



Assessment of Unique Plants Inhabiting with Special Emphasis on Their Therapeutic Significance in Tumakuru District Forests, Karnataka, India

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Abstract

The utilization of plants as traditional therapies constitutes a viable alternative within the healthcare system in rural communities. Present study seeks to identify and document the botanical names, families, plant habits, the specific plant parts utilized, alongside their medicinal applications and the conservation status as per the International Union for Conservation of Nature (IUCN) for each species of traditional medicinal plants found in the Tumakuru district forests. Comprehensive field surveys were undertaken to collect data on plant species, assess floristic diversity, and determine the medicinal importance of various plants across the forest ranges in Tumakuru district. The analysis identified a total of 73 medicinal plant species distributed across 38 families, with the Fabaceae family exhibiting the highest representation comprising 11 species, followed by Apocynaceae and Lamiaceae families, each with five species. Trees emerged as the most commonly utilized category, while leaves were identified as the predominant part employed for remedies, attributed to their ease of collection. Validation against Red Data Book, along with a comparative assessment with the IUCN Red List, indicated that 28% of the identified tree and herb species are classified as rare, endangered, threatened, underscoring the urgent need for conservation and the adoption of sustainable usage practices

Keywords: *Conventional method, Endemic plants, Indigenous awareness, IUCN Red Listed species, Medicinal plants, Native populace.*

Introduction

India encompassing a mere 2.4% of the world's land area proudly harbours an astounding 7-8% of global biodiversity. More than 100 genera of plants utilized in indigenous medicine worldwide are native to India. The country is celebrated for the exceptional quality and quantity of its medicinal flora, ranking second globally. Furthermore, India is acknowledged as one of the 12 mega biodiversity hotspots worldwide, comprising 16 agro-climatic zones and approximately 48,000 plant species, of which 7,000 are acknowledged as medicinal (Chakraborty, 2018). The conservation of this rich biodiversity is a critical undertaking, addressing intricate scientific, social, and political challenges. Furthermore, India boasts four among the global biodiversity hotspots: the Himalayas, the Western Ghats (which extend into Sri Lanka), north-eastern India (part of the Indo-Burma region), and the Nicobar Islands (Bhat *et al.*, 2012). This extraordinary diversity is a direct result of the country's 15 agro-climatic zones, each nurturing a variety of ecological habitats. Notably, the Western Ghats stand out for their exceptional biodiversity and remarkable levels of endemism (Tandon and Yadav, 2017). The International Union for Conservation of Nature (IUCN) has recognized the

significance of this region, designating 39 heritage sites across the Western Ghats, including states of Kerala, Karnataka, Tamil Nadu, and Maharashtra (IUCN, 2023; Semwal *et al.*, 2019).

Both traditional Chinese medicine and the Indian Ayurveda system have been documented for over a millennium, originating around the 1st millennium BC (Atanasov *et al.*, 2015). The extensive diversity of medicinal plants found across the globe is truly remarkable. Reports suggest that approximately 70,000 plant species, ranging from lichens to trees, possess potential therapeutic benefits for a variety of ailments (Kuruppu *et al.*, 2019). According to the World Health Organization (WHO), about 21,000 medicinal plants are actively utilized in various medical applications. Traditional herbal practitioners, particularly in rural areas, continue to adopt herbal medicine, relying on around 2,500 plant species to address common health issues, which are regarded as one of the most effective methods in Indian medicine practices (Panmei *et al.*, 2019). Karnataka, situated in southern India, encompasses approximately 3.83 million hectares of forested land, which constitutes nearly 20% of the state's total land area. This region is particularly notable for possessing the most extensive diversity of medicinal plants in the country, with approximately 4,800 species of flowering plants. Of these, around 2,000 species are recognized for their medicinal properties. The significance of medicinal plants as a crucial component of biodiversity has only recently gained prominence within the forestry sector. Research indicates that nearly 85% of India's medicinal plant diversity is concentrated in forests and natural habitats (Gupta *et al.*, 2022). However, rapid increase in the human population presents formidable challenges to these forests, jeopardizing their ability to fulfil the growing traditional needs of local communities. Consequently, research focused on forest ecology - analysing population status, regeneration, and potential threats to various species is essential. There is a particular emphasis on evaluating medicinal plants within forest ecosystems, as on-going studies continue to reveal the therapeutic properties of numerous plants that have not yet been fully acknowledged within contemporary medicine.

