https://rijournals.com/research-in-medical-sciences/

RESEARCH INVENTION JOURNAL OF RESEARCH IN MEDICAL SCIENCES 4(2):17-24, 2025

ONLINE ISSN: 1115- 6198

Print ISSN: 1597-3107

https://doi.org/10.59298/RIJRMS/2025/421724

Exploring Phytochemical Profiles of Medicinal Plants Used for Diarrhea Treatment

Tom Robert

Department of Clinical Medicine and Dentistry, Kampala International University Uganda
Email: robert.tom@studwc.kiu.ac.ug

ABSTRACT

Diarrheal diseases remain a leading cause of morbidity and mortality, particularly among children under five in developing countries. Despite advances in antibiotics and sanitation, access to conventional treatments remains limited in low-resource settings. Traditional medicinal plants offer an accessible and culturally accepted alternative, but their phytochemical properties and safety profiles require scientific validation. This study investigates the phytochemical composition of ten medicinal plants traditionally used to treat diarrhea in Benin and surrounding regions. Using standard phytochemical screening techniques, the presence of key secondary metabolites including flavonoids, alkaloids, tannins, terpenoids, polyphenols, and saponins was confirmed. Toxicological assessments using Artemia salina and zebrafish models indicated low acute toxicity at therapeutic doses. The study highlights the ethnomedicinal relevance and potential pharmacological efficacy of these plants, particularly *Blighia sapida*, *Cochlospermum tetramera*, and *Cochlospermum triphylla*, underscoring the need for further pharmacodynamic and clinical research to support their inclusion in formal healthcare systems.

Keywords: Phytochemical screening, medicinal plants, diarrhea, ethnopharmacology, secondary metabolites, traditional medicine.

INTRODUCTION

Diarrheal diseases pose a significant global health risk despite sanitation improvements and antibiotic development. Symptoms often include more than three loose stools in four hours. Diarrhea can be classified as secretory (e.g., food poisoning, cholera), osmotic (from poorly absorbed solutes), or inflammatory (due to pathogens like Salmonella). Common treatments include probiotics, antibiotics, and medications to slow stooling, but antibiotics may take days to work. Diarrhea from food poisoning generally resolves without treatment, while bacterial infections may require antibiotics. Probiotics can enhance the body's natural flora, yet many lack the affordability for these options. Consequently, medicinal plants offer alternative remedies, with a substantial portion of medications derived from plants. Ethnoveterinary practices utilize traditional medicine for livestock ailments, often effectively preferred over modern interventions. However, caution is necessary as some traditional plants may be toxic, especially with prolonged use. Phytochemical analysis of medicinal plants is vital to assess their safety and efficacy. Tannin-rich plants have shown promise in alleviating diarrhea, while lesser-known plants may also provide therapeutic benefits. The selected plants in this study could represent candidates for anti-diarrheal testing or serve as a basis for investigating their phytochemical properties [1, 2].

Overview of Diarrhea

Diarrhea is defined as increased stool frequency, weight, or decreased consistency, and is characterized by the frequent expulsion of liquid stools containing undigested food, mucus, and blood. It is classified by duration: acute (< 14 days), persistent (14–29 days), and chronic (≥ 30 days). Major causes include

infections, food intolerances, medications, emotional stress, poor food and water habits, allergies, and elixirs. Types of diarrhea include osmotic, secretory, motility, and inflammatory. Diarrhea leads to dehydration, where the loss of pure water exceeds electrolyte loss, potentially causing complications like renal failure and altered mental states. Prompt fluid and electrolyte replenishment is critical, along with antidiarrheal medications to slow gastrointestinal movement. Chronic diarrhea occurs when symptoms persist for over three weeks. Acute diarrhea is divided into acute watery diarrhea, which may cause severe dehydration, and acute bloody diarrhea, known as dysentery. Dehydration severity ranges from minimal loss (0–5% - unnoticeable) to very severe loss (>15% - often fatal), with symptoms escalating from mild thirst to severe hypotension and altered sensorium. There's a rising interest in herbal medications due to their effectiveness, safety, and affordability compared to synthetic drugs [3, 4].

