

Ethnopharmacological Validation of Traditionally Used Medicinal Plants in India: Phytochemical and Antimicrobial Evaluation

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Abstract

Medicinal plants have rich traditional utilization history in India; Ayurveda, Siddha, Unani and Folk healthcare system. The present study entitled, 'Ethnopharmacological Validation of Traditionally Used Medicinal Plants in India: Phytochemical and Antimicrobial Evaluation' has reviewed the literature about the importance of traditionally used medicinal plants in India. The main aim of the study is to elucidate traditional uses, highlight the major phytochemical constituents of selected medicinal plants and explore their reported antibacterial and antifungal activity. A secondary-data based research methodology was employed and the research articles, scientific journals, books, review papers, government publications, and a genuine online database were used as the data sources. The review emphasizes on the most significant phytochemical classes such as alkaloids, flavonoids, tannins, saponins, terpenoids and phenolic compounds that have been linked to several biological activities in the past. Traditional plants like neem, tulsi, turmeric, garlic, aloe vera and other medicinal plants are discussed in relation to their antimicrobial potential. The study also highlights the fact that the antimicrobial activity can be different based on plant species, plant parts, and methods of extraction, solvents, concentrations and microorganisms tested. Findings show that Ethnopharmacological research is a useful link between traditional knowledge and modern science. But, laboratory evidence does not prove clinical efficacy or safety. To ensure the safe development and proper therapeutic validation of plant-based medicines, further phytochemical characterization, toxicological studies, standardization, pharmacological investigations and clinical research is required.

Keywords: *Ethnopharmacology, Medicinal Plants, Phytochemical Screening, Antimicrobial Activity, Traditional Medicine.*

Introduction

India has a rich history of traditional medicine, where medicinal plants have been used for treating various diseases for centuries. The Ayurveda, Siddha, Unani and folk healing systems rely on nature for treatment. Traditional remedies are prepared from various plant parts like leaves, roots, bark, flowers, seeds and fruits. They are rich in natural chemical compounds known as phytochemicals that can have health benefits. A few compounds display antibacterial and antifungal properties. Traditional uses should be tested scientifically to prove their safety and efficacy, however. The phytochemical screening process is used to identify the important phytochemicals present in plants and antimicrobial testing is used to determine antimicrobial activity these compounds may have. This kind of research brings together traditional knowledge and today's

science and can help in the discovery of plant-based medicines. It also promotes the conservation of valuable medicinal resources.

Indian medicinal plants have been an integral part of Indian medical practice since ancient times. Natural plants are used in traditional remedies to treat infections, wounds, fever, digestion and other diseases. Due to various climatic conditions, forests and geographical areas, India has a rich diversity of medicinal species. Local communities also have a wealth of information about the preparation and utilization of herbal medicines. This is traditional information, which gives an important starting point for scientific research (Pandey et al., 2013).

Ethnopharmacology is the scientific discipline which investigates traditional medicines and their biological activities. It aids the researchers in understanding the selection, preparation, and utilization of plants in the treatment of ailments. It is

a requirement that scientific verification is required, as traditional claims should be looked at using appropriate scientific laboratory approaches. Through this process it is possible to determine useful plant materials as well as evidence of their potential medicinal properties.

Phytochemical Assessment is an important component of this investigation. The medicinal plants are found to have various naturally occurring substances like alkaloids, flavonoids, tannins, saponins, terpenoids and phenolic substances. They can demonstrate various biological activities, such as antioxidant, anti-inflammatory, and antimicrobial properties. They can be investigated by preliminary chemical screening and other lab tests. This analysis can be used to gain insight into the potential mechanisms for the healing effects of specific species.

The antimicrobial evaluation is the testing of plant extracts against harmful bacteria and fungi. Microbial infections are one of the key healthcare issues and the increasing resistance to certain drugs has made it vital to search for alternative sources of treatment. The extracts from the plants can contain active substances which can inhibit or prevent the growth of the microorganisms. These effects are measured by laboratory tests, such as the agar diffusion method.

