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Ethnobotanical Survey of Medicinal Plants Used for Treating Human Ailments in Tons Valley, Uttarkashi, Uttarakhand, Western Himalaya, India

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Abstract

This study investigates the ethnobotanical utilization of medicinal plants in the Tons Valley, Uttarkashi, Uttarakhand. It highlights the essential role of traditional medicine in supporting local communities in this remote region, where access to modern healthcare remains limited. Data collection was conducted through field observations and semi-structured questionnaires in seven villages. Thirty-four species of medicinal plants were found in the study, belongs to twenty-four families and the most dominant family was Asteraceae, Solanaceae, Lamiaceae (3spp), followed by Apiaceae, Menispermaceae, Poaceae, Rutaceae (2 spp), and Acoraceae, Aspleniaceae (1spp) etc. The study found that medicinal plants were mainly herbs (70.%), followed by shrubs (12%), climbers (9%), trees (6%), and ferns (3%). Among the plant parts used, roots (9%) were the most used, followed by leaves (18%), other parts like bark and flowers (22.86%), and seeds (8.57%). For example, *Bergenia ciliata* is known for its effectiveness in treating kidney stones, and *Zanthoxylum armatum* is frequently used to alleviate tooth pain and fight ringworm infections. *Solanum nigrum* is used to treat jaundice and fever. This inquiry shows highlights species' relevancies and their cultural and medicinal worth. It illustrates their contribution to important medical procedures and preserving conventional thinking. To preserve biodiversity and respect traditional traditions, the study promotes improved pharmaceutical research and conservation initiatives.

1. Introduction

The Charak Samhita (Agnivesha and Charaka, 1992), one of Ayurveda's foundational texts, first codified the Himalayas' preeminence for medicinal plants, a recognition that remains valid millennia later. This ancient wisdom finds modern validation through the World Health Organization (WHO, 2001, 2002), which reports that 80% of the global population, particularly in developing regions, depends on traditional herbal medicine for primary healthcare. Such enduring

reliance underscores the critical importance of ethnobotany, the scientific study of dynamic relationships between cultures and flora (Ram *et al*., 2004), in preserving both biodiversity and indigenous knowledge systems. Globally, the Himalayan region stands among Earth's most significant biocultural hotspots, where exceptional floristic diversity (Leslie and Young, 1992) intersects with ancient medical traditions including Ayurveda, Unani, and diverse folk practices (Bhakat and Sen, 2008; Jeeva *et al*., 2005). As one of only 17 megadiverse nations, India harbours approximately 8% of planetary biodiversity within just 2% of its land area (MoEFCC, 2020), including 7,918 documented medicinal species among its 17,209 flowering plants (Botanical Survey of India, 2019). Within this national context, the Himalayan state of Uttarakhand emerges as particularly significant, combining extraordinary plant diversity with living traditions of ethnomedicinal knowledge (Kala, 2005; Kunwar *et al*., 2006).

Our study focuses on the Garhwal Himalayas, where Atkinson's (1882) pioneering work first systematically documented ethnobotanical knowledge. These communities continue to rely on medicinal plants for healthcare, economic sustenance, and cultural preservation (Singh and Rawat, 2011), even as modernization threatens both species and traditional knowledge systems (Pandit and Bhakat, 2007). Modern ethnobotanical research uses different methods. Some focus on describing plants (Gazzaneo *et al*., 2005), while others test specific ideas (Reyes-Garcia *et al*., 2006). However, we still do not fully understand how much we can harvest without harming the environment and knowledge transmission pathways. The study focuses on documenting and analyzing the traditional knowledge of medicinal plants used by indigenous communities in the Tons Valley for treating human ailments. It includes details on the plant parts used, preparation techniques, dosage, and administration methods. The study also evaluates the diversity, dominant plant families, and life forms of ethnomedicinal species in the area, emphasizing their cultural importance and sustainable use. It aims to connect ancient knowledge (Charak Samhita) with contemporary conservation strategies (WHO, 2002).

2. Material and Methods

2.1. Study area

The study area is situated in the middle of the Greater Himalayan range at latitude 31°01' N and longitude 77°99’ E and distributed in an area of approximately 1,738 km^2 (Figure 1). The environment is mostly hilly, with an average elevation of 3191m asl, ranging from a minimum of 867 m to a maximum of 6498 m asl, with a total population of 40,491 (Anonymous, 2011). More than 92 % of the population lives in rural areas. It is bordered to the north by Himachal Pradesh's Kinnaur and Shimla districts, to the south by Tehri Garhwal, and to the west by Dehradun and a portion of Himachal Pradesh.