Medicinal plants have been an essential part of human health and wellness for thousands of years. They have been the primary source of drugs and treatments for various ailments. Many modern pharmaceutical drugs are derived from compounds found in plants. Traditional medicine systems like Ayurveda, Traditional Chinese Medicine (TCM), and Native American healing practices have relied on medicinal plants (Pandey *et al.*, 2013; Jamshidi-Kia *et al.*, 2018). These plants have been used for centuries to treat physical and mental health issues, making them deeply embedded in various cultures and societies (Raj *et al.*, 2018). Many medicinal plants contain bioactive compounds that have healing properties such as antimicrobial properties, boosting energy, anti-inflammatory properties. Compared to synthetic pharmaceuticals, many medicinal plants are considered to have fewer and less side effects, especially when used appropriately (Fonseca and Venticinque, 2018). This makes them an attractive alternative or complement to conventional medications for certain health conditions. Many scientists continue to explore medicinal plants for new treatments (Negi *et al.*, 2011; Tripathi *et al.*, 2013). With the on-going discovery of new plant species and their compounds, the potential for finding new, life-saving drugs remains high. The global interest in plant-based compounds for diseases like cancer, diabetes, and infections continues to grow. In rural or remote areas, where access to modern healthcare might be limited, medicinal plants often play a crucial role in maintaining health (Peltzer *et al.*, 2016). For many communities, they are the first line of defence against illness and disease. Many medicinal plants are used not just for treating physical symptoms but also for promoting mental and emotional well-being (Vineeta *et al.*, 2022).

Local forest-dwelling communities are integral to the maintenance of forest ecosystems, underscoring the necessity to address their livelihood requirements for the sustainable conservation of biodiversity, particularly regarding medicinal plants. A comprehensive action plan focused on the conservation and sustainable utilization of these resources is imperative. Such a strategy would not only protect cultural heritage but also advance scientific research, facilitate technology transfer, and uphold traditional spiritual practices. Recent ethnobotanical survey conducted in the semi-hilly region of Karnataka have yielded valuable documentation (Bhat *et al.*, 2012; Kshirsagar and Singh, 2001; Harsha *et al.*, 2002; Harsha *et al.*, 2003; Hegde *et al.*, 2007; Achar *et al.*, 2010; Ravikumar and Theerthavathy, 2012), yet knowledge gaps persist, particularly in the distribution patterns and population dynamics of medicinal plant species across various Indian landscapes. The primary objective of the study is to systematically catalogue the wild medicinal plants within the Tumakuru district, thereby addressing the deficit in available plant data. Through this research, we aim to define and advocate for the sustainable harvesting and use of medicinal plants, contributing to both ecological protection and the socio-economic stability of local communities in the Tumakuru region of Karnataka.

MATERIALS AND METHODS

Study area

The current study was carried out from 2022 to 2024 in Tumakuru forest division, located in the scenic region of Karnataka, plays a crucial role in the area's environmental landscape (Fig. 1).



Fig 1. Map of study area (Tumakuru District Forest Division, Karnataka, India.)

Tumakuru forest division is divided into two main sub-divisions: the Madhugiri Social Forestry Sub-Division and the Tiptur Social Forestry Sub-Division. Each sub-division manages five taluks, addressing the region's diverse ecological and social needs. The Tumakuru Forest Division comprises ten well-defined ranges, each contributing to the local ecosystem in unique ways. These ranges are Bukkapatna, Chikkanayanakahalli, Gubbi, Koratagere, Kunigal, Madhugiri, Pavagada, Sira, Tiptur, and Tumakuru. Together, they form a vibrant mosaic of flora, supporting sustainability and conservation initiatives across Karnataka. The forest area within the district, categorized under the dry-belt zone, differs significantly from the lush evergreen and mixed-belt regions. This expansive woodland primarily resides on the lower slopes of several hill ranges, such as the striking Devarayanadurga hills, the peaceful hills near Koratagere and Madhugiri, and the scenic hill chain west of Kibbanahalli. The landscape also includes the picturesque areas around Bukkapatna, as well as regions near Huliyaudurga, Kudurekanive, and Keepalpura. These forests are characterized by open canopies and host a variety of plant species typical of dry deciduous forests. Additionally, they feature clusters of hardy thorny bushes that thrive in the scrub jungle, creating unique habitats that support a diverse array of wildlife. The contrast between sunlit clearings and shaded groves highlights the resilience and beauty of this distinctive ecological zone.

Forest Type, Topography, Climate and Rainfall

The forest region within the district, classified under the dry-belt zone, stands out distinctly from the lush evergreen and mixed-belt areas. This expansive woodland is predominantly located on the lower slopes of several hill ranges, including the captivating Devarayanadurga hills, the serene hills surrounding Koratagere near Madhugiri, and the scenic chain of hills to the west of Kibbanahalli. Additionally, the area showcases the picturesque landscapes around Bukkapatna, as well as the regions near Huliyaudurga, Kudurekanive, and Keepalpura. These forests are characterized by their open canopies and feature a diverse mixture of plant

species typical of dry deciduous forests. They also include clusters of resilient thorny bushes that thrive in the scrub jungle, creating unique habitats that support various forms of wildlife. The interplay of sun-drenched clearings and shaded groves paints a vivid picture of nature's resilience and beauty in this distinct ecological zone. Tumakuru is a picturesque city located at geographic coordinates of 13.34°N latitude and 77.1°E longitude, nestled in the heart of Karnataka, India. With an average elevation of 822 meters (or 2,696 feet) above sea level, it offers a unique vantage point amidst the undulating landscapes of the region. The climate in Tumakuru district is generally moderate, even during the warmer months of April and May, as well as in the cooler months of December and January. Rainfall in the region varies significantly, majority occurring from July to October.

