



Medicinal Plants of Sham Valley in Trans-Himalayan region of Ladakh, India

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Abstract: The identification and documentation of medicinal plants is essential for preserving knowledge of traditional medicinal system, particularly in ecologically unique and culturally rich regions like Ladakh. An exploratory survey was carried out in Sham valley of district Leh, union territory of Ladakh, India in 2019 and 2020 aimed at collection and presentation of information regarding valuable medicinal and herbal wealth and its use in traditional “Amchi” system of Ladakh. A total of 61 medicinal plant species were documented, comprising 1 tree, 3 shrubs, and 57 herbs, distributed across 52 genera and 31 families. These plants are widely used in traditional medicine to treat a range of ailments, with notable applications for cough, fever, rheumatism, headache, diarrhoea, kidney disorders, and heart diseases.

Key words: Ladakh, Sham valley, medicinal plants, Tibetan Medicine System.

Use of medicinal plants as a source of relief and cure from illness is as old as humankind itself. Since the dawn of civilization, plants have been used by societies in variety of ways, ranging from sustenance to the development of art, culture and literature (Chauhan *et al.*, 2020). Many herbs and their parts have are known to possess medicinal properties and are used to prevent, alleviate or cure several human diseases (Kumar *et al.*, 2011). The high-altitude cold desert of Indian Himalayas includes Ladakh, Lahaul-Spiti, parts of Sikkim and Uttarakhand; known as Indian trans-Himalaya covering approximately 1,03,113 km² of area (Gupta and Arora, 2016). These arid areas are not benefited by the south east monsoons because they lie in the rain shadow area of the Himalayan mountain system. A cold desert ecosystem encounters climate of great extremes of being hot and cold combined with excessive dryness. Temperature ranges from -45°C in winters to +35°C in summers can occur in this region. In addition, scanty rainfall, massive snowfall, high wind velocity, sparse vegetation, high UV radiation, and extremely xeric conditions are the common features of this region (Devi and Thakur, 2011).

The union territory of Ladakh lies between 34°10' N and 77°35' E. It consists of two districts: Leh and Kargil, covering an area of about 65,000 km² (Namtak and Sharma, 2018). Topographically, it has a dusty, sandy and barren landscape

Table 1. Geographic location of different study sites

Village	Latitude	Longitude	Altitude (m)
Likir	34.278° N	77.206° E	3520
Mangue	34.246° N	76.080° E	3600
Tia	34.342° N	76.973° E	3460
Nurla	34.302° N	76.983° E	3041
Khalatse	34.322° N	76.880° E	2987
Skindiyang	34.323° N	77.003° E	3550
Wanla	34.252° N	76.830° E	3200
Takmachik	34.392° N	76.761° E	3050
Domkhar	34.331° N	76.928° E	3100
Skurbuchan	34.424° N	76.727° E	3050
Lamayuru	34.282° N	76.772° E	3370

which is devoid of vegetation at first sight but it is rich in valuable medicinal and herbal wealth. relative isolation from urban areas and other global communities (Dawa *et al.*, 2022), there is a significant gap in documented knowledge. The form of medicinal system followed in Ladakh region is known as Tibetan Medicine System or 'Amchi' system and the word Amchi refers to the name given to a local practitioner of this system (Gurmat, 2004). The altitude of Ladakh ranges from approximately 2,700 meters to 6,000 meters above mean sea level (Namtak and Sharma, 2018). Based on Gaussen's criterion for vegetation classification, Tewari and Kapoor (2013) have categorized the vegetation of Leh district as Eremic (desertic), characterized by arid and sparse plant cover, while the vegetation of Kargil district is classified as Hemi-eremic (semi-desertic), indicating a slightly higher moisture availability and more diverse flora. Geographically, Leh district can be divided into different regions viz. Sham valley, main area of Leh, Nubra valley and Changthang region. Though many studies have been undertaken in other regions of the district but the Sham valley remains unexplored. Therefore, the present exploratory survey was carried out to document the important herbal resources and their traditional use against different diseases.

Materials and Methods

Study area: The area to the west of Leh city extending from Snymo village to Dha-Hanu makes up the Sham Valley. It is situated at an average altitude of 2990 m msl and runs almost parallel to the course of the Indus River. The area of Sham is considered warmer and the land is very fertile and productive as compared

to the other regions of the district (Dorjey, 2015). The study on the medicinal plants was carried out during 2019 and 2020.

