Arabian Journal of Chemical and Environmental

Research Vol. 13 Issue 1 (2026) 89–107

Nigerian Medicinal Plants: Historical Perspectives, Therapeutic Potentials, and Utilization Challenges

K. Danjuma

Department of Science Laboratory Technology, Federal Polytechnic Idah, Kogi State, Nigeria

Email: kabirdanjumaa@gmail.com

Received 21 November 2025, Revised 29 Dec 2025, Accepted 07 Jan 2026

Cited as *Danjuma, K. (2026, Nigerian Medicinal Plants: Historical Perspectives, Therapeutic Potentials, and Utilization Challenges, Arab. J. Chem. Environ. Res. 13(1) (2026) 89-107*

Abstract

Nigerian medicinal plants have been a crucial component of traditional health systems in the provision of remedies to a broad range of diseases. Medicinal plants are a good source of bioactive compounds that display promising therapeutic potential, including antimicrobial, anticancer, anti-inflammatory, antioxidant, cardiovascular, and immunomodulatory activities. However, Nigerian medicinal plants face significant challenges in their use, including chemical variation, unstandardized nature, insufficient scientific validation, toxicity and safety levels, over-harvesting, and regulatory constraints. These challenges have been a significant barrier and a key restriction to the integration of alternative medicinal therapies derived from Nigerian traditional medicinal plants. To resolve the challenges and limitations associated with the use and application of Nigerian traditional medicinal plants, there is a need for an intensive research process on their pharmaceutical and clinical validity. Additionally, there is a need for the application and adoption of appropriate and efficient harvesting and conservation strategies. By merging traditional knowledge and modern scientific validation, Nigerian traditional medicinal plants have the potential to contribute significantly to improvements in healthcare and the preservation and conservation of biodiversity and traditional knowledge.

Keywords: Nigerian Medicinal Plants; Ethno-medicine; Bioactive Compounds; A ntimicrobial activity; Secondary Metabolites

K. Danjuma
E-mail address: kabirdanjumaa@gmail.com

1. Introduction

Medicinal plants are plant species that have bioactive compounds that have the potential to prevent, alleviate, or cure diseases (Olajide, 2020). For thousands of years, these plants have been a part of human health care and the source of medicine, prior to the development of modern medicine (Kadda *et al*., 2021; Afolayan *et al*., 2023; Merzouki *et al*., 2023; Bouammali *et al*., 2024; Kabir and Lawan, 2025; Kabir *et al.,* 2025). Alkaloids, flavonoids, tannins, saponins, terpenoids, and phenolic compounds are secondary metabolites and possess therapeutic potentials (Akinmoladun, 2021).

Traditional medicine, such as the use of medicinal plants, is an important health resource globally. Research by the World Health Organization (WHO) has found out that more than 80 percent of the population in the developing world is dependent on traditional medicinal plant-based remedies as a major source of primary health care (Kabir *et al.,* 2025). Moreover, modern drugs are also derived mainly by plants; some widely used drugs, including aspirin, morphine, and quinine, are directly derived from plants or made by chemical synthesis from plant-derived compounds (WHO, 2019; Kabir *et al.,* 2025).

The use of medicinal plants has strong premises in Nigerian cultural, social, and historical environments (Adeyemi *et al.,* 2015). Traditionally, medicinal plant information has been passed down generation after generation in most societies and this has been the foundation of ethnomedicine. Traditional medicine is still considered with the highest esteem in Africa, and Nigeria is not an exception, as it is accessible, affordable, and believed to be effective in treating most types of illnesses, both short and long-term such as malaria, fever, digestive disorders, and chronic diseases such as diabetes and high blood pressure (Ekor, 2014).

The scientific study of medicinal plants started with the discovery of the bioactive compounds of medicinal plants and the research of the pharmacological impact of these compounds (Iwalewa, 2016). The recent studies have been aimed at isolating these compounds, learning the mechanisms of action as well as confirming their safety and efficacy. For example, the plant *Vernonia amygdalina* (bitter leaf) is used in managing malaria and diabetes traditionally and its antimalarial and hypoglycemic properties have been proven by research findings (Chijindu *et al.,* 2020).

The increasing popularity of medicinal plants is also informed by the fact that synthetic drugs have a number of challenges including side effects, antimicrobial resistance development and cost. Importantly, medicinal plants are a sustainable and natural source and, therefore, an emphasis of drug discovery, nutraceutical, and integrative medicine (Evbuomwan *et al*., 2023).

Medicinal plants, often referred to as herbal or therapeutic plants, are species of flora that possess bioactive compounds capable of preventing, alleviating, or curing diseases (Olajide, 2020; Danjuma *et al.* (2025). These plants have been an integral part of human healthcare for thousands of years, serving as the primary source of medicine before the advent of modern pharmaceuticals (Afolayan *et al*., 2023). They

are rich in secondary metabolites, such as alkaloids, flavonoids, tannins, saponins, terpenoids, and phenolic compounds, which contribute to their therapeutic properties (Akinmoladun, 2021).

Globally, traditional medicine—including the use of medicinal plants—remains a crucial health resource. The World Health Organization (WHO) estimates that over 80% of people in developing countries rely on traditional plant-based remedies for primary healthcare. In addition, medicinal plants are a significant source of modern drugs; several contemporary pharmaceuticals, such as aspirin, morphine, and quinine, are either derived directly from plants or synthesized based on plant compounds (WHO, 2019; Kabir and Lawan, 2025; Kabir *et al.,* 2025).

The use of medicinal plants is deeply rooted in cultural, social, and historical contexts (Adeyemi *et al.,* 2015). In many societies, knowledge about medicinal plants has been transmitted orally across generations, forming the basis of ethnomedicine. In Africa, including Nigeria, traditional medicine remains highly valued due to its accessibility, affordability, and perceived effectiveness in treating a wide range of ailments—from malaria, fever, and digestive disorders to chronic conditions like diabetes and hypertension (Ekor, 2014).

The scientific exploration of medicinal plants began with the identification of their bioactive compounds and the study of their pharmacological effects (Iwalewa, 2016). Modern research has focused on isolating these compounds, understanding their mechanisms of action, and validating their safety and efficacy. For example, Vernonia amygdalina (bitter leaf) is traditionally used for malaria and diabetes management, and studies have confirmed its antimalarial and hypoglycemic activities (Chijindu *et al.,* 2020).