Data Collection

Ethnobotanical information was documented from traditional healers in the forests ranges of Tumakuru district, between 2022 to 2024 through regular, repeated field visits across different seasons. The purpose and objectives of the study was to ensure the data collection and documentation of medicinal plants in consultation with traditional healers, herbalists and District Forest Officer. A simple questionnaire was prepared with traditional practitioners to gather comprehensive information, including personal details of the healers, source of their knowledge, parts of the plant used, family and habit of the plant, herbal remedies, IUCN status of the plants and symptoms treated. Photographs of selected medicinal plants were taken for documentation. Any unidentified species were later verified by botanists at the Department of Botany, Bangalore University, Bengaluru, Karnataka.

RESULTS AND DISCUSSION

Tumakuru forest division in Karnataka is rich in medicinal plant diversity, offering significant potential for applications in the pharmaceutical and drug industries. These plants have long been used by local communities and Ayurvedic practitioners in traditional herbal and folk remedies. The surveys in Tumkur forest division had resulted in the identification of 73 taxa of plants belonged to 38 families documented from 10 Ranges such as Bukkapatna, Chikkanayakanahalli, Gubbi, Koratagere, Kunigal, Madhugiri, Pavagada, Sira, Tiptur, and Tumakuru as listed in table 1 and discussed in the following paragraphs. Among these, the Fabaceae family accounts for the highest number of species (11), followed by Apocynaceae and Lamiaceae with 5 species each and Rutaceae with 4 species. Other notable families like Combretaceae, Euphorbiaceae, Myrtaceae and Zingiberaceae with 3 species each. Whereas, Acanthaceae, Amaryllidaceae, Anacardiaceae, Dipterocarpaceae, Malvaceae and Piperaceae, each contributing 2 species. The remaining 24 families are represented by a single species each (Fig. 2).

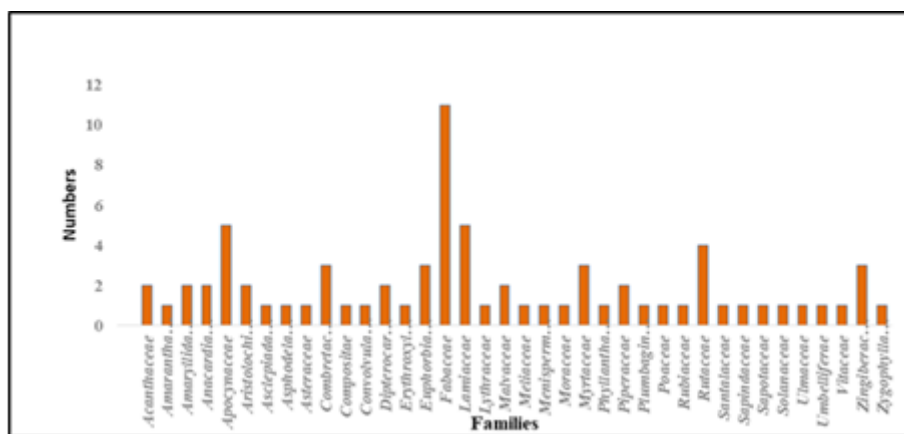


Fig 2. Families of medicinal plants in Tumakuru forest division

The medicinal plant species collected from various ranges of the Tumakuru forest division exhibited diverse growth forms. Among these, tree accounted for the highest proportion, comprising 39.7% (29 species), followed by herbs at 30.1% (22 species), shrubs at 17.8% (13 species) and climber at 10.9% (8 species). These findings indicate that trees are the most commonly used medicinal plants in the study area, followed by herbs, shrubs and climbers. Many plants documented during the surveys are known to be traditionally collected, traded, and used as medicines for centuries, in both oral and codified health systems in India (Fig. 3).



Fig 3. Plants habit used as medicine

Ethnobotanical data indicate that different plant parts including Leaves, whole plant, wood, roots, bark, fruits, bulb, latex, resin, pod, rhizome and seeds are used in traditional medicine preparation, depending on the ailment being treated. These plants are employed in the treatment of a wide range of health conditions such as fever, diarrhoea, dysentery, diabetes, jaundice, back ache, stomach ache, ulcers, colds, and coughs etc. The local population prepares remedies in various traditional methods, tailored for both minor and serious illnesses. Among the various plant parts used for medicinal purposes by the local communities, leaves are the most frequently utilized (38%), especially in treating wounds where they are typically applied externally in fresh form, followed by whole plant (15%), fruit (14%) and bark (14%). Notably, other parts like roots, seeds, rhizome, resin, latex, pods, extracts are also commonly used (Fig. 4).