Data collection and field survey

A questionnaire was prepared and used as a tool for the collection of information. It was divided into two parts: demographic and medicinal plant data. The first part included name, age and occupation and the second part contained questions about the medicinal plant resources being found and utilized in the area. Extensive field surveys were conducted between May to July, 2019 in different villages of Sham valley namely: Likir, Mangue, Tia, Nurla, Khalatse, Skindiyang, Wanla, Takmachik, Domkhar, Skurbuchan and Lamayuru. Before visiting the various sites (villages), the questionnaire was carefully designed and pre-tested to assess its effectiveness and clarity. Any necessary revisions identified during the pre-test were documented and incorporated to ensure the instrument's reliability and suitability for the study. Village elders and *Amchis* were identified from every village and interviewed to document their knowledge on occurrence of important medicinal plants and its uses. These medicinal plants were confirmed from direct observation as well as with the help of various floras. Additional help regarding identification of different species was also undertaken from National Institute of Sowa-Rigpa, Leh.

Results and Discussions

The study conducted in the Sham Valley of Leh district in Ladakh provides an in-depth account of the region's rich ethnobotanical heritage, focusing particularly on the traditional use of medicinal plants by local communities. A total of 61 species belonging to 52 genera and 31 plant families were documented (Table 2), with the majority being herbs (57 species), alongside a few shrubs (3) and a single tree species. These plants are not only vital to the region's traditional healthcare systems but also play an essential role in the cultural and spiritual practices of the people living in this high-altitude environment.

Ladakh's unique geographic and climatic conditions, which fall under the alpine and high-alpine zones, have contributed to the development of a distinct flora, markedly different from the rest of the Himalayan region

Table 2. Medicinal plant species in Sham Valley of Leh district, India

Species	Vernacular Name	Family	Name of sites where the occurrence of the species was recorded	Medicinal Uses
1. <i>Acantholimon lycopodioides</i> (Girard) Boiss.	Longze	Plumbaginaceae	Mangue, Tia, Likir, Lamayuru, Skindiyang	The ashes of plant are used to cure cardiac disorders. (Dawa <i>et al.</i> , 2022; Kala, 2006)
2. <i>Aconogonum tortuosum</i> (D. Don) H. Hara	Snyalo	Polygonaceae	Likir, Tia, Khalatse, Lamayuru	It is regarded as a blood purifier and its root is used to treat diarrhoea and dysentery. (Dawa <i>et al.</i> , 2022)
3. <i>Ajania tibetica</i> (Hook. F. and Thomson) Tzvelev	Khampa, Tibetan tansy	Asteraceae	Nurla, Khalatse, Tia, Takmachik	Used against swelling and inflammation of limbs and also cure problems related to kidney. (Dawa <i>et al.</i> , 2021)
4. <i>Allium przewalskianum</i> Regel	Skotse, Kangmar	Amaryllidaceae	Domkhar, Skindiyang, Khalatse, Tia, Wanla	It treats problems related to digestion and is used against diarrhoea and dysentery. (Dorje, 2015)
5. <i>Arnebia euchroma</i> (Royle) I.M. Johnst.	Demog	Boraginaceae	Wanla, Mangue, Likir, Skindiyang	It helps in purification of blood and cure problems related to kidney. It is also used to treat cough and cold. The locals use it as a hair tonic. (Dawa <i>et al.</i> , 2022; Dorje, 2015)
6. <i>Artemisia absinthium</i> L.	Burs-kar	Asteraceae	Tia, Domkhar, Khalatse, Skindiyang, Tia	Rheumatism, malaria and anti-worm (Namtak and Sharma, 2018)
7. <i>Artemisia brevifolia</i> Wall. Ex. DC	Khampa	Asteraceae	Likir, Wanla, Khalatse	It is aphrodisiac, laxative and antiseptic in nature. The plant helps to overcome obesity and reduces stomach fat deposition. (Dorje, 2015)
8. <i>Artemisia maritima</i> L. Ex. Hook. F.	Burtse	Asteraceae	Lamayuru, Wanla, Khalatse	Problems related to skin and intestinal parasites are treated using this plant. (Kala, 2006)
9. <i>Aster flaccidus</i> Bunge	Lukmik	Asteraceae	Skindiyang, Wanla	It is used against cold and fever. The plant is also useful in treating problems related to eyes. (Kala, 2006)
10. <i>Astragalus heydei</i> L.	Yanglang	Fabaceae	Takmachik	Used to treat arthritis, asthma, blood pressure and cold. (Dawa <i>et al.</i> , 2021)
11. <i>Astragalus tibetanus</i> L.	Tibet milk vetch	Fabaceae	Takmachik, Khalatse	It helps in boosting body immunity and is used to cure diabetes. (Dawa <i>et al.</i> , 2021)
12. <i>Berberis kunawarensis</i> Royle	Skerpa-karpo	Berberidaceae	Wanla	It is useful in treatment of diarrhoea, painful urination and disorders related to eye and skin. (Dawa <i>et al.</i> , 2021)
13. <i>Capparis spinosa</i> L.	Kabra	Capparaceae	Nurla, Khalatse, Tia, Takmachik, Domkhar	It helps in treatment of paralysis, rheumatism and problems related to skin and stomach. (Dorje, 2015)
14. <i>Caragana versicolor</i> Benth.	Brama	Fabaceae	Lamayuru, Wanla, Domkhar	The plant is used against nerve disorder, throat infection, food poisoning and fever. (Dawa <i>et al.</i> , 2022)
15. <i>Carum carvi</i> L.	Kosnyot	Apiaceae	Nurla, Skurbuchan, Khalatse, Skindiyang, Domkhar, Wanla, Mangue	The seeds are used to treat cardiac disorder, gastric problems and also increase appetite. It is also regarded as diuretic. (Dawa <i>et al.</i> , 2022; Dorje, 2015; Dorje, 2015)
16. <i>Chenopodium album</i> L.	Janchikarpo	Chenopodiaceae	Nurla, Khalatse	It is diuretic and solves gastric troubles. (Kala, 2006)
17. <i>Chenopodium botrys</i> L.	Snue	Chenopodiaceae	Nurla, Khalatse, Tia, Skindiyang, Mangue, Takmachik, Domkhar, Likir	It is used to treat constipation and issues related to intestinal worms. (Kala, 2006)