The study is oriented towards scientific assessment of traditionally used Indian medicinal plants by conducting the phytochemical screening and antimicrobial testing. Its goal is to link the traditional knowledge to laboratory evidence, to determine potential natural compounds and to advance the studies of plant-based therapeutic agents. The study also underscores the significance of sustaining traditional practices and the diversity of medicinal plants for future research on healthcare (Ravishankar & Shukla, 2007).

Importance of the Study

The present study is significant as it scientifically explores the medicinal properties of traditionally used Indian plants. Medicinal plants are used in Ayurveda, Siddha, Unani and folk medicine to cure various ailments. But, traditional applications need to be scientifically validated. The study is useful for identification of significant phytochemical compounds like alkaloids, flavonoids, tannins, saponins and terpenoids. It also explores the

antibacterial and anti-fungal properties of some plant extracts against the harmful microorganisms. The results could be beneficial for understanding what compounds may exist in nature with antimicrobial properties and for further drug discovery. Additionally, the study relates traditional knowledge to scientific approaches and identifies the importance of the conservation of medicinal plants for future healthcare applications.

Problem Statement

Medicinal plants are traditionally used in India to treat various health related diseases, but there is lack of scientific evidence to support the medicinal claims of many of these plants. In spite of the presence of various phytochemical constituents in these plants, their chemical composition and antimicrobial properties need to be systematically investigated. Moreover, there is the issue of microbial resistance to current medications and thus a need to seek novel sources of antimicrobial agents. Biological activities can vary, though, depending upon the plant species, extraction process, chemicals and their concentrations. Many traditional medicinal plants have not been scientifically validated and require further investigation to understand their actual medicinal uses and safety. For this reason, the present study was conducted on phytochemical screening and antimicrobial activity of the traditional medicinal plants used in India to get the laboratory evidences of their therapeutic importance.

Aim and Objectives of the Study

Aim of the Study

- To scientifically study traditionally used medicinal plants in India by identifying their phytochemical compounds and evaluating their antibacterial and antifungal activities.

Research Objectives

- To study the traditional uses and important phytochemical compounds of selected medicinal plants in India.
- To identify the chemical constituents present in different plant extracts through phytochemical screening.

- To evaluate the antibacterial and antifungal activities of selected medicinal plant extracts through laboratory testing.

Research Methodology

The present study adopts a secondary-based research methodology to examine the ethno pharmacological importance of traditionally used medicinal plants in India. Both the data being used and the source of the data have been gathered from existing sources, such as research articles, scientific journals, books, review papers, government publications, and authentic online databases. Relevant literature is reviewed to know the medicinal plants usage in Ayurveda, Siddha, Unani and folk medicine. Secondary information is also gathered for vital phytochemical compounds including alkaloids, flavonoids, tannins, saponins, terpenoids and phenolic compounds. The results of previous studies on the antimicrobial activity of medicinal plant extracts are reviewed and compared. The data collected is analyzed descriptively to determine what potential medicinal, safety, therapeutic and future uses they may have. This study does not involve any laboratory experiments, plant extraction, sample collection or primary data collection.

Traditional Medicinal Plants and Ethnopharmacology in India

India has an extensive tradition of using medicinal plants for health and cure of various diseases. Herbs have been handed down through generations within families and/or healers and communities. Ethnopharmacology can be defined as the scientific study of the traditional medicines and their effects on the human body. It brings together ancient healing methods with contemporary scientific studies. Indian plants with medicinal properties are well known like neem, tulsi, ashwagandha, aloe vera, turmeric and etc. Herbal medicines are prepared from various parts of the plant such as its roots, leaves, stems, flowers, seeds and bark (Laldingliani et al., 2022).

Traditional healthcare systems like Ayurveda, Siddha and Unani use natural ingredients to prevent and cure diseases. The plants include other chemical compounds which could exhibit antimicrobial, antioxidant, and anti-inflammatory properties. Scientific research can be used to detect these chemicals and to gain insight into their potential

medicinal benefits. Phytochemical screening and laboratory testing play an important role in substantiating traditional uses.