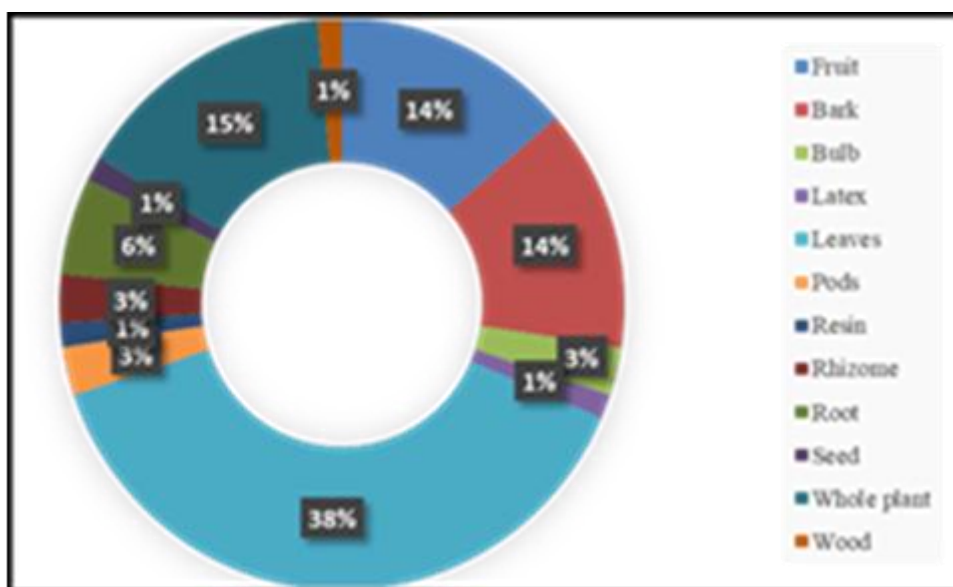


Fig 4. Different plant parts utilized as medicine at Tumakuru forest division

This data underscores the preference for leaves in traditional remedy preparation, primarily due to their accessibility and ease of use by native communities. These findings were similar ethnobotanical practices reported among the Sapera community in Jhajjar District of Haryana, highlighting a broader cultural reliance on medicinal plants across India. This study highlights the diverse range of plant species used to treat various human ailments in this region. However, medicinal plants in the Tumakuru Forest Division are under pressure from both natural and human-induced threats. Among these, anthropogenic factors pose the most significant risk. These include agricultural expansion, firewood collection, fence construction, and unsustainable harvesting of plants for medicinal purposes. Natural threats, such as drought and forest fires, also contribute to the degradation of plant habitats. To ensure the long-term availability of these medicinal resources, it is essential to prioritize the conservation of natural habitats and promote sustainable harvesting practices.

Protecting medicinal plant biodiversity is not only vital for ecosystem health but also for the continued well-being of the communities that rely on them. To safeguard medicinal plant diversity, it is essential to implement both in-situ and ex-situ conservation strategies. In Tumakuru region, many local residents depend on these plants not only for medicinal purposes but also for other daily needs such as food, firewood, and construction materials. This multi-purpose use increases the pressure on these valuable species, placing them at greater risk of depletion.

According to the study, approximately 72% of medicinal plant species are still commonly found in the wild. However, due to factors such as climate change, drought, and over-exploitation, around 28% of the medicinal species have been categorized as Rare, Endangered, or Threatened (RET) and are listed in the IUCN Red List (Table 1). The field survey identified 15 endangered medicinal plant species, including *Acacia ferruginea*, *Buchanania lanceolata*, *Canthium dicoccum*, *Chloroxylon swietenia*, *Dalbergia latifolia*, *Decalepis hamiltonii*, *Erythroxylum obtusifolium*, *Gymnema sylvestre*, *Hopea racophloea*, *Jatropha curcus*, *Madhuca bourdillonii*, *Prosopis cineraria*, *Santalum album*, *Terminalia pallida* and *Vateria indica*. Several other species were reported as rare or threatened, such as *Abrus precatorius*, *Acacia concinna*, *Achyranthes aspera*, *Hemidesmus indicus* and *Pterocarpus marsupium* and in need of targeted conservation efforts. Despite limited formal conservation measures, the local communities have shown a strong commitment to sustainable practices. For instance, nursery sites have been established to propagate and distribute various medicinal plant species. These community-driven initiatives play a crucial role in enhancing and preserving the region's plant biodiversity.

Table 1: Ethnomedicinal plants used to treat different ailments by rural folk in Tumakuru district forest areas