2.2. Collection and documentation of information

A reconnaissance house hold survey was carried out to collect information on the medicinal uses of plants found in the region during 2024-2025. A semi-structured questionnaires and Field observations, focused group discussion (FGD) was employed to gather this data. Ethnobotanical data were primarily collected from local informants, including older community members, healers (vaids), and others were either farmers, shopkeepers, or daily wage workers. The data were gathered using the conventional method (Jain and Rao, 1977). A questionnaire was created to collect data to document Indigenous knowledge on the uses and applications of traditional

medicine. According to various sources, these plants are used to treat common human illnesses, with detailed information on their preparation, usage conditions, method of application, dosage, and efforts toward their conservation. Informants with traditional knowledge were selected for their expertise in local medicinal plants.

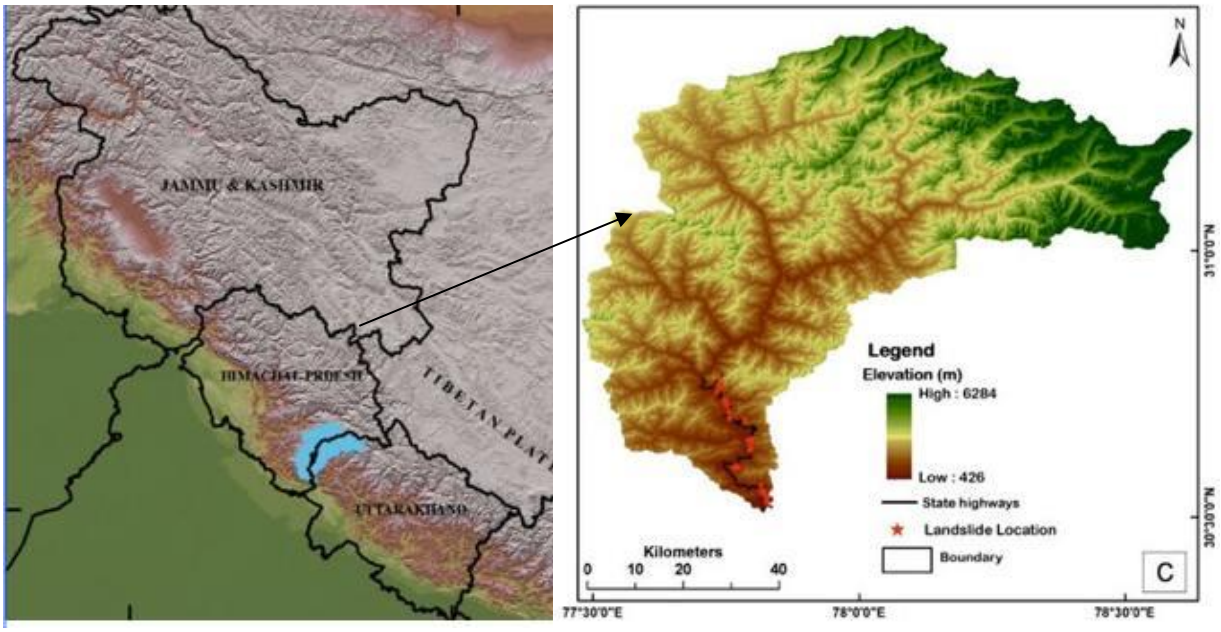

Figure 1: Map of the study area (Source: Map of India)

3. Results and Discussion:

3.1. Diversity and Dominant Families of Medicinal Plants

The study identified 34 medicinal plant species (Table 1) across 24 different families. The findings suggest that the local population possesses extensive knowledge of medicinal plants, the region is abundant in plant diversity, and the forests are well preserved. Additionally, there is restricted access to regional healthcare facilities, a deficiency in available medications and medical personnel, and the local community encounters economic difficulties. The most prevalent plant families identified were Asteraceae, Solanaceae, Lamiaceae (3spp each), followed by Apiaceae, Menispermaceae, Poaceae, Rutaceae (2 spp each), and the rest of the families contain one species in each family (1spp each) (Figure 2).

3.2. Plant Utilization and Traditional Preparation Methods

The present investigation revealed that herbs (70%), shrubs (12%), climbers (9%), ferns (3%), and trees (6%) were the predominant life-forms among the medicinal plants studied (Figure 3). This finding is consistent with the general distribution of medicinal plants in the Indian Himalayan Region, where Samant *et al*. (1998) reported 1020 herb species, along with 335 shrubs and 330 trees. However, in Uttarakhand's medicinal flora, herbs (53.7%) remain the most utilized,

though with slightly lower dominance, followed by trees (18.0%), shrubs (11.1%), and climbers (8.5%).

