

Traditional Herbal Healing Practices in Kashmir Valley: A Study of Indigenous Knowledge and Cultural Sustainability

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ABSTRACT

Medicinal plants form an integral component of traditional healthcare systems and play a vital role in sustaining rural livelihoods, particularly in biodiversity-rich regions such as the Kashmir Himalaya. The present study documents the diversity, traditional uses, and conservation status of medicinal plants in the Pahalgam valley of Jammu and Kashmir, India. Ethnobotanical data were collected through structured and unstructured interviews, group discussions, and field surveys involving local ethnic communities. A total of several high-value medicinal plant species was recorded, many of which are threatened due to overexploitation, habitat degradation, and anthropogenic pressures. The study highlights the rapid erosion of indigenous knowledge and the urgent need for systematic documentation and conservation. Findings emphasize the importance of integrating traditional knowledge with scientific approaches, promoting cultivation of threatened species, and strengthening community participation. The study contributes valuable baseline information to support conservation planning, sustainable utilization, and implementation of biodiversity policies for safeguarding medicinal plant resources in the Himalayan region.

Keywords: *Medicinal Plants; Ethnobotany; Conservation; Pahalgam Valley.*

1. INTRODUCTION

Medicinal plants are defined as plants that possess properties or produce bioactive compounds which can be used therapeutically for the prevention and treatment of diseases. According to the World Health Organization (WHO), such plants form the backbone of traditional medical systems worldwide. Since the dawn of human civilization, people have depended on nature to meet their basic needs, including food, shelter, and medicine. Historical evidence suggests that plants have been utilized for medicinal purposes across diverse cultures, largely influenced by their local availability and ecological distribution. For thousands of years, plants have served as the primary source of medicine in the form of crude preparations such as teas, tinctures, poultices, powders, and other herbal formulations, long before the advent of modern synthetic drugs. In recent decades, there has been a remarkable global resurgence of interest in plant-based and herbal medicines. This renewed attention is largely driven by the rising costs of modern healthcare, limited accessibility of allopathic medicines in developing regions, and growing concerns over the side effects associated with synthetic drugs. The World Health Organization estimates that nearly 80% of the global population relies on traditional medicine for primary healthcare needs. In developing countries alone, approximately 3.5 billion people depend primarily on plant-based medicines. Even in developed nations, herbal remedies are increasingly preferred as complementary or alternative therapies due to their perceived safety, affordability, and cultural acceptability.

The widespread reliance on traditional medicine is evident across many regions of the world. In China, traditional herbal medicine accounts for nearly 30–50% of total medical consumption. In African countries such as Ghana, Nigeria, and Zambia, herbal medicine is the first-line treatment for nearly 60% of children affected by malaria. Similarly, in South and Southeast Asia, countries such as Bangladesh, Myanmar, India, Nepal, Sri Lanka, and Indonesia report exceptionally high dependence on traditional medicine, ranging from 60% to 90% of the population. This growing reliance has contributed to a substantial increase in global demand for medicinal plants. The WHO estimates that the current global trade in ethnomedicinal plants exceeds US\$14 billion annually, with the market for plant-based raw materials growing at a rate of 15–25% per year. By 2050, this market is projected to exceed US\$5 trillion. India occupies a prominent position in the global medicinal plant sector due to its vast biodiversity and long-standing tradition of herbal medicine. The medicinal plant trade in India alone is estimated to exceed US\$1 billion annually. Although the country is home to more than 8,000 medicinal plant species used by various indigenous and tribal communities across different ecological zones, only about 10% of these species—approximately 880 plants—are actively traded. Among these, around 48 species are exported as raw drugs or extracts, while nearly 42 species are imported. Alarmingly, natural populations of nearly 100 traded species have been reported to be declining, placing them under threatened categories. A habit-wise analysis reveals that herbs constitute the largest group among traded medicinal plants, accounting for about 41%, followed by trees (26%), shrubs (17%), and climbers (16%). Taxonomically, these traded species are distributed across 151 plant families, with dicotyledons contributing nearly 79%, followed by monocotyledons (11%), pteridophytes (5%), gymnosperms (3%), and fungi and lichens (1% each).