Sl. No	Botanical Name	Family	Parts used	Habit	Medicinal use	IUCN status
1	<i>Abrus precatorius</i>	Fabaceae	Whole plant	Climber	Leaf extracts used for leucoderma, seed used as purgative & abortive, root extract used for cough.	Rare
2	<i>Abutilon indicum</i>	Malvaceae	Leaves	Shrub	Leaves are used to cure Ulcer, Inflammation, Bronchitis and Uterus displacement.	Common plant
3	<i>Acacia concinna</i>	Fabaceae	Pods	Climber	Dried pods are powdered to produce Shikakai powder, used in traditional medicine to treat jaundice, constipation and skin problems.	Threatened
4	<i>Acacia ferruginea</i>	Fabaceae	Pods	Tree	Pods used to treat cancer, leprosy, menstrual misdeeds, bleeding piles, tuberculosis, congestion, fever, cough, diarrhoea, dysentery, gall bladder, haemorrhoids, sclerosis.	Endangered
5	<i>Achyranthes aspera</i>	Amaranthaceae	Whole plant	Herb	Whole plant used to treat leprosy, asthma, arthritis, haemorrhoids, snakebite, renal disorders	Threatened
6	<i>Adathoda vasaca</i>	Acanthaceae	Leaves	Shrub	Leaves are very effective for Cough, Asthma and Bronchitis.	Common plant
7	<i>Aegle marmelos</i>	Rutaceae	Leaves	Tree	Leaf extract used to treat dysentery, fever with dropsy and impotency.	Common plant
8	<i>Allium cepa</i>	Amaryllidaceae	Bulb	Herb	Bulb is used in cardiovascular, gastrointestinal, nervous, respiratory, as anti-osteoporosis, anti-hypertensive, anti-asthmatic, diuretic effects.	Common plant
9	<i>Allium sativum</i>	Amaryllidaceae	Bulb	Herb	Bulb is essential for cholesterol and blood pressure control, preventing heart disease, improving blood	Common plant

					circulation, preventing cancer.	
10	<i>Aloe barbadensis</i>	Asphodelaceae	Whole plant	Herb	Plant has antioxidant and antibacterial properties. Reduce dental aque, many skin diseases.	Common plant
11	<i>Andrographis paniculata</i>	Acanthaceae	Whole plant	Herb	Whole plant is used to treat cold, fever and sore throat.	Common plant
12	<i>Aristolochia indica</i>	Aristolochiaceae	Leaves	Tree	Leaf decoction is used to treat cholera, fever, bowels, ulcers, leprosy, skin infections.	Common plant
13	<i>Azadirachta indica</i>	Meliaceae	Leaves	Tree	Leaves used as blood purifier, improve liver function, fever reduction, and are best to use for various skin infections.	Common plant
14	<i>Bambusa vulgaris</i>	Poaceae	Leaves	Tree	Leaves are used in treating hypertension, arteriosclerosis, cardiovascular disease, and certain forms of cancer.	Common plant
15	<i>Buchanania lanceolata</i>	Anacardiaceae	Bark	Tree	Bark decoction to treat intrinsic haemorrhage, diarrhoea with blood and as tonic.	Endangered
16	<i>Butea Monosperma</i>	Fabaceae	Leaves	Tree	Leaves are used for constipation, colic, dysuria, menstrual disorders, seminal weakness, obesity, piles.	Common plant
17	<i>Calotropis gigantea</i>	Apocynaceae	Latex	Tree	Latex is used in inflammation, skin pimples, useful to cure ringworm, scabies, leprosy.	Common plant
18	<i>Canthium dicocum</i>	Rubiaceae	Bark	Shrub	Bark is used as febrifuge, for fever, applied as external application for rheumatic pains.	Endangered
19	<i>Chloroxylon swietenia</i>	Rutaceae	Leaves	Tree	Leaf is used in fungal infection of skin, rheumatism, common cold, cough, ophthalmic infection, cataract, wounds, as an astringent.	Endangered
20	<i>Curcuma longa</i>	Zingiberaceae	Rhizome	Herb	Rhizomes used for treatment of flatulence, jaundice, menstrual snags, haematuria, haemorrhage, as an anti-inflammatory, applied as an ointment to treat skin diseases.	Common plant
21	<i>Dalbergia latifolia</i>	Fabaceae	Bark	Tree	Bark is used to treat body pain, leprosy, dyspepsia, diarrhoea, obesity and stomach ache.	Endangered
22	<i>Decalepis hamiltonii</i>	Apocynaceae	Root	Shrub	Root used as an anti-inflammatory, degenerative diseases including atherosclerosis, ischemic heart disease, ageing, diabetes, cancer and neurodegenerative diseases.	Endangered
23	<i>Dodonaea viscosa</i>	Sapindaceae	Leaves	Shrub	Leaf decoction is used as insecticidal, antioxidant, cytotoxic, antifertility and anti-inflammatory.	Common plant
24	<i>Elettaria cardamomum</i>	Zingiberaceae	Fruits	Herb	Cardamom is used to cure indigestion, nausea, vomiting, expel out phlegm out of body.	Common plant
25	<i>Erythroxylum obtusifolium</i>	Erythroxylaceae	Bark	Tree	Bark is used for treatment of sleep disorders and anxiety.	Endangered