The growing interest in medicinal plants is also driven by the challenges associated with synthetic drugs, such as adverse side effects, resistance development, and high cost. Medicinal plants offer a sustainable and natural alternative, making them an important focus for drug discovery, nutraceuticals, and integrative medicine (Evbuomwan *et al.,* 2023). This review highlights the historical perspectives, therapeutic potentials, and utilization challenges of Nigerian medicinal plants.

2. History of Medicinal Plants in Nigeria

Nigeria has a rich history of plant medicine, and its diverse ethnic groups had long before the arrival of colonialists, a vast amount of knowledge about plants (Rafiu *et al.,* 2025). Herbal medicines were (and continue to be) a part of local health care, as the traditional healers and elders relied on plants found locally to treat diseases such as fever, malaria, digestive disorders, wounds, respiratory infections (Bamigboye *et al.,* 2015; Evbuomwan *et al.,* 2023). The transmission of knowledge was oral, and the knowledge and treatment practices tended to include spiritual, cultural, and ritual aspects (Nguyen *et al*., 2023).

Mid-20 th century, the scholars started to capture plant uses, which were only known as oral tradition (Rafiu *et al.,* 2023). The Nigerian communities were surveyed using ethnobotanical methods that provided a comprehensive record of the traditional applications of many species in the country. The initial attempts documented the way plants could be used to treat common diseases in the Southeast, Southwest, Northwest, and Northeast such as fever, malaria, dysentery, and skin diseases (Mukaili and Ajao, 2025).

Innovative publications such as ethnomedical Uses of Plants in Nigeria listed many of the species that individuals continue to use today and even helped save local knowledge that were under a threat of extinction (Tajudeen *et al*., 2025). Medicinal plants were employed not only by the physical health but also spiritual safeguarding and cultural rituals - e.g. plants as amulets or in cleansing rituals. This is an indication of holistic health perceptions among most of the Nigerian cultures (Adeyemi *et al.,* 2015).

Starting in 1990s, most academic studies have been increased, with traditional plant use being connected with laboratory experiments. The study of phytochemicals, which are bioactive compounds, that provided feasible explanations of traditional efficacy commenced (Lawan *et al.,* 2022). The researchers confirmed the use of many plants such as Ocimum gratissimum and Piper guineense in activities such as antimicrobial, anti-malarial, anti-inflammatory, and antioxidant activities (Oyesola *et al*., 2024). It is also at the time of regional ethnobotanical surveys, such as Ogun, Rivers, and Benue, which record plant use, as well as mappings of medicinal species and recording techniques of preparation and administration (Adeniran *et al.,* 2024).

In the 2000s, attempts to combine traditional knowledge and formal education and health systems were undertaken. Other books such as A Textbook of Medicinal Plants in Nigeria (edited by Tolu Odugbemi) gave broad surveys, such as the historic use, culture, and regional variations, and the problems with traditional medicine. Such writings were used to connect oral history and science (Afolayan *et al.,* 2023). Following this period, there were attempts to compile some local traditional pharmacopoeias, which recorded plants, modes of preparation and usual dosage - a move towards standardizing knowledge which was hitherto only passed down orally (Liang *et al*., 2021; Madara *et al.,* 2025).

In Nigeria, ethnobotanical studies have recently been transferred into the modern systems, combining traditional knowledge with molecular and applied science (Chijindu *et al.,* 2020; Madara *et al*., 2025). Given the effectiveness of plant medicines in Nigeria, modern surveys have documented hundreds of medicinal plant species in use throughout the regions of the country and how plant medicines serve as primary health care in rural areas (where access to modern pharmaceuticals is less available) (Rijal and Odugbemi, 2023; Kumar *et al*., 2023).

Researchers are still validating the old arguments, increasing the knowledge of plant bioactivity, and incorporating these plants into larger pharmacological studies - a scenario that may result in the discovery of new medications based on indigenous knowledge (Gbolade, 2024; Zhu *et al.,* 2017).

3. Phytochemical Compounds in Medicinal Plants

Bioactive compounds are a highly valuable natural chemical substances and they are produced by medicinal plants and have physiological effects on the human body (Shrestha and Paudel, 2020). The compounds have long-term history in the traditional medicine due to their therapeutic effects over centuries, including antimicrobial and anti-inflammatory, antioxidant and anticancer. These bioactive compounds have pharmacological effects and thus are a useful resource of developing drugs as they can be used as leads to developing novel therapeutic agents (Tiwari and Pandey, 2020). Research on these compounds, and the actions of these compounds has made a substantial input to the understanding of medicine plants and how they could be used in the contemporary health care system (Mohammed and Isa, 2018).

These chemical constituents in medicinal plants are frequently classified according to their chemical structure, functional groups or their therapeutic effects (Wong and Yu, 2020; Haddou *et al.,* 2023). These bioactive compounds have different effects on biological systems, where they affect the metabolic systems, the functions of cells and the immune responses (Singhal and Sharma, 2020). The medicinal effects of medicinal plants have generally been described to be the result of the presence of certain bioactive compounds which may work independently or maintain synergistic relationship to offer benefit to the health (Puri and Ahuja, 2020).

The anti-inflammatory properties of other plants are also known to be useful in the management of conditions like arthritis, inflammatory bowel diseases and skin diseases like eczema. Terpenoids and alkaloids are some of the compounds that are usually central to alleviating inflammation by suppressing the action of inflammatory mediators like cytokines and prostaglandins (Saini and Pratap, 2021).

Another therapy property of medicinal plants is antimicrobial activity, and most medicinal plants have bioactive compounds capable of battling pathogens like bacteria, fungi, viruses, and parasites (Singhal and Sharma, 2020). The example is that alkaloids such as quinine and flavonoid such as quercetin are known to have a potent antimicrobial activity making them a good natural cure to infections (Saqib and Rizwan, 2020).

The multiple therapeutic benefits of medicinal plants highlight the fact that one needs to establish the chemical structure of these plants, and the manner in which the various compounds relate with the human body (Shrestha and Paudel, 2020). Due to the ongoing research on these relationships by modern researchers, a significant number of plant-derived compounds have been identified, researched, and synthesized to be used in the pharmaceutical and nutraceutical industries (Shah and Bashir, 2021)

4. Therapeutic Applications of Phytochemicals from Medicinal Plants

4.1. Antioxidant Activity

Medicinal plants are broadly used as a natural antioxidant as they are rich in a variety of bioactive compounds that can eliminate free radicals and decrease oxidative stress (Akinmoladun *et al.,* 2020). The antioxidants found in plants have been involved in the prevention, treatment, and prevention of numerous chronic and degenerative diseases caused by oxidative stress (Owais and Khan, 2019). Numerous phytochemicals, in particular flavonoids and phenolic compounds are antioxidants (Moses *et al.,* 2024).