Ethnopharmacological research is also important in the discovery of new sources of natural medicines. It helps to scientifically support traditional knowledge, and promotes the proper use of plant resources. Before developing herbal products, however, correct safety evaluation, dosage and identification of the plants are required. Hence the study of medicinal plants is significant in the correlation of traditional healthcare with modern medicine and aid in future discovery of drugs (Ralte & Singh, 2024).

Traditional Uses of Medicinal Plants in Indian Healthcare Systems

The use of medicinal plants has been part of the Indian health care system for centuries. Traditional systems incorporate the use of natural plant materials to ward off illness, lessen symptoms and promote recovery. There are a number of herbal preparations in Ayurveda, Siddha, Unani and local folk medicine for common health ailments. Powders, pastes, oils, juices and decoctions are used in the form of leaves, root, bark, flowers and seeds. Traditionally, neem is used for skin care, tulsi for respiratory complaints and turmeric for wounds, inflammation. These practices are a result of knowledge that has been gained over time in the community. But scientific assessment is required in order to know their actual therapeutic effect. Correct identification, preparation and dosage are also critical to safe use. The traditional medicinal knowledge offers significant insights into plant-based remedies and their potential applications in contemporary medicine. Traditional medicinal knowledge can offer insights for researchers exploring plant-based remedies and their potential applications in modern medicine (Niazi & Monib, 2024).

- **Ayurveda and Herbal Treatment** - Ayurveda is one of the oldest traditional healthcare systems of India. Its medicinal herbs are used to keep physical balance and promote overall health. It uses different herbs like ashwagandha, turmeric, amla, and neem in various formulations. They are usually used for skin care, immunity and digestion. In the Ayurvedic system of medicine,

oils, powders and decoctions are frequently employed.

- **Siddha System of Medicine** - Siddha is primarily practiced in south India and is a system of health care based on herbs, minerals and natural materials. Medicinal plants are made into powder, herbal oils, pastes and liquids. Traditional preparations use locally grown species, such as neem for skin ailments, aloe vera for digestive problems and as a tonic for overall health. This system also puts emphasis on diet and lifestyle.
- **Unani System and Natural Remedies** - The unani medicine treats various health issues using herbal ingredients and helps the body to function properly. Herbal products such as syrups, extracts, oils and herbal medicines are made from the plants. She uses herbs in her medicine for digestive and other health issues, including senna, liquorice and fennel. They are used according to traditional knowledge and according to the personal needs of the individual.
- **Folk Medicine and Community Knowledge** - Folk medicine is used by the rural and tribal population all over India. Plants from the local forests, fields and home gardens are used by local healers. Some leaves may be ground into pastes and roots/bark may be boiled to make traditional medicines. These practices are significant because they help to maintain the local knowledge of plant identification, preparation and usage(Manisha et al., 2025).

Phytochemical Constituents and Bioactive Compounds of Medicinal Plants

Medicinal plants are rich in natural chemical substances (phytochemicals) that are responsible for their biological activities. They can be found in various parts of the plants such as leaves, roots, flowers, seeds, and bark. Alkaloid, flavonoids, tannins, saponins, terpenoids and phenolic compounds are among the important phytochemicals groups. Experimental work indicates that some of these compounds have antimicrobial, antioxidant and anti-inflammatory properties(Kurmukov, 2013). The quantity and nature of these may vary, depending on the plant species, plant growth condition, and season and extraction method. Phytochemical screening is a process which assists in determining the main chemical groups found within the selected plant

samples. Individual compounds and their structures can be determined if further analysis is performed. It is essential to know these constituents so that they can be explained in the context of the potential therapeutic properties of traditional herbs. It also helps to select the promising extracts from plants for antimicrobial testing and further pharmaceutical research(Phillipson, 2001).