26	<i>Eucalyptus globulus</i>	Myrtaceae	Leaves	Tree	Leaf and leaf oil are used for bronchitis, and smoked to treat asthma. Oil cools the body from fever, to treat skin problems, aching joints.	Common plant
27	<i>Euphorbia thymifolia</i>	Euphorbiaceae	Whole plant	Herb	Herb is commonly known as Asthma Plant. It is also used in the treatment of bronchitis, dysentery and diarrhoea.	Common plant
28	<i>Ferula asafoetida</i>	Umbelliferae	Resin	Tree	Asafoetida is imparted to the breath, secretions, flatus, and gastric eructation's. Asafoetida has also been used as a sedative.	Common plant
29	<i>Ficus benghalensis</i>	Moraceae	Bark	Tree	Bark is used in diarrhoea, dysentery, leukorrhoea, piles, gum teeth disorders, back pain.	Common plant
30	<i>Gymnema sylvestre</i>	Apocynaceae	Leaves	Climber	Leaves help fight inflammation, weight loss, lower cholesterol and triglyceride levels.	Endangered
31	<i>Hemidesmus indicus</i>	Apocynaceae	Leaves	Shrub	Leaves used to treat bone-loss, low body weight, fever, stress, topical wound, psoriasis.	Rare
32	<i>Hibiscus rosasinensis</i>	Malvaceae	Leaves	Shrub	Leaves are used for treating wounds, inflammation, fever, coughs, diabetes, hair growth.	Common plant
33	<i>Holoptelea integrifolia</i>	Ulmaceae	Bark	Tree	Bark decoction is used in treatment of localized swelling, skin diseases, nausea, diabetes, indigestion, piles.	Common plant
34	<i>Hopea racophloea</i>	Dipterocarpaceae	Bark	Tree	Bark used to treat Proteus infections.	Endangered
35	<i>Ipomea obscura</i>	Convolvulaceae	Leaves	Herb	Leaf paste used to treat diarrhoea, open sores, pustules. ulcers, haemorrhoids, swellings.	Common plant
36	<i>Jatropha curcus</i>	Euphorbiaceae	Seed	Shrub	Seed oil used to treat laxative, purgative and skin ailment	Endangered
37	<i>Leucas zeylanica</i>	Lamiaceae	Leaves	Herb	Leaf used to treat cough, cold, headache, toothache, abdominal pain, scabies, snake bites.	Common plant
38	<i>Limonia assidissima</i>	Rutaceae	Fruit	Shrub	Fruit used to treat chronic diarrhoea, dysentery, peptic ulcers.	Common plant
39	<i>Madhuca bourdillonii</i>	Sapotaceae	Bark	Tree	Bark used in healing skin disease, rheumatism, headache, laxative, piles.	Endangered
40	<i>Mangifera indica</i>	Anacardiaceae	Fruit	Tree	Fruits are antiseptic, astringent, diaphoretic, stomachic, vermifuge, tonic, laxative and diuretic. Used to treat diarrhoea, dysentery, anaemia, asthma, bronchitis.	Common plant
41	<i>Mentha arvensis</i>	Lamiaceae	Leaves	Herb	Leaves are utilized for the treatment of liver disease, spleen, asthma and jaundice.	Common plant
42	<i>Mimosa pudica</i>	Fabaceae	Whole plant	Herb	Crushed leaves can be applied as a paste to wounds, cuts, and burns to promote faster healing	Common plant

					and prevent infections.	
43	<i>Ocimum sanctum</i>	Lamiaceae	Whole plant	Herb	Plant has actions such as anti-diabetic, anticancer, anti-arthritic, antiviral, antifungal, antioxidant, anti-asthmatic, antipyretic, memory enhancer, anticoagulant, antiulcer.	Common plant
44	<i>Phyllanthus amarus</i>	Euphorbiaceae	Whole plant	Herb	Plant used in the problems of stomach, genitourinary system, liver, kidney and spleen.	Common plant
45	<i>Phyllanthus emblica</i>	Phyllanthaceae	Fruit	Tree	Fruit is used in common cold, fever.	Common plant
46	<i>Piper betle</i>	Piperaceae	Leaves	Climber	Leaves are chewed as carminative, stimulant, astringent, against parasitic worms, conjunctivitis, rheumatism.	Common plant
47	<i>Piper nigrum</i>	Piperaceae	Fruit	Climber	Fruits are traditionally used for the treatment of cough, cold, throat diseases and fever.	Common plant
48	<i>Plectranthus scutellarioides</i>	Lamiaceae	Root	Herb	Roots are used to treat respiratory trouble, thirst, muscular skeleton conditions, abdominal pain, skin diseases, gastrointestinal disorders	Common plant
49	<i>Plumbago zeylanica</i>	Plumbaginaceae	Leaves	Shrub	Leaves are used in the treatment of sleeping sickness and effective against liver flukes.	Common plant
50	<i>Pongamia pinnata</i>	Fabaceae	Root	Tree	The root is effective for treating gonorrhoea, cleaning gums, teeth, and ulcers, and is used in vaginal and skin diseases.	Common plant
51	<i>Prosopis cineraria</i>	Fabaceae	Leaves	Tree	Fresh Leaves juice given for dyspepsia, earache, toothache. Leaf paste applied on boils and blisters.	Endangered
52	<i>Psidium guajava</i>	Myrtaceae	Leaves	Shrub	Leaves used to treat diarrhoea, dysentery, gastroenteritis, diabetes and hypertension.	Common plant
53	<i>Pterocarpus marsupium</i>	Fabaceae	Bark	Tree	Bark decoction used to treat diabetes, wound healing, skin illnesses.	Threatened
54	<i>Pulicaria wightiana</i>	Asteraceae	Leaves	Herb	Leaves used traditionally in the treatment of cancer, diabetes and inflammation.	Common plant
55	<i>Punica granatum</i>	Lythraceae	Fruit	Shrub	Fruit used to treat sore throats, coughs, urinary infections, digestive disorders, skin disorders, arthritis, and to expel tapeworms.	Common plant
56	<i>Rauvolfia serpentina</i>	Apocynaceae	Leaves	Herb	Leaf used in the treatment of snake and insect bites, febrile conditions, malaria, abdominal pain,	Common plant
57	<i>Santalum album</i>	Santalaceae	Wood	Tree	Wood has sedative, aromatic, diuretic, diaphoretic, disinfectant, cardio tonic, aphrodisiac, expectorant, haemostatic properties.	Endangered
58	<i>Syzygium cumini</i>	Myrtaceae	Fruit	Tree	Fruits used for diabetes, worm infection, asthma, diarrhoea, cough,	Common plant