Table 2. Cont...

Species	Vernacular Name	Family	Name of sites where the occurrence of the species was recorded	Medicinal Uses
18. <i>Chesneya cuneata</i> (Benth.) Ali	Tata kanou	Fabaceae	Lamayuru, Khalatse, Nurla, Mangu	It is considered as an antiseptic plant. (Dawa <i>et al.</i> , 2021)
19. <i>Cicer microphyllum</i> Benth.	Sari	Fabaceae	Tia, Skindiyang, Khalatse, Takmachik, Wanla and Lamayuru	The plant is used in treatment of stress, fatigue, sore throat and jaundice. (Dawa <i>et al.</i> , 2022; Kala, 2006)
20. <i>Cirsium arvense</i> (L.) Scop.	Biangtser	Asteraceae	Khalatse, Skindiyang, Tia, Domkhar, Takmachik, Nurla	The aerial parts are used as an anti-vomiting agent and also help to overcome headache. (Dawa <i>et al.</i> , 2022)
21. <i>Codonopsis ovata</i> Benth.	Ludud-dorje	Campanulaceae	Nurla, Skindiyang	It is regarded as a blood purifier and is also beneficial against ulcer and rheumatism. (Kala, 2006)
22. <i>Corydalis flabellate</i> Edgew.	Makshang	Papaveraceae	Khalatse, Wanla, Lamayuru	It helps in treatment of syphilis. (Dawa <i>et al.</i> , 2021)
23. <i>Dactylorhiza hatagirea</i> (D. Don.) Soo	Wangbo-lakpa	Orchidaceae	Wanla, Domkhar	It is sedative and diuretic in nature and also useful against kidney problems. The plant is used to find relief against the burning sensation of urine and Kidney problems. (Kala, 2006)
24. <i>Delphinium brunonianum</i> Royle	Ladhar-mentok	Ranunculaceae	Tia, Domkhar, Skindiyang	This plant is used against malaria and throat pain. (Dawa <i>et al.</i> , 2022)
25. <i>Dracocephalum heterophyllum</i> Benth.	Kalchor Tsoa, Zypsi	Lamiaceae	Nurla, Khalatse	The plant is useful for people suffering from headache, cough and cold. It is also very effective against hypertension. (Dawa <i>et al.</i> , 2022)
26. <i>Echinops cornigerus</i> DC.	Ak-zema	Asteraceae	Likir, Mangu, Takmachik, Tia	It is a tonic and overcomes fatigue. The plant is also useful against jaundice and food poisoning. (Kala, 2006)
27. <i>Ephedra gerardiana</i> Wall. Ex. Stapf.	Tse-pat	Ephedraceae	Likir, Lamayuru, Wanla, Tia	The plant is very useful in treating problems related to irregular menstruation in women. It also treats asthma, rheumatism, fever, liver disorders and purifies blood. (Dawa <i>et al.</i> , 2022; Dorje, 2015)
28. <i>Euphorbia tibetica</i> Boiss.	Tibetan spurge	Euphorbiaceae	Skurbuchan	It removes diseases through purgation. (Kala, 2006)
29. <i>Gentianella moorcroftiana</i> (Wall. Ex Griseb) Shaw	Zangs-tig	Gentianaceae	Tia, Skindiyang	It is used to treat fever and reduces inflammation in bones. (Lamo <i>et al.</i> , 2019)
30. <i>Geranium pratense</i> L.	Godur	Geraniaceae	Takmachik	The plant is used against fever, influenza and pneumonia. (Kala, 2006)
31. <i>Heracleum pinnatum</i> C.B. Clarke	Tud-kar	Apiaceae	Skurbuchan	Leprosy, chicken pox and small pox are treated using this plant. It also helps in curing fever and checks irregular menstruation in women. (Dawa <i>et al.</i> , 2021)
32. <i>Hippophae rhamnoides</i> Rousi	Tsesta-lulu	Elaeagnaceae	Nurla, Khalatse, Wanla, Tia	The plant is a very rich source of vitamin c and work as an anti-ageing agent. It helps in memory restoration and can be used as a tonic for malnourished children and women. (Dawa <i>et al.</i> , 2022; Dorje, 2015)
33. <i>Juniperus macropoda</i> Boiss.	Shukpa	Cupressaceae	Wanla, Domkhar, Skindiyang	The fruits are used to treat the problem of irregular menstrual cycle. (Dorje, 2015)
34. <i>Lactuca tatarica</i> (L.) C. A. Mey.	Tsa-mik-rhes	Asteraceae	Nurla, Tia	The plant can cure headache, fever and stops vomiting. (Dawa <i>et al.</i> , 2022)