- **Alkaloids and Their Biological Importance** - Alkaloids are naturally occurring nitrogen containing chemical compounds that can be found in numerous medicinal plants. They have different biological effects and play a crucial role in drug development. Alkaloids exhibit antimicrobial activity and could have an inhibitory effect on the development of harmful microorganisms. They are found in a number of plant families and undergo appropriate chemical tests. The medicinal potential will vary with the compound, concentration and biological system under investigation.
- **Flavonoids and Phenolic Compounds** - An important group of plant compounds that are related to antioxidant activity is the flavonoids and the phenolic compounds. They are important to help protect plant cells from harm done by harmful environmental factors. Other members of these groups also demonstrate antimicrobial and antifungal activity in vitro. The compounds are often found in leaves, fruits, flowers and bark. In many cases, their presence is investigated as part of the preliminary phytochemical screenings(Ferreira, 2022).
- **Tannins and Saponins** - Plant substances that bind with proteins are called tannins. They are classically linked to wound healing, and might exhibit antimicrobial properties. The saponins are natural substances which form a lather when added to water. They are studied for their possible antimicrobial and other biological activities. Both groups occur in various medicinal species and they form part of the chemical constitution of medicinal extracts.
- **Terpenoids and Other Active Constituents** - Terpenoids form a large group of natural compounds found in essential oils and other plant extracts. They are responsible for the aroma and biological characteristics of numerous herbs. In lab tests, some terpenoids have been found to

have antibacterial and antifungal properties. They are also part of other phytochemicals, which give valuable data on the choice of medicinal plants for further studies and development of medicines(Debnath et al., 2018).

Extraction and Identification of Phytochemicals from Medicinal Plants

The extraction and identification of medicinal plants are significant processes in the scientific research of medicinal plants. The separation of valuable chemical components from the plant material using appropriate solvents is called extraction. It typically starts with harvesting, cleaning, drying and grinding of plants. Solvents, for example water, ethanol, methanol and other appropriate solvents, are chosen dependent on the kind of compounds being studied. The prepared extracts are then subjected to preliminary phytochemical tests to identify the major groups of substances. Special methods can be employed to determine the specific components and chemical composition. Reliable results can only be obtained if the extraction conditions are appropriate. The yield may vary depending on the factors: temperature, extraction time, solvent type, and particle size. Such procedures offer scientific approach to chemical composition and potential antimicrobial activity of traditional medicinal plants (TMPs)(Sinha et al., 2022).

- **Collection and Preparation of Plant Materials** - Firstly, the selection of medicinal plants with traditional uses and research purpose is done. Plant samples should be well identified in order to prevent species misidentification. Fresh materials are gathered, washed and decontaminated to remove soil, dust and unwanted materials. They are then dried under the appropriate conditions, to lower the moisture content and minimize undesirable alterations. The samples are then dried and then finely ground. The extraction process is more consistent if it is prepared properly.
- **Selection of Suitable Solvents** - The use of the appropriate solvent is crucial as each phytochemical will dissolve in a different type of solvent. Laboratory solvents, such as water, ethanol, methanol and other solvents may be used

as needed for research. Typically, polar solvents will be used for the extraction of many phenolic compounds and less polar solvents for the extraction of other chemical groups. The amount and nature of the products obtained from the plant material is determined by the solvent used(Alelah et al., 2026).

- **Extraction of Plant Compounds** - Extraction is the process of extracting soluble chemical constituents from powdered plant samples. Typical methods are maceration, Soxhlet extraction and aqueous extraction. Maceration involves soaking plant powder in an appropriate solvent for a certain amount of time. Soxhlet extraction is a process that extracts soluble substances by repeatedly passing the solvent through the material. Once extracted, the liquid is filtered and the solvent can be extracted under controlled conditions to create a concentrated extract.
- **Preliminary Phytochemical Screening** - The extract obtained is subjected to testing for the presence of major chemical groups. Alkaloids, flavonoids, tannins, saponins, terpenoids and phenolic compounds are detected by specific chemical reactions. These preliminary tests give basic information regarding the chemical composition of the sample. The results guide researchers for further selection of extracts for analysis and bioassay.
- **Advanced Identification Techniques** - More detailed information on constituents of plants can be obtained using advanced laboratory techniques. Thin-layer chromatography (TLC) is used to separate compounds and high-performance liquid chromatography (HPLC) to analyze compounds. The analytical method of gas chromatography–mass spectrometry (GC-MS) can be employed to find appropriate volatile compounds. The Fourier transform infrared spectroscopy (FTIR) gives data on key chemical functional groups. These techniques can be used in concert to ensure reliable identification and further investigation of bioactive substances (Handa et al., 2008).

