SHORT COMMUNICATION article

Chemical analysis of the hexane/ethyl acetate fractions of *ficus sur* stem extracts

Rukevwe M. Iyekekpolor *, **Philip A. Oviawe**, **Osaro Iyekowa**, **Miracle I. Ilenikhina**, **Benedict Akomu**, and **Victory E. Ogizien**

Department of Chemistry, University of Benin, Benin City, Nigeria
* Author to whom correspondence should be addressed

Article number: 17, **Received:** 25-08-2025, **Accepted:** 04-12-2025, **Published online:** 09-12-2025

HOW TO CITE THIS

Iyekekpolor et al. Chemical analysis of the hexane/ethyl acetate fractions of *ficus sur* stem extracts. Mediterr J Med Med Sci. 2025; 1(3): 47-54. [Article number: 17]. https://doi.org/10.5281/zenodo.17860519

Keywords: Analysis, health benefits, ethyl extract, hexane extract, natural products

Abstract: Natural products such as plants remains the most readily available remedy to many of human problems. The free oxygen we breathe in comes from plants and many more nutritional and health benefits which are yet to be discovered. This is the reason why the hexane/ethylacetate fractions of *Ficus sur* extract was analyzed. The proximate analysis, phytochemical screening and mineral content analysis were carried using standard methods. The proximate analysis of the stem bark indicated 60.12%, 20.35% and 8.37% respectively for carbohydrate, crude fibre and moisture content respectively. The presence of active phytochemical constituents such as alkaloids, glycosides, flavonoids, terpenoids, phenolics and eugenols were detected. Among the minerals present in the stem bark was potassium which gave the highest concentration of 17.7 ppm. Others were sodium (12.60 ppm), calcium (5.62 ppm), magnesium (1.63 ppm), Iron (5.30 ppm) and chrome (0.05). This study suggests that the plant samples have useful phytochemicals and minerals which can have useful pharmacological effects and also serve as nutritional supplements.

Introduction

The therapeutic use of natural products from indigenous plants for ethnomedicinal and nutritional purposes has grown tremendous interest among scientists to search for more bioactive components that are beneficial to man [1-8]. Recently, the interest in natural products from plants and their use has increased tremendously even in areas where conventional medicines are very much available. Medicinal plants are sources of raw materials for pharmaceutical drug formulation [3, 4, 9]. A significant percentage of medicinal plants used by the rural populace in Africa are affordable when compared to the high cost of conventional drugs [10]. In the rural communities, people depend mostly on traditional plants because of its richness in nutrients and phytochemicals which have physiological actions on the human body. Medicinal plants contain numerous biologically active compounds [11-13] and these inherent active ingredients are used to treat various ailments [14, 15]. A majority of the world's population in developing countries still rely on herbal medicines to meet their health needs [16]. Presently, in Nigeria, vegetables are the cheapest and readily available sources of proteins, vitamins and minerals [17] and, therefore, could benefit the populace with their medicinal properties. About 200 different varieties of Ficus are present as woody trees, shrubs and vines in the forests of tropical and subtropical regions [18]. They have been indicated to be rich sources of various vitamins, minerals, fibers and poly phenols. Hence, they have the capacity to provide several health benefits. Consumption of fruits and green leafy vegetables reduces the risk of several diseases like diabetes, cancer, heart disease etc. *Ficus sur* belongs to the family Moraceae [19]. Its other names include *F. guinensis, F. carpensis, F. ituriensis, F.*