Table 1: List of Medicinal plants used to treat Human ailments in Tons Valley.

S.No.	Scientific name	Vernacular Name	Folk medicinal Uses	Mode of usage
1.	*Acorus calamus*	Bauj	Dysentery, fever	Rhizome is used for the dysentery, fever
2.	*Angelica glauca*	Chora	Gastrointestinal disorders	The ground power is taken with milk.
3.	*Artemisia vulgaris*	Charmar	Headaches, abdominal cramps,	Leaves are crushed in hands, juice squeezed and applied on cuts or wounds.
4.	*Asplenium dalhousiae*	Gutthi	Pimples	Leaf extracts useful in pimples
5.	*Aster thomsonii*	Tara phool	Bacterial and fungal infections	Leaf extract is used in bacterial and fungal infections
6.	*Berberis lycium*	Kingor	Blood purification, diabetes	Root is used as blood purifier
7.	*Bergenia ciliata*	Silphara	kidney stones	Root decoction is taken empty stomach in morning.
8.	*Brassica campestris*	Sarshon	Jaundice, joint pain	Oil is applied externally to relieve from joint pain and jaundice
9.	*Cannabis sativa L.*	Bang	Jaundice	Seeds used for jaundice
10.	*Citrus limon*	Nimbu	Acidity, vomiting	Fruit extract in vomiting, acidity and gastric.
11.	*Cleome viscosa*	Jakhiya	Blood pressure	Seeds used for high blood pressure.
12.	*Coriandrum sativum*	Dhanya	Constipation	Seeds are used for constipation
13.	*Cynodon dactylon*	Doob	Nose bleeding	Plant extract is useful for nose bleeding
14.	*Cyperus scariosus*	Nagarmotha	Fever, liver damage	Plant extract is useful for fever, liver damage
15.	*Equisetum telmateia*	Ganthi	Broken bone healing	Leaf extracts useful broken bone
16.	*Geranium molle*	Kashamul	Internal and external injuries, skin anxiety	Leaf extracts useful Internal and external injuries, skin anxiety
17.	*Hedera helix*	Van Kakdi	Weakness	Root is used in weakness
18.	*Hedychium spicatum*	Kapur	Digestive disorders	Rhizome is used for the digestive disorders
19.	*Hordeum vulgare*	Jau	Eye	Leaf extracts useful in eye diseases
20.	*Menispermaceae*	Gindaru	Weakness	Leaf extracts useful in weakness
21.	*Mentha longifolia*	Pudina	Liver disorder, vomiting	Leaf extract taken during vomiting and liver disorder
22.	*Nicotiana obtusifolia*	Tambakoo	Cough	Leaf is used in cough
23.	*Ocimum gratissimum*	Van Tulsi	Wound/cuts healing	Leaf part is taken with black pepper.
24.	*Oxalis corniculata*	Changeri	Hypothermia, eye pain	Leaf extracts useful in eye pain
25.	*Plantago major*	Isabgol	Stomach worms in babies	Plant extract is useful for Stomach worms in babies
26.	*Rumex nepalensis*	Amlya	Wounds	Leaf extracts useful in wounds
27.	*Salvia grandis*	Sathi	Fever	Root is used in fever
28.	*Solanum nigrum*	Bichchi	Fever, jaundice, weakness	Leaf is used in fever, jaundice, weakness
29.	*Solanum viarum*	Athlo	Hair fall	Fruit is used in hair fall
30.	*Strobilanthes reptans*	Karvi	Piles, fever, ulcer	Plant extract is useful for piles, fever, ulcer
31.	*Tinospora cordifolia*	Giloya	Weakness	Root is used in weakness
32	*Viburnum dentatum*	Chchari	Postpartum pain	Leaves and twigs extract is taken with milk.
33.	*Xanthium strumarium*	Gokhuru	Bacterial and fungal infections	Leaf extract is used in bacterial and fungal infections
34.	*Zanthoxylum armatum*	Timroo	Toothache, ringworm	Chewing the young shoots or fruits.

Regarding the plant parts used, leaves (18) were the most frequently used, followed by roots (9), seeds (4), and fruit, stem, and seed, which were used only from one plant each (Figure 4). These findings are consistent with earlier researchers (Pala *et al*., 2010; Bhatia *et al*., 2014; Kumar *et al*., 2015; Rao *et al*., 2015; Kandari *et al*., 2015; 2012; Kumari *et al*. (2011). Significant concern is the high proportion (35.29%) of plants harvested through destructive means, including roots, whole plants, rhizomes, bark, and bulbs. This falls within the 30–75% range documented across various Himalayan regions (Samant *et al*., 2007; Pala *et al*., 2010; Bisht *et al*., 2013; Chandra *et al*., 2013).

