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Documentation of Indigenous Uses and Traditional Practices of Ethnomedicinal Plants Used by the Inhabitants for Respiratory Disorders in Baagi and Munjhag Catchments of Mandi District, Himachal Pradesh, North-Western Himalaya, India

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Abstract: The present investigation was conducted in Baagi and Munjhag Catchments of Mandi district in Himachal Pradesh between 2018 and 2021. The surveys and interviews of the inhabitants and local *Vaidyas* resulted a total of 44 plant species belonging to 29 families, representing trees (6 spp.), shrubs (9 spp.) and herbs (29 spp.) utilized for addressing a range of respiratory ailments, including asthma, bronchitis, colds, coughs, pneumonia, tuberculosis, whooping cough, lung disorders, sinusitis, and issues related to phlegm. Diverse preparations were made using the leaves (26%), roots (15%), whole plant (15%), fruits (15%), seeds (12%), flowers (6%), barks (4%), rhizomes (2%), and each of the aerial part, shoot, latex, wood, and tubers accounted for 1% each. The leaves and roots emerged as the preferred components. The Use value (UV) and Informant Consensus Factor (ICF) of wild medicinal plants offer important insights into the effectiveness of these plants for different respiratory conditions. The excessive collection of medicinal plants from natural habitats poses significant concerns regarding their future viability. Consequently, it is crucial to urgently document indigenous knowledge and to promote sustainable utilization and conservation practices among local inhabitants to preserve valuable traditional knowledge.

Keywords: Baagi and Munjhag Catchments, Ethnomedicinal Plants; Respiratory Disorders; Use Value; Informant Consensus Factor (ICF); Sustainable utilization

INTRODUCTION

Ethnobotany explores the complex relationships between plants and human communities, emphasizing the roles of medicinal plants in prevention, promotion, and treatment (Raut *et al*., 2013). The diverse and abundant flora of India plays a vital role as a significant source of medicinal species (Yadav *et al*., 2012). Indigenous and local communities hold a deep appreciation for the knowledge of herbs, with traditional healers acting as the main source of information about their medicinal importance (Patil & Patil, 2012; Sinhababu & Banerjee,

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2013). People living in rural regions worldwide rely on traditional knowledge about medicinal plants to meet their fundamental health care requirements (WHO, 2013 & 2019). Exploring ethnobotany is crucial for understanding the connection between precolonial societies and their plant surroundings. In developing nations, a considerable segment of the population, around 80%, relies on traditional medicines due to their safety, affordability, and availability (WHO, 2011; Namsa *et al*., 2011). In India, around 7,500 plant species have been recorded for their medicinal uses in traditional health practices as well as modern medical systems. Throughout history, plants have been employed for their healing attributes and to enhance human sustenance (Arti *et al*., 2014; Gowthami *et al*., 2021). In India, approximately 75% of the population lives in rural areas, and during periods of food scarcity, a considerable number of these rural communities depend on natural resources like wild edible plants (Samant & Dhar, 1997; Rashid *et al*., 2008). About 800 species of food plants are utilized by rural communities, and wild edible plants play a crucial role for humans as they contribute to maintaining a balance between population growth and agricultural production (Singh & Arora, 1978). The historical use of botanical remedies for therapeutic purposes has been a longstanding practice in the Himalayan region, where 65-80% of developing nations rely on traditional healthcare systems (WHO, 2011). At present, over 90% of plant species used in herbal industries are obtained from natural habitats, with 50% of raw materials coming from the western Himalaya (Singh & Rawat, 2011). This has led to an increased interest in commercially valuable biological resources like medicinal plants. The Indian Himalayan Region's biodiversity has long been acknowledged as a vital foundation for traditional medicine (Sharma *et al*., 2014). The state of Himachal Pradesh, divided into four unique zones, showcases an impressive diversity of plant life, including both endemic and endangered species (Chauhan, 1999; Sharma *et al*., 2005). However, there is a significant gap in the thorough documentation of ethnomedicinal plants used by rural communities, emphasizing the necessity for systematic recording to safeguard medicinal plant resources.

In Himachal Pradesh, India, around 165 species of medicinal plants are traded annually, with 24 species listed among the top 100 most traded (HPMPSP, 2006; Kaisth & Sharma, 2006). The Himalaya is home to a remarkable variety of medicinal plants and a wealth of traditional medicinal knowledge, with Himachal Pradesh standing out as a crucial center for these important resources. In Himachal Pradesh, researchers from different organizations have been engaged in ethnobotanical studies. Throughout history, plant resources have been essential to human society, with around 88% of the global population relying on herbal medicine for their primary healthcare needs, particularly in rural areas (WHO, 2023). Respiratory diseases present a considerable challenge to global public health, resulting in a renewed focus on traditional medicine systems (Soriano *et al*., 2020). This transition is primarily influenced by increasing apprehensions about the adverse effects and accessibility challenges associated with traditional medical therapies (Yuan *et al*., 2016). Long-established healthcare systems such as Ayurveda, Siddha, and Unani have significantly influenced medical practices in the region for thousands of years (Ahmad *et al*., 2003; Lepcha *et al*., 2023), utilizing native plants to address respiratory issues. The foundations of these traditions are deeply connected to cultural heritage and have been passed down through generations.