Evaluation of Antimicrobial Activity against Bacterial and Fungal Pathogens

Antimicrobial evaluation is one of the crucial technique used to investigate the antimicrobial

activity of medicinal plant extracts to control harmful microorganisms. Humans suffer a range of infections from bacteria and fungi, but they have become immune to most of the current medicines and a search for new sources of treatment has begun. The antibacterial and antifungal activities of the natural compounds of traditionally used medicinal plants of India are found to be present in them. The evaluation starts from the preparation of extracts from plant using appropriate solvents. Selected strains of bacteria and fungi are used in controlled laboratory conditions to test these extracts (Marasini et al., 2015).

Some of the common bacteria are *S. aureus*, *E. coli*, *P. aeruginosa*, and *B. subtilis*. Experimental testing could also include fungal organisms like *Candida albicans* and *Aspergillus niger*. The agar well diffusion method is one of the most commonly-used techniques for observing antimicrobial effects. In this technique, plants extracts are introduced into the wells cut in the agar plates with microorganisms. The zone of inhibition is the measure of the clear area around each well after incubation. The larger the zone, the higher the degree of growth inhibition under the test condition(s) (Dubale et al., 2023).

The minimum inhibitory concentration (MIC) is a test that determines the lowest concentration of the extract that inhibits the growth of microbes. The minimum bactericidal concentration (MBC) or minimum fungicidal concentration (MFC) could be carried out to investigate if the material being tested is bactericidal or fungicidal. Positive controls are standard antimicrobial medicines and the solvent itself is used as a negative control.

The results are compared to determine if there are differences in activity between the plant species, extracts, and concentrations. This evaluation gives microbiological proof of potential antimicrobial properties of traditional herbs. Laboratory studies are not sufficient to establish efficacy or safety in clinical use, however. More toxicological, pharmacological and clinical tests need to be conducted before medicinal plant extracts can be recommended for clinical use (M & Koyya, 2025).

Antimicrobial Properties of Traditionally Used Medicinal Plants

Medicinal plants traditionally used contain naturally-occurring ingredients, which could be useful in terms of controlling the proliferation of bacteria and fungi. Their antimicrobial properties are

mainly associated with phytochemicals such as alkaloids, flavonoids, tannins, terpenoids, and phenolic compounds. It has been studied how Indian herbs like neem, tulsi, turmeric, garlic and aloe vera can affect various microorganisms. Plant extracts can attack microbial cell walls, cell membranes, enzymes or other vital cellular processes. The activity of their is dependent on plant species, extraction solvent, concentration and type of microorganisms. Laboratory experiments can be used to measure these effects, including agar diffusion and minimum inhibitory concentration testing. These investigations yield scientific knowledge of traditional medicine. But more studies are needed for determining their safety, the range at which they are efficient, and the possibility of their use in the development of plant-based antimicrobial products (Khatoon et al., 2024).

- **Antibacterial Properties** - Laboratory studies have demonstrated the antibacterial properties of several of the medicinal plants. Rather, neem, garlic and tulsi are widely researched against selected bacterial species. They are able to affect the growth of bacteria through their natural compounds which could disrupt key cellular functions. Activity fluctuates with concentration of the extracts and type of bacteria. The results of such studies can be used to pursue the study of plant antimicrobial agents.
- **Antifungal Properties** - Some medicinal plants have compounds that can inhibit fungi growth. Turmeric, neem and other herbal materials have been studied for their activity against *Candida*, *Aspergillus* and other organisms. Certain plant compounds could disrupt fungal cell membrane structure or other biological processes. These effects are investigated using laboratory testing. They should be further evaluated for their safety and efficacy before they can be used (Breijyeh & Karaman, 2024).
- **Role of Phytochemicals in Microbial Control** - Biological activities of medicinal plants are due to the phytochemicals. Microbial proteins and cellular processes can be influenced by flavonoids and tannins and terpenoids might interact with microbial membranes. Other compounds that are investigated for their potential antimicrobial activity include alkaloids and phenolic compounds. The simultaneous occurrence of

these compounds may have an effect on the activity of crude plant extracts.