They eliminate reactive oxygen species and free radicals and stop the destruction of cells associated with chronic illnesses such as cancer, diabetes, neurodegenerative diseases (Yang *et al.,* 2024; Kumar *et al.,* 2016).

4.2. Antimicrobial Effects

Phytochemicals, like tannins, alkaloids, and terpenoids, prevent the growth of bacteria, fungi and viruses. They impair microbial cell walls, block enzyme systems, or disrupt nucleic acid synthesis, and they can be useful in the treatment of infectious diseases (Choudhary and Singh, 2021). Most medicinal plants are broad-spectrum antibacterial against gram-positive and gram-negative bacteria. Medicinal plants that have antibacterial properties are applied in treating skin and wound infections, gastrointestinal and respiratory infections, and controlling food-borne pathogens. Examples are Azadirachta indica (Neem) that is also active against Staphylococcus aureus and Escherichia coli, Allium sativum (Garlic) preventing a variety of multiple drug-resistant bacteria, and Vernonia amygdalina that is used to treat typhoid and gastrointestinal infections (Breijyeh and Karaman, 2024). Medicinal plants are employed to treat the skin, nail, and mucous membrane fungal infections (Ashraf *et al.,* 2023). The examples are the following: ocimum gratissimum has anti-candida properties, Zingiber officinale (Ginger) has anti-pathogenic fungal properties, and Syzygium aromaticum (Clove) is an excellent antifungal essential oils (Messaoudi and Vacher, 2019).

4.3. Anti-inflammatory Activities

Flavonoids, terpenoids, saponins, etc. regulate inflammatory signals by preventing the activity of proinflammatory enzymes (e.g., COX, LOX) and cytokines (Shrivastava *et al*., 2015). This mitigates inflammation and pain, which is the basis of the numerous medicinal plants in the treatment of arthritis and other related diseases (Priyadarshi *et al*., 2018). The use of medicinal plants as anti-inflammatory in modern and traditional medicine is very common. Acute inflammation is a normal defense mechanism to infection or injury, and chronic inflammation is one of the causes of arthritis, cardiovascular diseases, diabetes, cancer, and neurodegenerative diseases (Hemalatha *et al.,* 2024). Bioactive compounds found in many medicinal plants can regulate the process of inflammation with fewer side effects compared to synthetic drugs (Mohd *et al.,* 2024). Medicinal plants have been identified to have anti-inflammatory effects such as Zingiber officinale (Ginger) that contains Gingerols and shogaols, which inhibits the

production of prostaglandin and pain caused by inflammatory factors. Vernonia amygdalina (Bitter leaf) V. amygdalina is employed as a source of traditional medicine in Africa in inflammatory and metabolic diseases Azadirachta indica (Neem) has a great potential concerning anti-inflammatory and immunomodulatory activities. Boswellia serrata is a source of boswellic acids which block the production of leukotrienes; useful in asthma and arthritis. The other plant is Aloe vera that is topically and orally used to treat inflammation, wound healing, and skin disorders (Shingala *et al.,* 2021).

4.4. Cytotoxic and Anticancer Properties

Many compounds derived from plants have shown the ability to prevent cancer, slow tumor growth, or improve the effectiveness of conventional chemotherapy while causing fewer side effects. These anticancer effects are largely due to a variety of phytochemicals that can act on multiple molecular targets involved in cancer development. For instance, certain alkaloids like vincristine and vinblastine, terpenoids such as paclitaxel (Taxol), and flavonoids can trigger cancer cell death or halt their growth. What makes these plant compounds particularly promising is their ability to target malignant cells while leaving normal cells largely unharmed, making them attractive candidates for chemotherapy (Jamal *et al.,* 2023).

Several medicinal plants have been identified as sources of these potent anticancer agents. Catharanthus roseus (Madagascar periwinkle) produces vincristine and vinblastine, widely used in treating leukemia and lymphomas (Olaleye *et al.,* 2024). Camptotheca acuminata contains camptothecin, a strong inhibitor of DNA topoisomerase I, while Taxus brevifolia (Pacific yew) yields paclitaxel, which is effective against breast, ovarian, and lung cancers. Curcuma longa (turmeric) provides curcumin, known for its ability to stop cancer cell growth, induce apoptosis, and prevent new blood vessel formation in tumors. Garcinia kola (bitter kola) contains kolaviron, which exhibits both chemopreventive and cytotoxic effects, and Allium sativum (garlic) produces organosulfur compounds that can inhibit tumor growth and boost the immune system. Additionally, Nigella sativa (black seed) produces thymoquinone, which promotes apoptosis and hinders tumor angiogenesis, while Vernonia amygdalina (bitter leaf) has demonstrated cytotoxic effects against breast, prostate, and leukemia cells (Mandala *et al.,* 2023; Alghamdi *et al.,* 2025; Saheed *et al.,* 2024; El-Saadony *et al.,* 2025).

4.5. Cardiovascular Benefits

Phytochemicals such as flavonoids and cardiac glycosides are known to support heart health by helping regulate blood pressure, heart rate, and overall vascular function. Their antioxidant and anti-inflammatory properties also play a key role in preventing atherosclerosis (El-Saber *et al.,* 2020; Al-Snafi, 2016).

For centuries, medicinal plants have been used to promote cardiovascular health. Many of these plants contain bioactive compounds that can lower blood pressure, reduce cholesterol, improve blood circulation, protect against oxidative stress, and prevent plaque buildup in the arteries—all critical factors in reducing the risk of cardiovascular diseases (El-Saadony *et al.,* 2025).

Some notable medicinal plants with cardiovascular benefits include Allium sativum (garlic), Camellia sinensis (green tea), Curcuma longa (turmeric), Crataegus species (hawthorn), Terminalia arjuna (arjuna), Allium cepa (onion), Zingiber officinale (ginger), Hibiscus sabdariffa (roselle), Panax ginseng (ginseng), and Punica granatum (pomegranate) (Pop *et al.,* 2024; Purwanto, 2025; Hasan, 2025; Mahmood, 2024; Saleem, 2025; Johnson, 2023).