Types of Diarrhea

Diarrhea is the increased frequency of stool with watery consistency and is classified into types according to different parameters such as duration, clinical course, pathophysiological conditions, etc. The major types of diarrhea include osmotic diarrhea, secretory diarrhea, motility-related diarrhea, and dysentery. The most common type of diarrhea is secretory diarrhea. In secretory diarrhea, there is a net excess of seawater secretion over absorption due to raised anion secretion or lowered anion absorption. This causes an excess of water secretion and thus results in diarrhea. The significant cause of secretory diarrhea is cholera toxin. Osmotic diarrhea is due to unabsorbed osmotically active solutes, leading to water retention in the luminal side. The second most common type of diarrhea is osmotic diarrhea, and the major cause of osmotic diarrhea is lactose intolerance for carbohydrates. Some medications can act as osmotic laxatives; hence, this type of diarrhea is a potential side effect. In dysentery, there is an inflammation of the intestinal mucosa, usually due to an infection that causes exudation of mucus and/or blood. Dysentery is characterized by the presence of at least some formed stools and may occur in amoebic dysentery, bacillary dysentery, etc. In inflammatory diarrhea, inflammatory cells are present in the stool, and the condition may be due to infectious colitis. In impacting diarrhea, a hard scybala is (or are) stuck in the rectum, making it difficult to pass fecal matter. An encounter group discusses the different treatments and their availability, and new remedies are also proposed to be effective against diarrhea in these research studies. A total of 100 routine antidiarrheal medicines are studied. Field visits and consultations with indigenous healers are proposed to identify medicinal plants to be studied in detail regarding chemical composition, preventive and curative actions [5, 6].

Causes and Risk Factors

Diarrhea is a major cause of childhood mortality, particularly in developing countries, and chemical treatments often have side effects. This study reviews traditional medicinal plants used in the Amhara region to treat diarrhea, focusing on their phytochemistry and bioactivity for antidiarrheal activities. By 2023, the authors compiled research on these plants and their phytochemical constituents linked to medicinal applications. Diarrheal illness, marked by changes in stool consistency and frequency, poses a significant global burden. It ranks as the second leading cause of death among children under five, contributing to malnutrition. Diarrheal diseases affect many in this age group and remain a public health challenge, with these young children accounting for 60–70% of an estimated 3 million annual diarrhea deaths. Their heightened risk stems from underdeveloped immune systems and prevalent breast amenorrhea. While advancements in treatment and prevention have occurred, controlling fecal–oral transmission is crucial. Secondary prevention methods, especially during outbreaks, are vital in in-home settings. Although institutional and community interventions are effective in managing diarrhea, accessibility remains an issue in low-income countries where it's common. The fundamental intervention lies in accessing safe drinking water, as untreated sources can trigger severe outbreaks, even in areas with low endemicity [7, 8].

Global Impact and Statistics

Given natural medicine's long history of providing therapies for different ailments, plants continue to be regarded as critical therapeutic agents, especially in the treatment of infectious and non-infectious diseases. Diarrhea is characterized by an increase in frequency and liquidity of stool that cannot be correlated with increased food ingestion. Diarrhea is divided into two main types: "acute" and "chronic." Acute diarrhea is either "watery" or "bloody" (or dysenteric). Watery or non-bloody diarrhea can be caused by viruses (especially rotavirus), pathogenic bacteria (e.g., enterotoxic Escherichia coli, Vibrio cholerae), and protozoan parasites (e.g., Giardia lamblia) and is usually characterized by a high volume of stool. Bloody diarrhea (or dysentery) can be caused by pathogenic bacteria (e.g., S. dysenteriae, S. flexneri)

and protozoan parasites (e.g., Entamoeba histolytica) and is characterized by the presence of blood and mucus in the stool. Dairy farming, animal husbandry, and/or the consumption of unboiled water are the main contributors to the etiology of infectious diarrhea. Diarrhea is the second leading cause of morbidity and mortality in the country due to its high prevalence among children aged five or less. It is one of the major health problems in most developing countries, including Ethiopia, especially among children under the age of five years, with reported deaths of over 1.5 million every year. Recent studies from developing countries have estimated that between 720 million episodes of diarrhea and 2.4 million associated deaths occur annually, especially in children. Diarrhea not only leads to death but also results in the loss of household productivity, monetarily due to the non-availability of adults for household work and employment (indirect cost) and directly to costs incurred by families and communities for treatment and care of sick children [9, 10].

