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Ethnobotanical studies on traditional medicinal plants used by tribal communities in Chengalpattu district, Tamil Nadu

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Abstract
The present ethno-botanical study was conducted in Chengalpattu district of Tamil Nadu, India, to document and evaluate traditional knowledge related to the use of medicinal plants by rural and tribal communities. Through field surveys conducted between October 2023 and April 2024 in 20 villages, information was collected from 20 knowledgeable local healers, including both men and women aged between 45 and 75 years. Data were obtained through interviews and direct plant collection, identifying 20 plant species across nine botanical families commonly used for treating various ailments. The study revealed a diverse range of plant-based remedies used in the form of decoctions, infusions, pastes, and raw extracts to treat illnesses such as skin diseases, respiratory issues, digestive disorders, diabetes, wounds, and snakebites. Frequently used plant parts included leaves, roots, and bark, with internal applications being more common than external ones. Several species such as *Aegle marmelos*, *Andrographis paniculata*, *Phyllanthus amarus*, and *Solanum nigrum* were found to have significant ethnomedicinal importance. The research underscores the urgency of documenting this rapidly vanishing traditional knowledge due to modernization and generational shifts. The findings highlight the importance of preserving and promoting sustainable use of indigenous medicinal resources, ensuring community participation in conservation strategies.

Keywords: Ethno-botany, traditional knowledge, indigenous healing, tribal medicine, plant-based remedies, rural healthcare, ethno-pharmacology

Introduction
Ethno-botany, a multidisciplinary science at the intersection of botany and anthropology, explores the complex relationships between human cultures and the plant world, particularly how indigenous and rural communities utilize local flora for their everyday needs [1-2]. The term encompasses the traditional knowledge and cultural practices surrounding the use of plants for food, shelter, medicine, rituals, clothing, tools, and more. Among these, the medicinal use of plants holds a vital role in maintaining human health and continues to serve as a foundational pillar of healthcare in many parts of the world, especially where modern medical infrastructure remains limited [3-4]. Historically, the close association between humans and plants has contributed significantly to the development of formal medicinal systems such as Ayurveda, Unani, and Siddha. In India alone, it is estimated that over 2,500 plant species are used in traditional medicine, with tribal and rural communities serving as the custodians of this invaluable knowledge [5-7]. These traditional practices, passed orally from generation to generation, represent centuries of observational learning, experimentation, and cultural adaptation. The Chengalpattu district of Tamil Nadu, rich in ecological diversity and cultural heritage, is home to several tribal and rural populations who still rely on traditional plant-based medicine for the treatment of common and chronic ailments. The district's location, bordered by varied landscapes including forests and coastal zones, contributes to its botanical wealth. However, modernization, urban migration, and the declining interest among younger generations pose a significant threat to the preservation of this knowledge system. With traditional healers aging and fewer individuals taking up the practice, much of this ethno-medicinal wisdom risks being lost forever unless properly documented and studied. Ethno-botanical studies, therefore, become not only tools for cultural preservation but also for biodiversity conservation and sustainable development. These investigations provide insights into species of high medicinal value and open avenues for further pharmacological and

conservation research [8] [2]. The relevance of such documentation is amplified by the World Health Organization's estimate that over 80% of the global population still relies on plant-based traditional medicine for their primary health care needs.

Objectives of the Study

- To document the traditional knowledge and medicinal uses of plants by tribal communities in the Chengalpattu district.
- To understand the pattern of natural resource use and local knowledge systems in the region.
- To encourage local communities, especially youth, to participate in the preservation and propagation of medicinal plant wealth.
- To identify rare, endangered, and economically important medicinal plants and promote their sustainable use and conservation.
- To assess the factors affecting biodiversity and traditional knowledge related to medicinal and aromatic plants in the region.

Through field surveys, plant identification, and interviews with knowledgeable local healers, the present study aims to provide a comprehensive ethno-botanical record of the medicinal flora used in the Chengalpattu district. By doing so, it contributes to the preservation of traditional knowledge, supports biodiversity conservation, and highlights the potential for integrating indigenous wisdom into modern healthcare and sustainable development strategies.