The Kashmir Valley, nestled in the foothills of the Himalayas and surrounded by snow-capped mountains, pristine lakes, and lush green meadows, has long been regarded as a cradle of herbal medicine. Owing to its unique topography, altitudinal variation, and temperate climate, the region supports a remarkable diversity of medicinal plants. It is estimated that nearly 500 medicinal plant species occur in the valley, thriving in both high-altitude alpine zones and lowland areas. Of these, around 300 species are utilized in various formulations of the Indian Systems of Medicine, and more than 100 species found in Kashmir are considered high-potential medicinal plants. The use of herbal medicines in Kashmir has a deep-rooted history, with local communities relying on indigenous plant knowledge for generations to treat a wide range of ailments. The Kashmir Himalaya exhibits exceptional medicinal plant diversity due to its varied ecological niches and microclimatic conditions. Indigenous communities have traditionally practiced plant-based healing, and this valuable knowledge has been transmitted orally from generation to generation. However, in recent decades, this ethnomedicinal wisdom has been rapidly eroding due to socio-cultural transformations, modernization, and the declining interest of younger generations. Furthermore, only limited scientific studies have been conducted to systematically document and evaluate the traditional medicinal plant use in Kashmir, making the preservation of this knowledge increasingly urgent.

The medicinal plant wealth of Kashmir faces serious threats from habitat degradation and excessive exploitation driven by urbanization, soil erosion, overgrazing, and unregulated tourism. These pressures, coupled with climate change, overharvesting, poor regeneration, and lack of effective conservation measures, have significantly altered the ecological balance of the region. As a result, many valuable medicinal plant species have become rare, endangered, or locally extinct. More than 95% of medicinal plants are still harvested from the wild, often through destructive methods that involve uprooting entire plants or indiscriminate collection of leaves, bark, roots, fruits, and seeds, without consideration for regeneration and long-term survival. Although natural factors such as glaciation, landslides, avalanches, forest fires, prolonged droughts, and excessive rainfall have historically influenced plant diversity, the majority of contemporary threats to Kashmir's medicinal flora are anthropogenic in nature. Habitat destruction, overexploitation of resources, overgrazing, unplanned developmental activities, tourism pressure, and the introduction of invasive exotic species have collectively intensified the decline of medicinal plant populations. In light of these challenges, there is an urgent need for systematic botanical documentation, accurate taxonomic identification, and comprehensive studies on species distribution, habitat preference, and therapeutic value. Such efforts are essential for developing effective conservation strategies and ensuring the sustainable utilization of Kashmir's medicinal plant heritage before this invaluable natural and cultural resource is lost forever.

1.1 Conservation Strategies

Most medicinal plants are indigenous species whose therapeutic efficacy is closely linked to the production of secondary metabolites, often synthesized in response to specific ecological stimuli present in their natural habitats. These bioactive compounds may not always be produced in the same concentration or composition under artificial cultivation conditions. Therefore, conserving medicinal plants within their natural environments is of critical importance. In situ conservation, which

involves the protection of entire ecosystems and natural plant communities, ensures the preservation of not only individual species but also the complex ecological interactions that influence plant growth, adaptation, and medicinal value. By safeguarding habitats such as forests, alpine meadows, wetlands, and grasslands, in situ conservation maintains genetic diversity and ecological resilience. Moreover, this approach strengthens the link between conservation and sustainable utilization by allowing regulated harvesting while maintaining natural regeneration processes. Community-managed conservation areas, protected reserves, and habitat restoration initiatives further enhance biodiversity conservation. Such integrated strategies support long-term availability of medicinal resources while sustaining traditional healthcare systems and local livelihoods.

1.2 In-Situ Conservation

In situ conservation of medicinal plants has globally emphasized the protection of entire ecosystems rather than focusing solely on individual species. This ecosystem-based approach recognizes that medicinal plants derive their therapeutic properties from complex interactions with soil, climate, microorganisms, and associated flora and fauna. Effective in situ conservation therefore requires clearly defined rules, harvesting restrictions, monitoring mechanisms, and community compliance to ensure the sustainable presence of medicinal plants within their natural habitats. Habitat degradation and destruction remain the primary causes of medicinal plant loss, making the establishment of protected areas a crucial conservation strategy. Worldwide, more than 202,000 protected areas have been designated, covering approximately 19.8 million square kilometers, or about 15% of the Earth's land surface, with the aim of conserving biodiversity and restoring ecological balance. However, due to financial constraints and competing land-use demands, it is not feasible to protect every natural habitat. In this context, the concept of wild nurseries has gained importance. These nurseries are established within or near natural habitats to cultivate and domesticate threatened medicinal plants, providing an effective in situ conservation approach for endemic, endangered, and high-demand species while maintaining ecological integrity.