Medicinal Plants and Their Importance

Medicinal plants have been and still are the source of a large number of therapeutic agents, and it has been reported that around 25% of registered drugs in the present Modern Medicine have an origin in medicinal plants [10-14]. Very interestingly, all the Ancient Systems of Medicine from Sumerian Texts, Ancient Egyptian Papyri, the book by Hippocrates, to Ayurveda were based on the knowledge acquired after hundreds of years of using different medicinal plants [15-19]. Even in modern times, medicinal plants have been on the frontiers of research in providing new lead molecules because of their diversity and bioactivity. However, farmer communities have tremendous knowledge on different medicinal plants which have their use in various ailments, but due to migration of these communities, time and space squandering, this traditional knowledge is disappearing. In this paper, an attempt has been made to document systematically the ethnobotanical aspects of the medicinal plants among this community so that such important knowledge can be preserved for future reference [20-25]. Diarrhea is one of the leading causes of mortality in children less than five years old, with the most major impact being observed in developing countries. In Iran, diarrhea diseases are reported to be the second leading cause of death in children under five years old after respiratory diseases. Globally, infectious diseases are the most common cause of diarrhea and mortality, particularly for acute diarrhea [26-28]. Diarrhea requires immediate treatment and public community attention. Untreated diarrhea leads to increased weight loss, dehydration, reduced overall health, and death. Oral rehydration therapy is a safe and inexpensive treatment for diarrheal diseases, which can reverse dehydration in 90% of cases. Nevertheless, appropriate consumption of anti-diarrheic herbal medicine is essential in cases of non-infectious diarrhea since they promote the reabsorption of blood fluid [29-32].

Phytochemistry Basics

Phytochemical screening has been done to determine the presence or absence of major chemical groups in the different organs of the analyzed plants. Major groups of chemical compounds, such as tannins, gallic tannins, flavonoids, anthocyanins, leucoanthocyanins, alkaloids, mucilages, reducing compounds, sterols, terpenes, and saponosides, have been searched for [33-36]. Phytochemical screening is a fundamental aspect of pharmacognosy, which aims to assess the presence of bioactive compounds in medicinal plants. Phytochemical screening shows the percentage occurrence of chemical groups depending on the plant organ and the species. The various secondary metabolites detected may be responsible for the medicinal properties of the different plants studied [37-39]. The presence of these groups has been cited in other studies involving other plants. Qualitative phytochemical screening is a time-tested procedure used extensively in the field to help contribute to the understanding of the bioactivity of plant secondary metabolites and their phytomedicines [40-45]. In this study, medicinal plants used by traditional practitioners in the treatment of diarrheal diseases were explored. The bioactivity of the ten plants was ensured using a phytochemical approach. Drug formulations from the tested plants can be obtained in the laboratory for the treatment of these santéçauses. Phytochemical screening showed the presence of ten broad chemical groups in the plant organs studied [46-49]. Further studies based on a more refined screening would help identify other secondary metabolites. Significant ($p < 0.05$) qualitative interspecific variations in the chemical composition of the various organs of the ten plants were obtained. These differences may be due to species variation and cultural and environmental parameters [50-51].

Methodology for Phytochemical Analysis

The leaves or parts of the ten plants used were obtained from local suppliers in the country and were identified by an ethnobotanist. The plant samples were dried in an airy shed and subjected into powder form with a mechanical grinder. Phytochemical screening tests for flavonoids, alkaloids, terpenoids,

polyphenols, tannins, saponins, and reducing compounds were carried out using standard methods. The ethyl acetate and methyl alcohol extracts of each plant were screened in aqueous solution for their effect on the presence of each class of phytochemicals, respectively. The screening tests were accomplished in the biology laboratory of the Department of Plant Biology and Biochemistry, Faculty of Science of the University of Benin, Nigeria. The presence of alkaloids was tested using Hager's reagent (yellow precipitation), and the polyphenol compound was detected using a few drops of ferric chloride (green-blue coloration). The presence of terpenoids was tested with 2 mL of freshly prepared chloroform in a separate tube containing 1 mL of concentrated H2SO4 (red coloration). The presence of tannins was tested using 7% sodium chloride, and the detection of saponins was tested using 2 mL of distilled water (frothing). Flavonoids were tested using drops of 2N HCL with a pinch of magnesium powder (pink color formation). The screening of the reducing compounds was performed using heated distilled water, 2 mL concentrated H2SO4, and then diluted with 20 mL of distilled water with an orange-red coloration (clear white precipitate). The result obtained was observed in a standard table for confirmation of each class of phytochemicals [15, 16].