The Indian subcontinent, marked by its varied climatic conditions and dense population, encounters considerable risks for a range of respiratory diseases (Dey *et al*., 2012), including asthma, chronic obstructive

pulmonary disease (COPD), tuberculosis, and respiratory infections (Halpin *et al*., 2019). The incidence of these diseases can be associated with multiple factors, including air pollution, smoking, indoor air quality, and occupational hazards (Bala *et al*., 2021). Understanding the patterns and root causes of respiratory diseases in the subcontinent is crucial for developing targeted strategies for their treatment and prevention.

Traditional approaches to addressing respiratory issues in the Indian subcontinent utilize an array of herbs, roots, leaves, and plant-based elements to relieve symptoms and tackle the underlying causes of respiratory conditions. Scientific investigations have validated the authenticity of numerous traditional practices. Anand *et al*., 2022; Fabricant & Farnsworth, 2001); nonetheless, further exploration is crucial to fully understand the mechanisms by which these plants function, determine ideal dosages, and identify any potential negative effects.

The existing literature highlights several shortcomings, including the limited number of comprehensive scientific trials to validate the efficacy and safety of these treatments, a poor understanding of the specific pharmacological effects of different plants, and a lack of standardization in the preparation and application of herbal remedies (Fung & Linn, 2015). In recent years, there has been a significant decrease in conventional medicinal practices, primarily due to insufficient thorough studies into their ethnomedicinal characteristics. The decline is further intensified by a waning interest among younger generations in conventional treatment systems, coupled with challenges like widespread deforestation and rural depopulation (Hazarika *et al*., 2012).

A number of ethno-botanical studies have been conducted in Himachal Pradesh, located in the north-western Himalayan region (Uniyal & Chauhan, 1971; Gaur & Singh, 1995; Samant & Dhar, 1997; Chauhan, 1999; Chauhan, 2003; Sharma & Lal, 2005; Sharma, Chauhan & Lal, 2005; Samant *et al*., 2007; Rana & Masoodi, 2014; Sharma *et al*., 2015; Devi *et al*., 2016; Bodh *et al*., 2017; Shashni *et al*., 2017;Rathor *et al*., 2018; Kumari *et al*., 2018; Kumar *et al*., 2018; Prakash *et al*., 2020; Arya *et al*., 2021; Kumar *et al*., 2021; Rana *et al*., 2021; Barman *et al*., 2021;Samant *et al*., 2023; Rathore *et al*., 2023; Sharma *et al*., 2024;Kumar *et al*., 2024;Sharma *et al*., 2024; Thakur & Kumar, 2024).

Nonetheless, a concentrated investigation into plant species employed for respiratory issues has yet to be conducted. The current investigation sought to; (i) identify and examine the plant species traditionally utilized for addressing respiratory issues, (ii) document the customary practices associated with the plants, including their preparation methods, dosages, and modes of administration, and (iii) conduct a quantitative analysis. The data was quantified to identify the groups of plant species that were extensively utilized and exhibited consensus.

STUDY AREA

The study was conducted in Baagi and Munjhag catchments (B & MCs) located between 31°45′ and 31°50′ N latitudes and 77°04′ and 77°07′ E longitudes, within the Beas River basin in the Mandi District of Himachal Pradesh **(Fig.1).** The catchments converge at Katola, located next to the Indian Institute of Technology (IIT), Mandi. These catchments cover a total area of 48.04 km^2 and inhabited by Kandhi, Chorinala, Chowki, Tihari, Bambola, Solang, Halgarh, Baagi, Sheghali, Kaafalgalu, Sandoa, and Kundhakh villages. The villagers belong to different castes and communities. The elevation varies from 1180 to 3000 m amsl, and the region accommodates a variety of habitats, species, and communities across sub-tropical, temperate, and sub-alpine zones. The vegetation consists of sub-tropical and temperate types, primarily characterized by the dominance of evergreen coniferous species, alongside

broad-leaved evergreen and deciduous species. The forests are home to a significant array of sensitive biodiversity components, encompassing orchids, medicinal and aromatic plants, wild edibles, as well as threatened, native, and endemic species, alongside a distinctive variety of fauna. The populations living in these remote villages within the catchments are part of the rural demography, relying on agriculture, horticulture, and forest resources for their livelihoods. There is a notable scarcity of studies focused on plant-based topics in this region. Consequently, an effort has been undertaken to investigate and record the native applications and customary practices associated with the plant species by the local population, particularly concerning respiratory system ailments.

