Jagua Publication

Current Research in Interdisciplinary Studies, 5(5-6):7–11, 2026. DOI: 10.58614/cris562

Current Research in Interdisciplinary Studies

ISSN (Online): 2583-5181

Journal homepage: https://jpub.org/journal-details.php?journal-id=40

Research Article

Proximate and Physicochemical Analysis of *Alchornea Cordifolia* Seed

Ike Ozoemena Christian [1*], **Ogbuanu Cyril Chinedu** [1] **and Okoye Nebeolisa Johnson** [1]

[1] *Department of Industrial Chemistry, Enugu State University of Science and Technology, Enugu State, Nigeria.*
[*] *Corresponding author: born2excell555@gmail.com*

Article Info

Keywords: *Ethyl Acetate, Alchornea Cordifolia, Proximate and Physicochemical Analysis.*

Received: *20.05.2026;*
Accepted: *12.06.2026;*
Published: *20.06.2026*

Abstract

The soxhlet extraction of *Alchornea Cordifolia* seed oil was used to determine the proximate and physicochemical screening. The parameters obtained for the proximate screening were 7.64% moisture content, 4.05% ash content, 29.65% crude fat, 34.92% crude protein and 52.30% carbohydrate while the values obtained for the physicochemical screening were 62.45% for Iodide, 1.1% for specific gravity, 9.84 for free fatty acid, 162.84% for saponification value, 4.10% for peroxide value, 1.46% for refractive index, 10.50% for viscosity and 5.95% for acid value. The results showed that *Alchornea Cordifolia* seeds and seed oil could be employed for edible and commercial purposes.

1. Introduction

The biological activities of medicinal plants have been reopened as a research topic due to pathogen resistance to current antibiotics and greater awareness of traditional medicine as an alternative source of healthcare [1]. Traditional medicine has been practiced for millennia in many parts of the world, including India, where it is particularly popular in rural regions because to its accessibility and low cost. Nature has generated medical agents for hundreds of years, and a large number of modern pharmaceuticals are derived from natural sources, many of which have roots in traditional medicine [2]. Medicinal plants are those that have medical characteristics or actions [3]. Antimicrobial noncompliance has multiple ramifications for resistance, and poverty is a major underlying reason of antimicrobial use in developing countries [4]. Plants were formerly used to treat common infectious ailments, and even before civilization discovered the existence of germs, the concept that specific plants could heal was generally accepted [5]. These plants' therapeutic efficacy is based on distinctive chemical components that have a distinct physiological effect on the human or animal body [6]. The indiscriminate use of commercial antimicrobial drugs routinely employed in the treatment of infectious diseases has led to an increase in the prevalence of various resistances in human pathogenic bacteria [7]. Bacterial resistance to currently available antibiotics necessitates the discovery of novel antibacterial drugs. Various plant extracts have been employed in several researches to screen antibacterial activity and identify novel antimicrobial chemicals [8–11]. Scientists' efforts to produce plants with potential antibacterial qualities are yielding results, as a number of plants with significant antimicrobial capabilities have been identified [12–17]. Alchornea belongs to the spurge family Euphorbiaceae, which includes about 7500 species of trees, shrubs, and herbs from around the world [18]. Plant leaf extracts have been shown to have antibacterial action against both Gram-negative and Gram-positive bacteria [19–22]. It has been demonstrated to possess antifungal activities [23].

How To Cite: I.O. Christian, O.C. Chinedu and O.N. Johnson. Proximate and Physicochemical Analysis of Alchornea *Cordifolia Seed. Current Research in Interdisciplinary Studies*, 5(5-6):7–11, 2026. https://doi.org/10.58614/cris562

2. Methods

Alchornea Cordifolia seeds were collected from the Applied Biology department's botanic garden at ESUT Agbani in Enugu state. A botanist from Enugu's Department of Applied Biology and Biotechnology (ESUT) verified the seed.

2.1. Sample preparation

The *Alchornea Cordifolia* seeds were collected and opened to release the seeds trapped within the pods before being transported to the laboratory in a black plastic bag. *Alchornea Cordifolia* seeds were cleaned and dried in the sun for four weeks to remove moisture. The dry seeds were ground into a powder using a grinding mill and stored in an airtight plastic container until ready for ethyl acetate extraction [24].

2.2. Extraction procedure

Approximately 230 g of the sample was placed in a soxhlet extraction equipment fitted with a 1-L round bottom flask and a condenser. The extraction was performed using 0.9 L of ethyl acetate at 600°C for 12 hours, until the required amount was achieved. The oil was subsequently extracted by evaporating the solvent in a water bath heated to 500°C. The sample was weighed, and the difference was calculated as the weight of the sample before extraction minus the weight of the sample after extraction, multiplied by 100 and then divided by the sample's original weight to get the percentage yield oil. The oil was stored in a cool place for further analysis without being processed.