1.3 Ex-Situ Conservation

Ex situ conservation serves as an important complementary approach to in situ conservation, particularly for medicinal plant species that are overexploited, endangered, slow-growing, sparsely distributed, or highly sensitive to replanting stress and diseases. This strategy involves cultivating and maintaining threatened species outside their natural habitats in controlled environments to ensure their continued survival. Ex situ conservation is often adopted as a rapid and practical response to prevent the immediate loss of valuable medicinal plant resources and to generate sufficient planting material required for pharmaceutical research and drug development. Many medicinal plants that were once harvested exclusively from the wild have been found to retain high therapeutic potency when cultivated under suitable conditions, while their reproductive materials can be preserved in seed banks for future restoration efforts. Botanic gardens play a significant role in ex situ conservation by maintaining living collections of medicinal plants and providing opportunities for research on propagation, domestication, and selective breeding. Similarly, seed banks are considered highly effective for conserving the genetic diversity of medicinal plants, as they allow long-term storage and easy access to plant material for evaluation and reintroduction programs. In addition,

efficient and regulated cultivation practices help address challenges such as low active ingredient concentration, pesticide contamination, and misidentification of botanical sources. The adoption of organic farming and sustainable harvesting practices further supports conservation goals by reducing pressure on wild populations, restoring natural ecosystems, and ensuring the long-term availability of medicinal plant resources for traditional and modern healthcare systems.

1.4 Rationale of Undertaking the Present Work

In recent years, there has been a significant global increase in the demand for medicinal and aromatic plants, largely due to the growing acceptance of natural products as safe, non-toxic, and relatively free from adverse side effects. The international market for medicinal plants is projected to reach nearly US\$70 billion, with an estimated annual growth rate of about seven percent. According to a World Health Organization (WHO) report on Traditional Medicine (1978), nearly 80 percent of the world's population continues to rely on traditional healthcare systems as their primary source of medical treatment. This rising demand has intensified pressure on natural plant resources, particularly in biodiversity-rich regions such as the Himalayas.

In many cases, extraction contracts for high-value medicinal plant species are issued on a royalty basis to private contractors, who often employ untrained labour and follow unscientific harvesting methods. Such practices result in over-exploitation or improper collection, reducing plant populations to critically low levels. This decline makes species increasingly vulnerable to environmental, demographic, and genetic risks, including loss of genetic diversity and accumulation of harmful mutations. Consequently, the uncontrolled harvesting of seeds, roots, rhizomes, leaves, flowers, and entire plants from wild habitats has placed several once-abundant Himalayan medicinal species at risk of extinction. The depletion of naturally occurring genetic resources and germplasm pools further limits the potential for developing new medicinal and economically valuable products.

There is therefore an urgent need to investigate, document, and preserve both the known and undocumented traditional knowledge related to medicinal plant resource management before it is irreversibly lost. Indigenous and ethnic communities share a deeply interwoven relationship with their natural environment, and the use of wild plants is integral to their cultural and healthcare practices. However, systematic efforts to document, conserve, and sustainably utilize this traditional knowledge in the region have been minimal. Moreover, increasing concerns related to access and benefit sharing, intellectual property rights, and bio-piracy further emphasize the necessity of comprehensive documentation of medicinal flora and associated indigenous knowledge.

In this context, the present study aims to assess the diversity of medicinal plants in the Kashmir Valley and create a comprehensive database of regional medicinal plant resources. The study will identify vulnerable and threatened species, document their local and common names, and record their therapeutic significance. The findings are expected to bridge critical gaps in existing knowledge regarding biological resources and biodiversity maintenance, thereby contributing valuable insights for the formulation of effective conservation and sustainable utilization strategies.

2. REVIEW OF LITERATURE

A review of literature constitutes a vital component of any scientific investigation, as it provides the theoretical foundation, highlights earlier research, and offers insight into the development of knowledge related to the subject under study. It helps in identifying research gaps, understanding methodological approaches, and contextualizing the present work within existing scholarship. In the present study, an attempt has been made to critically review literature that is directly relevant to medicinal plants, traditional knowledge systems, and their historical and scientific significance.