4.6. Immunomodulatory Effects

Medicinal plants are increasingly valued for their ability to modulate the immune system—that is, they can stimulate, enhance, or even suppress immune responses as needed. This makes them useful not only for preventing infections but also for supporting cancer therapy, managing autoimmune conditions, and boosting overall immune health. These effects are largely due to bioactive compounds such as polysaccharides, flavonoids, alkaloids, saponins, terpenoids, and phenolics. For instance, saponins and polysaccharides from certain medicinal plants can strengthen immune responses, helping the body defend more effectively against infections and diseases. Many medicinal plants possess immunomodulatory properties, meaning they can either enhance or regulate immune responses depending on physiological needs. Because of this ability, they are increasingly explored for use in infection prevention, cancer management, autoimmune conditions, and overall immune support (Mahendran *et al*., 2020).

Several medicinal plants are particularly noted for their immunomodulatory properties. For instance, Echinacea purpurea stimulates macrophages, natural killer cells, and cytokine production, while Withania somnifera helps counter stress-related immunosuppression, supports chronic infection management, and serves as an adjunct in cancer therapy. Tinospora cordifolia activates macrophages and T-cells, enhancing phagocytosis and antibody production, and Astragalus membranaceus provides supportive therapy for viral infections and chemotherapy-induced immune suppression. Other examples include Glycyrrhiza glabra, which modulates cytokine production and exhibits antiviral and anti-inflammatory effects; Panax ginseng, which boosts macrophage and natural killer cell activity as well as antibody production; Curcuma longa, which influences T-cell proliferation and innate immunity; and Moringa oleifera, which enhances both antibody production and macrophage function. Collectively, these medicinal plants demonstrate the important role of natural products in supporting immune balance and strengthening the body's defense mechanisms (Pelvan *et al.,* 2022; Kadiyska *et al.,* 2023).

Table 1: Nigerian medicinal plants with therapeutic applications (Lawal *et al.,* 2022; Husaini *et al*., 2023; Gbadamosi *et al.,* 2014; Danjuma K, 2024; Balumas and Kinghorn, 2014; Ajao *et al.,* 2023; Adeniran and Akindele, 2024; Omotayo, 2025; Sani Halliru *et al.,* 2025; Kabir *et al.,* 2023)

SN	Medicinal Plants	Local Name	Bioactivity
1	Vernonia amygdalina	Bitter leaf	Malaria, digestive disorders
2	Garcinia kola	Bitter kola	Cough, inflammation
3	Azadirachta indica	Neem	Malaria, skin diseases
4	Ocimum gratissimum	Scent leaf	Diarrhea, respiratory infections
5	Allium sativum	Garlic	Hypertension, infections
6	Zingiber officinale	Ginger	Nausea, inflammation
7	Aloe vera	Aloe	Wounds, burns
8	Xylopia aethiopica	Uda	Cough, bronchitis
9	Psidium guajava	Guava	Diarrhea, oral infections
10	Mangifera indica	Mango	Diabetes, antimicrobial, Antioxidant
11	Carica papaya	Pawpaw	Digestive aid, parasites
12	Senna alata	Ringworm plant	Fungal skin infections
13	Alstonia boonei	Ahun	Fever, pain
14	Morinda lucida	Oruwo	Malaria, jaundice
15	Hibiscus sabdariffa	Roselle	Hypertension, liver support
16	Khaya senegalensis	African mahogany	Fever, GI disorders
17	Guiera senegalensis	Sabara	Fever, diarrhea
18	Annona senegalensis	Wild custard apple	Wounds, infections

19	Nauclea latifolia	African peach	Malaria, hypertension
20	Ficus exasperata	Sandpaper leaf	Hypertension, wounds
21	Alchornea cordifolia	Magic leaf	Inflammation
22	Momordica charantia	Bitter melon	Diabetes, stomach pain
23	Tamarindus indica	Tamarind	Digestion, fever
24	Terminalia avicennioides	Iroko white	Diarrhea, malaria
25	Anacardium occidentale	Cashew	Wound infections
26	Bridelia ferruginea	False almond	Fever, cough
27	Chromolaena odorata	Siam weed	Wound healing
28	Vernonia colorata	Bitter bitter	Fever, headache
29	Jatropha curcas	Physic nut	Skin infections
30	Bauhinia monandra	Orchid tree	Antibacterial
31	Spondias mombin	Yellow mombin	Worm infections
32	Cymbopogon citratus	Lemongrass	GI upset, anxiety

5. Challenges in the Utilization of Medicinal Plants

Medicinal plants have long been valued for their healing properties and remain an important part of both traditional practices and modern healthcare. Despite their proven potential, their use is still limited by a number of challenges that affect how widely and safely they can be applied. These challenges cut across several areas, including scientific research, regulatory control, economic constraints, and environmental sustainability.

5.1. Lack of Standardization

The use of medicinal plants is often complicated by natural variations in their chemical composition. Differences between plant species, the geographical areas where they grow, seasonal changes, and cultivation or harvesting conditions can all influence the type and amount of bioactive compounds present. As a result, the same plant collected from different locations or at different times

may not produce the same therapeutic effect. These variations make it difficult to maintain consistent quality and potency in herbal products. Unlike synthetic drugs, which are manufactured under tightly controlled conditions, herbal preparations often lack uniform processing standards. In addition, many medicinal plants do not have well-defined or standardized doses and formulations. This lack of standardization can lead to unpredictable therapeutic outcomes, reduced effectiveness, or even safety concerns, especially when products are used over long periods or alongside conventional medicines (Pelvan *et al.,* 2022; Yadav, 2025).

5.2. Limited Scientific Validation

The main factor that has made many medicinal plants widely accepted today is the conventional knowledge that has been passed on from generation to generation. However, although such information is valuable, the fact is that to date, there is a lack of scientific evidence that many medicinal plants are safe and effective for human consumption. Most often, systematically conducted clinical studies are rare as a way of ascertaining the claimed pharmacological properties and the documented therapeutic benefits that people derive from them. As a result, much of the information available today is merely based on findings that have been derived from preliminary lab research and personal experience. To begin with, detailed mechanistic research that elaborates on the molecular and cellular mechanisms of the concerned plant agents is surprisingly inadequate. Indeed, the ways that these agents interact and function inside the human body are yet to be fully discovered and understood. Moreover, the relevant active constituents that produce the claimed therapeutic effects of these plant agents are often inadequately isolated and identified. Such information and knowledge naturally pose a problem to predictions of efficacy and dosages that are to be optimally formulated as well as the possible interactivity and reactions. Predicting efficacy, optimizing dosage, evaluating interactions with conventional drugs, and assessing potential side effects are all made challenging by this knowledge gap. For medicinal plants to be safely and successfully incorporated into contemporary healthcare systems, these research gaps must be filled through methodical pharmacological, toxicological, and clinical studies (Pelvan *et al.,* 2022; Yadav, 2025).