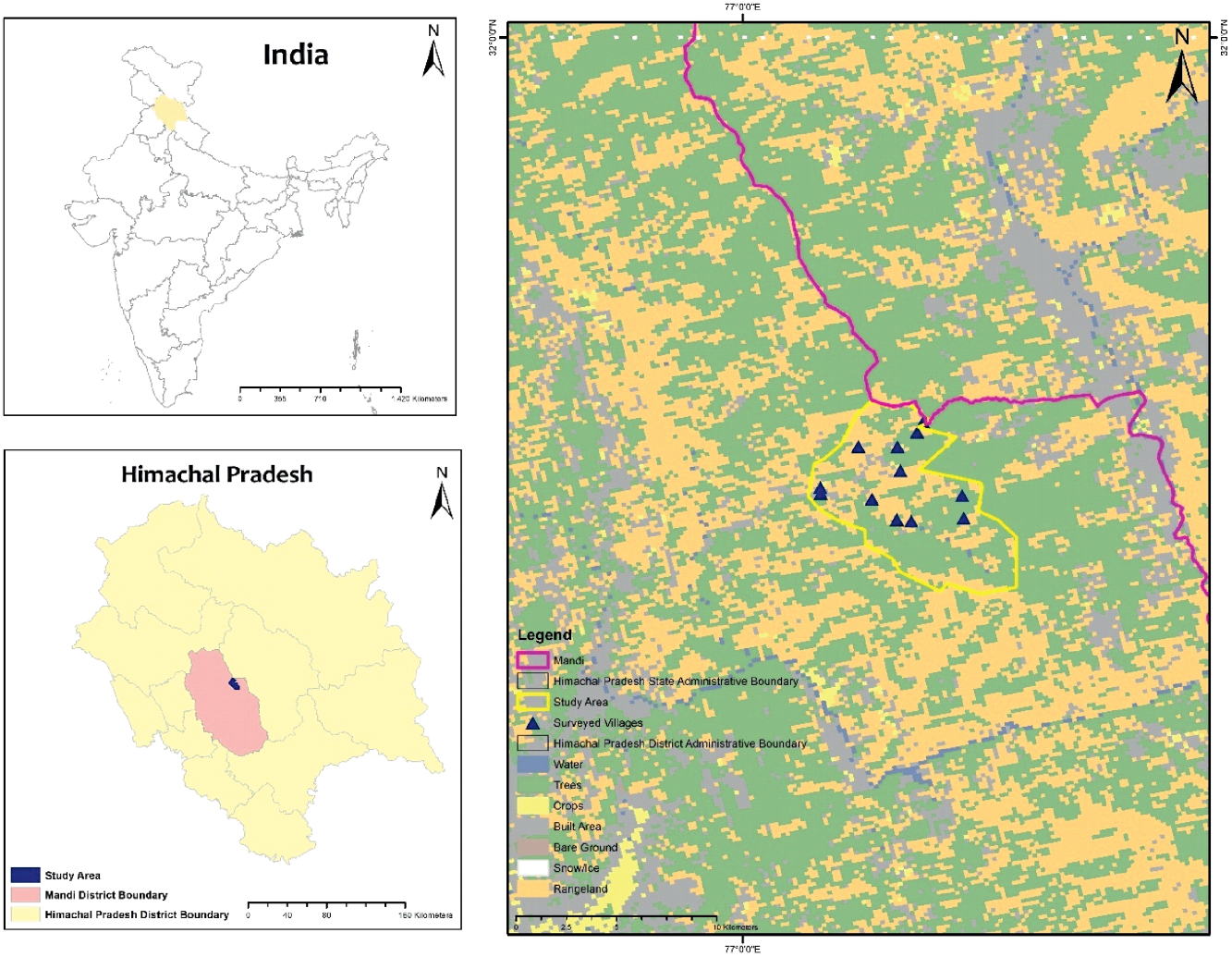

Fig. 1: Study area map

MATERIALS AND METHODS

The twelve villages namely, Kandhi, Chorinala, Chowki, Tihari, Bambola, Solang, Halgarh, Baagi, Sheghali, Kaafalgalu, Sandoa, and Kundhakh, located in the Baagi and Munjhag Catchments, were surveyed from 2018 to 2021. These villages are situated at varying elevations. Interviews were conducted with 60 local knowledgeable individuals, including Vaidyas, to gather information on indigenous uses (Singh & Chauhan, 2005; Jain, 1987; Boktapa & Sharma, 2010; Azad, 2013). The interviews primarily consisted of individual sessions, employing an informal approach and open-ended questions instead of adhering to a rigid questionnaire format (**Table 1**). The survey

utilized the local dialect or Hindi language for engaging with native individuals. Data regarding the local nomenclature of the plants, the specific parts utilized for remedying the condition, and the methods of application were collected. The plant specimens were gathered and classified using local and regional floras (Singh PB, 2018; Chowdhery & Wadhwa, 1984; Dhaliwal & Sharma, 1999; Singh & Rawat, 2000). The botanical names of the plants and their families were validated using various online resources such as www.theplantlist.org, http://www.flowersofindia.net, and www.efloras.org. and The World Flora Online. The indigenous applications are derived from the surveys, and this information has been further refined through the incorporation of existing secondary literature.

Quantitative Data Analysis

The ethnomedical information on diseases of the respiratory system was gathered and tabulated. The ethnomedicinal data was quantified using the two values. Use Value (UV) comes first, followed by Informant Consensus Factor (ICF). The data was quantified using these two characteristics. Percentages and proportions were used to report the data. The formula for calculating the Use Value is as follows.

$$UV = U/N$$

Table 1: Profile of informants of Baagi and Munjhag Catchments in Mandi district, Himachal Pradesh, North Western Himalaya