Review of Literature on Medicinal Plants, Traditional Knowledge, and Conservation

Author / Period	Study Area / Theme	Major Findings / Contributions	Relevance to Present Study
Ancient Civilizations (2500 BC–600 BC)	Egypt, Assyria, China, India	Medicinal plants formed the basis of early healthcare systems; texts like <i>Pun-Tsao</i> , <i>Yellow Emperor's Classic</i> , Vedas and Ayurveda documented herbal therapies.	Establishes historical roots of medicinal plant use and indigenous healthcare systems.
Li Shi Chin (1600 AD)	China	<i>Pun-Tsao</i> described medicinal properties of Ephedra and Ginseng; Ephedra considered “water of life.”	Demonstrates early scientific understanding of medicinal plants.
Rigveda, Atharveda, Ayurveda (4000–600 BC)	India	Detailed herbal formulations, holistic treatment, and preventive healthcare approaches.	Forms philosophical and medicinal foundation of Indian ethnobotany.
Kirtikar & Basu (1918)	India	Systematic botanical description of Indian medicinal plants.	Landmark reference for medicinal plant taxonomy.
Nadkarni (1926)	India	Detailed medicinal uses and pharmacology of plants.	Strengthened scientific validation of traditional medicine.
Chopra (1933)	India	Documented indigenous drugs and therapeutic values.	Linked traditional remedies with modern medicine.
Satyavati et al. (1976)	India	Emphasized cultivation and sustainable utilization of medicinal flora.	Supports conservation-oriented approach of present study.
Atal & Kapur (1982)	India	Highlighted economic importance of medicinal plants.	Establishes livelihood value of medicinal biodiversity.

Jain (1985)	India	Extensive ethnobotanical documentation among tribal communities.	Provides methodological base for ethnobotanical surveys.
Jain & De Filippis (1991)	India	Documented ~1,850 medicinal plant species.	Strengthened systematic medicinal plant research.
Lawrence (1895)	Kashmir	Documented medicinal herbs used by Hakims.	Earliest ethnomedicinal record from Kashmir.
K.N. Koul (1924)	Gurais Valley	Pioneer collector of medicinal plant species.	Initiated regional botanical exploration.
Kaul (1928)	Jammu & Kashmir	Listed 19 medicinal plants from forest regions.	Early regional medicinal plant inventory.
Bal (1939); Kapoor (1951)	Kashmir	Reported several medicinal species.	Strengthened early regional documentation.
Botanical Survey of India (1960)	India	Listed 1,097 medicinal plants with distribution.	Important national reference for biodiversity.
Gupta (1962)	Western Himalaya	Identified 22 medicinal plants, many native to Kashmir.	Highlights Himalayan medicinal richness.
Dhar & Bhat (1977)	Kashmir	Studied <i>Atropa</i> species with pharmaceutical value.	Links ethnobotany with pharmacology.
Bhat & Pandita (1977)	Kashmir	Studied <i>Digitalis</i> species for cardiac medicine.	Demonstrates medical significance of Himalayan flora.
Sarin & Atal (1977)	Himalaya	Identified diosgenin from <i>Dioscorea deltoidea</i> .	Shows industrial pharmaceutical relevance.
Kapur & Sarin (1977)	J&K	Documented medicinal ferns.	Expands plant group diversity.
Kak (1981–83)	Kashmir	Documented ~500 useful plant species; aquatic plants with economic value.	Highlights biodiversity and economic potential.
Kapur (1983)	J&K	Reported endangered medicinal plant species.	Emphasizes conservation urgency.
Navchoo & Buth (1994, 1996)	Gujar, Bakarwal & Zanskar	Documented 86 medicinal species used by tribal communities.	Directly relevant to tribal ethnobotanical focus.
Hussain (1996)	Kashmir	Elaborated Unani medicinal system and plant remedies.	Shows coexistence of traditional systems.