riparia, and F. thonningiana while its common names are cape fig and broom cluster. In Nigeria, it has common names such as Ogbaikolo among the Igalas, Opoto in Yoruba, Akoro in Nsukka area of Enugu State, Obada in Edo State, Rimabichehiby by the fulanis and Uwargara in Hausa. The wild plant is distributed from Cape Verde and Senegambia across tropical West Africa to Cameroon and the Central African Republic, eastward to Eritrea, Northern Somalia and Yemen, South wards through all tropical eastern and southern African countries [20]. The plant is a fast-growing, deciduous or evergreen tree and usually grows from 5-12 meters in height, but may attain a height of 35-40 meters [21]. About 500 species of Ficus are found in the region of Asia and Australia [22]. Some species of Ficus are also grown as indoor as well as outdoor ornamental plants. Ficus species are rich in nutritional components and used as a source of food in Egypt, India, south China, Turkey and Malaysia. The plants of Ficus species are well known in the field of traditional medicine. Ficus species have been found to be a rich source of phenolic acid and flavonoids which make them able to protect against disorders of oxidative stress [23]. *Ficus sur* is a fast-growing, deciduous or evergreen tree. It usually grows from 5-12 meters in height, but may attain a height of 35-40 meters. Large specimens develop a massive spreading crown [24]. fluted trunks, and butress roots. The large, alternate and spirally arranged leaves are ovate to elliptic with irregularly serrated margins. Fresh foliage is a conspicuous red color and the papery, one cm long stipules are soon dropped [25]. The bark of younger trees is smooth and pale greyish-white in color, in contrast to the flaky, yellow bark of *F. sycomorus* with increasing age the bark becomes darker and rough [26]. The figs are carried on short or long drooping spurs (or follicles) which may emerge from surface roots, the trunk or especially from lower main branches [9]. The figs are 2-4 cm in diameter and acquire a rosy, speckled exterior when ripe. The fig seeds are dispersed after passing through the intestinal tracts of birds, bats, and primates [21]. Phytochemicals are bioactive compounds found in plants that contribute to their therapeutic effects. The phytochemical constitutes that are found in *Ficus sur* includes the alkaloids, steroids, flavonoids, tannins, saponins, coumarins, cardiac glycosides, anthraquinones, phenolic compounds and among others [27]. These compounds exhibit antioxidant, anti-inflammatory, antimicrobial properties.

Materials and methods

Sample collection and preparation of Ficus sur stem: The stem bark of *Ficur sur* were collected in Benin city, identified and authenticated in the Department of Plant Biology and Biotechnology, University of Benin, Benin City, Edo State, Nigeria. The stem bark of the plants was dried at room temperature for two weeks. It was pulverized with an electric blender and kept for further analysis.

Extraction and sample preparation: The extraction was conducted for 8.0 hrs, after which the crude extract was concentrated with a rotary evaporator to obtain a dark brown crude.

Phytochemical screening/tests: The phytochemical screening was done to detect the presence of the active chemical constituents such as alkaloids, glycosides, steroids, flavonoids, terpenoids, phenolics, tannins, eugenols and reducing sugar. It was done using standard procedure [28, 29].

Test for flavonoids: A few drops of lead acetate solution were added to 2.0 ml of plant extract. Observation was made for the formation of a yellow precipitate.
Test for saponins: 5.0 ml of the filtrate was diluted with 20.0 ml of water and shaken vigorously. A stable froth upon standing indicated the presence of saponins.

Test for alkaloids: Dragendorff's test: A few mg of extracts sample was taken and dissolved in 5.0 ml water. Then 2.0 M hydrochloric acid was added until an acid reaction developed. In this mixture, 1.0 ml of Dragendorff's reagent was added. The formation of orange red precipitate indicated the presence of alkaloid.
Test for tannins: Ferric chloride test. One gram of powdered crude plant sample was boiled with 50.0 ml of water, filtered and the filtrate was used for:

Ferric chloride test: To 3.0 ml of the filtrate, two drops of ferric chloride were added. The presence of green precipitate indicated the presence of tannins. However, tannins were absent in all extracts of leaves and stem back.

Test for phenolic compounds: Three drops of ferric chloride solution was added to 2.0 ml of the plant extract. The observation was made for the formation of a bluish-black colored solution.

Test for Coumarins: 0.5 gm moistened extracts was taken in a test tube, the mouth of the was covered with 2.0 M NaOH treated filter paper. The mixture was heated for few minutes in water bath. Yellow florescence from paper under UV light indicated the presence of coumarins.

Test for glycosides: 1.0 ml of the extract was mixed with 2.0 ml of glacial acetic acid in a test tube, then 1.0 drop of 15.0% of ferric chloride and 1.0 ml of concentrated sulfuric acid were added to the mixture. The observation was made for the formation of a brown coloration at the interface.

Test for reducing sugar: 1.0 ml of the plant extract was added to a boiling mixture of 1.0 ml each of Fehling's solutions A and B in a test tube. A color change from blue to green was observed.