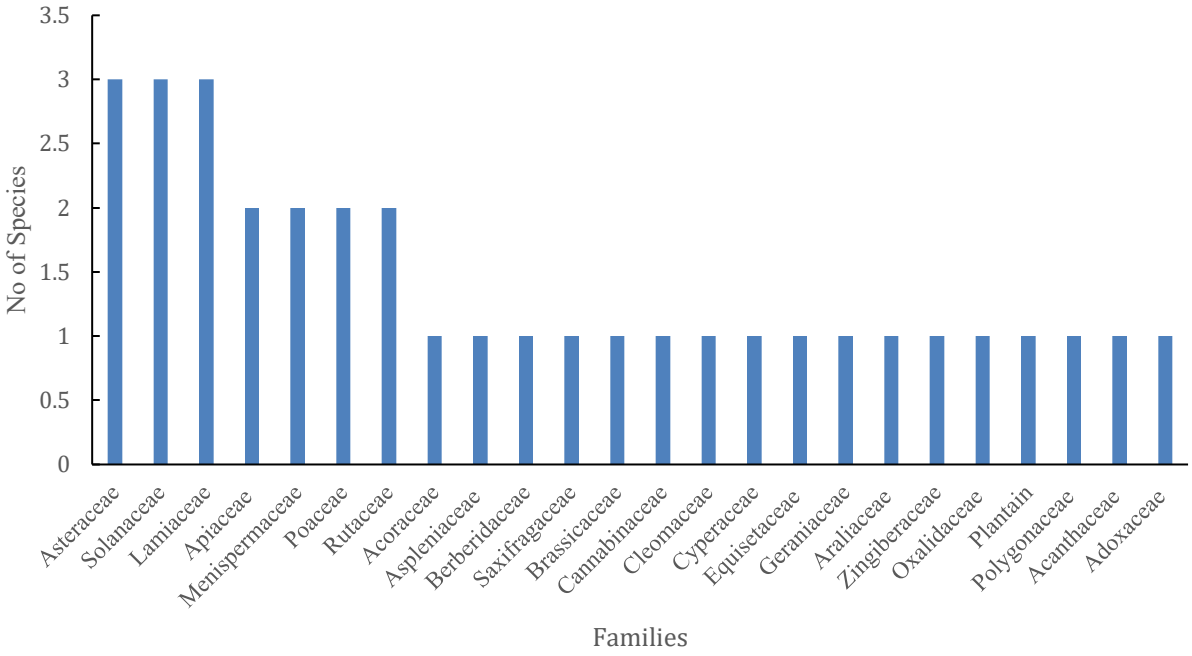

Figure 2: Dominant families at study area.

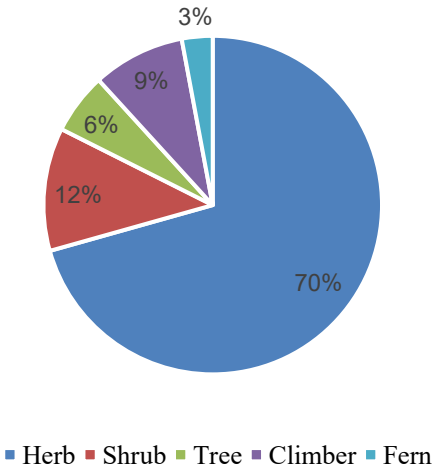

Figure 3: Plant form in study area

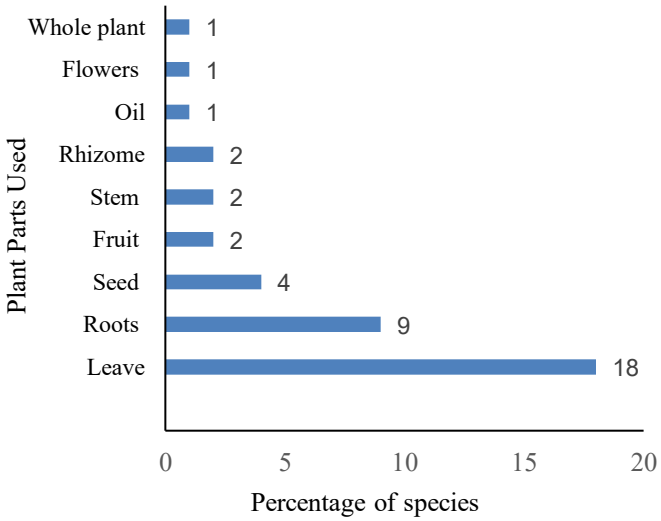

Figure 4: Use of different plants parts.