Table 2. Cont...

Species	Vernacular Name	Family	Name of sites where the occurrence of the species was recorded	Medicinal Uses
35. <i>Lancea tibetica</i> Hook. F. & Thomson	Spa-yak-rtsaba	Plantaginaceae	Nurla, Skindiyang	It is used to cure heart diseases, cough and chest congestion. (Kala, 2006)
36. <i>Lonicera microphylla</i> Willd. Ex Roem & Schultes	Phang-ma	Capparaceae	Wanla	It is useful against fever and the fruits are used to cure gynecological problems. (Dawa <i>et al.</i> , 2021)
37. <i>Mentha royleana</i> Benth.	Phowa-res	Lamiaceae	Nurla, Tia	The leaf is used against stomach pain and also acts as an appetizer. (Dawa <i>et al.</i> , 2022)
38. <i>Myricaria elegans</i> Royle	Ombu	Tamaricaceae	Nurla, Khalatse, Skindiyang	It is used as a blood purifier. (Dawa <i>et al.</i> , 2022)
39. <i>Nepeta discolor</i> Royle Ex. Benth.	Shama-lolo	Lamiaceae	Skurbuchan, Takmachik	The decoction of leaf is used against cough and cold. (Dawa <i>et al.</i> , 2022)
40. <i>Nepeta floccose</i> Benth.	Wooly catmint / Shamalolo	Lamiaceae	Takmachik	Leaf decoction is very effective against malaria. (Dawa <i>et al.</i> , 2022)
41. <i>Oxyria digyna</i> (L.) Hill	Lug-sho	Polygonaceae	Tia, Domkhar	It treats Indigestion, loss of appetite and cures gastric problems. (Dawa <i>et al.</i> , 2021)
42. <i>Oxytropis microphylla</i> (Pall.) DC.	Stag-sha	Fabaceae	Wanla	The leaf help in subsiding of swellings and also controls fever. (Dawa <i>et al.</i> , 2022)
43. <i>Pedicularis longiflora</i> (Klotzsch) Tsong	Lugru-serpo	Orobanchaceae	Tia	It helps in drying up of lymph fluid and pus. It is also used to treat fever and cough. (Dawa <i>et al.</i> , 2021)
44. <i>Pervoskia abrotanoides</i> Kar.	Iski-ling	Lamiaceae	Tia, Nurla, Khalatse	It is used against cough, headache, constipation and painful urination. . (Dawa <i>et al.</i> , 2022)
45. <i>Physochlaina praealta</i> (Deene.) Miers	Langthang	Solanaceae	Takmachik, Khalatse	The plant is used to treat ulcer, toothache and problems related to eyes. (Dawa <i>et al.</i> , 2021)
46. <i>Potentilla sojakii</i> Sajak	Rgy-makrhes-smugpo	Rosaceae	Skindiyang, Wanla	The leaf paste is used to cure stomach related problems, cold and cough. . (Dawa <i>et al.</i> , 2021)
47. <i>Potentilla anserine</i> L.	Troma	Rosaceae	Takmachik, Wanla, Tia	It is used to cure the problem of kidney stone. The plant is also effective against diarrhoea and stomach ache. (Namtak and Sharma, 2018)
48. <i>Rheum speciforme</i> Royle	Lachu	Polygonaceae	Likir, Tia, Lamayuru, Khalatse, Skindiyang, Mangue	The plant is useful against constipation, piles, rheumatism and chronic bronchitis. (Dawa <i>et al.</i> , 2021)
49. <i>Rhodiola imbricate</i> Edgew.	Shrolo	Crassulaceae	Likir, Tia, Skindiyang	Problems related to lung and high altitude sickness are treated using its root. (Dawa <i>et al.</i> , 2022)