- **Importance of Plant Extract Concentration** - The activity of an extract could be concentration dependent. In some cases, higher concentrations lead to increased microbial growth inhibition, but this is not necessarily true. Various solvents also remove various chemical components. Thus, several concentrations of testing are important to researchers as it provides some understanding of the activity pattern and identify appropriate samples for later testing.
- **Importance in Modern Drug Research** - Plants are a source of natural materials for the discovery of new antimicrobial agents. Their investigation could lead to the identification of useful compounds that will be useful in the development of future drugs. In the laboratory, however, there needs to be some toxicity studies, chemical characterization and clinical research that confirms laboratory results. Scientific assessment also promotes the sustainable use and conservation of traditional medicinal resources(El-Saadony et al., 2025).

Pharmacological Significance, Safety, and Therapeutic Potential of Medicinal Plants

Pharmacological Significance of Medicinal Plants

Medicinal plants are of great pharmacological importance due to their natural compounds which can have various biological effects. Herbal materials are sources of study of major substances, such as alkaloids, flavonoids, phenolic compounds, tannins, terpenoids and saponins. Under experimental conditions these compounds demonstrate antimicrobial, antioxidant, anti-inflammatory, analgesic or other activities. The pharmacological value of a plant is related to its chemical constituents, parts utilized, extraction methods and concentration used. Laboratory research can elucidate the possible interaction of plant extracts with microorganisms or other biological targets. Other compounds in plants have also been good sources for research in the pharmaceutical industry. In the laboratory, however, the activity seen does not necessarily indicate what will happen in people. Thus, controlled pharmacological studies are required to investigate the biological mechanisms and therapeutic potential.

Traditionally used plants can be scientifically evaluated for useful information that will help in future development of plant-based medicines and identification of promising natural substances(Latif & Nawaz, 2026).

Safety of Medicinal Plants

Natural products are not necessarily safe, so safety is a fundamental aspect of medicinal plant studies. The safety of a herbal preparation could be determined by the plant species, the plant part, the dose, the preparation method, the length of time using it and the individual's health. Some plants may have compounds which, if eaten in large quantities, can be harmful. Other health risks can also be caused by contamination with microorganisms, pesticides, heavy metals or other unwanted materials. Therefore, it is important to properly identify plant species before preparation or testing. Toxicity studies are conducted to look at the potential harmful effects on cells, tissues, organs, and living organisms. Standardization of extraction and QC processes can enhance reliability of herbal products. Interactions with conventional medicines are also possible, and should be taken into account when using a plant preparation. The use of traditional medicine should be supplemented with adequate scientific data. Thus, toxicological studies, controlled testing, quality assessment, and appropriate dose assessment must be performed prior to broad therapeutic use(Zhang et al., 2015).

Medicinal and therapeutic applications of plants

Medicinal plants have significant therapeutic value, as the plants' natural properties can be used to generate beneficial biological effects. Traditional herbs used to investigate their antimicrobial, antioxidant, anti-inflammatory, wound-healing, digestive and other activities. Plants with antimicrobial activity are particularly significant as it is continued to be a problem in health care due to bacterial and fungal infections. The flavonoids, phenolics, terpenoids, alkaloids and other extracts may have different biological mechanisms. These effects can be studied in the laboratory, in animals, and in appropriate clinical studies. Biological activity, safety, effective concentration, chemical stability and reproducibility all play a part in determining therapeutic potential. A good laboratory result is not enough to prove a treatment for the human disease. Additional work is required to

identify effective compounds, their mechanisms of action, appropriate doses and potential side effects. Therefore, Ethnopharmacological studies can provide information that can be used in the discovery and development of future therapeutic agents from plants (Salmerón-Manzano et al., 2020).