Dar et al. (2000)	Kashmir Himalaya	Documented 106 medicinal species with ecology and distribution.	Provides baseline conservation data.
Dar & Naqshi (2001)	Kashmir	Discussed medicinal uses, economic value and conservation status.	Supports sustainable utilization framework.
Sharma (1991); Ara et al. (1992); Naqshi et al. (1992)	Jehlum Valley	Recorded 129 medicinal plants from 57 families.	Demonstrates rich ethnobotanical diversity.
Nawchoo et al. (1994); Singh (1994)	Jammu	Documented medicinal importance of <i>Ocimum sanctum</i> .	Validates pharmacological and cultural significance.
Kaul (1997)	Kashmir & Ladakh	Comprehensive account of temperate and cold desert medicinal flora.	Key reference for Himalayan studies.
Chaurasia et al. (1999)	Ladakh & J&K	Documented ethno-veterinary plant use.	Extends medicinal plant use to livestock care.
Kirn et al. (1999)	Poonch District	Reported multipurpose uses of plants.	Shows livelihood dependence on plant resources.
Baba et al. (2012); Mir et al. (2018)	India	Over 75,000 plant species used by 4,635 ethnic groups.	Demonstrates magnitude of traditional knowledge.
Dar et al. (2018); Khuroo et al. (2007)	India	Medicinal plants widely used in veterinary medicine.	Broadens healthcare dimension.
Gupta et al. (1992)–Rai et al. (2000)	Himalaya	Reported overexploitation, habitat loss, and population decline.	Identifies threats addressed in present study.
Verma et al. (2007)	Uttar Pradesh	Documented 72 medicinal plant species.	Confirms continued dependence on herbal medicine.
Bhattacharyya & Borah (2008)	Assam	Studied medicinal weeds used by rural women.	Highlights gender role in ethnomedicine.
Kalita & Phukan (2010)	Assam	Documented remedies for 17 ailments among Tai Ahom tribe.	Reinforces community-based healthcare.
Rajkumar & Shivanna (2010)	Karnataka	Documented healer-based medicinal knowledge.	Supports oral knowledge transmission.
Rahmatullah et al. (2010)	Bangladesh	Recorded 50 medicinal plant species used by Kavirajes.	Regional South Asian comparison.

Engler (2008)	Global	Overexploitation for fuel and fodder causes extinction.	Explains anthropogenic pressure.
Jain (2000)	India	Urbanization, grazing, and pollution reduce biodiversity.	Strengthens conservation rationale.
WHO–IUCN–WWF (1993); IUCN (2011)	Global	Issued medicinal plant conservation guidelines.	Provides international conservation framework.
Kala (2000)	Trans-Himalaya	Assessed rare and endangered medicinal plants.	Important Himalayan conservation reference.
Sarin (2003)	India	Suggested inventory, cultivation, and standardization.	Supports sustainable management strategies.
Chaudhury (2007)	India	Documented endangered medicinal plant species.	Key conservation literature.
Semwal et al. (2007)	Himalaya	Analyzed density, diversity, and population structure.	Provides ecological assessment methods.
Trivedi (2009)	India	Comprehensive work on medicinal plant conservation.	Supports policy-oriented conservation planning.
Kasagana et al. (2011)	Global	Emphasized in-situ conservation and sustainable use.	Aligns with integrated conservation approach.
Abida Bano et al. (2013)	Azad Kashmir	Identified vulnerable, endangered, and extinct species.	Highlights severity of conservation crisis.
Ashish Kumar et al. (2016)	India	Developed agro-techniques for rare medicinal plants.	Promotes domestication-based conservation.
Morya et al. (2016)	India	Emphasized biodiversity conservation and ecological balance.	Supports long-term sustainability framework.

3. STUDY AREA

Jammu and Kashmir (J&K) is the northernmost region of India, strategically located at the crossroads of South and Central Asia. It is bounded by Afghanistan and China to the north, China to the east, Himachal Pradesh and Punjab to the south, and the North-West Frontier Province and Punjab Province of Pakistan to the west. The region covers a vast geographical area of about 222,236 square kilometers and is characterized by remarkable physiographic and ecological diversity. Administratively and physiographically, Jammu and Kashmir comprises three distinct regions: the foothill plains of Jammu, the fertile valleys and lakes of Kashmir extending up to alpine mountain passes, and the high-altitude cold desert landscapes of Ladakh beyond these passes.