Test for steroids: 1.0 ml of the extract in a test tube was mixed with 2.0 ml of acetic acid and 2.0 ml of concentrated sulphuric acid. The observation was made for a color change from violet to blue-green.

Test for anthraquinones: 1.0 ml of extract in a test tube was mixed with 5.0 ml of benzene and 2.5 ml of dilute ammonia. The mixture was then shaken vigorously. A pink red color at the lower phase indicated the presence of anthraquinones.

Proximate analysis: The analyses for the proximate contents of the dried powder of *Ficur sur* leaves and stem bark were carried out using methods described by the Association of Official Analytical Chemists [30]. The samples were analyzed for moisture content, carbohydrates, crude fibre, crude proteins, total ash content and crude fats (lipids).

Mineral analysis: Mineral analysis involves examining materials to determine the mineral composition and mineral structure. The analysis can be used to identify mineral species and understand their characteristics and properties. Atomic Absorption Spectrophotometer (AAS) and Flame Photometer (FP) can be used to determine the minerals present. *Ficus capensis* leaves were found to have high quantities of calcium, magnesium and phosphorus. Iron, zinc, copper and manganese were present but not in very high concentration [16]. The atomic absorption spectrophotometer (AAS) was used for the analyses of the following metals: Mg, Zn, Fe, Cd, Cu, Pb, Ca, Ni, while the flame photometer was used in the analyses of K and Na. Using AAS, the ash solutions of the plant samples were prepared by weighing 5g of each of the powdered plant samples, these were ashed at 550°C in muffle furnace for 5.0 hrs, and the residues dissolved in 100 ml of deionized water. Suitable salts of the metals were used to make their standards, lamps were fixed. The standard minerals solutions were injected to calibrate the AAS using acetylene gas. An aliquot of ash solutions was injected and the concentrations obtained from the AAS. Using the flame photometer, the diluents of sample was aspirated into the Jenway Digital flame photometer using the filter corresponding to each mineral element. All of these were carried out using the method described by Ibitoye [31].

Results and discussion

Table 1 indicates a high presence of alkaloids, which are known for their broad-spectrum pharmacological activities, including antimicrobial, analgesic, and anticancer effects [32-34]. Similarly, flavonoids are present in substantial amounts and are recognized for their strong antioxidant, anti-inflammatory, and cardioprotective properties [35]. These compounds play a crucial role in neutralizing free radicals and preventing oxidative stress-related diseases. Moderate amounts of steroids, terpenoids, and cardiac glycosides were also detected. Steroids have been associated with hormonal regulation and anti-inflammatory effects, while terpenoids

exhibit antimicrobial, antiviral, and anti-inflammatory activities. Cardiac glycosides are well known for their role in managing heart conditions by regulating cardiac function [24]. Additionally, tannins, coumarins, and phenolic compounds were present, suggesting potential antimicrobial, anticoagulant, and antioxidant effects [36-37]. However, anthraquinones and saponins were absent in the ethanol extract, indicating that their specific pharmacological contributions are not relevant in this preparation. The absence of saponins suggests limited potential for foaming or emulsifying activities commonly associated with these compounds in other medicinal plants. The overall phytochemical profile of *Ficus sur* stem bark highlights its potential medicinal applications, particularly in oxidative stress-related conditions, microbial infections, and cardiovascular health. This study supports the traditional use of *Ficus sur* in herbal medicine and suggests further research to isolate and characterize its bioactive compounds for pharmaceutical applications. Future studies could explore different extraction methods and solvent systems to determine whether additional phytochemicals may be present under varying conditions [32, 38].

Table 1: Result of the phytochemical screening of *Ficus sur*

Phytochemicals present	Ficus sur stem bark (100% ethanol)
Alkaloids	highly present
Steroids	present
Terpenoids	present
Cardiac Glycosides	present
Flavonoids	highly present
Anthraquinones	absent
Saponins	absent
Tannins	present
Coumarins	present
Phenolic compounds	present