Challenges and Future Prospects of Ethnopharmacological Research in India

Challenges of Ethnopharmacological Research in India

- **Loss of Traditional Knowledge** - Traditional knowledge is generally transmitted among generations through verbal means. With the urbanization and lifestyle changes, valuable information may be lost.
- **Plant Identification and Quality** - Identification of medicinal plants may be challenging. Their chemical composition may vary depending on species, growing conditions, time of harvest, storage, etc(Heinrich, 2010).
- **Limited Scientific Evidence** - There are many traditional remedies that have not undergone extensive laboratory, toxicological or clinical testing. As a result, they may not work as intended or be safe.
- **Standardization Problems** - The results may vary with the type of extraction, the plant part and the dosage. Standardization is needed to ensure more consistent studies and safe herbal medicines(Kumar et al., 2026).

Future Prospects of Ethnopharmacological Research in India

- **Discovery of New Bioactive Compounds** - Studies on traditional plants could be used to find new compounds that have antimicrobial, antioxidant, anti-inflammatory or other beneficial properties.
- **Advanced Scientific Techniques** - New techniques like chromatography, spectroscopy, molecular studies and computer analysis can aid in identifying and understanding the active constituents in plants(Mishra & Mishra, 2024).
- **Development of Herbal Medicines** - Plants extracts and purified compounds, which have been validated, could be used for producing

standardised herbal medicines and other plant-based health care products.

- **Conservation and Knowledge Protection** - Future studies can promote sustainable harvesting, conservation of medicinal plants, and appropriate documentation of community knowledge. This area can be enhanced by cooperation between traditional healers and scientists(Patwardhan & Aswar, 2025).

Discussion

This study proves that traditional medicinal knowledge of Indian medicinal plants is important and needs scientific study. The literature reviewed suggests that the phytochemicals that may be present in the extracts, including alkaloids, flavonoids, tannin, saponins, terpenoids and phenolic compounds, may have antimicrobial properties and other biological activities. Traditional knowledge as available in the traditional system of medicine such as Ayurveda, Siddha, Unani and folk medicine can be useful in identification of potentially useful plant resources. However, the biologically activity reported is affected by the plant species, plant parts, extraction methods, solvents, concentrations of extracts and microorganisms targeted. However, traditional use should not be regarded as adequate proof of efficacy, but be supported by a systematic scientific evaluation. The study also highlights the importance of toxicity assessments, standardization, chemical characterization, pharmacological study and clinical trials. This kind of integrated research can contribute in the responsible development and conservation of medicinal plant resources.

Conclusion

The present study suggests that medicinal plants as used traditionally in India are a rich source of knowledge and bioactive compounds for Ethnopharmacological research. The study achieved the principal objective of the study which was to explore the Traditional Medicinal Plants from a scientific angle by reviewing the phytochemical constituents and reported antimicrobial activity of the traditional medicinal plants. The first goal was achieved by studying the traditional medicinal applications of medicinal plants in the systems of Ayurveda, Siddha, Unani and folk medicine. The second objective was achieved by identifying and

discussing the major phytochemical groups such as alkaloids, flavonoids, tannins, saponins, terpenoids and phenolic compounds. The third goal was covered with the assessment of reported antibacterial and antifungal activities of medicinal plant extracts and laboratory methods applied to assess medicinal plant extracts.

The study has proven that traditional knowledge can be useful in identifying plant resources with potential therapeutic use. Concurrently, no clinical efficacy or safety can be blamed on traditional use or initial antimicrobial activity. Research results may differ as a result of differences in plant species, extraction method, solvents, concentrations, and growing conditions. Hence, subsequent studies with standardized extraction, comprehensive phytochemical profile, toxicological, pharmacological, and clinical trials need to be conducted. In summary, systematic Ethnopharmacological research can help build a stronger linkage between the knowledge of traditional healers and scientific research and contribute to the sustainable conservation and future development of plant-based therapeutic resources.

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