S. No.	*Name*	*Age*	*Sex*	*Education*	*Profession*	*Village*
1	Hans Raj	34	Male	Graduation	Farmer	Tihri
2	Maya Devi	37	Female	Graduation	Housewife	Tihri
3	Jitender Kashyap	34	Male	Graduation	Banking	Tihri
4	Pushap Raj	35	Male	Graduation	Mobile Networking	Tihri
5	Tilak Raj	37	Male	12th	Mobile Networking	Tihri
6	Nup Ram	40	Male	12th	Farmer/ Contractor	Kandhi
7	Room Singh	34	Male	10th	Shopkeeper	Kandhi
8	Pawan Kumar	33	Male	12th	Shopkeeper	Kandhi
9	Tirth Kumar	33	Male	BHM	Hospitality	Kandhi
10	Utam Chand	42	Male	8th	Sheep Herder	Kandhi
11	Shridev	36	Male	12th	Govt. job	Chauki
12	Harish Kumar	33	Male	12th	Chef	Chauki
13	Parminder Kumar	42	Male	8th	Farmer	Chauki
14	Santosh Kumar	38	Male	10th	Farmer	Chauki
15	Hari	31	Male	Graduation	Shopkeeper	Chauki
16	Hans Raj	32	Male	12th	Restaurant Owner	Kundhak
17	Chuni Lal	40	Male	12th	Farmer/ Contractor	Kundhak
18	Mahender Kumar	33	Male	10th	Sheep Herder	Kundhak
19	Rakesh Kumar	35	Male	Graduation	Coaching Institute	Kundhak
20	Inder Kumar	33	Male	12th	Farmer	Kundhak
21	Narotam	58	Male	3rd	Carpenter	Halgarh
22	Tek Chand	31	Male	ITI	Electrician	Halgarh
23	Lata Devi	28	Female	12th	Housewife	Halgarh
24	Naveen	37	Male	12th	Electricity Board	Halgarh
25	Rakesh Kumar	27	Male	12th	IPH dept.	Halgarh
26	Jay Kishan	32	Male	12th	Farmer	Bambola
27	Chudamani	36	Male	8th	Farmer	Bambola
28	Anish	30	Male	12th	Farmer	Bambola
29	Deepak	33	Male	12th	Farmer	Bambola
30	Om Chand	35	Male	8th	Farmer	Bambola
31	Bhed Ram	32	Male	10th	JCB Operator	Shegali
32	Chandresh	30	Male	12th	IPH dept.	Shegali

S. No.	Name	Age	Sex	Education	Profession	Village
33	Bihari Lal	30	Male	12th	Shopkeeper	Shegali
34	Moti Ram	31	Male	12th	JCB Operator	Shegali
35	S. Thakur	36	Male	10th	Mobile Shop	Shegali
36	Hukam Chand	40	Male	5th	Farmer	Chorinala
37	Ail Chand	54	Male	5th	Farmer	Chorinala
38	Gurdayal	32	Male	8th	Farmer	Chorinala
39	Amar Singh	32	Male	12th	Private job	Chorinala
40	Hoshiyar	38	Male	8th	Farmer	Chorinala
42	Fakrudin	34	Male	10th	Transport business	Kafalgalu
42	Shafi	32	Male	12th	Farmer	Kafalgalu
43	Noor Mohamad	34	Male	12th	JCB operator	Kafalgalu
44	Juquab Ali	42	Male	5th	Transport business	Kafalgalu
45	Meena Mohamad	55	Male	5th	Farmer	Kafalgalu
46	Pappu	33	Male	12th	Security Guard	Sandoa
47	Dinu	37	Male	12th	Farmer	Sandoa
48	Pune Ram	33	Male	8th	Driver	Sandoa
49	Gopal	32	Male	10th	Driver	Sandoa
50	Neelmani	32	Male	12th	Welder	Sandoa
51	Som Dev	34	Male	12th	Meteorological dept.	Solang
52	Chet Ram	48	Male	12th	Farmer	Solang
53	Dharmender	28	Male	12th	Govt. job	Solang
54	Karm Singh	33	Male	10th	Farmer	Solang
55	Maheshwar	26	Male	10th	Farmer	Solang
56	Ramesh	33	Male	12th	Tourism	Baagi
57	Devender	28	Male	12th	Tourism	Baagi
58	Ritu	28	Female	12th	Housewife	Baagi
59	Yugal	20	Male	12th	Student	Baagi
60	Lekh Raj	24	Male	12th	Govt. Job	Baagi

The UV is the ratio of number of citations per species (U) to the number of informants (N) (Polat *et al*., 2015).

A plant species with a high UV is said to be widely used, which also suggests that the species is relatively important to the community in question. Few reports of its use are indicated by low UV (Abe & Ohtani, 2013).

The Informant Consensus Factor (ICF) was calculated as follows.

$$ICF = (Nur - Nt)/Nur - 1$$

Where, Nt is the number of species utilized for a certain group by all informants, and Nur is the number of useful reports in each category (Ragragio *et al*., 2013). The range of the ICF value is 0 to 1. Additionally, the greatest number derived from this formula was 1, indicating that respondents concurred that the plant species in question might be able to treat that particular illness or condition. According to Abu-Irmaileh and Afifi (2003), the lowest number of 0 indicates that there is no information sharing regarding plants among the respondents.