5.3. Toxicity and Safety Concerns

Despite their general view as safe drugs, it should be noted that herbal drugs may also be toxic and therefore their improper use can lead to negative side effects. There are also certain plant compounds such as alkaloids and cyanogenic compounds, as well as certain heavy metals from contaminated soil and water, which, in high quantities, can cause serioushealth ailments like poisoning and damage to certain organs of the human body, which in turn can lead to death. However, it should also be kept in mind that the interaction between herbal and conventional drugs is one of the most serious concerns that can cause adverse reactions to certain conventional drugs, such as anticoagulants like Warfarin and antidiabetic

drugs, as certain herbal drugs can impede the effects of such drugs, thus causing side effects. Such drug uses and interactions are not commonly understood by the users or the health practitioners, and this adds to the danger level in such drugs. Moreover, the lack of proper regulation and controls over the quality of the drugs also creates a major safety concern for the users. Lack of proper processing, and improper handling and packing are potential contributors to the rendering of the drug unsafe through the addition of such contaminants as microorganisms, pesticides, or heavy metals. Additionally, the drug could also be adulterated with unlisted compounds (Pelvan *et al.,* 2022; Yadav, 2025).

5.4. Overexploitation and Environmental Threats

Overharvesting from the wild threatens endangered species and biodiversity. Habitat destruction and climate change reduce availability of medicinal plants.

Unsustainable harvesting practices limit long-term supply for research and therapeutics (Pelvan *et al.,* 2022; Yadav, 2025).

5.5. Regulatory and Policy Issues

Weak or inconsistent regulations for herbal medicines in many countries is affecting the Utilization of medicinal plants. There is lack of clear guidelines for approval, labeling, and marketing, and difficulty in integrating traditional medicine into national healthcare systems (Pelvan *et al.,* 2022; Yadav, 2025).

5.6. Economic and Access Challenges

High cost of cultivating, processing, and standardizing medicinal plants. Limited funding for research and development of plant-based drugs. Poor access in rural areas despite high reliance on medicinal plants for primary healthcare (Pelvan *et al.,* 2022; Yadav, 2025).

5.7. Quality Control and Authentication

Misidentification of plant species due to taxonomic confusion. Adulteration with non-medicinal or toxic plants. Difficulty in chemical fingerprinting or standardization in complex mixtures (Pelvan *et al.,* 2022; Yadav, 2025).

6. Overcoming the Challenges

To effectively address the issues being faced through the use of medicinal plants, it is necessary for there to be an integrated and long-term strategy. Firstly, there should be scientific research being conducted on medicinal plants that are already being widely utilized, as it will not only increase the acceptance and authorization of their use, it will also ensure their safe usage alongside other medications.

Secondly, there should be proper harvesting and growing practices so as not to deplete medicinal plant species, which will benefit not only medicinal plant conservation but also ensure that the overall environment stays safe. There also should be standardized measures being implemented concerning the processing, manufacturing, and dosage, as it will not only ensure their effectiveness, it will also ensure them staying non-adversely reactive. Lastly, there should be proper regulation being brought about so as not to compromise consumer safety, which will not only safeguard their rights, it will also ensure their staying safe. Also significant, on the other hand, are the necessary regulatory changes aimed at the guidelines of the use, distribution, or manufacture of herbal medicines. Again, the documentation of the traditional knowledge available is a significant process, as this particular knowledge faces the loss of the traditions of the communities due to the culture change. Through the improvement of the aforementioned related factors, the use of Nigerian medicinal plants can occur effectively, ensuring benefits in health, biodiversity, or the integration of herbal practice in the health services of the contemporary society used today (Afam-Ezeaku *et al.,* 2024; Igwillo *et al.,* 2019).

7. Conclusion

Nigerian medicinal plants have a long history based on traditional knowledge and practices. The medicinal uses of these plants include antimicrobial, anticancer, anti-inflammatory, antioxidant, cardiovascular, and immunomodulatory activities. Despite these medicinal uses, the use of Nigerian medicinal plants is faced with several challenges, including a lack of standardization, unscientific use, safety issues, over-exploitation of these plants, and the failure of regulatory measures. These challenges in the use of Nigerian medicinal plants need to be addressed in order to tap their full potential.

References

Adeniran L. A., Akindele O. (2024). Ethnobotanical survey of medicinal plants used by the indigenous people of Ilorin, North Central, Nigeria. *Medicine India,* 3, 21–32.

Adeniran L. A., Akindele O. (2024). Ethnobotanical survey of medicinal plants used by the indigenous people of Ilorin, North Central, Nigeria. *Medicine India,* 3, 21–32.

Adeyemi S. B., Oyebanji O. O., Oyedepo B. A., Ogunsola O. K., Afonja A. I. (2015). Ethnobotanical investigation of medicinal plants commonly used by the indigenous people of Omu Aran, Kwara State, Nigeria. *Jewel Journal of Scientific Research,* 3(1).

Afam-Ezeaku C. E., Eze H. N., Mbaukwu O. A., Igbozurike R. I. (2024). A Critical Review on Need for Preservation of Significant Medicinal and Ethno-Botanical Plants in Nigeria. *Asian Journal of Research in Biology*, 7(1), 89-108. https://doi.org/10.56557/ajrib/2024/v7i141

Afolayan F. A., Ketenfe M., Adesoye S. D. (2023). Ethnobotanical survey of medicinal plants traditionally used to boost immunity in Oyo State, Southwestern Nigeria. *Nigerian Journal of Immunology*, 4(1).

Ajao A. A.-nun, Mukaila Y. O., Kenkpen D. Y. (2023). An ethnobotanical study of medicinal plants used to treat and manage diabetes mellitus in Ede, Osun State, Nigeria. Ethnobotany Research and Applications.