50. <i>Rhodiola tibetica</i> (Hook. F. & Thomson) S. H. Fu	Shrolo-marpo	Crassulaceae	Likir, Tia, Skindiyang	The plant is a tonic and cures headache and stress. It is also used to sharpen memory. (Lamo <i>et al.</i> , 2019)
51. <i>Ribes orientale</i> Desf.	Se-rgod-rigs	Geraniaceae	Likir, Skurbuchan	The fruits are used for treating fever and the cortex helps in treatment of swollen limbs. (Dawa <i>et al.</i> , 2021)
52. <i>Rosa webbiana</i> Wall. Ex Royle	Sai-marpo	Rosaceae	Wanla, Takmachik, Nurla, Tia, Khalatse	It is highly used against skin diseases and fever. (Dawa <i>et al.</i> , 2022)
53. <i>Rumex patientia</i> L.	Shoma	Polygonaceae	Wanla, Khalatse	It treats the problem of constipation, rheumatism and backache. The plant is also used to cure skin infections. (Namtak and Sharma, 2018)

Table 2. Cont...

Species	Vernacular Name	Family	Name of sites where the occurrence of the species was recorded	Medicinal Uses
54. <i>Saussurea obvallata</i> (DC) Edgew	Zadug-nagpo	Asteraceae	Wanla, Domkhar	Very useful in treatment of paralysis and epilepsy. (Kala, 2006)
55. <i>Silene gonosperma</i> (Edgew.) Majumdar	Sug-pa	Caryophyllaceae	Skindiyang	Nasal problems and hearing defects are treated using the roots of this plant. . (Dawa <i>et al.</i> , 2022)
56. <i>Sedum ewersii</i> Ledeb	Dachungpa	Crassulaceae	Skindiyang	It heals external injury and used as an appetizer. (Lamo <i>et al.</i> , 2019)
57. <i>Thalictrum foliolosum</i> DC	Snyo-sprin	Ranunculaceae	Khalatse, Takmachik	It is used to treat fever, serum disorder and it provides relief from muscular spasm. (Dawa <i>et al.</i> , 2021)
58. <i>Thermopsis barbata</i> Benth.	Glabasadma	Fabaceae	Domkhar, Wanla	The plant is useful for treatment of inflammation in muscle tissues, Epilepsy and Skin problems. (Dawa <i>et al.</i> , 2021)
59. <i>Thermopsis inflata</i> Camb.	Ol-mango	Fabaceae		The fruit is used to treat problems related to swellings. (Kala, 2006)
60. <i>Urtica hyperborea</i> Jacq. Ex Wedd.	Zatsod	Urticaceae	Domkhar, Tia, Skindiyang, Wanla, Likir, Domkhar	It purifies the blood and the leaves are useful against cough and cold. (Dawa <i>et al.</i> , 2022; Kala, 2006)
61. <i>Waldheimia tomentosa</i> (Decne.) Regel	Palu	Asteraceae	Tia, Skindiyang, Domkhar	Disorders related to nerve are treated using the leaves and flowers. (Kala, 2006)

(Kumar *et al.*, 2011). The harsh climate, high altitude, and relative isolation of the region have fostered both the preservation of unique plant species and the survival of ancient traditional knowledge systems related to their use. The medicinal plants identified in this study are employed to treat a wide range of ailments and are often the first and most accessible form of healthcare for local populations.