The proximate analysis of Ficus sur stem bark provides essential insights into its nutritional and chemical composition, which is significant for medicinal and industrial applications. **Table 2** shows the results of the proximate analysis of Ficus sur stem. It revealed that the moisture content of Ficus sur stem bark is 8.37%, which plays a crucial role in determining the shelf life and susceptibility to microbial degradation. A relatively low moisture content, such as observed in this study, indicates better preservation potential, reducing the likelihood of microbial growth and chemical degradation [39]. The ash content was found to be 6.21%, representing the total inorganic mineral content present in the stem bark. This fraction includes essential minerals such as calcium, potassium, and magnesium, which may contribute to the medicinal value of the plant. High ash content is often associated with a rich presence of bioactive minerals beneficial for human and animal health [40]. Crude fiber content was determined to be 20.35%, indicating that Ficus sur stem bark is a significant source of dietary fiber. Fiber plays an important role in digestion, promoting gut health and aiding in the regulation of blood sugar levels. Moreover, high fiber content enhances the plant's potential for pharmaceutical applications, particularly in digestive health formulations [40]. The crude protein content was recorded at 3.78%, which is relatively low. Proteins are essential macromolecules necessary for growth, repair, and enzymatic functions in biological systems. Although the protein content is modest, it may still contribute to the plant's overall nutritional profile and its potential use in traditional medicine [41]. The fats/lipids content was found to be 1.17%, suggesting a minimal presence of essential oils or fatty compounds. While low in quantity, the lipids present could still contain bioactive compounds such as phytosterols and essential fatty acids, which play a role in anti-inflammatory and antioxidant activities [42]. Carbohydrates were the most abundant component, making up 60.12% of the bark's composition. This suggests that the bark serves as a good energy source and may contain polysaccharides with potential medicinal benefits. Carbohydrates, particularly polysaccharides, are known to have immunomodulatory and prebiotic effects, making them useful in pharmacological applications [43].

Table 2: The results of the proximate analysis of *Ficus sur* stem bark

Test	% in stem bark
Moisture content	8.37
Ash content	6.21
Crude fibre	20.35
Crude protein	3.78
Fats/lipids	1.17
Carbohydrates	60.12

The proximate analysis of *Ficus sur* stem bark reveals its rich carbohydrate and fiber content, moderate ash composition, and minimal protein and lipid presence. These findings suggest potential applications in nutrition, medicine, and industrial processing. The high carbohydrate and fiber levels may contribute to its medicinal properties, particularly in digestive health, while the ash content implies a valuable mineral profile. Future research should focus on the specific bioactive compounds within these macronutrient classes to further explore their potential benefits. **Table 3** reveals *Ficus sur* stem bark have high quantities of potassium and sodium. Calcium, iron, magnesium, zinc was present in small quantities. Nickel, copper, chromium, manganese was present in trace amount. Potassium and sodium, present in relatively high concentrations, are essential for maintaining electrolyte balance and regulating cellular functions [44]. The presence of calcium and magnesium indicates potential benefits for bone health, nerve function, and enzymatic activities [45]. Iron, which plays a crucial role in oxygen transport and hemoglobin formation, is present in moderate amounts, suggesting that *Ficus sur* could contribute to preventing iron-deficiency anemia [46]. The trace elements manganese, copper, and chromium serve as cofactors in various enzymatic processes, supporting metabolic activities and immune function [47]. The detection of nickel in trace amounts suggests minimal toxicity risks, aligning with safety recommendations for nickel intake [9]. The absence of lead and cadmium, both toxic heavy metals, further supports the safety of *Ficus sur* stem bark for potential medicinal applications [48].

Table 3: The results of the mineral analysis of *Ficus sur* stem bark

Element	Concentration in ppm (stem bark)
Pb	ND
Zn	1.40
Cd	ND
Ni	0.01
Cu	0.04
Cr	0.05
Mn	0.20
Fe	5.30
Mg	1.63
Ca	5.62
K	17.70
Na	12.60

Key: ND means not detected within the detection limit for Cd and Pb of the AAS machine used

Conclusion: The results of proximate analysis, phytochemical screening and mineral analysis of *Ficur sur* stem bark reveals that the plant contains essential minerals and phytochemicals which could be harness for medicinal and nutritional purposes. The existence of these components in the plant should therefore justify its use in alternative/traditional medicine, specifically in the treatment of heart disease, sexually transmitted illnesses, hypertension, anemia and diarrhea.