2. Materials and Methods

2.1 Study area and Ethno-botanical Survey

Tamil Nadu, the 11th largest state in India, spans a geographical area of 130,058 km² and lies between 11°00′ to 12°00′ North latitudes and 77°28′ to 78°50′ East longitudes. The state contains a significant forest cover of 21,482 km², constituting approximately 16.52% of its total area. This includes 12,499 km² of dense forests (9.61%) and 8,963 km² of open forests (6.91%). Approximately 3,305 km² (15%) of the forest area falls under protected zones, which include wildlife sanctuaries, 12 bird sanctuaries, 5 national parks, 3 biosphere reserves, and 1 tiger reserve [9]. Chengalpattu district, located in the southern part of Tamil Nadu, covers an area of 3,678 km² and has a population of approximately 2,285,395. Geographically, it is bordered by Villupuram district to the north, the Bay of Bengal to the east, Nagapattinam district to the south, and Perambalur district to the west. The district lies between 11°11′ to 12°35′ North latitudes and 78°38′ to 80° East longitudes.

2.2 Selection of Informants and Field Work

Ethno-botanical fieldwork was conducted in 20 villages across Chengalpattu district between October 2023 and April 2024. The survey involved four field trips over a total of 50 days. Local traditional healers, identified as key informants due to their practical knowledge of medicinal plant use, were selected through purposive sampling based on their local reputation and family traditions in healing. Informants were requested either to collect plant specimens they commonly used or to guide the researchers to plant locations in situ. Most informants either practiced traditional medicine themselves or came from families with generational knowledge of ethno-medicinal practices. The wealth of medicinal knowledge in these communities reflects centuries of cultural transmission through oral traditions. However, this knowledge is rapidly declining as younger generations show less interest in maintaining these practices.

2.3 Data Collection

Following the ethno-botanical methodology outlined by Jain [1], semi-structured interviews and open-ended conversations were conducted with a total of 20 informants, including 14 males and 6 females, aged between 45 and 75 years. A questionnaire was employed to gather detailed information on:

- Local (vernacular) names of medicinal plants
- Plant parts used
- Preparation methods (e.g., decoctions, infusions, pastes)
- Modes of administration
- Therapeutic uses and efficacy

During field visits, informants were asked to identify and demonstrate the plants in their natural habitats. Each plant species mentioned was taxonomically identified.

2.4 Collection and Preservation of Plant Specimens

Standard herbarium procedures, as per Jain [1], were followed for plant collection, drying, mounting, and preservation. For each documented species, voucher specimens in triplicate were prepared and deposited at the Department of Botany, Pachaiyappa's College, Chennai. Correct botanical nomenclature was confirmed using authoritative floras: The Flora of the Presidency of Madras [10] and The Flora of Tamil Nadu Carnatic [11]. Identifications were further validated at the Botanical Survey of India, Southern Circle, and Coimbatore.

3. Results

3.1 Documentation of Medicinal Plants

In total, medicinal plant specimens were collected from 20 villages in the Chengalpattu district. These plants were identified and catalogued with their botanical names, vernacular names, plant family; plant parts used, and associated ethno-medicinal uses. The compiled data is presented in Table 1, with the plants arranged alphabetically.

3.2 Ethno-botanical Observations

The tribal communities of Chengalpattu possess profound herbal knowledge. Medicinal plants are used in various traditional preparations, depending on the ailment and plant part:

- **Juice Extracts:** Prepared by grinding cleaned plant parts with water and filtering the mixture.
- **Decoctions:** Obtained by boiling plant materials in water to extract active compounds.
- **Pastes:** Made by crushing plant parts into a soft mass using water.
- **Infusions:** Created by soaking plant parts in water for several hours or days, then filtering for use.

These simple yet effective methods have been developed through centuries of empirical knowledge and remain vital to the community's primary healthcare practices.

A comprehensive list of ethnomedicinal plants, including their scientific names, family classification, local names, useful parts, and medicinal applications, is provided below in tabular format.