The region is drained by major river systems, notably the Indus River, which flows through Ladakh and parts of Kashmir, and the Jhelum River, which originates in the northeastern part of the Kashmir Valley and serves as a lifeline for the region. Jammu and Kashmir experiences a comparatively equable climate when contrasted with southern and central India, largely due to its varied topography and altitude, which ranges from approximately 395 meters to 6,910 meters above mean sea level. This wide altitudinal variation gives rise to diverse climatic zones and vegetation types.

Climatically, the region exhibits pronounced seasonal variations. Summers are generally mild and of short duration, particularly in the Kashmir Valley, due to rainfall on the outer hills and plains and the cooling effect of moisture-laden winds striking the high mountain ranges. Winters are cold and dry, with temperatures decreasing sharply at higher elevations, leading to heavy snowfall in the upper reaches. The Kashmir Valley, situated at a higher altitude, experiences colder conditions compared to the outer plains. Mediterranean winds contribute significantly to winter snowfall in the valley. Srinagar serves as the summer capital, while Jammu functions as the winter capital of the region. This diverse climate and terrain make Jammu and Kashmir one of the most ecologically rich regions in the Indian subcontinent, supporting a wide range of flora, including numerous medicinal plant species.

4. STUDY SITE

Pahalgam (literally meaning “village of shepherds” in the Kashmiri language) is a prominent town and designated area committee located in the Anantnag district of the Union Territory of Jammu and Kashmir, India. It is one of the most popular hill stations and tourist destinations of the region, attracting hundreds of visitors annually due to its scenic meadows, dense forests, and pristine waterways. Pahalgam is situated approximately 45 km from Anantnag town on the banks of the Lidder River, at an elevation of about 7,200 feet (2,200 m) above mean sea level. Administratively, it serves as the headquarters of one of the five tehsils of Anantnag district.

The terrain of the Pahalgam region is predominantly hilly and mountainous, interspersed with dense forest patches that support a rich diversity of medicinal plant species. The area includes several well-known locations such as Baisaran, Aru, Lidderwat, Shekhwas, Sukhai, and the alpine meadows of Tarsar and Marsar. The Lidder River and the Jhelum River traverse the region, contributing to the ecological richness and availability of diverse habitats. These varied landscapes provide favorable conditions for the growth and sustenance of a wide range of herbal species.

The present study will be carried out through frequent exploratory field visits to the hilly terrains, plains, and alpine grasslands of the Pahalgam valley. These field surveys will facilitate direct interaction with local ethnic communities to document traditional knowledge related to the use of medicinal plants for treating prevalent ailments in the region. The diverse topography of the area offers multiple habitats and microhabitats, which support varied vegetation types. Vegetation growth begins with the melting of snow in early April, reaches peak flowering between June and September, and gradually declines by late November. The region experiences heavy snowfall during winter, remaining snow-covered until March.

The Kashmir Valley, as part of the Indian Himalayan region, is well known for its commercially important plant resources used for food, fodder, medicine, fiber, and other purposes. The region exhibits remarkable plant diversity and unique floral biodiversity, with numerous species utilized in traditional and modern medicine in various forms (Lone et al., 2014; Malik et al., 2015). Despite being a rich repository of medicinal plants, the southern region of Kashmir has remained relatively unexplored in ethnomedicinal and conservation studies (Dhar and Kachroo, 1983). Therefore, the present investigation focuses on the alpine grasslands of the Pahalgam valley to document the distribution patterns, indigenous uses, and conservation status of medicinal plants, thereby contributing to the understanding and sustainable management of this valuable biological resource.