References

1. Oktay M, Gülçin I, Küfrevioglu OI. Determination of *in vitro* antioxidant activity of fennel (*Foeniculum vulgare*) seed extracts. Journal of Advanced Scientific Research. 2003; 36(2): 263-271. doi: 10.1016/S0023-6438(02)00226-8
2. Wangensteen H, Samuelsen AB, Malterud KE. Antioxidant activity in extracts from coriander. Food Chemistry. 2004; 88: 293-297. doi: 10.1016/j.foodchem.2004.01.047
3. Ahmed R, Khandaker MS. Natural products as of nutraceuticals treatment for neurological disorders: An overview. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2025; 5(2): 62-69. doi: 10.5281/zenodo.15226021
4. Akhlaq M, Alum MK, Alam MM. Anti-inflammatory potential of medicinal plants. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2022; 2(1): 13-21. doi: 10.5281/zenodo.6399381
5. Sami A, Usama M, Saeed MM, Akram M. Medicinal plants with non-steroidal anti-inflammatory-like activity. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2021; 1(3): 25-32. doi: 10.5281/zenodo.5534605
6. Nizamuddin SFS. Polyphenol-rich black chokeberry (*Aronia melanocarpa*) and its therapeutic potential in type 2 diabetes mellitus: A comprehensive review. Mediterranean Journal of Medicine and Medical Sciences. 2025; 1(3): 31-42. doi: 10.5281/zenodo.17619107
7. Obel MA, Asfoor TAT. The potential of endemic medicinal plants in the central regions of Abyan Governorate, Yemen for sustainable pharmaceutical applications. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2025; 5(3): 46-51. doi: 10.5281/zenodo.16537815
8. Rafi IK, Aktaruzzaman M. An overview of therapeutic qualities and various applications of *Centella asiatica*. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2025; 5(1): 130-137. doi: 10.5281/zenodo.14933667
9. Nkollo MI, Ngwuede RO, Efejene IO, Olele CH, Iwelumo C, Chibuogwu C, Aisuodionoe EM. Phytochemistry and pharmacological insights into Kalanchoe pinnata: A brief review. Mediterranean Journal of Medical Research. 2025; 2: 26-31. doi: 10.5281/zenodo.15368110
10. Han KSS, Win KT, Chit MT. Evaluation of antimicrobial, antioxidant, antidiabetic activities, and acute toxicity of *Elephantopus scaber* L. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2025; 5(2): 87-95. doi: 10.5281/zenodo.15365040
11. Adeleke PA, Okubena O, Okubena A, Ajayi AM, Okubena O, Jegede FB, et al. Anti-aging potentials of a polyphenol-rich supplement from African *Sorghum bicolor* leaf sheaths: A narrative review. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2025; 5(4): 58-77. doi: 10.5281/zenodo.17742769
12. Ogbeide OS, Omorodion S, Akhidenor FI, Orazulike OJ, Igbinosa MO, Otortor D, et al. Comparative study on the phytochemical composition, amino acid profile, antioxidant, *in vitro* anti-inflammatory, and *in vitro* antidiabetic activities on the leaf and stem bark of *Acalypha indica*. Mediterranean Journal of Medical Research. 2025; 2: 55-64. doi: 10.5281/zenodo.15579785
13. Nwaneri MGU, Ilechukwu OA, Ugo UA. Antimicrobial activity of endophytic fungal metabolites from breadfruit *(Artocarpus altilis*) leaves against multidrug-resistant *Staphylococcus aureus* and *Klebsiella* spp. Mediterranean Journal of Medicine and Medical Sciences. 2025; 1(3): 23-30. doi: 10.5281/zenodo.17611720
14. Olowokudejo JD, Kadiri AB, Travih VA. An ethnobotanical survey of herbal markets and medicinal plants in Lagos State of Nigeria. Ethnomedicinal Leaflets. 2008; 12(8): 51-65. doi: Nil.
15. Okigbo RN, Eme UE, Ogbogu S. Biodiversity and conservation of medicinal and aromatic plants in Africa. Biotechnology and Molecular Biology Reviews. 2008; 3: 127-134. Corpus ID: 54993657.
16. Uzoekwe M, Mohammed JJ. Phytochemical, proximate and mineral contents of leaves and bark of *Ficus capensis*. Journal of Applied Science and Environmental Management. 2015; 8(4): 125-129. doi: 10.4314/jasem.v19i4.10
17. Thompson HC, Kelly WC. Vegetable Crops. 5th Ed. New Delhi: Mac Graw Hill Publishing Company Ltd., 1995. ISBN: 0070644187.
18. Awad NE, Ahmed AS, Hamed MA, Elbatanony MM. Hypolipidaemic and antioxidant activities of *Ficus microcarpa* (L.) in hypercholesterolemic rats. Natural Product Research. 2011; 25(12): 1202-1207. doi: 10.1080/14786419.2010.538015
19. Exell AW. Flora Zambesiaca. 2023; 10(4). Governments of Portugal. ISBN: 1842460536.
20. César J, Chatelain C, Schmidt M, Zizka G, Marie B, Nacoulma I, Diarra ML, Thiombiano A, Dressler S, Spichiger R. Flore illustrée du Burkina Faso et du Mali. 2024; 1-2; 1062. ISBN 978-3-510-61426-4.
21. Njoku-Oji NN, Nwike CV, Dimkpa U, Ifegwu NO, Anike LC, Maduka SO, Sobanke OA, Uchefuna RC. Hematological changes following oral administration of aqueous leaf extract of *Ficus Capensis* in Albino rats. International Blood Research and Reviews. 2016; 5 (1): 1-7. doi: 10.9734/IBRR/2016/23083.