Akinmoladun F. O. (2021). Traditional medicinal plants in Africa: Biodiversity, pharmacology, and conservation. *Frontiers in Pharmacology,* 12, 673176.

Akinmoladun, F. O., Akinrinlola, B. L., & Komolafe, O. T. (2020). Antioxidants and their roles in human health. *Biomedicine & Pharmacotherapy*, 129, 110467.

Alghamdi S. S., Alshkrh R., Mohammed A. E., Alowais S. A. (2025). From herb to hope: A systematic exploration of medicinal plants' role in cancer therapy. *Journal of Cancer,* 16(14), 4081–4098. https://doi.org/10.7150/jca.114837.

Al-Owais M., Khan R. A. (2019). Phytochemical constituents and antioxidant potential of medicinal plants. *J Nat Prod Res*, 33(5), 678–690.

Medicine, 9(4), 55–71. https://doi.org/10.2174/2215083808666220914123526jddtonline.info

Al-Snafi A. E. (2016). The pharmacological activities of Cuminum cyminum—A review. *IOSR Journal of Pharmacy*, 6(6), 46–65.jddtonline.info

Ashraf, M. V., Pant, S., Khan, M. A. H., Shah, A. A., Siddiqui, S., Jeridi, M., Alhamdi H. W. S., Ahmad S. (2023). Phytochemicals as Antimicrobials: Prospecting Himalayan Medicinal Plants as Source of Alternate Medicine to Combat Antimicrobial Resistance. *Pharmaceuticals,* 16(6), 881.

Balunas M. J., Kinghorn A. D. (2014). A bioactivity versus ethnobotanical survey of medicinal plants from Nigeria, West Africa. *Natural Products and Bioprospecting*, 4, 1–19.

Bamigboye T. O., Kayode J. (2015). Ethnobotanical survey of plants used in the treatment of children's ailments in Ekiti State, Nigeria. *Journal of Biology and Nature*, 4(2), 89–96.

Bouammali, H., Zraibi, L., Ziani, I., Merzouki, M., Bourassi, L., Fraj, E., Challioui, A., Azzaoui, K., Sabbahi, R., *et al*. (2024). Rosemary as a Potential Source of Natural Antioxidants and Anticancer Agents: A Molecular Docking Study. *Plants,* 13, 89. https://doi.org/10.3390/plants13010089

Breijyeh Z., Karaman R. (2024). Antibacterial activity of medicinal plants and their role in wound healing. *Future Journal of Pharmaceutical Sciences,* 10, 68.

Chijindu P. C., Okpoma M. O., Atubi O. (2020). Ethnobotanical survey of medicinal plants used in Erhuwaren community, Ughelli South LGA, Delta State, Nigeria. *UNILAG Journal of Medicine, Science and Technology*, 8(1), 176–206.

Choudhary N., Singh V. (2021). Neuromodulators in food ingredients: Insights from network pharmacological evaluation of Ayurvedic herbs. *arXiv preprint* arXiv:2108.09747. ://arxiv.org/abs/2108.09747arXiv

Danjuma K. (2024). Ethno-medicinal and Pharmacological Applications of African Senna alata, Guiera senelengalis, and Annona senegalensis, *J. Appli. Sci. Envir. Stud.,* 7(1), pp. 24-39

Danjuma K., Abdu K., Lawan I., Jibrin M., Amayindi M. (2025). Phytochemical screening, antimicrobial and antioxidant properties of the leaf fractions of Scoparia dulcis, *Indonesian Journal of Health Research and Develolment,* 3(2), 57-65

Danjuma K., Lawan I. (2025). Evaluation of antioxidant and antibacterial activities of Telfairia occidentalis sold in Idah, Kogi State, Nigeria, *Arabian Journal of Chemical and Environmental Research,* 12(2), 138-151

Edo G. I., Onoharigho F. O., Jikah A. N., Agbo J. J. (2024). The ameliorative effect of methanol extract of Ricinodendron heudelotii (Baill.) leaves on paracetamol-induced hepatotoxicity in Wistar rats. *Drug and Chemical Toxicology.* https://doi.org/10.1080/01480545.2024.2362891

Ekor M. (2014). The growing use of herbal medicines: Issues relating to adverse reactions and challenges in monitoring safety. *Frontiers in Pharmacology,* 4, 177.

El-Saadony M. T., Alkafaas S. S., Saad A. M. (2025). Medicinal plants: nutritional, immunological and therapeutic role in treating cancer-related malnutrition: a comprehensive review. *Cancer Cell International,* 25, 266. https://doi.org/10.1186/s12935-025-03720-2.

El-Saber Batiha G., Beshbishy A. M., Wasef L. G., Elewa Y. H. A., Al-Sagan A. A., Abd El-Hack M. E., Hetta H. F. (2020). Chemical constituents and pharmacological activities of garlic (Allium sativum L.): A review. *Nutrients,* 12(3), 872. https://doi.org/10.3390/nu12030872jddtonline.info

Evbuomwan I. O., Adeyemi O. S., Oluba O. M. (2023). Indigenous medicinal plants used in folk medicine for malaria treatment in Kwara State, Nigeria. *BMC Complementary Medicine and Therapies,* 23, 324. https://doi.org/10.1186/s12906-023-04131-4

Gbadamosi I. T. (2014). Ethnobotanical survey of plants used for the treatment and management of sexually transmitted infections in Ibadan, Nigeria. *Ethnobotany Research and Applications,* 12, 659–669.

Gbolade A. A. (2014). A bioactivity versus ethnobotanical survey of medicinal plants from Nigeria, West Africa. *Journal of Ethnopharmacology,* 152(3), 66–74.

Haddou S., Mounime K., Loukili E. H., Ou-yahia D., Hbika A., Yahyaoui Idrissi M., Legssyer A., Lgaz H., Asehraou A., Touzani R., Hammouti B., Chahine A. (2023) Investigating the Biological Activities of Moroccan Cannabis Sativa L Seed Extracts: Antimicrobial, Anti-inflammatory, and Antioxidant Effects with Molecular Docking Analysis, *Mor. J. Chem.,* 11(4), 1116-1136, https://doi.org/10.48317/IMIST.PRSM/morjchem-v11i04.42100

Hasan R. U. (2025). Cardioprotective potentials of medicinal plants: an integrative review of herbal interventions in cardiovascular disorders. *Journal of Neonatal Surgery,* 14(2), Article 8770.