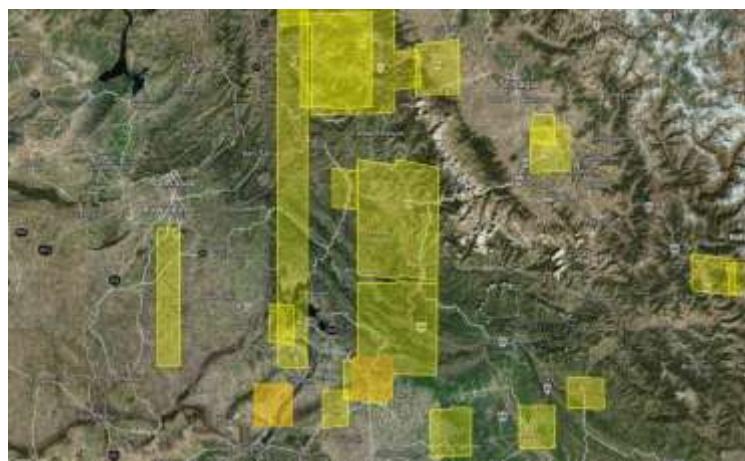


Fig 1: Satellite Imagery of Pahalgam Valley

5. METHODOLOGY

The present study will employ structured interviews and systematic field surveys to document ethnomedicinal knowledge from traditional communities residing in remote and ecologically sensitive areas of the study region. Field surveys will be conducted repeatedly across different locations during the entire research period to ensure comprehensive coverage of seasonal and spatial variation. The investigation in each community will typically begin with interviews of elderly and experienced individuals, who are considered key custodians of traditional medicinal knowledge. A structured questionnaire will be administered to family elders in visiting households to collect detailed information on medicinal plant usage, modes of preparation, ailments treated, and frequency of use. Simultaneously, observations and interactions with local inhabitants will be used to assess the current threats to high-value medicinal plant species and their natural habitats.

In addition to structured surveys, unstructured and informal interviews will be conducted with other family members, along with group discussions, to gain deeper insights into traditional practices, partial or selective use of plant parts, and changes in usage patterns over time, including household consumption and commercial exploitation. Interviews will be conducted in Kashmiri, Urdu, and Hindi to ensure clear communication and accuracy of information. A comprehensive inventory of medicinal plants will be prepared through field collection of plant specimens, documenting updated botanical nomenclature, vernacular names, morphological characteristics, plant parts used, and distribution. Standard procedures for plant collection, identification, and herbarium preparation will

be followed (Jain and Rao, 1977). The conservation status of recorded species will be determined by consulting the IUCN Red List of Threatened Plants and official records from the Department of Forestry, Jammu and Kashmir.

Table 1: List of Some Important Threatened Medicinal Plants Reported in The Region of Pahalgam Valley, J&K, India.

Botanical Name	Vernacular Name	Part Used	Medicinal Uses
<i>Aconitum heterophyllum</i>	Patis	Root	Anti-inflammatory, digestive disorders
<i>Arnebia benthamii</i>	Kahzaban	Root	Antimicrobial
<i>Artemisia absinthium</i>	Tethwan	Whole plant	Fever, vermicide, insect repellent
<i>Datura stramonium</i>	Datur	Leaves, seeds	Antiseptic, relief from toothache
<i>Podophyllum hexandrum</i>	Wanwangun	Fruit, root	Treatment of ulcers, cuts, and wounds
<i>Atropa belladonna</i>	Sagungur	Whole plant	Pain reliever, anti-inflammatory, ulcer treatment
<i>Cannabis sativa</i>	Bhang	Leaves, flower tops	Muscle spasms, seizures, nausea
<i>Aquilegia nivalis</i>	Noon Posh	Rhizome	Intestinal disorders, anti-inflammatory, wound healing
<i>Arnebia euchroma</i>	Lailoot	Root	Antimicrobial, antipyretic
<i>Atropa acuminata</i>	Brand	Whole plant	Sedative, antidote, antispasmodic
<i>Saussurea costus</i>	Kuth	Root	Worm infections, asthma, dysentery
<i>Meconopsis aculeata</i>	Budhzadh	Root	Antifungal, antibacterial, anti-inflammatory
<i>Lagotis cashmeriana</i>	Neel Posh	Root, leaves	Fever, indigestion
<i>Aconitum chasmanthum</i>	Patis	Root	Analgesic, diuretic, sedative
<i>Inula racemosa</i>	Poshkar	Root, rhizome	Antiseptic, febrifuge
<i>Rheum emodi</i>	Pambchalan	Root	Laxative, treatment of menstrual disorders

6. DISCUSSION

The world's natural vegetation is rapidly declining due to increasing human pressure, leading to serious threats to biodiversity and traditional knowledge systems. Communities that once lived in close association with nature are undergoing social and cultural changes, resulting in the gradual loss of indigenous knowledge about medicinal plants. Many medicinal species are now facing genetic erosion or extinction, yet reliable conservation data and protection measures remain inadequate. Most threatened species are poorly represented in gene banks, and conservation efforts are limited. Furthermore, excessive emphasis on discovering new pharmaceutical compounds has overshadowed the importance of traditional medicine use and community-based conservation, highlighting the need for integrated and sustainable approaches.