22. Al-Aboudi A, Afifi FU. Plants used for the treatment of diabetes in Jordan: A review of scientific evidence. Pharmaceutical Biology. 2011; 49(3): 221-239. doi: 10.3109/13880209.2010.501802
23. Sirisha N, Sreenivasulu M, Chetty C. Antioxidant properties of Ficus species-A review. International Journal of PharmTech Research. 2010; 2(4): 2174-2182. doi: Nil.
24. Pooley E, Nichols G, Hankey AJ. South African Indigenous Garden Plants, the gardener's guide. 2025; Publisher: Struik Nature: Flora and Fauna Publications trust Editor: Natalie Bell, Collette Alves, Helen de Villiers. ISBN: ISBN 978-1-77584-650-5.
25. Palgrave KC, Moll EJ, Palgrave MC. Trees of Southern Africa. 2002; 3rd Ed., Struik Publishers. ISBN: 186872767X.
26. Ramde-Tiendrebeogo A, Tibiri, A. Hilou OM, Lomp H, Millogo-Kone OG, Nacoulma IP, Guissou. Antioxidative and antibacterial activities of phenolic compounds from *Ficus sur* Forssk. and *Ficus sycomorus* L. (Moraceae): Potential for sickle cell disease treatment in Burkina Faso. International Journal of Biological and Chemical Sciences. 2012; 6(1): 328-336. doi: Nil.
27. Mgbemena NM, Ilechukwu I, Okwunodulu FU, Chukwurah JO, Lucky JB. Chemical composition, proximate, and analysis of Irvingiagabonenensis and InvingiaWombulu peels, seed coat, leaves and seeds. Ovidius University of Annals of Chemistry Science. 2019; 30(1): 65-69. doi: 10.2478/auoc-2019-0012
28. Trease GE, Evans WC. Pharmacognosy. 11th Ed., Baillere Tindoll, London. 1989. ISBN: 978-0-7020-2933-2.
29. Harbon JB. Phytochemical methods, 3rd Ed. Thompson Science Boundary, London. 1996. ISBN: 041257270 2.
30. AOAC. Official Methods of Analysis of the Association of Officials Analytical Chemists, 14th Ed., Association of Official Analytical Chemist, Washington D.C., USA. 1990. ISBN: 0-935584-42-0.
31. Ehigie S, Oviawe PA, Owolabi BJ, Michael OT, Oghomwen RO, Aselu CV, Iyekowa O. Comparative phytochemical and mineral analysis of methanol extract of *Teifairia occidentalis* (Fluted pumpkin) leaves, stem, and roots. Mediterranean Journal of Medical Research. 2025; 2: 65-70. doi: 10.5281/zenodo.15653316
32. Bazine HA, Shlaka MA, Sherif FM. A neuropharmacological profile of *lycium schweinfurthii* (solanaceae) methanolic extract in mice. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2023; 3(1): 43-50. doi: 10.5281/zenodo.7771364
33. Ibitoye AA. Laboratory manual on basic soil analysis. Foladave Nigeria Ltd, Akure, Nigeria. 2016. doi: Nil.
34. Nwan Ebenebe IN, Nedum CH, Okezie UM, Egbuna NR, Obasi CC, Nwaneri MGU. Comparative assessment of *Solanum melongena* (Eggplant) against multi-drug-resistant Staphylococcus aureus and Pseudomonas aeruginosa. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2024; 4(4): 33-40. doi: 10.5281/zenodo.14176439
35. Nwaneri MGU, Umeugoji LN, Ugo UA. Fungicidal action of endophytic fungi, obtained from *Justicia carnea*, against multidrug-resistant Candida albicans. Mediterranean Journal of Medical Research. 2025; 2(4): 179-185. doi: 10.5281/zenodo.17449274
36. Sulong NA, Nasir NS, Misamiruddin R, Lee VS, Azad AK. Cytotoxicity study of aqueous extract of Asam Gelugur (*Garcinia cambogia*) against Vero cell line: Implications for nutraceutical safety. Mediterranean Journal of Pharmacy and Pharmaceutical Sciences. 2025; 5(2): 36-42. doi: 10.5281/zenodo. 15164035