RESULTS AND DISCUSSION

The current study documented 44 plant species across 43 genera and 29 families, showcasing a variety of life forms, including herbs (29 species), shrubs (9 species), and trees (6 species) (Table 2). The species are organized in alphabetical order, detailing their botanical name, family, local name, altitudinal range (m), life form, nativity, part(s) utilized, associated ailments or diseases, total citations, use value, and method of preparation. The local community of Baagi and Munjhag catchments utilizes these species to address

Fig 2. (a) ***Questionnaire survey;*** **(b)** ***Rhododendron arboreum;*** **(c)** ***Cynoglossum zeylanicum; and*** **(d)** ***Oxalis corniculata***

various respiratory disorders, including asthma, bronchitis, colds, coughs, pneumonia, tuberculosis, whooping cough, lung disorders, sinusitis, and issues related to phlegm, among others (Fig. 4). Leaves constituted 26%, roots 15%, whole plant 15%, fruits 15%, seeds 12%, flowers 6%, bark 4%, rhizomes 2%, while the aerial part, shoot, latex, wood, and tubers each accounted for 1% in the preparation of various kinds of products (Fig. 3). The leaves and roots emerged as the preferred parts. It was noted that various species were effective in curing specific ailments, such as asthma and cough. These are primarily utilized in the form of decoctions, infusions, powders, pastes, juices, teas, and through the inhalation of smoke or vapours. The primary method of application utilized by the local community for treating ailments was oral intake, with ingredients such as honey, ginger juice, milk, and hot water frequently employed as complementary aids to enhance the effectiveness of treatments. The excessive collection of medicinal plants from natural habitats prompts significant worries regarding their future viability. Consequently, it is crucial to urgently document indigenous knowledge and promote sustainable utilization and conservation practices among local communities to preserve valuable traditional knowledge.

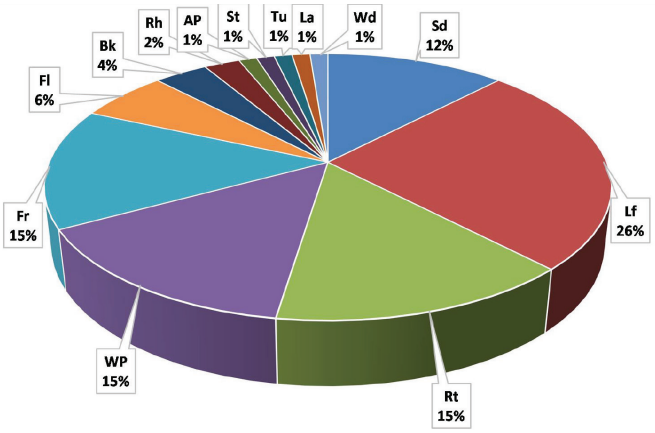

Fig. 3: Percentage of plant parts used

Abbreviations used: Lf=Leaf; **Rt**=Root; **WP**= Whole plant; **Fr**=Fruit; **Sd**=Seeds; **Fl**=Flower; **Bk**=Bark; **Rh**=Rhizomes; **AP**=Aerial part; **St**=Shoot; **La**=Latex; **Wd**=Wood and **Tu**=Tuber

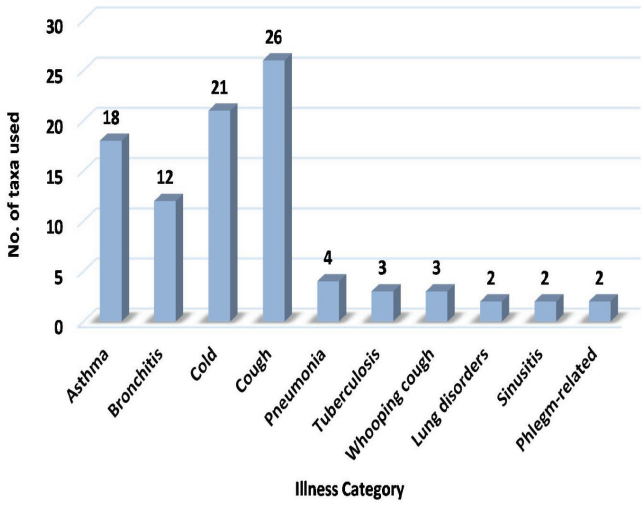

Fig. 4. Botanical solutions for targeted respiratory issues

Use values

The utility of the plants was assessed by calculating their use values, which were determined by the frequency of citations from a specific number of respondents as shown in table 2. The minimum use value of 0.0833 was noted for *Oxalis corniculata*, succeeded by *Micromeria biflora* (0.1), *Rubus ellipticus* (0.1), *Anaphalis contorta* (0.15), and *Aesculus indica* (0.1166). Fewer respondents reported these plants in relation to respiratory issues. Conversely, a high use value (UV=0.4166) was demonstrated by *Cynoglossum zeylanicum*, *Desmodium gangeticum*, *Trichosanthes tricuspidata*, *Myrica esculenta*, *Cissampelos pareira*, and *Rhododendron*

Table 2: Ethnomedicinal Plants Used by The Local Community of Baagi and Munjhag Catchments in Mandi District , Himachal Pradesh for Respiratory Diseases in Himachal Pradesh, North-Western Himalaya, India