2.3. Proximate Analysis

The proximate composition of seed samples was analyzed using the method recommended by AOAC [25]. Moisture content, ash content, crude fiber, protein content, lipids and oil, and carbohydrates are all considered proximate analysis.

2.4. Physicochemical Analysis

Specific Gravity

An empty specific gravity bottle was weighed and labeled as W_1. Then, another specific gravity container was filled with distilled H_2O and placed in a water bath at 550°C for 1 hour, after which the weight was recorded as W_2. After drying, the bottle was filled with the extracted oil, and the weight was recorded as W_3. The procedure was repeated to establish the final weight.

$$\text{SG of oil} = \frac{W_2 - W_1}{W_3 - W_1}$$

W_1= weight of empty SG bottle
W_2 = weight of SG bottle + water
W_3 = weight of SG bottles + oil

Free Fatty Acid (FFA) value

A pipette was used to transfer 2g of the sample into a 500 mL conical flask. The conical flask containing sample was filled with 70 mL of ethanol and spun continually. Then, three drops of phenolphthalein indicator were added and titrated with 0.1N NaOH solution for 40 s, shaking vigorously until it became faint.

$$\textit{Free Fatty Acid value} = \frac{\text{TV} \times \text{N} \times 56.1}{\text{Weight of sample}}$$

Where, TV = Titre value
N= normality of titrant
56.1 = acid constant

Acid Value

1.3 g of oil was weighed using a pipette into a conical flask. Three drops of phenolphthalein indicator and 60 mL of ethanol were added to the conical flask. The mixtures were titrated with 0.1N NaOH solution until a pink tint appeared.

$$\text{Acid value} = \frac{\text{TV} \times 0.0282 \times 100}{\text{Weight of sample}}$$

Saponification value

5 g of the sample was weighed into a 400 mL conical flask. With the sample in the container, 50 mL of alcoholic potassium hydroxide was added while constantly swirling. The resulting mixture was refluxed for 2h, until the oil was entirely dissolved. Two drops of indicator were added and titrated with 0.5 N HCl while shaking constantly until the pink hue faded to colorless.

$$\text{Saponification value} = \frac{\text{N} \times \text{M} \times (\text{TV}_2 - \text{TV}_1)}{\text{Weight of sample}}$$

Where,
TV_2 - TV_1 = difference in titre value of sample and blank
N = Normality of HCL, M = molecular weight of KOH

Iodine Value

1.5 g of the sample was placed in a conical flask, followed by 30 mL of chloroform. 25 mL of Wiji's reagent was added, and the mixture was thoroughly stirred with a glass rod. The flask was carefully wrapped and kept in a dark room for an hour. 60 mL of 20% potassium iodide and 200 mL of distilled water were shaken vigorously. The mixtures were titrated against a 0.1N solution of sodium thiosulphate until the reddish solution was nearly gone. A small amount of starch indicator was applied and titrated until the blue-black color vanished entirely after vigorously shaking.

$$\text{Iodine value} = \frac{TV_2 - TV_1 \times N \times 12.69}{\text{Weight of sample}}$$

Where, 12.69 = constant for iodine value
N = Normality of titre
TV_2 = titre value of blank
TV_1 = titre value of the sample.

Peroxide Value

1.5 g of oil was placed in a conical flask. The conical flask containing the oil sample was filled with 1.8g of potassium iodide and 40 ml of DMSO-acetic acid solution. It was heated for fifteen minutes. The yellow hue was almost completely removed after adding 25 mL of 3% potassium iodide and titrating with 0.08 sodium thiosulphate. 1.0 mL of starch indicator was added, forcefully agitated, and precisely titrated until the blue hue vanished.

$$\textit{Peroxide value} = \frac{S \times N \times 1000}{\text{Weight of sample}}$$

Where, S = titre value
N = normality of titrant.

Viscosity

The viscosity was measured with a Brookfield viscometer (LVII, Brookfield Inc., USA) at a spindle number of 5 and a shear rate of 100 rev/min.

Refractive Index

An Abbe's refractometer was used to calculate the refractive index of oil. Two or three drops of material were used, and the reading was recorded.