37. Panche AN, Diwan AD, Chandra AR. Flavonoids: An overview. Journal of Nutritional Sciences. 2016; 5: 47. doi: 10.1017/jns.2016.41
38. Akomolafe SF, Oboh G, Oyeleye SI, Boligon AA. Aqueous extract from Ficus capensis leaves inhibit key enzymes linked to erectile dysfunction and prevent oxidative stress in rats' penile tissue. NFS Journal. 2016; 4: 15-21. doi: 10.1016/j.nfs.2016.06.001
39. Nielsen, JC, Nielsen J. Development of fungal cell factories for the production of secondary metabolites: linking genomics and metabolism. Synthetic and Systems Biotechnology. 2017; 2(1): 5-12. doi: 10.1016/j.synbio.2017.02.002.
40. Iniaghe OM, Malomo SO, Adebayo JO. Proximate composition and phytochemical constituents of leaves of some Acalypha species. Pakistan Journal of Nutrition. 2009; 8(3): 256-225. doi: 10.3923/pjn.2009.256.258
41. Nawaz H, Waheed R, Nawaz M. Phytochemical composition, antioxidant potential, and medicinal significance of Ficus. 2019. In: Modern fruit industry. doi: 10.5772/intechopen.86562
42. Fagbohun ED, Lawal OU, Ore ME. The proximate, mineral and phytochemical analysis of the leaves of *Ocimum grattissimum* L., *Melanthera scandens* A. and *Leea guineensis* L. and their medicinal value. International Journal of Applied Biology and Pharmaceutical Technology. 2012; 3: 15-22. Corpus ID: 97057597.
43. Diba D, Mekasha Y, Urge M, Tolera A. Feed intake, digestibility, growth performance, and blood profile of pigs fed mixtures of dried and ground fig (*Ficur sur*) fruits and graded levels of maize. Tropical Animal Health and Production. 2015; 47: 339-346. doi: 10.1007/S11250-014-0725-Z
44. McDonald A, Edwards, RA, Greenhulgh FD, Morgan CA, Sinclair LA, Wilkinson RG. Animal nutrition 7th Ed. Pearson, Harlow, England. 2011. ISBN: 978-1-4082-0423-8.
45. Fallon S, Enig MG. Nourishing traditions: The cookbook that challenges politically correct nutrition and the diet dictocrats. 2001; 40-45. ISBN-13: 978-1887314152.

Author contribution: RMI, APO & OI conceived and designed the study. RMI, MI, BA & VO collected data and contributed to data analysis. All authors performed data analysis and contributed to interpretation of data RMI & OI drafted the manuscript/revised it for important intellectual context. All the authors approved the final version of the manuscript and agreed to be accountable for its contents.
Conflict of interest: The authors declare the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.
Ethical issues: The authors completely observed ethical issues, including plagiarism, informed consent, data fabrication or falsification, and double publication or submission.
Data availability statement: The raw data that support the findings of this article are available from the corresponding author upon reasonable request.
Author declarations: The authors confirm that they have followed all relevant ethical guidelines and obtained any necessary IRB and/or ethics committee approvals.
Generative AI disclosure: No Generative AI was used in the preparation of this manuscript.