Sr. No.	*Botanical Name*	*Family*	*Local Name*	*AR (m)*	*LF*	*Nativity*	*PU*	*Ailment Treated*	*Mode of Preparation*	*TC*	*UV*
1	*Abrus precatorious* L.	Fabaceae	Rati	1180-1400	H	Ind Or Malaya	Sd, Lf, Rt	Cold and Cough	Leaves and roots possess a sweetish flavor and are traditionally employed to treat fever, stomatitis, asthma, and bronchitis.	12	0.2
2	*Achillea millefolium* L.	Asteraceae	Banajwain, Bhutkesi, Fye	1800-3000	H	Europe	WP, Lf	Cold	Juice of the entire plant is utilized to treat respiratory infections. Paste derived from leaves utilized for the treatment of cold and cough.	15	0.25
3	*Aesculus indica* Coleb. ex Camb.	Hippocastanaceae	Khanor	1800-2600	T	Reg Himal	Lf	Whooping cough	Leaf extract is utilized for the treatment of whooping cough.	7	0.11666
4	*Anaphalis contorta* Hk. f.	Asteraceae		1800-3000	H	Reg Himal	WP	Cold and cough	Whole plant is utilized for the treatment of cold and cough.	9	0.15
5	*Argemone mexicana* L.	Papaveraceae	Pila dhatura	1180-1500	H	Am Bor Mexico	Sd	Asthma	Seed oil is used for the treatment of asthma.	23	0.3833
6	*Agrimonia pilosa* Ledeb.	Rosaceae	Kanaula	1180-3000	H	Reg Bor Temp	AP, Rt	Cough	Roots are used for the management of cough and cold.	16	0.2666
7	*Angelica glauca* Edgew.	Apiaceae	Chaura	2000-2800	H	Reg Himal	Rh, Rt	Asthma, bronchitis	Roots are crushed into powder and administered orally with water twice a day for bronchitis.	11	0.183

Sr. No.	*Botanical Name*	*Family*	*Local Name*	*AR (m)*	*LF*	*Nativity*	*PU*	*Ailment Treated*	*Mode of Preparation*	*TC*	*UV*
8	*Artemisia nilagirica* (Cl.) Pamp.	Asteraceae	Kubsh	1180-3000	H	Reg Temp Bor	Lf, Fr	Asthma, bronchitis	Inhaling smoke from foliage and flowering branches is efficacious in treating asthma and bronchitis.	12	0.2
9	*Baliospermum solanifolium* (Burm.) Suresh	Euphorbiaceae	Danti	1180-1500	Sh	Ind Or Malaya	Lf, Sd, Rt	Asthma and bronchitis	Leaves are beneficial for asthma and bronchitis.	8	0.1333
10	*Berberis lycium* Royle	Berberidaceae	Kshambal	1180-2200	Sh	Reg Himal	Rt	Cough and cold	Roots are boiled in water, and the resulting decoction is combined with honey for oral consumption in cases of cough and cold.	11	0.1833
11	*Butea monosperma* (Lam.) Taub.	Fabaceae	Dhak	1200-1600	T	Ind Or Burma	Sd, Fl, Bk, Lf	Cold and cough	A decoction obtained by boiling the bark or flowers in water and consuming the resultant liquid in cold and cough.	7	0.1166
12	*Cannabis sativa* L.	Cannabaceae	Bhang	1180-2000	H	As Centr Reg Himal Bor Occ	Lf, Bk, Sd, Fr, Fl, St	Bronchitis, cold, cough	Plant is utilized for the treatment of bronchitis, cough, and cold.	11	0.1833
13	*Cissampelos pariera* L.	Menispermaceae	Akanadi, Batindu	1180-2000	H	Reg Trop	Rt, Lf	Cough	Five millilitres of powdered roots and leaves combined with five millilitres of *Zingiber officinale* juice and honey is given twice in a day and continued for five days to treat dry cough.	25	0.4166
14	*Cynodon dactylon* (L.) Pers.	Poaceae	Doob	1180-2500	H	Cosmop	Lf	Asthma	50 to 100 ml of leaf juice is given twice a day for a duration of 5 days to treat asthma.	13	0.2166
15	*Cynoglossum zeylanicum* (Vahl) Brand	Boraginaceae		1200-3000	H	Ind Or Malaya	Lf, Rt	Asthma, cough	Infusion administered for asthma and cough	25	0.4166
16	*Dactylorhiza hatagirea* D. Don	Orchidaceae	Hath panja; Salampanja	2600-3000	H	Reg Himal	Tu	Cold, cough	The powder is administered orally with lukewarm water twice daily for chronic cold and cough.	11	0.18333
17	*Datura stramonium* L.	Solanaceae	Datura	1180-1700	H	Cosmo Trop et Temp	Lf, Sd, Fr	Asthma	Seeds and leaves are utilized as antiasthmatic agents.	20	0.3333
18	*Desmodium gangeticum* (L.) DC.	Fabaceae	Chagla	1180-2200	Sh	As Trop Austr	WP	Asthma, bronchitis and cough	Various preparations, such as decoctions or pastes derived from the roots of *Desmodium gangeticum*, are utilized to alleviate coughs, asthma, and chronic conditions.	25	0.4166
19	*Drymaria cordata* Edgew. & Hk.	Caryophyllaceae	Pithpapra	1180-2100	H	Cosmop Trop	WP	Asthma, pneumonia	A decoction of the entire plant is utilized for asthma and colds.	15	0.25
20	*Ficus racemosa* L.	Moraceae	Umreya	1180-1500	T	Ind Or Burma	Fr, La	Asthma	Two to three fresh fruits are consumed with honey twice daily for one week to alleviate asthma.	10	0.1666