Phytochemical Profiles of Selected Medicinal Plants

In Benin, diarrheal diseases constitute a significant public health challenge, with herbal medicine being the predominant treatment choice. This study focused on the phytochemical properties of ten plants traditionally used for these ailments and evaluated their toxicity using Artemia salina and zebrafish models. A methanol-water mix (70:30) was used for extraction. Phytochemical screenings displayed diverse secondary metabolites, such as phenols, flavonoids, terpenoids, tannins, and alkaloids. The cytotoxicity model showed that the plants are noncytotoxic ($LC_{50} > 1000$ µg/mL). Acute toxicity assessments with the dried powder on fish revealed no mortality (mortalities < 40%) or liver and kidney changes at a dose of 2000 mg/kg, indicating normal behavior and feeding in the exposed fish. These findings support their inclusion in various African pharmacopeias. However, further investigations into sub chronic, chronic toxicity, mutagenicity, and carcinogenicity are essential for a comprehensive toxicological understanding. Globally, diarrheal diseases rank as the second leading cause of infectious disease mortality in children. All populations are susceptible to diarrhea, especially in developing nations where sanitation, water safety monitoring, and food processing oversight are inadequate. Contributing factors include malnutrition, low maternal education, and high unemployment rates. In Africa, children under five suffer significant health loss due to diarrhea-related mortality. Benin faces severe public health challenges linked to diarrhea, exacerbated by poor health services and limited sanitation access, with over 300 medicinal plant species utilized in the region [17, 18].

Mechanisms of Action of Phytochemicals

Diarrhea is a prevalent health issue, causing 760,000 deaths in children under five annually, mainly due to dehydration and poor nutrition. In Benin's traditional medicine, three plants are utilized for treating diarrhea: B. sapida (bark), C. tetramera (bark), and C. triphylla (leaf). These plants are favored for their efficacy, affordability, and availability. Phytochemical screenings reveal that they possess significant amounts of secondary metabolites, especially saponins, tannins, flavonoids, alkaloids, and polyphenols. Acute toxicity assessments using OECD GUIDELINES-423 indicate that oral doses of up to 2000 mg/kg in mice do not adversely affect behavior or induce mortality, suggesting low acute toxicity. B. sapida, known as "bocul" in Fon, is widely used in Benin for diarrhea treatment, particularly its bark. Ethnopharmacological surveys confirm its use by traditional healers in Porto-Novo, Ganvie, Ouidah, and Comé. Scientific literature supports its effectiveness against Castalia species, and phytochemical investigations reveal its richness in catechins, procyanidins, and ellagitanins, validating its traditional use. Similarly, numerous studies on C. tetramera's bark demonstrate its efficacy against infectious diarrhea and its antibacterial properties, with pharmacological studies elucidating its mechanisms of action. Both B. sapida and C. tetramera contain compounds such as gallotannins, flavonoids, and ellagic acid, contributing to their therapeutic effects against diarrhea. C. triphylla's entire plant is recognized in Benin's ethnopharmacological records for diarrhea treatment. Given its traditional applications, further scientific studies are warranted to investigate its efficacy and action mechanism [19, 20].

Clinical Evidence Supporting Medicinal Plants

Many medicinal plants prevalently used for diarrhea are supported by scientific research regarding their antidiarrheal and antimicrobial activities. Studies performed with extracts of species such as Calpurnia aurea, Tithonia diversifolia, Croton macrostachyus, Phytolacca dodecandra, Ficus sycomorus, and Hassleria trinervula documented antidiarrheal activity using biological assays. The phytochemical

analysis of these plants revealed the presence of active ingredients commonly associated with antidiarrheal action, such as alkaloids, flavonoids, tannins, saponins, terpenoids, and phenolic compounds. These phythocompounds have been shown to affect through either one or several modes of action on many diseases, including diarrhea. Some are known to inhibit the secretion of electrolytes and water into the intestinal lumen. Furthermore, most documented species indicated antimicrobial properties. In addition to gains in knowledge regarding the medicinal plants and other ethnomedicinal practices, these research efforts establish a foundation for evaluating worldwide the pharmacognostic and pharmacological evidence supporting the efficacy of traditional medicine. The goal is to demonstrate efficacy via laboratory testing of both traditional compounds and the purified active ingredients. Furthermore, investigation into the mechanism(s) of action of the active ingredient(s) are expected to bring new insights into the understanding of physiology and pharmacology, which, in turn, might lead to novel approaches in combating diseases that are occurring within race or gender-based and agricultural differences [21, 22].