The documented remedies were primarily used to treat weakness and fever, which were considered the most important health concerns, as indicated by their highest preference ranking. Jaundice and wounds/cuts were also significant, though slightly less prioritized. Digestive disorders, vomiting, liver issues, and eye diseases followed in terms of treatment importance. In contrast, ailments such as blood purification, dysentery, pimples, and hair fall were considered less important and received lower attention (Figure 5). Interestingly, there was little agreement among people on how to treat liver disorders. In comparison, skin problems and digestive issues were among the most frequently treated health concerns.

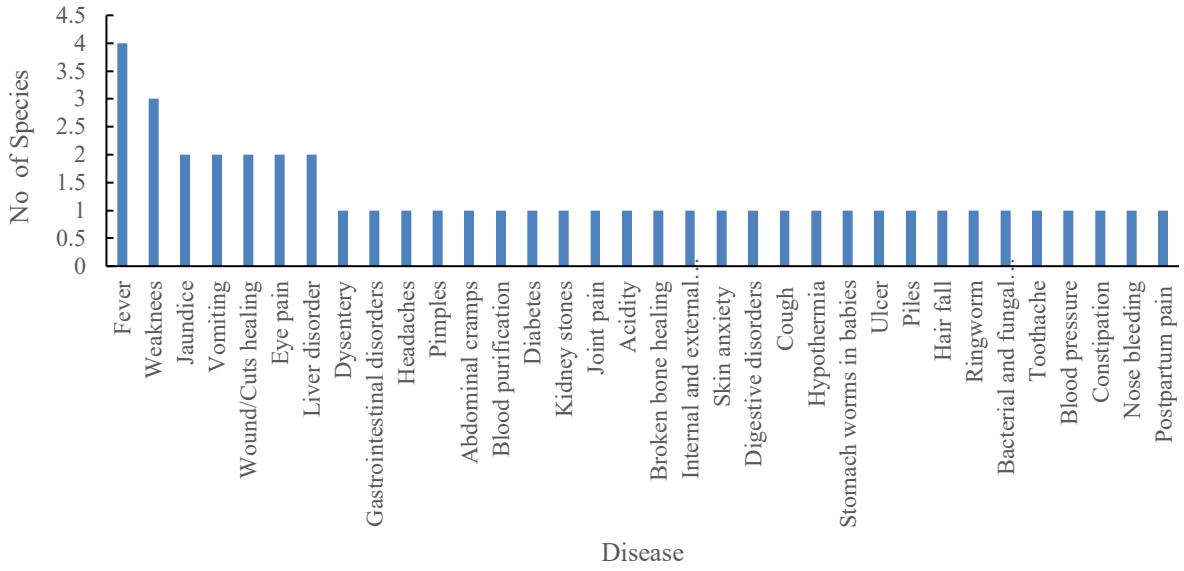

Figure 5: Plant species used for different ailments

4. Conclusion:

The informant of Tons Valley has a good knowledge of medicinal plants, having identified 34 species from 24 different families, with herbs being the most common and roots and leaves the most frequently used parts. Traditional knowledge systems remain vital in the selection, preparation, and application of treatments for various health issues, with a strong focus on treating fever, weakness, jaundice, and digestive problems. These traditional practices are highly esteemed as a community heritage, likely supported by the effectiveness of herbal remedies and limited access to modern healthcare. The current study identified numerous families and plant species commonly used by local communities. The research offers valuable insights into the indigenous knowledge and practices related to medicinal plant use in the area. Consequently, it is advised that conservation efforts should encourage sustainable harvesting methods, establish community-based conservation, and document and safeguard traditional knowledge associated with medicinal plant use. This approach will help preserve the rich diversity of medicinal plants and ensure their availability for future generations.

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Author's Contribution: Vivek Ankur (VA) designed the research problem, developed the question survey, compiled and analyzed data, interpreted results, and served as the corresponding author. L.S. Kandari (LSK) conceptualized the study, critically revised the manuscript, and approved the final version. Mousumi Chatterjee (MC) assisted in the question survey and drafting the research manuscript. Abhishek Chandra (AC) contributed to the final editing of the manuscript.

Author's Agreement: All the authors have seen and approved the final version of the manuscript being submitted. Further, we warrant that the article is the authors' original work, hasn't received prior publication and isn't under consideration for publication elsewhere.

Declaration of interests: The authors declare no competing interests, whether financial or personal relationships with other people or organizations that could inappropriately influence or bias our work.

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