6.1 Formulating A Strategy

The conservation and sustainable utilization of medicinal plants cannot be effectively achieved by any single sector, whether public or private, working in isolation. This complex task requires a coordinated and collaborative approach involving multiple stakeholders, including government agencies, research institutions, local communities, non-governmental organizations, and the private sector. One of the most practical and effective ways to initiate and manage such collaboration is through the formulation of a comprehensive national strategy or policy focused on the conservation and long-term use of medicinal plant resources. Developing such a strategy helps build consensus on priorities and actions, clearly define roles and responsibilities among institutions, motivate stakeholders to actively participate in implementation, and establish mechanisms for monitoring progress. A well-defined strategy thus serves as a guiding framework to ensure systematic planning, accountability, and sustained conservation outcomes.

6.2 To Study Traditional Knowledge on The Use of Plants in Health Care

Ethnobotany, the study of how traditional societies use plants for health and healing, holds immense potential for identifying new and valuable plant-based medicines. Many modern drugs have originated from medicinal plants first used in indigenous healthcare systems, though often for different therapeutic purposes. Beyond drug discovery, ethnobotany plays a vital role in helping local communities adapt to social, environmental, and economic changes by sustaining traditional healthcare practices. Modern ethnobotanical approaches increasingly emphasize ethical research, ensuring protection of indigenous knowledge, recognition of community ownership, and fair sharing of benefits arising from the commercial or scientific use of traditional plant-based knowledge.

6.3 Cultivate Medicinal Plants as A Source of Supply Wherever Possible

Cultivation of medicinal plants offers the most reliable and sustainable source of raw material for healthcare and pharmaceutical needs. Unlike wild collection, cultivation prevents depletion of natural populations and reduces pressure on fragile ecosystems. With shrinking natural habitats unable to meet growing market demand, especially for high-value medicinal species, cultivation ensures consistent supply without ecological damage. For rare, endangered, or over-exploited plants, cultivation becomes the only viable option to obtain plant material while safeguarding species survival. Promoting scientific cultivation practices also improves quality control, enhances yield of active compounds, and supports conservation through reduced dependence on wild resources.

7. CONCLUSION

The conservation and management of traditional medicinal plants is a matter of global concern, especially in developing countries where dependence on plant-based healthcare systems remains high. Rapid overexploitation driven by growing demand from pharmaceutical industries and traditional medical practices has resulted in the steady depletion of natural plant populations. This situation is further aggravated by habitat degradation caused by anthropogenic activities such as deforestation, urbanization, overgrazing, and unplanned development. If these pressures continue unchecked, many medicinal plant species may decline drastically and eventually disappear from their natural habitats. To address this challenge, it is essential to systematically study the diversity, distribution, and utilization patterns of medicinal plants, document folklore and indigenous knowledge, identify native and endemic species, and develop effective conservation and management strategies. In line with Section 8 of the Biological Diversity Act, 2002—which emphasizes conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of benefits arising from biological resources and associated knowledge—a coordinated and participatory action plan is required. Such a plan must involve scientists, government agencies, non-governmental organizations, local communities, and farmers to balance conservation priorities with livelihood needs and market demands.

Several practical approaches can support these objectives. Establishing medicinal plant gardens in public parks, botanical gardens, hospitals, educational institutions, and municipal spaces can enhance conservation, education, and accessibility while promoting awareness of plant-based healthcare. Guided tours of research centers and botanical institutions can further engage both professionals and the general public, offering direct exposure to medicinal plants and their therapeutic uses. Educational initiatives such as lectures, formal classes, and interactive sessions can strengthen public understanding and encourage informed participation in conservation efforts. Additionally, time-bound educational campaigns—supported by media and implemented in collaboration with non-governmental organizations—can effectively raise public awareness, for example by promoting medicinal plant cultivation during events like annual tree-planting programs. Designated protected areas also play a vital role in medicinal plant conservation. National parks and reserves often harbour valuable medicinal flora, yet remain underutilized as educational and awareness platforms. Encouraging responsible eco-tourism and providing interpretative information can help visitors appreciate medicinal plants in their natural habitats while reinforcing conservation ethics. Collectively, these integrated approaches can contribute significantly to safeguarding threatened and economically important medicinal plant biodiversity, ensuring its sustainable use for present and future generations.

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