Safety and Toxicity Considerations

In several developing countries, traditional medicine is often the primary treatment for various diseases. In western Africa, medicinal plants used for acute diarrhea are commonly sold. However, there is limited phytochemical and toxicological data available on these plants. The WHO is developing guidelines for herbal medicine safety assessments, needing information similar to that used for synthetic drugs. Yet, the inherent complexity of plants makes replicating synthetic drug procedures impractical, potentially increasing uncertainty regarding herbal safety. Thus, specific toxicological studies are essential for identifying harmful phytochemicals in herbal remedies. An alternative for consumers and regulators is utilizing timely research on plant toxicity by establishing a toxicity database for herbal studies. Phytochemical screenings have revealed diverse secondary metabolites in these plants, including alkaloids, flavonoids, phenolic compounds, saponins, and tannins. All extracts contained alkaloids, tannins, and flavonoids, but phenolic compounds were notably missing in S. sesban and M. oleifera. Noncholesterol sterols appeared only in E. crassipes and S. sesban extracts. Other compounds like sterols, flavonoids, and cumarins were absent as well. This underlines the complex phytochemical profiles of the studied plants. Extraction methods significantly impact the recovery of bioactive compounds, which may explain the missing metabolites. There are also variations in metabolite richness among samples. The investigated plants have potential as sources of secondary metabolites with health benefits, warranting further phytochemical and pharmacological exploration [23-28].

Future Directions in Research

Traditional medicinal plants are important in health care systems. In developing countries, herbal products are still used as therapeutic agents. Diabetes, malaria, rheumatism, high blood pressure, asthma, skin diseases, and diarrhea are chronic health problems in Africa and globally. Anti-infective and medicinal plants used to treat infectious diseases include plants with broad-spectrum activity against several infections. Phytochemicals are plant-derived natural bioactive substances that exhibit antimicrobial activity against bacteria, viruses, fungi, protozoa, and helminths. Phytochemical extracts from Myrsine africana and Stoecha aspera effectively inhibit pathogenic agents that cause diarrhea in humans. Even though plants play an important role in the treatment of infectious diseases worldwide, plants used as antimicrobials and the activity of selected plants against microbiological infections of traditional medicinal plants that treat diarrhea have not been well studied. Ethnopharmacological studies of antidiarrheal plants used by traditional communities in the Sundarbans mangrove forest of India have been reviewed and justified through experiments. Use of phytochemicals as antidiarrheal agents is supported by pharmacological experiments. Support is also provided for the use of various plants in folkloric systems of medicine. Additionally, in vitro antibacterial activity is demonstrated. Their antidiarrheal effects can also be studied in acute diarrhea animal models. These findings may open the way to more pharmacognostic studies on these plants with folklore use in diarrhea treatment [29-33].

CONCLUSION

The findings of this study validate the traditional use of several medicinal plants in the treatment of diarrhea, revealing significant phytochemical diversity that likely contributes to their therapeutic effects. Key compounds such as tannins, flavonoids, and alkaloids play crucial roles in the anti-diarrheal mechanisms of these plants. Toxicological evaluations affirm their safety at conventional doses, making them promising candidates for affordable and accessible treatment options in resource-limited regions. However, to ensure public health safety and regulatory integration, further research is essential to

investigate subchronic toxicity, pharmacological efficacy, dosage standardization, and mechanisms of action. Documenting and preserving indigenous knowledge, while integrating it with modern phytomedicine, can enhance health outcomes and foster sustainable medicinal plant use.