Many of the plants are used for treating digestive issues, including indigestion, diarrhea, gastric disorders, and loss of appetite. Species such as *Allium przewalskianum*, *Oxyria digyna*, and *Cicer microphyllum* are notable in this regard. Others, such as *Ephedra gerardiana*, *Mentha royleana*, and *Dracocephalum heterophyllum*, are used to manage respiratory conditions like asthma, cough, and cold. Several species are employed to treat fevers, infections, and flu-like symptoms, including *Aster flaccidus*, *Geranium pratense*, and *Heracleum pinnatum*. For urinary and kidney-related problems, plants like *Arnebia euchroma*, *Dactylorhiza hatagirea*, and *Potentilla anserina* are used extensively.

Skin diseases and external injuries are also addressed using local flora, including *Rosa webbiana*, *Sedum ewersii*, and *Rumex patientia*. Neurological and muscular disorders, such as epilepsy and muscle inflammation, are treated with species like *Thermopsis barbata* and *Saussurea*

obvallata. Several plants serve gynecological purposes, especially for regulating menstruation and treating related ailments; *Juniperus macropoda*, *Ephedra gerardiana*, and *Lonicera microphylla* are among the most significant in this category.

In addition to their direct medicinal applications, many plants are valued for their broader health benefits. *Myricaria elegans* and *Astragalus tibetanus* are used as blood purifiers and immune boosters. *Hippophae rhamnoides* stands out as a plant with exceptional nutritional value, known for its high vitamin C content and anti-aging properties. It is commonly used as a general tonic, especially beneficial for children and women. Similarly, *Rhodiola tibetica* is used to sharpen memory and reduce stress, highlighting the local knowledge of adaptogenic plants suited to the high-altitude environment.

Some plants, such as *Juniperus macropoda* (locally known as Shukpa) and *Arnebia euchroma* (Demog), hold special cultural and religious significance (Dorjey, 2015). These species are not only valued for their medicinal properties but are also integral to religious rituals and traditional ceremonies, underscoring the spiritual connection between the people and their natural environment.

The data for this study was collected from various villages across Sham Valley, including Tia, Nurla, Lamayuru, Likir, Wanla, and others, showing the widespread use and accessibility of these plants across the region. Despite the remoteness and challenging terrain, traditional plant-based medicine continues to play a critical role in maintaining community health and wellbeing.

In summing up, the medicinal plants of Sham Valley represent not only a vital component of traditional healthcare but also a living legacy of cultural knowledge and ecological adaptation. However, this wealth of knowledge and biodiversity is under increasing threat from changing lifestyles, over harvesting, and environmental degradation. There is an urgent need to document and preserve indigenous knowledge, promote sustainable harvesting practices, and support further pharmacological research on these plant species. Integrating traditional knowledge into broader health systems could significantly enhance healthcare delivery, particularly in remote and under served regions. The flora of Sham Valley is more than just a natural resource; it is a testament to the deep interconnection between nature, culture, and survival in one of the world's most rugged landscapes.

Conclusions

This study provides a comprehensive account of the medicinal plant diversity in the Sham Valley of Leh district, highlighting their significant role in traditional healthcare practices. Traditional medicinal knowledge is deeply rooted in local culture, offering safe, effective, and affordable alternatives to modern pharmaceuticals, which are often costly and associated with side effects. However, rapid socio-economic transitions, modernization, and the erosion of traditional knowledge threaten the preservation of ethno-botanical heritage by reducing reliance on medicinal plants, disrupting knowledge transmission, and promoting commercial pharmaceuticals over indigenous remedies. Migration, urbanization, and changing cultural values have led to the declining practice of traditional medicine, while the lack of systematic documentation accelerates the loss of valuable plant-based healing traditions. By systematically documenting medicinal plant species and their

uses, this study serves as a critical reference for future studies, conservation strategies, and sustainable utilization initiatives. Furthermore, promoting the cultivation and conservation of these medicinal species can support biodiversity preservation and enhance the livelihoods of local communities.

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