Table 1: Medicinal Plants Used by Traditional Healers in Chengalpattu District, Tamil Nadu

S. No	Botanical Name	Family	Local Name (Tamil)	Plant Part(s) Used	Preparation & Mode of Administration	Medicinal Uses
1	*Adhatoda vasica* Nees	Acanthaceae	Adathodai	Leaves	Decoction	Asthma, cough[12]
2	*Aegle marmelos* (L.) Corr. ex Roxb	Rutaceae	Vilvam	Leaves	Paste	Wound healing[13]
3	*Andrographis paniculata* (Burm. f.) Wallich ex Nees	Acanthaceae	Nilavembu	Leaves	Paste, powder	Snake, scorpion, and insect bites; diabetes[14]
4	*Azadirachta indica* A. Juss.	Meliaceae	Vembu	Leaves, bark	Paste, decoction	Skin diseases, wounds, rheumatism, smallpox[15]
5	*Citrus aurantifolia* (Christm.) Swingle	Rutaceae	Elumitchai	Leaves	Decoction	Fever, cold, headache[16]
6	*Clerodendrum inerme* (L.) Gaertn	Verbenaceae	Piei nari sangu	Leaves	Juice	Fever[17]
7	*Eclipta prostrata* L.	Asteraceae	Karisalanganni	Leaves	Oil, paste	Hair growth, liver disorders[18]
8	*Gymnema sylvestre* R. Br.	Asclepiadaceae	Sirukurinjan	Leaves, roots	Powder, paste	Diabetes, snake bites[19]
9	*Hemidesmus indicus* (L.) R. Br.	Asclepiadaceae	Nannari	Whole plant	Juice	Cooling agent, skin diseases[20]
10	*Lantana camara* L.	Verbenaceae	Unni chedi	Flowers	Paste	Headache[21]
11	*Lippia nodiflora* Mich.	Verbenaceae	Poduthalai	Leaves	Paste	Swellings, wounds[22]
12	*Murraya koenigii* (L.) Sprengel	Rutaceae	Karuveppilai	Leaves	Juice	Vomiting[23], digestive issues
13	*Phyllanthus emblica* L.	Phyllanthaceae	Nellikai	Fruit	Raw, juice	Cough, cold, digestive disorders[24]
14	*Solanum nigrum* L.	Solanaceae	Manathakkali	Whole plant	Raw, cooked	Cough, Mouth ulcers, respiratory issues[25]
15	*Solanum torvum* Sw.	Solanaceae	Sundaikkai	Leaves, fruits	Juice, cooked	Body heat reduction, digestive aid[26]
16	*Solanum trilobatum* L.	Solanaceae	Thuthuvalai	Leaves, fruits	Juice, cooked	Cough, respiratory issues[27]
17	*Sphaeranthus indicus* L.	Asteraceae	Kottaikkarantai	Leaves, flowers	Paste	Skin diseases, piles[16]
18	*Vitex negundo* L.	Verbenaceae	Nirgundi	Leaves	Paste	Fever, cold, cough[28]-[31]
19	*Wattakaka volubilis* (L.) Cooke	Asclepiadaceae	Kurinjan	Leaves	Paste	Rheumatic pain, cough, fever, severe cold[30]
20	*Withania somnifera* (L.)	Solanaceae	Amukkara	Root, Leaves, Berries	Churna, Decoction	Arthritis[29], Inflammation, Diabetes and Blood Sugar Regulation

4. Discussion

Plants have played a significant role in maintaining human health and improving the quality of life for thousands of years, serving as essential components in medicines, seasonings, beverages, cosmetics, and dyes. Herbal medicine operates on the belief that plants contain natural substances capable of promoting health and alleviating illness. Numerous herbs are widely used to treat cardiovascular conditions, liver disorders, central nervous system issues, digestive and metabolic disorders. Given their potential to exert significant therapeutic effects, such plants are promising candidates as drugs or dietary supplements in managing various diseases. Herbal remedies continue to play a vital role in traditional medicine, particularly in rural regions of Tamil Nadu, where plants are used therapeutically as antiseptics, anti-inflammatories, and treatments for infections, candidiasis, and dermatophytosis [32]. In Chengalpattu district, rural communities maintain a strong connection with their natural surroundings and have retained traditional ethnobotanical knowledge. The present study highlights this long-standing heritage and the use of medicinal plants in folk remedies by the local population. In total, 30 plant species from 10 angiosperm families were documented. Among these, herbs, trees, climbers, and shrubs each constituted 5% of the total. The families Euphorbiaceae, Lamiaceae, and Solanaceae were frequently used. Traditional healers employed specific plant parts in defined dosages for treating particular ailments. Remedies were administered either orally—through raw consumption or decoctions/infusions—or externally, as pastes. Fresh leaves, roots, and stems were more frequently used compared to other plant parts. Notably, internal treatments were more common than external applications. When multiple plants were combined in remedies, these formulations bore similarities to Siddha medicine preparations. However, details regarding the specific roles of each component in multi-plant preparations remain unclear. The tribal communities of Chengalpattu district utilize a wide range of plants for both medicinal and non-medicinal purposes. A significant number of these species are also known from other ethnobotanical studies [33]. Several species are particularly valued for their diverse properties. Abutilon indicum is known for its medicinal uses, including treating gout, tuberculosis, and raktapita (bleeding disorders). It is also beneficial in managing piles and alleviating leg pain, as