3. Results and Discussion

Table 1 shows the result of proximate analysis of *Alchornea cordifolia* Oil

Table 1: Proximate analysis result

Parameters	Values in (%)
Moisture	7.80
Crude Protein	35.50
Oil	39.54
Crude fat	30.60
Ash	5.80
Carbohydrate	54.70

Table 2 shows the result of physicochemical analysis of *Alchornea cordifolia* Oil

Table 2: Physic-chemical analysis result

Parameters	Values in (%)
Iodine value	59.50
Specific gravity	1.00
Free fatty acid (MgKOH/g)	11.70
Saponification value(MgKOH/g)	165.40
Peroxide value (MgEq/Kg)	5.00
Refractive index	1.56
Viscosity (MM_2/S)	12.30
Acid Value	7.35

4. Discussion

The 38.8% oil percentage yield agrees with 35-40% yield reported by solade (2008). The value of the 162.84% for saponification and 62.45% for iodine value was in agreement with [26]. The crude fat value of 29.65% and 10.50% for viscosity is contrary to what [27, 28] reported. The 4.05% for ash and 52.30% for carbohydrate obtained agrees with 4.2% and 56.42% reported by Nzikou [26, 27] respectively. 7.64% value for moisture content, 1.1% for specific gravity, 4.10% for peroxide value, 5.95% for acid value and 1.46% for refractive index was in agreement with 7.51% for moisture, 0.896 for specific gravity, 5.00 for peroxide, 6.35 for acid value and 1.457 for refractive index as reported by Olaleye [28]. Orhevba [26] reported 8.27% free fatty acid and Nzikou [27] reported 37.6% for crude protein.

5. Conclusion

Because of its high saturated oil content, the extracted oil from *Alchornea cordifolia* seed might be used successfully as edible oil for human consumption as well as for other industrial applications.

Article Information

Acknowledgments: The authors are grateful to the scholars and technicians of the Department of Industrial Chemistry, Enugu State University of Science and technology for their moral support and technical assistance during this research.

Author Contributions: I.O.C. - Conceptualization, Methodology, Formal analysis, Writing – review & editing; O.C.C. - Data curation, Writing – original draft, Supervision.

Funding / Financial Support: The authors received no external funding.

Conflict of Interest (Competing Interests): The authors declare that there is no conflict of interests.

Ethical Approval: Not Applicable.

Informed Consent: Not Applicable.

Data Availability Statement: Not Applicable.

Clinical Trial Registration: Not Applicable.

Disclaimer (Artificial Intelligence): The author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.), and text-to-image generators have been used during writing or editing of manuscripts.

References

[1] G. A. Agbor, T. Leopold, and N. Y. Jeanne. The antidiarrhoeal activity of Alchornea cordifolialeaf extract. *Phytotherapy Research Journal*, 18(11):873–876, 2004.

[2] G. M. Cragg and D. J. Newman. *Drugs from Nature: Past Achievements, Future Prospects*. In: M. M. Iwu and J. C. Wootton, Eds., Ethnomedicine and Drug Discovery, Elsevier Science, Amsterdam, 2002, pp. 23-37, 2002.

[3] M. A. Rather, B. A. Dar, and M. Y. Dar. Chemical composition, antioxidant and antibacterial activities of the leaf essential oil of Juglans regia L. and its constituents. *Phytomedicine*, 19(13):1185–1190, 2012.

[4] P. Jenkins, Z. A. Bhutta, R. Laxminarayan, A. G. Duse, T. F. O'Brien, and I. N. Okeke. Antimicrobial resistance in developing countries. Part I: recent trends and current status. *Lancet Infectious Diseases*, 5(8):481–493, 2005.

[5] J. L. Rios and M. C. Recio. Medicinal plants and antimicrobial activity. *Journal of Enthopharmacology*, 100(1-2):80–84, 2005.

[6] H. O. Edeoga, D. E. Okwu, and B. O. Mbaeble. Phytochemical constituents of some Nigerian medicinal plants. *African Journal Biotechnology*, 4(7):685–688, 2005.

[7] A. A. Allero and A. J. Afolayan. Antimicrobial Activity of Solanum tomentosum. *African Journal of Biotechnology*, 5:369–372, 2006.

[8] M. R. F. De Lima, J. De Souza Luna, A. F. Dos Santos, M. C. C. De Andrade, A. E. G. Sant Ana, J. P. Genet, B. Marquez, L. Neuville, and N. Moreau. Antibacterial Activity of Some Brazilian Medicinal Plants. *Journal of Ethnopharmacology*, 105(1-2):137–147, 2005. doi: 10.1016/j.jep.2005.10.026.

[9] J. Parekh, N. Karathia, and S. Chanda. Screening of Some Traditionally Used Medicinal Plants for Potential Antibacterial Activity. *Indian Journal of Pharmaceutical Science*, 68:832–834, 2006. doi: 10.4103/0250-474X.31031.

[10] J. Parekh and S. Chanda. Antibacterial and Phytochemical Studies on Twelve Species of Indian Medicinal Plants. *African Journal of Biomedical Research*, 10:175–181, 2007.

[11] M. H. S. Hediat and N. Marraiki. Antimicrobial Activity and Phytochemical Analyses of Polygonum aviculare L. (Polygonaceae), Naturally Growing in Egypt. *Saudi Journal of Biological Sciences*, 17(1):57–63, 2010. doi: 10.1016/j.sjbs.2009.12.009.