Hemalatha S., Nirmalkumar G., Priya S., Mahalakshmi K., Kabilan D., Logeshwari, N. (2024). Herbal Medicinal Plants with Anti-Inflammatory Properties: A Comprehensive Review. *Journal of Chemical Health Risks,* 14(4). https://doi.org/10.3390/ph17060800MDPI

Husaini M., Lawan I., Hamza M., Kabir D., Mu'azu J.B. (2023). Traditional and Advanced Extraction Methods of Bioactive Compounds: A Review, *J. Appl. Sci. Envir. Stud.,* 6(3), pp. 253-267

Igwillo U. C., Ola-Adedoyin A. T., Abdullahi M. M., ChukwuemekabA. E. (2019). A Review of Opportunities and Challenges in Conservation and Use of Medicinal and Aromatic Plants in Nigeria. *International Journal of Advanced Research,* 7(4), 770-778.

Iwalewa E. O. (2016). Ethnobotanical and pharmacological relevance of Nigerian medicinal plants. *Nigerian Journal of Natural Products and Medicine,* 20(3), 1–14

Johnson R. (2023). Medicinal plants with multiple effects on cardiovascular risk factors: a systematic analysis, *Bentham Journal of Clinical Pharmacology,* 17(3), 210–235.

Kabir D. and Lawan I. (2025) Impact of Extracts from Fluted Pumpkin (Telfairia occidentalis) leaves on Antimicrobial and Antioxidant Properties, *J. Mater. Environ. Sci.,* 16(11), 2035-2046

Kabir D., Hamza M., Lawan I., Mohammed A.S., Mu'azu J.B. (2023). Nutritional and Therapeutic Applications of Cashew: A Review, *J. Appl. Sci. Envir. Stud.,* 6(3), 218-237

Kabir D., Hamza M., Lawan I., Mohammed A.S., Mu'azu J.B. (2023). Nutritional and Therapeutic Applications of Cashew: A Review*, J. Appl. Sci. Envir. Stud.,* 6(3), 218-237

Kabir D., Hussaini M., Lawan I., Hamza M. Mohammed A.S., Abdu K. (2025) A Mini Review on Phytochemical Constituents, Medicinal and Environmental Applications of Guava Leaves, *J. Mater. Environ. Sci., 16*(12), 2279-2292

Kabir D., Mohammed A.S., Hamza M., and Lawan I. (2025) Natural Products and their Applications: A Review, *J. Mater. Environ. Sci.,* 16(11), 2105-2125

Kadda S. and Belabed A. (2021). Temperature and mechanical extraction effect on chemical compositions of Argania spinosa l seed oil of Eastern region of Morocco. *Mor. J. Chem*. 9 N°4, 822–831. https://doi.org/10.48317/IMIST.PRSM/morjchem-v9i4.29521

Kadiyska T., Tourtourikov I., Dabchev K., Zlatarova A., Stoynev N., Hadjiolova R., Adamaki M., Zoumpourlis V. (2023). Herbs and plants in immunomodulation: A review. *International Journal of Functional Nutrition*, 4(1). https://doi.org/10.3892/ijfn.2023.31

Kumar D., Rawat A., Dubey D., Kumar U., Keshari A. K., Saha S., Guleria A. (2016). NMR based pharmaco-metabolomics: An efficient and agile tool for therapeutic evaluation of traditional herbal medicines. arXiv preprint arXiv:1602.02492. https://arxiv.org/abs/1602.02492arXiv

Kumar S., Gopal K. M., Choudhary A. (2023). Advancing the one health approach through integration of Ayush systems: Opportunities and way forward. *Journal of Family Medicine and Primary Care,* 12, 1764–1770. L https://doi.org/10.4103/jfmpc.jfmpc_192_23

Lawal I. O., Rafiu B. O., Ale J. E., Majebi O. E., Aremu A. O. (2022). Ethnobotanical survey of local flora used for medicinal purposes among indigenous people in five areas in Lagos State, Nigeria. *Plants,* 11(5), 633.

Liang Z., Hu H., Li J. (2021). Advancing the regulation of traditional and complementary medicine products: A comparison of five regulatory systems on traditional medicines with a long history of use. *Evidence-Based Complementary and Alternative Medicine,* 2021, 1–16. https://doi.org/10.1155/2021/5833945

Madara A. A., Abah R. O., Elkanah O. S. (2025). Ethnobotanical survey of medicinal plants used in the treatment of malaria by the Idoma speaking people of Ogbadibo, Benue State, Nigeria. FUDMA Journal of Sciences. — Documents 37 plant species used as antimalarials.

Mahendran G., Rahman L. U. (2020). Ethnomedicinal, phytochemical and pharmacological updates on peppermint (Mentha × piperita L.)—A review. *Phytotherapy Research,* 34(9), 2088–2139. https://doi.org/10.1002/ptr.6664jddtonline.info+1PMC+1

Mahmood M. (2024). A role of medicinal plants in cardiovascular diseases: prevention and management. *GSC Biological and Pharmaceutical Sciences,* 24(0461), 1–15.

Mandal M.K., Mohammad M., Parvin S.I., Islam M.M., Gazi H.A. (2023). A short review on anticancer phytochemicals. *Pharmacognosy Reviews,* 17(33), 11–23. https://doi.org/10.5530/097627870236.

Merzouki M., Bekkouch A., Alkowni R., Bourassi L., Abidi R., Bouammali B., *et al*. (2023). Flavone Derivatives as Potential Inhibitors of SARS-Cov-2rdrp through Computational Studies. *Journal of Biochemical Technology*, 14(4), 74-82. https://doi.org/10.51847/Bo9tanDZ4G

Messaoudi M., Vacher M. (2019). Antiviral properties of plant-derived compounds: A review. *Viruses,* 11(10), 902.

Mohammed A., Isa M. (2018). Traditional uses of medicinal plants in the treatment of human diseases. *Pharmacognosy Reviews,* 12(24), 48-56.

Moses R.J., Edo G.I., *et al*. (2024). Bioactive compounds and biological activities of garlic. *Current Food Science and Technology Reports,* 2, 111–120. doi:10.1007/s43555-024-00029-5SpringerLin

Mohd. W., P. Yadav A.A. (2024). A Review Article On Spice Up The Solution Of Inflammation Through Phytomedicines. *Emerging Trends in Metabolites*, 2(1), 1–10.