REFERENCES

1. Tripathi DM, Semwal N. Therapeutic potential of ayurvedic herbal preparations against human diarrheal diseases. Medicinal Plants-International Journal of Phytomedicines and Related Industries. 2022;14(1):1-6.
2. Anbari, K., Abbaszadeh, S., & Basati, G. (2019). Medicinal plants with preventive and therapeutic effect on diarrhoea: A cross-sectional epidemiologic and ethnobotanical study in traditional therapists of Shahrekord, south-west of Iran. *Plant Science Today*, *4*(6), 512-517.
3. Vecchio AL, Conelli ML, Guarino A. Infections and chronic diarrhea in children. The Pediatric infectious disease journal. 2021 Jul 1;40(7):e255-8. sip-spp.pt
4. Offor CE, Ugwu OP, Alum EU. The anti-diabetic effect of ethanol leaf-extract of Allium sativum on Albino rats. International Journal of Pharmacy and Medical Sciences. 2014;4(1):01-3.
5. Gómez-Escudero O, Remes-Troche JM. Approach to the adult patient with chronic diarrhea: a literature review. Revista de Gastroenterología de México (English Edition). 2021 Oct 1;86(4):387-402. sciencedirect.com
6. Ugwu CN, Ugwu OP, Alum EU, Eze VH, Basajja M, Ugwu JN, Ogenyi FC, Ejemot-Nwadiaro RI, Okon MB, Egba SI, Uti DE. Medical preparedness for bioterrorism and chemical warfare: A public health integration review. Medicine. 2025 May 2;104(18):e42289.
7. Keely SJ, Barrett KE. Intestinal secretory mechanisms and diarrhea. American Journal of Physiology-Gastrointestinal and Liver Physiology. 2022 Apr 1;322(4):G405-20. physiology.org
8. Kadyrov TX, Sarimsakov MI, Maxmutov RX, Qalandarova MX. Etiological factors of secretory and invasive diarrhea and measures to improve their treatment. InBIO Web of Conferences 2023 (Vol. 65, p. 05021). EDP Sciences. bio-conferences.org
9. Ugwu CN, Ugwu OP, Alum EU, Eze VH, Basajja M, Ugwu JN, Ogenyi FC, Ejemot-Nwadiaro RI, Okon MB, Egba SI, Uti DE. Sustainable development goals (SDGs) and resilient healthcare systems: Addressing medicine and public health challenges in conflict zones. Medicine. 2025 Feb 14;104(7):e41535.
10. Kungu E, Inyangat R, Ugwu OP, Alum EU. Exploration of Medicinal Plants Used in the Management of Malaria in Uganda. NEWPORT INTERNATIONAL JOURNAL OF RESEARCH IN MEDICAL SCIENCES 4 (1): 101-108 [Internet]. 2023
11. Behera DK, Mishra S. The burden of diarrhea, etiologies, and risk factors in India from 1990 to 2019: evidence from the global burden of disease study. BMC public health. 2022 Dec;22:1-9.
12. Mosisa D, Aboma M, Girma T, Shibru A. Determinants of diarrheal diseases among under five children in Jimma Geneti District, Oromia region, Ethiopia, 2020: a case-control study. BMC pediatrics. 2021 Dec;21:1-3.
13. Ongesa TN, Ugwu OP, Ugwu CN, Alum EU, Eze VH, Basajja M, Ugwu JN, Ogenyi FC, Okon MB, Ejemot-Nwadiaro RI. Optimizing emergency response systems in urban health crises: A project management approach to public health preparedness and response. Medicine. 2025 Jan 17;104(3):e41279.
14. Khan AI, Amin MA. Understanding deaths from diarrhoea in children younger than 5 years. The Lancet Global Health. 2024 Jun 1;12(6):e891-2.
15. Kungu E, Inyangat R, Ugwu OP, Alum EU. Exploration of Medicinal Plants Used in the Management of Malaria in Uganda. NEWPORT INTERNATIONAL JOURNAL OF RESEARCH IN MEDICAL SCIENCES 4 (1): 101-108 [Internet]. 2023
16. Hartman RM, Cohen AL, Antoni S, Mwenda J, Weldegebriel G, Biey J, Shaba K, De Oliveira L, Rey G, Ortiz C, Tereza M. Risk factors for mortality among children younger than age 5 years with severe diarrhea in low-and middle-income countries: findings from the World Health Organization-coordinated Global Rotavirus and Pediatric Diarrhea Surveillance Networks. Clinical Infectious Diseases. 2023 Feb 1;76(3):e1047-53. oup.com
17. Cohen AL, Platts-Mills JA, Nakamura T, Operario DJ, Antoni S, Mwenda JM, Weldegebriel G, Rey-Benito G, De Oliveira LH, Ortiz C, Daniels DS. Aetiology and incidence of diarrhoea requiring hospitalisation in children under 5 years of age in 28 low-income and middle-income

countries: findings from the Global Pediatric Diarrhea Surveillance network. BMJ global health. 2022 Sep 1;7(9):e009548. bmj.com