[12] S. Dash, L. K. Nath, S. Bhise, and B. Nihar. Antioxidant and antimicrobial activities of heracleum nepalense d. don root. *Tropical Journal of Pharmaceutical Research*, 4:341–347, 2005.

[13] R. Nair and S. Chanda. Antibacterial Activity of Some Medicinal Plants against Some Medically Important Bacterial Strains. *Indian Journal of Pharmacology*, 38:142–144, 2006. doi: 10.4103/0253-7613.24625.

[14] M. B. Tadhani and R. Subhash. In vitro antimicrobial activity of stevia rebaudiana bertoni leaves. *Tropical Journal of Pharmaceutical Research*, 5:225–230, 2006.

[15] S. Mandal, M. D. Mandal, and N. Pal. Antibacterial Potential of Azadirechta indica Seed and Bacopa monniera Leaf Extracts against Multidrug Resistant Salmonella en terica Serovar Typhi Isolates. *Archives of Medical Science*, 3:14–18, 2007.

[16] R. Nair and S. Chanda. In-vitro Antimicrobial Activity of Psidium guajava L. Leaf Extracts against Clinically Important Pathogenic Microbial Strains. *Brazilian Journal of Microbiology*, 38:452–458, 2007. doi: 10.1590/S1517-83822007000300013.

[17] S. Chanda, Y. Baravalia, M. Kaneria, and K. Rakholiya. Fruit and Vegetable Peels—Strong Natural Source of Antimicrobics. Current Research, Technology and Education Topics in Applied Microbiology and Microbial Biotechnology, Formatex Research Center, Spain, Vol. 2, 2010, pp. 444-450.

[18] S. Chanda, S. Dudhtra, and M. Kaneria. Antioxidative and Antimicrobial Effects of Seeds and Fruit Rind of Nutraceutical Plants Belonging to the Fabaceae Family. *Food and Function*, 1:308–315, 2010. doi: 10.1039/c0fo00028k.

[19] F. Dos Santos, T. R. Calvo, S. I. C. Mara, W. Vilegas, and E. A. Varanda. Mutagenicity of two species of the genus alchornea measured by salmonella microsome assay and micronucleus test. *Revista Brasileira de Farmacognosia Brazilian Journal of Pharmacognosy*, 20 (3):382–389, 2010.

[20] L. Tona, K. Kambu, N. Ngimbi, N. Mesia, O. Penge, M. Lusakibanza, K. Cimanga, T. De Bruyne, S. Apers, J. Totte, L. Pieters, and A.J. Vlietinck. Antiamoebic and spasmolitic activities of extracts from some antidiarroeal traditional preparations used in Kinshasa, Congo. *Phytomedicine*, 7:31–38, 2000.

[21] J. T. Banzouzi, R. Prado, H. Menan, A. Valentin, C. Roumestan, M. Mallie, Y. Pelissier, and Y. Blache. In vitro antiplasmodial activity of extracts of Alchornea cordifolia and identification of an active constituent: ellagic acid. *J Ethnopharmacol*, 81:399–401, 2002.

[22] S. W. Hassan, R. A. Umar, M. Lawal, L. S. Bilbis, and B. Y. Muhammad. Evaluation of antifungal activity of Ficussy comorus L. (Moraceae). *Biol. Environ. Sci. J Tropics*, 3:18–25, 2006.

[23] D. Kubmarawa, G. A. Ajoku, N. M. Enwerem, and D. A. Okorie. Preliminary phytochemical and antimicrobial screening of 50 medicinal plants from Nigeria. *Afr. J Biotechnol.*, 6(14):1690–1696, 2007.

[24] AOCS. *Official and Recommended Practices of the American Oil Chemists' Society*. AOCS Press, Champaign, IL, 5^{th} edition, 2001.

[25] AOAC. *Official Methods of Analysis*. Association of Official Analytical Chemists International, Maryland, USA, 18^{th} edition, 2005.

[26] B. A. Orhevba, M. O. Sunmonu, and H. I. Iwunze. Extraction and Characterization of Moringa oleifera Seed Oil. *Journal of Food and Dairy Technology*, 1(1):22–27, 2013.

[27] J. M. Nzikou, L. Matos, G. Bouanga-Kalou, C. B. Ndangui, N. P. G. Pambou-Tobi, A. Kimbonguila, T. Silou, M. Linder, and S. Desobry. Chemical composition and characteristics of moringa peregrina seeds and seeds oil. *Journal of the American Oil Chemists' Society*, 61 (9):85–86, 1984.

[28] O. O. Olaleye and R. E. Kukwa. Physico chemicalproperties and chemical constituentcharacterization of Moringa oleifera seedoil from Benue State, Nigeria, extracted using cold and soxhlet method. *International Research Journal of Pure & Applied Chemistry*, 16(3): 1–11, 2018.