm oils (elaeis guineensis) obtained from major markets in agbarho, unenurhie, opete, ughelli and evwreni town, Delta state, Nigeria. International journal of trend in scientific research and development,4(2):56-60
11. Omale,J. and Emmanuel, T. (2010). Friday Phytochemical Composition, Bioactivity and Wound Healing Potential of Euphorbia Heterophylla (Euphorbiaceae) Leaf Extract. International Journal on Pharmaceutical and Biomedical Research, 1(1): 54-63.
12. Owoyele B, Olaleye S, Oke J, Elegbe R (2022). Anti-inflammatory and analgesic activities of leaf extracts of Landolphiaowariensis. Afr J Biomed Res. 2001; 4:131-13

13. R.E. Ekpo, A.C. Marcus and E.K. Obruche (2023). Spartial and Temporal Variations in the Concentration of Particulate Matter in Ambient Air from three Different Locations in River State, Nigeria. International Journal of Scientific Research in Chemical Science,10(4):32-38
14. Sahelian.R. (2005). Flavonoids inhibit platelet function through binding to the thromboxane A2 receptor, J. Thromb. Haemost, 3(2): 369-376.
15. Ugochukwu Gladys Chioma, Ataine Theresa Ifeyinwa and Erienu Kennedy Obruche (2025). Determination of the Physicochemical Properties of Soil Amended with Cassava Mill Effluent in Mosogar Area of Delta State. Mosogar Journal of Science Education,10(1):81-89
16. Umanah F. I ; Oyibo R. U ; Rita C. N; Bashir M. A, Ibebuike U. O. & Obruche E. K. (2025). Self-Concept, Self-Efficacy and Parental Involvement as Predictors of Academic Achievement of Junior Secondary School Students in DeltaSouth Senatorial DiJournalof Education Research and Library Practice,9(8):51-65
17. Umudi E. Q., Obruche E. K., Sani M. I., Onwugbuta G. C., Aghemwenhio I.S., Ikechukwu S. C., Clark P. D., Essiet A.G., Eresanya O.I., Ibe M.C. & Hashimu. A. (2025). Evaluation of Polycyclic Aromatic Hydrocarbons (PAHs) Contents of Fishes, Waters and Sediments of Rivers Niger: Human Health Risk Assessment. Journal of Basics and Applied Sciences Research,3(5),187-199. https://dx.doi.org/10.4314/jobasr.v3i5.20
18. Umudi Ese Queen, Ese Ekanem , Sani Mamman Ibrahim, Onwugbuta Godpower Chukwuemeka , Suleiman Abdulmajid, Magashi Luper, Udo Idongesit , Ikechukwu Chikwe Odontimi Nimighaye , Essiet Gordon , Chinedu Okechukwu, Brown Amieye Bright and Erienu Obruche Kennedy.(2025) Degradation Efficiencies of the Total Petroleum Hydrocarbons (TPHs) in the Soil Amended with Palm Bunch Ash and Tween 80 in Ibenomo L.G.A, Akwa Ibom State. International Journal of Chemistry and Chemical Processes,11(5):1-20 10.56201/ijccp.vol.11.no5.2025.pg1.21
19. Umudi Ese Queen, Odontimi Nimighaye, Sani Mamman Ibrahim, Chidi Henry, Onwugbuta Godpower Chukwuemeka, Odejobi BabajideMichael, Jemimah Wakawa Ronald Winfred Abhulimen , Abiodun Emmanuel Adams , Ikechukwu Chikwe and Erienu Obruche Kennedy. (2025). Assessment of the Seasonal Variations in Heavy Metals Concentration in the Ughelli Central Market River, Delta State, Nigeria. International Journal of Applied Science and Mathematical Theory,11(6),78-88 https//doi.org/10.56201/ijasmt.vol.11.no6.2025.pg78.88
20. Umudi Ese Queen; Ese Ekanem; Idongesit O. Ekpenyong; Sani Mamman Ibrahim; Onwugbuta Godpower Chukwuemeka; Suleiman Abdulmajid; Ikechukwu Chikwe; Chidi Henry; Chidi Victory; and Erienu Obruche Kennedy.(2025). Seasonal Assessment of Heavy Metals Concentrations in Sediment of the Sapele River, Nigeria Journal of Science Innovation & Technology Research, 9(9),124 – 139