reported by Rajurkar [34]. Similarly, *Acalypha indica* is commonly applied for conditions like eczema and chest pain, while *Achyranthus aspera* extract is used to treat urinary disorders. Jain and Patole [35] have documented similar uses, highlighting plant species like *Cassia fistula* and *Gloriosa superba*. The juice or decoction of Aerva lanata is another noteworthy remedy, valued for its diuretic, anthelmintic, antidiabetic, expectorant, and hepatoprotective properties, and is traditionally used to treat urinary problems [36]. *Andrographis paniculata*, often referred to as the "king of bitters," is used for treating fever, liver disorders, diabetes, and snakebites, with its leaves and entire herb holding medicinal value [37]. *Aegle marmelos* (Bael), a plant native to India and widespread in sub-Himalayan forests, is renowned for its treatment of dysentery and other intestinal issues. It also exhibits a wide range of therapeutic properties, including microfilarial, radioprotective, analgesic, antihyperglycemic, anticancer, anti-dyslipidemic, and antidiabetic activities. In the Solanaceae family, *Datura metel* leaf paste is mixed with *Curcuma aromatica* to treat swelling, and its leaf juice is used to alleviate earaches [38]. *Solanum nigrum*, on the other hand, is consumed as a food remedy for cough and is also applied externally for stomachache [39]. *Leucas aspera*, belonging to the Lamiaceae family, is used by inhaling vapors from boiled leaves to relieve coughs and colds, while its juice is applied to treat eye irritation [40]. These uses are consistent with the findings of Nadkarni [41], who documented specific plant species traditionally employed to treat conditions like asthma, cough, dysentery, jaundice, and snakebites. While the plant species remain largely the same, the preparation methods and the parts of the plants used can vary. In most cases, healers prefer to use freshly collected plant materials. Leaves, stems, and bark are the most commonly used plant parts, followed by roots, flowers, seeds, and fruits. The dosage and method of administration often vary depending on the patient's age, gender, health condition, and severity of illness. Traditional practitioners also impose dietary restrictions—such as avoiding rice, chillies, oil, spices, cold water, eggs, meat, and curd—to promote faster recovery. In some cases, spiritual and magical practices are used alongside herbal treatments, especially for illnesses like colds and fevers.

Treatment duration for conditions like skin diseases varies widely, from one week to up to 30 days, depending on the plant's potency, the parts used, the number of species involved, and the preparation method. These findings reinforce the importance of ethnobotanical fieldwork, as some potentially remarkable medicinal plants for difficult-to-treat diseases are still known only to local communities and are passed down as family secrets. It is, therefore, crucial to popularize, identify, and preserve the utility of these medicinal plants.

5. Conclusion

The survey conducted in Chengalpattu district revealed a rich diversity of medicinal plants traditionally used to treat a wide range of human ailments. Ethno-botanical studies across Tamil Nadu have similarly shown that economically disadvantaged and tribal communities often prefer traditional medicine due to its affordability and deep cultural roots. Interviews from various villages indicate that knowledge of medicinal plants is primarily held by traditional healers, herbalists, and elderly individuals in rural areas. The study also raised concerns about the unsustainable exploitation of certain species by locals unaware of their ecological and medicinal value. Despite the availability of modern healthcare, many residents continue to rely on plant-based remedies for common ailments such as colds, coughs, fevers, headaches, poisonous bites, skin diseases, and dental problems. Experienced healers maintain strong patient relationships, contributing significantly to rural healthcare. However, with most healers being elderly and younger generations showing little interest in preserving this heritage—often migrating to urban areas—there is a growing risk of losing this traditional knowledge. Therefore, systematic documentation and specimen identification are crucial for its preservation. According to the World Health Organization, over 80% of the global population depends on traditional herbal medicine for primary healthcare, underscoring the importance of this ethno-botanical study in contributing to the conservation of indigenous knowledge systems and promoting sustainable use of medicinal plant resources.

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