					and cold treatment.	
59	<i>Tamarindus indica</i>	Fabaceae	Leaves	Tree	Leaves used in wound healing, abdominal pain, diarrhoea, cold, fever and inflammation.	Common plant
60	<i>Terminalia bellirica</i>	Combretaceae	Fruit	Tree	Fruit promotes hair growth, adds nutrition, useful against greying, cough, cold, asthma, jaundice, leprosy, anaemia, cardiac problems, diabetes, urinary problems.	Common plant
61	<i>Terminalia chebula</i>	Combretaceae	Fruit	Tree	Fruits used topically as a mouthwash and gargle.	Common plant
62	<i>Terminalia pallida</i>	Combretaceae	Fruit	Tree	Fruits are antidiabetic and wound healing activity.	Endangered
63	<i>Tinospora cardifolia</i>	Menispermaceae	Leaves	Climber	Leaves are used in the treatment of jaundice, diabetes, rheumatoid arthritis, as an immune stimulant.	Common plant
64	<i>Toddalia asiatica</i>	Rutaceae	Whole plant	Climber	Plant used to treat jaundice and skin diseases.	Common plant
65	<i>Tribulus terrestris</i>	Zygophyllaceae	Leaves	Herb	Leaves used as pain reliever, appetite stimulant, in the treatment for kidney stones, high blood pressure, and urinary infections.	Common plant
66	<i>Trigonella foenum-graecum</i>	Fabaceae	Leaves	Herb	Leaves are helpful for digestive and gastric issues such as gastritis, stomach inflammation, loss of appetite, and stomach disorders.	Common plant
67	<i>Tylophora asthmatica</i>	Asclepiadaceae	Leaves	Climber	Leaves are used to cure asthma, cough, inflammation, jaundice, snakebite, syphilitic rheumatism, gout, diarrhoea and dysentery.	Common plant
68	<i>Vateria indica</i>	Dipterocarpaceae	Bark	Tree	Bark is used to treat cough, asthma, leprosy, skin eruptions, ulcer, wounds, dysentery, anaemia.	Endangered
69	<i>Vernonia cinerea</i>	Compositae	Whole plant	Herb	Plant is used to treat respiratory and digestive issues, skin ailments.	Common plant
70	<i>Vitex negundo</i>	Lamiaceae	Leaves	Shrub	Leaves have anti-inflammatory, antibacterial, antimicrobial antifungal, antioxidant, and anticancer properties.	Common plant
71	<i>Vitis cineria</i>	Vitaceae	Fruit	Climber	Fruits used to treat piles, chronic bronchitis, hepatopathy.	Common plant
72	<i>Withania somnifera</i>	Solanaceae	Root	Herb	Roots are anticonvulsive, antiaging, sedative anticancer, antioxidant, anti-inflammatory and aphrodisiac.	Common plant
73	<i>Zingiber officinale</i>	Zingiberaceae	Rhizome	Herb	Rhizomes are antiemetic, stomachic, expectorant, anti-inflammatory and aphrodisiac.	Common plant

During the course of the investigation, photographs of meticulously selected medicinal plants were captured to assist in their identification and to support ongoing conservation efforts. Additionally, these images serve as valuable documentation for future reference, contributing to the body of knowledge surrounding these important botanical resources (Fig. 5).