Mukaila Y. O., Ajao A. A. (2025). Ethnobotanical survey of medicinal plants used for oral health in Osogbo, Osun State, Nigeria. *Vegetos.* https://doi.org/10.1007/s42535-025-01231-z

Nguyen. (2023). Ethnobotanical survey of local flora used for medicinal purposes among indigenous people in Lagos State, Nigeria, 11(5), 633. https://www.mdpi.com/2223-7747/11/5/633

Olajide O. (2020). Phytochemical and pharmacological potentials of Nigerian medicinal plants: A review. *Journal of Ethnopharmacology,* 259, 112914.

Olaleye O. O., Kim D. H., Spriggs K. A. (2024). Antiproliferative activities of some selected Nigerian medicinal plants against breast, liver, and cervical cancer cells. *BMC Complementary Medicine and Therapies, 24*, 110. https://doi.org/10.1186/s12906-024-04365-w.

Omotayo A. O. (2025). Ethnobotanical uses of plants in Nigeria: An analysis of current research trends and patterns. *Journal of Ethnobiology and Ethnomedicine,* 21, 57.

Oyesola O., Ojo-Adebayo E. O., Olayemi O. E., Adebanjo S. O. (2024). Local medicinal plants in Nigeria for diabetes management. *Journal of Associated Medical Sciences,* 58(1), 205–214.

Pelvan E., Karaoğlu Ö., Önder Fırat E., Kalyon B. B., Ros E., Alasalvar C. (2022). Immunomodulatory effects of selected medicinal herbs and their essential oils: A comprehensive review. *Journal of Functional Foods*, 94, 105108. https://doi.org/10.1016/j.jff.2022.105108

Pop R. M., Pop M. A., Dima L. (2024). Cardiovascular effects of herbal products and their interaction with antihypertensive drugs. *International Journal of Molecular Sciences,* 25(12), 6388. https://doi.org/10.3390/ijms25126388

Purwanto A. (2025). An evidence-based review of herbal medications in cardiovascular disease. *Tropical Journal of Natural Product Research,* 9(7), 3404–3412.

Priyadarshi A., Ram B. (2018). A review on pharmacognosy, phytochemistry, and pharmacological activity of Carica papaya (Linn.) leaf. *International Journal of Pharmaceutical Sciences and Research,* 9(10), 4071–4078. doi:10.13040/IJPSR.0975-8232.9(10).4071-78jddtonline.info

Puri H., Ahuja A. (2020). Medicinal plants and their role in the management of diabetes mellitus. *Indian Journal of Traditional Knowledge,* 19(1), 42-58.

Rafiu B. O., Omotayo A. O., Lawal I. O. (2025). Ethnobotanical uses of plants in Nigeria: an analysis of current research trends and patterns. *Journal of Ethnobiology and Ethnomedicine,* 21, 57. https://doi.org/10.1186/s13002-025-00788-y

Rijal K., Odugbemi T. (2023). Flavonoids from Nigerian indigenous medicinal plants and their bioactivities: a review. *Phytomedicine Plus,* 3(2), 100405.

Saheed E. S. (2024). Anticancer potentials of bioactive compounds in some locally available spices in Nigeria. *Discoveries in Plants,* 1, 49. https://doi.org/10.1007/s44372-024-00059-2.

Saleem M. (2025). A review on Terminalia arjuna: cardiovascular benefits, mechanisms and biomedical potential. *Journal of Medical Plant Research,* 19(6), 412–425.

Sani Halliru B., Wada N., Mahmud A. A., Labaran I., Danlami H. (2024). Ethnobotanical survey of medicinal plants used in the treatment of transmissible diseases in Katsina State, Nigeria. *Journal of Science and Technology*.

Saini R. K., Pratap D. (2021). Medicinal plants for neuroprotection: Recent advancements and challenges. *Phytomedicine,* 84, 153509.

Saqib N., Rizwan M. (2020). Medicinal plants in modern pharmaceutical science: A review of novel trends. *Acta Botanica Gallica,* 167(2), 193-208.

Shah S. M. A., Bashir S. (2021). Modern advances in medicinal plant research for cancer treatment. Journal of Medicinal Plants Studies, 9(4), 128-138.

Shingala Z., Chauhan B., Baraiya J. (2021). A review on medicinal plants as a source of anti-inflammatory agents. *Journal of Pharmacognosy and Phytochemistry*, 10(6), 364–371

Shrestha S., Paudel A. (2020). Role of medicinal plants in health care: Current perspectives. *Herbals and Therapeutics Journal,* 5(3), 77-83.

Singhal M., Sharma R. (2019). Medicinal plants and their application in wound healing. *Current Drug Therapy,* 14(3), 213-221.

Shrivastava S.R., Shrivastava P.S., Ramasamy J. (2015). Mainstreaming of Ayurveda, Yoga, Naturopathy, Unani, Siddha, and Homeopathy with the health care delivery system in India. *Journal of Traditional and Complementary Medicine,* 5, 116–118. doi:10.1016/j.jtcme.2014.11.002

Tiwari A., Pandey A. (2020). Biochemical and pharmacological properties of medicinal plants: A review. *International Journal of Biological Macromolecules,* 153, 928-943.

Tajudeen O. Y., Salisu T. F., Obaroh I. O. (2025). Toxicological evaluation of Ficus exasperata leaves in Birnin Kebbi, Nigeria. arXiv:2501.11037.

World Health Organization (2019). WHO Traditional Medicine Strategy 2014–2023. Geneva: WHO.

Wong C. H., Yu Y. L. (2020). Medicinal plants in cardiovascular diseases: Current developments and future prospects. *Phytotherapy Research,* 34(10), 2672-2687.

Yadav A. (2025). Challenges in sustainable harvesting and quality control of medicinal plants. *World Journal of Pharmaceutical Research*, 14(06), 1191–1199.

Yang K., Wang Z., Wang P., Wang L., Li Y., He L., Liu X., Xu J., Duan Y., Ma W. (2024). A comprehensive research review of herbal textual research, phytochemistry, pharmacology, traditional uses, clinical application, safety evaluation, and quality control of Trollius chinensis

Zhu Z., Gui Y., Wang L., Wang T., Yang Y., Niu Y., Fu, D., Wang J., Cui T. (2017). Innovative development path of ethnomedicines: A case study. *Frontiers of Medicine*, 11, 297–305. https://doi.org/10.1007/s11684-017-0513-zPMC