Sr. No.	Botanical Name	Family	Local Name	AR (m)	LF	Nativity	PU	Ailment Treated	Mode of Preparation	TC	UV
21	*Flemingia semialata* Roxb.	Fabaceae	Bara solpan, Ban chola	1180-1700	Sh	As Trop	Lf	Tuberculosis	Leaf decoction administered in the management of Tuberculosis.	22	0.3666
22	*Gentiana carinata* Griseb.	Gentianaceae		2800-3000	H	Reg Argent	WP	Cold, cough	Powdered plant is administered for the treatment of cold and cough.	8	0.1333
23	*Hedera nepalensis* Koch.	Araliaceae	Mathodi, Grumru	1180-2500	Sh	Europe Afr Bor As Temp	Fr, Lf	Cold, cough	Powered leaves serve as a cure.	19	0.3166
24	*Hedychium spicatum* Buch.-Ham. ex Sm.	Zingiberaceae	Ban halder, Shau Sati	1180-2500	H	Reg Himal	Rh, Lf	Asthma and bronchitis	10 grams of powdered rhizome is utilized in bronchial asthma. The powdered rhizomes are combined with hot water and utilized for the treatment of cough and asthma.	16	0.26666
25	*Malva verticillata* L.	Malvaceae	Mikanchi	1180-2000	H	Europe As et Afr Bor	Rt	Whooping cough	The root is utilized for treating whooping cough.	22	0.3666
26	*Micromeria biflora* Buch.-Ham.	Lamiaceae	Jangli Ajwan	1180-2100	H	Ind Or Arab Afr Trop	Lf	Cold	Utilized as a herbal infusion, treatment for colds.	6	0.1
27	*Myrica esculenta* Buch.-Ham. ex Don	Myricaceae	Kaphal	1400-2400	T	As Trop et Sub Trop	Bk, Fr, Wd	Asthma and cough and chronic bronchitis	Bark is beneficial for cough, asthma, sinusitis, and chronic bronchitis.	25	0.4166
28	*Origanum vulgare* L.	Lamiaceae	Bantulsi	1180-3000	H	Europe As	WP Rt, Lf	Cold and influenza	Root is grounded into powder and administered to treat tuberculosis. Its oil is administered for cough and bronchitis. Internal administration of an infusion made from leaves and flowering stems to alleviate cold symptoms.	16	0.2666
29	*Oxalis corniculata* L.	Oxalidaceae	Malori	1180-2200	H	Amphig Temp et Trop	Lf, WP	Cough	Leaf is used with honey for cough relief.	5	0.0833
30	*Pedicularis pectinata* Wall. ex Benth.	Scrophulariaceae		2500-3000	H	Reg Himal	WP	Cold and cough	Plant is utilized for the treatment of colds and coughs.	13	0.2166
31	*Pistacia integerrima* Sw.	Anacardiaceae	Kakare	1180-2200	T	Reg Himal Aegypt Persia	WP	Cough, asthma	Plant is utilized for the treatment of cold and cough.	24	0.4
32	*Podophyllum hexandrum* Royle	Berberidaceae	Ban Kakri	2600-3000	H	Reg Himal	WP, Fr, Rt, Sd	Cough	A decoction of the root is administered to treat asthma. The whole plant is utilized for the treatment of cough and tuberculosis.	16	0.2666
33	*Rhododendron arboreum* Sm.	Ericaceae	Brash,burans	1400-2700	T	Reg Himal	Fl	Cough, cold	Juice of desiccated flowers is utilized to alleviate coughs and colds.	25	0.4166
34	*Rubus ellipticus* Sm.	Rosaceae	Akhaey/ Heer	1500-1800	Sh	Reg Himal	Fr	Cough	Fresh fruit juice is utilized to alleviate fever and cough.	6	0.1

Sr. No.	*Botanical Name*	*Family*	*Local Name*	*AR (m)*	*LF*	*Nativity*	*PU*	*Ailment Treated*	*Mode of Preparation*	*TC*	*UV*
35	*Salvia moorcroftiana* Wall. ex. Benth.	Lamiaceae	Thuth, Tuth	2000-3000	H	Reg Himal	Rt	Cold and cough	Roots are utilized for alleviating cold and cough symptoms.	24	0.4
36	*Sonchus oleraceus* L.	Asteraceae	Dudhi	1180-1800	H	Cosmop	Rt	Asthma and cough	A tea made from the roots is utilized for the treatment of asthma and cough.	19	0.3166
37	*Trichosanthes tricuspidata* Lour.	Cucurbitaceae	Bimbel	1180-2300	H	Cochinch	Fr	Asthma	Administered for the management of asthma.	25	0.4166
38	*Thymus linearis* Benth.	Lamiaceae	Ban jira Jangli ajwain	2000-3000	H	Europe As et Afr Bor	WP	Whooping cough, cold and phlegm	Oral use of thyme, when combined with other herbs, alleviates bronchitis symptoms, including coughing.	16	0.2666
39	*Urena lobata* L.	Malvaceae	Sampakpi	1180-1600	Sh	Reg Trop	Lf	Cough	Leaf extract combined with honey is administered for cough relief.	12	0.2
40	*Verbascum thapsus* L.	Scrophulariaceae	Gaddi Tamaku	1180-2800	H	Europe Afr Reg Himal	Lf, Fr, Sd	Asthma and cough	Smoke from flowers and leaves is beneficial for asthma and other respiratory issues. Tea made from leaves is utilized for colds.	14	0.2333
41	*Viola canescens* Wall.	Violaceae	Banafsha	1180-2500	H	Ind Or Malaya China	Lf, Fl	Asthma, bronchitis and cold	A decoction of flowers and leaves is utilized for the treatment of cough, cold, bronchitis, and asthma.	19	0.3166
42	*Viola pilosa* Bl.	Violaceae	Banafsha	1800-2600	H	Ind Or Malaya China	WP, Lf, Fl	Cold, cough and lung diseases	Plant is utilized to remedy cough, cold, and pulmonary disorders.	23	0.3833
43	*Vitex negundo* L.	Lamiaceae	Banha	1180-1600	Sh	As Trop et Sub Trop	Lf	Asthma, cold and cough	Three to five fresh leaves are consumed everyday for one week to alleviate cough. Fresh leaves are cooked in water, and the vapours are inhaled twice daily to alleviate cold and cough symptoms. Fresh leaf juice combined with honey is consumed on an empty stomach for asthma.	19	0.3166
44	*Zanthoxylum armatum* DC.	Rutaceae	Tirmara, Trimbar	1180-1800	Sh	Reg Himal China	Lf, Fr, Sd	Cough	A decoction of leaves is administered for cough relief.	21	0.35