Medicinal plants have been utilized by local populations and experts in Ayurvedic medicine for centuries, serving as important components of herbal and folk remedies (Dinesh *et al.*, 2008). These plants have demonstrated effectiveness in treating a variety of health issues, including fever, diarrhoea, dysentery, diabetes, jaundice, back pain, stomach discomfort, ulcers, as well as colds and coughs (Ghelani *et al.*, 2016). Local practitioners often prepare traditional medicines using these plants in diverse ways to address both minor and major health concerns. In drug preparation, extracts are commonly obtained from various parts of the plant, such as the whole plant, roots, stem bark, fruits, latex, and seeds (Singh, 2016; Suntar, 2020). Similar practices have been observed within the Sapera community in Jhajjar District of Haryana State, indicating a shared reliance on these traditional healing methods (Panghal *et al.*, 2010). Previous studies have emphasized that leaves are among the most sustainable plant parts to harvest for medicinal purposes, as they are easily renewable and their collection generally does not harm the plant or disrupt its survival (Enyew *et al.*, 2014). This sustainable practice enables continued use of medicinal plants in traditional healthcare without significantly impacting their long-term viability (Wubetu *et al.*, 2017). In contrast, harvesting roots can be highly detrimental, often leading to the death of the entire plant by halting its physiological functions. As local communities continue to depend on medicinal plants for everyday health needs, it becomes increasingly important to understand and mitigate the threats these valuable resources face (Adhikari *et al.*, 2010). This study highlights the diverse range of plant species used to treat various human illnesses. Medicinal plants face various threats that can be broadly classified into two main categories: natural factors and human-induced factors. Natural factors may include climate change, pests, and diseases, while human-induced factors encompass habitat destruction, overharvesting, and pollution. Understanding these threats is crucial for the conservation and sustainable use of medicinal plants (Sinaga *et al.*, 2021).

According to an earlier report (Shubharani *et al.*, 2024), 68 medicinal plant species from 27 families in the Ramanagara district forests were documented, with Fabaceae and Malvaceae being the most represented. In the Dakshina Kannada district of the Western Ghats, Karnataka, India, local folk practitioners use 53 plant species belonging to 29 families, with leaves being the most commonly utilized plant parts in the preparation of herbal formulations (Yogeesha & Krishnakumar, 2022). An ethnobotanical survey conducted in the forests of Kodagu district documented a total of 205 ethnomedicinal plant species belonging to 72 families (Ganesh & Prasad, 2021). Among these, herbs were the most commonly used, to treat a wide range of ailments, including diabetes, jaundice, skin diseases, snake bites, dysentery, hyperacidity, and conditions requiring abortifacient, anthelmintic, antiseptic, stomachic treatments, as well as for piles, fever, and cough (Pradeep *et al.*, 2014). Traditional practitioners of the Nalike community in Bantwal taluk of Dakshina Kannada district treat a variety of ailments, with paralysis being the most commonly addressed condition. For this, they commonly use *Syzygium aromaticum*, *Cinnamomum verum*, and *Glycyrrhiza glabra*. In contrast, traditional healers in Bhadravathi taluk rely on *Embelia ribes* and *Withania somnifera* for their medicinal practices (Byrappa & Rajkumar, 2010). Recent research has highlighted the role of species from the Asteraceae family plays a vital role in wound healing management among the ethnic communities in India's North Eastern regions (Chayanika *et al.*, 2023). The family Fabaceae making up a notable share of the collected specimens, particularly leaves play a significant role in local healing practices (Tauseef *et al.*, 2024). The predominance of leaves in ethnomedicinal use may be attributed to their high content of readily extractable phytochemicals. This pattern has been consistently observed in various studies, both at the regional and global levels (Mir *et al.*, 2021). The dominance of these plant families may be attributed to their wide distribution and abundance within the study area (Shamsi *et al.*, 2019; Tshabalala *et al.*, 2022). Additionally, the presence of nutraceutical and other bioactive compounds likely contributes to their prominence. In particular, Fabaceae family members thrive in nutrient-poor soils were found in large numbers in local forests (Kranke 2023; Tajamul *et al.*, 2023).





Acacia nilotica



Bridelia retusa



Celastrus paniculatus



Desmodium triflorum



Diospyros Montana



Evolvulus alsinoides



Phyllanthus emblica



Pterocarpus marsupium



Fig 5. Visual documentation showing the diverse array of wild medicinal plants in Tumakuru district forest regions highlights their natural habitats and emphasizing the rich biodiversity.

CONCLUSION

Herbal medicine plays a vital role in managing a wide range of health conditions, particularly in rural regions of developing countries where access to modern healthcare is limited. The increasing popularity of herbal remedies can be attributed to their affordability, accessibility, and the perception of being safer compared to conventional pharmaceuticals. India, with its rich and diverse biodiversity, is home to numerous plant species that not only offer immense medicinal value but also contribute to maintaining ecological balance. However, many of these valuable species are now facing the threat of extinction. This article highlights the plight of some of India's most endangered medicinal plants, their unique therapeutic applications, and the critical need for conservation efforts to preserve these natural resources. The over-exploitation of medicinal plants, largely

driven by their high pharmaceutical and therapeutic demand, has placed significant pressure on their natural populations. To address this, it is crucial to implement effective conservation strategies, including the establishment of Field Gene Banks and other ex-situ conservation initiatives. These efforts will be instrumental in ensuring the long-term survival and sustainable use of medicinal plant species, ultimately benefiting both present and future generations.

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