18. Nneoma UC, Fabian O, Valentine EH, Paul-Chima UO. Innovations in Renewable Energy for Health Applications. system. 2025;1:2.
19. Ghosh K, Chakraborty AS, Mog M. Prevalence of diarrhoea among under five children in India and its contextual determinants: A geo-spatial analysis. Clinical Epidemiology and Global Health. 2021 Oct 1;12:100813. sciencedirect.com
20. Oloya B, Namukobe J, Ssengooba W, Afayoa M, Byamukama R. Phytochemical screening, antimycobacterial activity and acute toxicity of crude extracts of selected medicinal plant species used locally in the treatment of tuberculosis in Uganda. Tropical medicine and health. 2022 Feb 17;50(1):16. springer.com
21. Nabi M, Tabassum N, Ganai BA. Phytochemical screening and antibacterial activity of Skimmia anquetilia NP Taylor and Airy Shaw: A first study from Kashmir Himalaya. Frontiers in plant science. 2022 Aug 12;13:937946.
22. Shakir L, Shakir U, Mohammad S, Rihan U, Muhammad S. Phytochemical analysis, antipyretic and antifungal activities of Solanum nigrum L. National Journal of Pharmaceutical Sciences. 2023;32:6-12. researchgate.net
23. Tura AM, Anbessa M, Tulu ED, Tilinti BZ. Exploring Vernonia amygdalina's leaf extracts for phytochemical screening and its anti-bacterial activities. International Journal of Food Properties. 2024 Dec 31;27(1):960-74. tandfonline.com
24. Béhanzin L, Houéto D, Hounyo JC, Goma-Matsétsé E, Agonnoudé M, Adoukonou T. Accessibility to safe drinking water and diarrheal diseases: A quasi-experiment on a case of water well drilling in the village of Kassouala, Municipality of Tchaourou, Benin, January 2018-July 2019. Open Journal of Epidemiology. 2022 Mar 15;12(2):107-24. scirp.org
25. Degbey C, Houessionon E, de Brouwer C. Prevalence and Factors Associated with Waterborne Diseases in Couffo, Southwestern Benin: The Case of Aplahoué. International Journal of Environmental Research and Public Health. 2025 Jan 3;22(1):58. mdpi.com
26. Ugwu OP, Alum EU, Ugwu JN, Eze VH, Ugwu CN, Ogenyi FC, Okon MB. Harnessing technology for infectious disease response in conflict zones: Challenges, innovations, and policy implications. Medicine. 2024 Jul 12;103(28):e38834.
27. Dougnon TV, Hounsa E, Agbodjento E, Koudokpon H, Legba B, Fabiyi K, Afaton A, Sintondji K, Akpode B, Klotoé JR, Tchobo F. Toxicological characterization of ten medicinal plants of the Beninese flora used in the traditional treatment of diarrheal diseases. Evidence-Based Complementary and Alternative Medicine. 2021;2021(1):6676904.
28. Wangensteen H, Klarpås L, Alamgir M, Samuelsen AB, Malterud KE. Can scientific evidence support using Bangladeshi traditional medicinal plants in the treatment of diarrhoea? A review on seven plants. Nutrients. 2013 May 22;5(5):1757-800.
29. Liheluka E, Gibore NS, Lusingu JP, Gesase S, Minja DT, Lamshöft M, Dekker D, Bali T. Medicinal plants for treatment of diarrhoeal diseases among under-five children: experience from traditional healers in North-eastern Tanzania. BMC Complementary Medicine and Therapies. 2023 Oct 25;23(1):379. springer.com
30. Gahamanyi N, Munyaneza E, Dukuzimana E, Tuyiringire N, Pan CH, Komba EV. Ethnobotany, ethnopharmacology, and phytochemistry of medicinal plants used for treating human diarrheal cases in Rwanda: A review. Antibiotics. 2021 Oct 9;10(10):1231. mdpi.com
31. Tallur PN, Verma RK, Limaye P, Jena N, Kumar S. Qualitative phytochemical analysis of fruits of Suregada multiflora (A. Juss.) Baill.: a medicinal tree of India. Medico Biowealth of India. 2024;16. researchgate.net
32. Gizaw A, Marami LM, Teshome I, Sarba EJ, Admasu P, Babele DA, Dilba GM, Bune WM, Bayu MD, Tadesse M, Abdisa K. Phytochemical screening and in vitro antifungal activity of selected medicinal plants against Candida albicans and Aspergillus niger in West Shewa Zone, Ethiopia. Advances in Pharmacological and Pharmaceutical Sciences. 2022;2022(1):3299146. wiley.com
33. Plaatjie MT, Onyiche TE, Ramatla T, Bezuidenhout JJ, Legoabe L, Nyembe NI, Thekisoe O. A scoping review on efficacy and safety of medicinal plants used for the treatment of diarrhea in sub-Saharan Africa. Tropical Medicine and Health. 2024 Jan 3;52(1):6. springer.com