arboreum, indicating that these ethnomedicinal plants hold significant importance. These plants were utilized to address a diverse array of respiratory conditions. Additional species like *Viola pilosa* (0.3833), *Argemone mexicana* (0.3833), and *Flemingia semialata* (0.3666) demonstrated notably high use values as well.

Informant Consensus Factor (ICF) Values

The Informant Consensus Factor (ICF) values were computed to assess the reliability of the responses from informants regarding the use of plants for treating ailments. Table 3 presents the ICF values for 10 ailments. The ICF value of indigenous knowledge fundamentally relies on

the presence of plant species and the likelihood of disorders within the area. The calculated range of ICF value in this study was between 0.6667 and 0.7500. Lung disorders, sinusitis, and phlegm-related issues exhibit the highest ICF value of 0.7500 each, with usage reports of 5 for two plant species each. This is followed by asthma at 0.7344 and the common cold at 0.7297. The ICF values recorded were 0.7191 for cough, 0.7179 for bronchitis, and 0.7143 for tuberculosis. Pneumonia and whooping cough exhibited the lowest ICF values, recorded at 0.6667. The elevated ICF values indicated that the referenced medicinal plant was notably effective in addressing a specific ailment and demonstrated consistent usage among the indigenous population of the area. Table 3 presents all the ICF values. The ICF value was influenced by several informants. The highest ICF value signifies a consensus among respondents regarding the use of plants for treating a specific ailment. The highest ICF value can assist in identifying highly effective medicinal plant (Heinrich *et al*., 1998).

Table 3: Informant Consensus Factor Utilization of Plants in Different Illness Categories

S. No.	*Illness Category*	*No. of taxa used (N_t)*	*No. of use reports (N_{ur})*	*ICF*
1	Asthma	18	65	0.7344
2	Bronchitis	12	40	0.7179
3	Cold	21	75	0.7297
4	Cough	26	90	0.7191
5	Pneumonia	4	10	0.6667
6	Tuberculosis	3	8	0.7143
7	Whooping cough	3	7	0.6667
8	Lung disorders	2	5	0.75
9	Sinusitis	2	5	0.75
10	Phlegm-related	2	5	0.75
Total		**93**	**310**	-

CONCLUSION

The traditional understanding of medicinal plants is passed down orally from generation to generation, with no written records available in the current region or worldwide. Traditional healing methods are becoming more at risk as modern medical practices steadily penetrate in the remote areas. This study serves as a preliminary investigation into the ethnobotanical characteristics of plant species employed for respiratory issues by the local communities in the Baagi and Munjhag Catchments of Mandi district, Himachal Pradesh. A total of 44 plant species from 29 families representing a diverse range of life forms i.e., herbs (29 spp.), shrubs (9 spp.), and trees (6 spp.) were documented for their use in treating various respiratory diseases. The Use value (UV) and Informant Consensus Factor (ICF) value of wild medicinal plants offer significant insights into the effectiveness of these plants for different respiratory conditions. The feedback collected from the participants demonstrates their solid comprehension of plants. The consensus among informants underscored the considerable potential of specific plants, indicating a noteworthy opportunity for the pharmaceutical industry. This information acts as a crucial reference for future studies and plays a significant role in the progress of pharmaceuticals. The findings of this study reveal that indigenous communities living in remote areas have a profound understanding of the various applications of plant resources in the studied region. This study suggests implementing various management strategies that involve indigenous communities through village administrative councils to protect medicinal plants that are at risk of extinction. The interaction between traditional knowledge and practices plays a crucial role in shaping plant populations in the realm of ecology. Innovative theories for sustainable resource conservation can arise from the fusion of indigenous knowledge with its application in scientific inquiry. All these plants necessitate comprehensive assessment through phyto and pharmaco investigations to reveal their potential as therapeutic agents. This study seeks to provide new insights into the traditional healthcare system and will aid

professionals and the pharmaceutical industry in investigating further uses of plants that may enhance modern healthcare practices. The present investigation indicates that the collection of medicinal plants via destructive techniques, including the gathering of leaves (26%), roots (15%), whole plants (15%), and fruit (15%), is alarmingly prevalent, presenting considerable threats to the survival of these species in their natural environments. The significant decline of species in the region is linked to human-induced stress on forests and the unregulated harvesting of medicinal plants for commercial purposes. It is essential to take suitable measures for protecting and maintaining the medicinal plants in the local ecosystem to ensure their sustainable use in future. Facilitating commercial cultivation through the provision of essential training and financial support to individuals is a crucial approach to addressing the increasing demand in the medicinal plants' market. The cultivation of high-value medicinal plants by farmers has the potential to improve their economic circumstances, while also playing a crucial role in the conservation of endangered species.

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