34. Orji OU, Ibiam UA, Aja PM, Ugwu P, Uraku AJ, Aloke C, Obasi OD, Nwali BU. Evaluation of the phytochemical and nutritional profiles of Cnidoscolus aconitifolius leaf collected in Abakaliki South East Nigeria. World J Med Sci. 2016;13(3):213-217.
35. Enechi OC, Okpe CC, Ibe GN, Omeje KO, Ugwu Okechukwu PC. Effect of Buchholzia coriacea methanol extract on haematological indices and liver function parameters in *Plasmodium berghei*-infected mice. Glob Veterinaria. 2016;16(1):57-66.
36. Alum EU, Uti DE, Ugwu Okechukwu PC, Alum BN. Toward a cure–Advancing HIV/AIDS treatment modalities beyond antiretroviral therapy: A review. Med. 2024;103(27):e38768.
37. Obeagu EI, Bot YS, Obeagu GU, Alum EU, Ugwu Okechukwu PC. Anaemia and risk factors in lactating mothers: A concern in Africa. Int J Innov Appl Res. 2024;11(2):15-17.
38. Alum EU, Ibiam UA, Ugwuja EI, Aja PM, Igwenyi IO, Offor CE, Orji UO, Ezeani NN, Ugwu OP, Aloke C, Egwu CO. Antioxidant effect of Buchholzia coriacea ethanol leaf extract and fractions on Freund's adjuvant-induced arthritis in albino rats: A comparative study. 2022;59(1):31-45.
39. Offor CE, Ugwu Okechukwu PC, Alum EU. Determination of ascorbic acid contents of fruits and vegetables. Int J Pharm Med Sci. 2015;5:1-3.
40. Amusa MO, Adepoju AO, Ugwu Okechukwu PC, Alum EU, Obeagu EI, Okon MB, Aja PM, Samson AOS. Effect of ethanol leaf extract of *Chromolaena odorata* on lipid profile of streptozotocin-induced diabetic Wistar albino rats. IAA J Biol Sci. 2024;10(1):109-117.
41. Amusa MO, Adepoju AO, Ugwu Okechukwu PC, Alum EU, Obeagu EI, Okon MB, Aja PM, Samson AOS. Effect of ethanol leaf extract of *Chromolaena odorata* on lipid profile of streptozotocin-induced diabetic Wistar albino rats. IAA J Biol Sci. 2024;10(1):109-117.
42. Enechi YS, Ugwu OC, Ugwu Okechukwu PC, Omeh K. Evaluation of the antinutrient levels of *Ceiba pentandra* leaves. IJRRPAS. 2013;3(3):394-400.
43. Ugwu Okechukwu PC, Nwodo OFC, Joshua EP, Odo CE, Ossai EC. Effect of ethanol leaf extract of *Moringa oleifera* on lipid profile of malaria-infected mice. Res J Pharm Biol Chem Sci. 2014;4(1):1324-1332.
44. Ugwu OPC, Alum EU, Uhama KC. Dual burden of diabetes mellitus and malaria: Exploring the role of phytochemicals and vitamins in disease management. Res Inven J Res Med Sci. 2024;3(2):38-49.
45. Alum EU, Ugwu Okechukwu PC, Aja PM, Obeagu EI, Inya JE, Onyeije AP, Agu E, Awuchi CG. Restorative effects of ethanolic leaf extract of *Datura stramonium* against methotrexate-induced hematological impairments. Cogent Food Agric. 2013;9(1):2258774.
46. Offor CE, Nwankwegu FC, Joshua EP, Ugwu Okechukwu PC. Acute toxicity investigation and anti-diarrhoeal effect of the chloroform-methanol extract of the leaves of *Persea americana*. Iran J Pharm Res. 2014;13(2):651-658. PMID: 25237361; PMCID: PMC4157041.
47. Afiukwa CA, Oko AO, Afiukwa JN, Ugwu Okechukwu PC, Ali FU, Ossai EC. Proximate and mineral element compositions of five edible wild grown mushroom species in Abakaliki, southeast Nigeria. Res J Pharm Biol Chem Sci. 2013;4:1056-1064.
48. Ugwu OP, Alum EU, Ugwu JN, Eze VH, Ugwu CN, Ogenyi FC, Okon MB. Harnessing technology for infectious disease response in conflict zones: Challenges, innovations, and policy implications. Med. 2024;103(28):e38834.
49. Obeagu EI, Ugwu OPC, Alum EU. Poor glycaemic control among diabetic patients; A review on associated factors. Newport Int J Res Med Sci (NIJRMS). 2023;3(1):30-33.
50. Nwaka AC, Ikechi-Agba MC, Okechukwu PU, Igwenyi IO, Agbafor KN, Orji OU, Ezugwu AL. The effects of ethanol extracts of *Jatropha curcas* on some hematological parameters of chloroform intoxicated rats. Am-Eur J Sci Res. 2015;10(1):45-49.
51. Ezeani NN, Ibiam UA, Orji OU, Igwenyi IO, Aloke C, Alum E, Aja PM, Ugwu OP. Effects of aqueous and ethanol root extracts of *Olax subscopioidea* on inflammatory parameters in complete Freund's adjuvant-collagen type II induced arthritic albino rats. Pharmacogn J. 2019;11(1)

CITE AS: Tom Robert (2025). Exploring Phytochemical Profiles of Medicinal Plants Used for Diarrhea Treatment. RESEARCH INVENTION JOURNAL OF RESEARCH IN MEDICAL SCIENCES 4(2):17-24. https://doi.org/10.59298/RIJRMS/2025/421724