

Ethnobotanical study and quantitative analysis of medicinal plants used by the people of Kargil district, UT Ladakh India.

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KEYWORDS

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ABSTRACT

Introduction: The study conducted in the Kargil district of UT Ladakh shed light on the invaluable ethnomedicinal practices deeply rooted within indigenous communities. The present research endeavors to document the ethnomedicinal practices of Kargil district. It is also to establish a baseline data in continuing studies aimed at detailed investigation on active principles of indigenous medicinal plants.

Methods: Over the course of May 2020 to October 2022, an exhaustive compilation of ethnomedicinal data was conducted across many villages using semi-structured interviews, guided fieldwork. The quantitative analysis involved calculating the Informant Consensus Factor (Fic), and Use value (UV) to assess the significance of each medicinal plant and recognize its acceptance.

Results: The study identified 149 medicinal plant species from 44 families and 107 genera used to treat around 60 ailments. The focus was notably on stomach-related issues, with 41 species, including 14 for gastrointestinal disorders and 9 for female genital disorders. High informant consensus (Fic > 0.85) was observed for blood purification, diarrhea, and jaundice, while poisoning had the lowest consensus (Fic = 0.61). Use value (UV) calculations ranged from 0.02 to 0.56, with *Carum carvi* having the highest UV (0.56) and *Gentiana squarrosa* the lowest (0.02).

Conclusion: The study area showcased a considerable repository of plant resources, indicative of the profound indigenous knowledge possessed by local inhabitants concerning medicinal plant application, but insufficient documentation and threats to conservation threaten these species. Scientific validation of high Fic and UV plants can protect this cultural legacy and aid novel drug development.

Introduction

Ladakh, a high-altitude cold desert in the Indian Trans-Himalaya, is a repository of valuable plant species and traditional knowledge systems. Traditional medicine has a long history of serving people worldwide. Plants with beneficial and medicinal properties have been utilized in various forms, even by primitive people. Human societies living in high-altitude areas have remained isolated due to poor accessibility and harsh climatic and geographical conditions over the centuries. This isolation has shaped their unique art, culture, and therapeutic traditions.¹

The traditional medicine system in Ladakh, known as the 'Amchi system of medicine,' is an adaptation of Tibetan traditional medicine.² This system shares similarities with the Unani (Greek) and Ayurvedic (Indian) systems of medicine. The diverse ethnic groups inhabiting the remote and isolated valleys of Ladakh provide significant opportunities for ethnobotanical studies. Indigenous knowledge systems and traditional survival strategies are integral to the mountain perspective but are not adequately valued in the march towards modernization.³

Over time, humans have relied on nature for survival and food, leading to the discovery of natural cures for common illnesses. This reliance fostered the growth of traditional knowledge and the establishment of traditional healthcare systems, now recognized as an additional medical specialty. Traditional herbal practices are prevalent worldwide, and due to their superior quality, safety, biocompatibility, and efficacy compared to synthetic pharmaceuticals, the demand for their services is increasing daily.^{4,5} Numerous herbal medicines have been used safely and extensively in India's officially recognized alternative health systems, including Ayurveda, Yoga, Unani, Siddha, Homoeopathy, and Naturopathy.⁶

Residents of rural regions are well-versed in the use of plants and prefer medicinal plants due to their availability and affordability compared to prescription drugs. Through traditional experiences, residents in isolated locations have learned about the medicinal properties of plants for treating specific ailments.^{7,8} Numerous global

investigations on the medicinal use of plants among diverse indigenous people have been conducted.⁹ Ladakh boasts a wealth of knowledge about medicinal and wild food plants,¹⁰ but not much research has documented the traditional knowledge of wild plant species that may be useful for discovering new medicinal sources. Due to its distinct topographic, physiographic, and climatic conditions, Ladakh's vegetation generally falls into the sub-alpine, alpine, and high alpine zones.¹¹ While several writers have extensively studied Ladakh ethnobotanically, their research has often been limited to specific ethnic communities. The Kargil district, which has the most floristic variety in Ladakh, remains the least researched area with minimal quantitative studies conducted so far.¹² The proposed research work, conducted locally, is expected to address many local issues and benefit Amchis or local traditional healers. Species with high medicinal value may be widely used by Ayurvedic or Unani practitioners, addressing some national-level problems. Pharmacological tests of these important medicinal plants could lead to novel drug discoveries in the near future. The proposed research may contribute new ideas to the existing knowledge of ethnobotany. While extensive research has been conducted in areas like Nubra, Changthang, and some localities of Leh district, with published research papers, no extensive studies have been done in the Kargil district except for Zaskar Tehsil. Thus, a wide area remains open for exploring new communities in the ethnobotany of the Kargil area.

Materials and methods

Study area

Originating from the words "khar," which means castle, and "rkhil," which means centre, Kargil refers to a resting spot situated between forts. It is situated at an equal distance from the capital cities of Kashmir, Ladakh, and Baltistan, respectively, Srinagar, Leh, and Skardo. After being established in 1979, Kargil broke away from Leh to become its own district. It was granted membership in the Ladakh Autonomous Hill Development Council (LAHDC) in 2003. Of the 30 councilors, 26 were elected and 4 were nominated. On October 31, 2019, a significant development took place when the Indian Parliament passed the J&K Reorganization Act 2019, including Kargil into the newly created union region of Ladakh. According to the District Statistical & Evaluation Office Kargil's Statistical Handbook of Kargil, 2018–19, the Kargil District in Ladakh U.T. now has 127 villages, 5 subdivisions, 7 tehsils, and 15 administrative blocks. The 14,086 square kilometer Kargil district is located between latitudes 32°15 to 34°56N and longitudes 75°35 to 76°57E. Its boundaries are shared by Kashmir to the west, Pakistan to the north, and the Leh district to the east. Many areas of the Kargil district in Ladakh, UT, from Zojila-pass to Zaskar, were the subject of extensive field studies. The surveys were conducted diligently from May 2020 to October 2022.

Because Kargil is tucked away in the rain shadow of the Himalayas, it receives very little precipitation overall, mostly snow and very little rainfall. Its chilly, temperate climate is characterised by extremes: lengthy, bitterly cold winters that drop as low as -34°C, and pleasant summers that peak at 35°C. Known for their bone-chilling cold, Drass and Zaskar experience jaw-dropping lows of -45 to -55°C. The landscape of Kargil, which covers 14,086 square kilometres, is characterised by shallow, sandy-loamy soil that is devoid of organic matter and is prone to erosion. The hard circumstances mean that the growth season is short. The scant natural vegetation is mostly found in alpine and high alpine zones, where dwarf shrubs, bushes, and an abundance of annual and perennial plants may be found. The steep slopes and meadows display an amazing variety of cold desert flowers despite the difficulties. The area's thin atmosphere makes it vulnerable to strong winds and UV radiation, which exacerbates the region's delicate ecology.

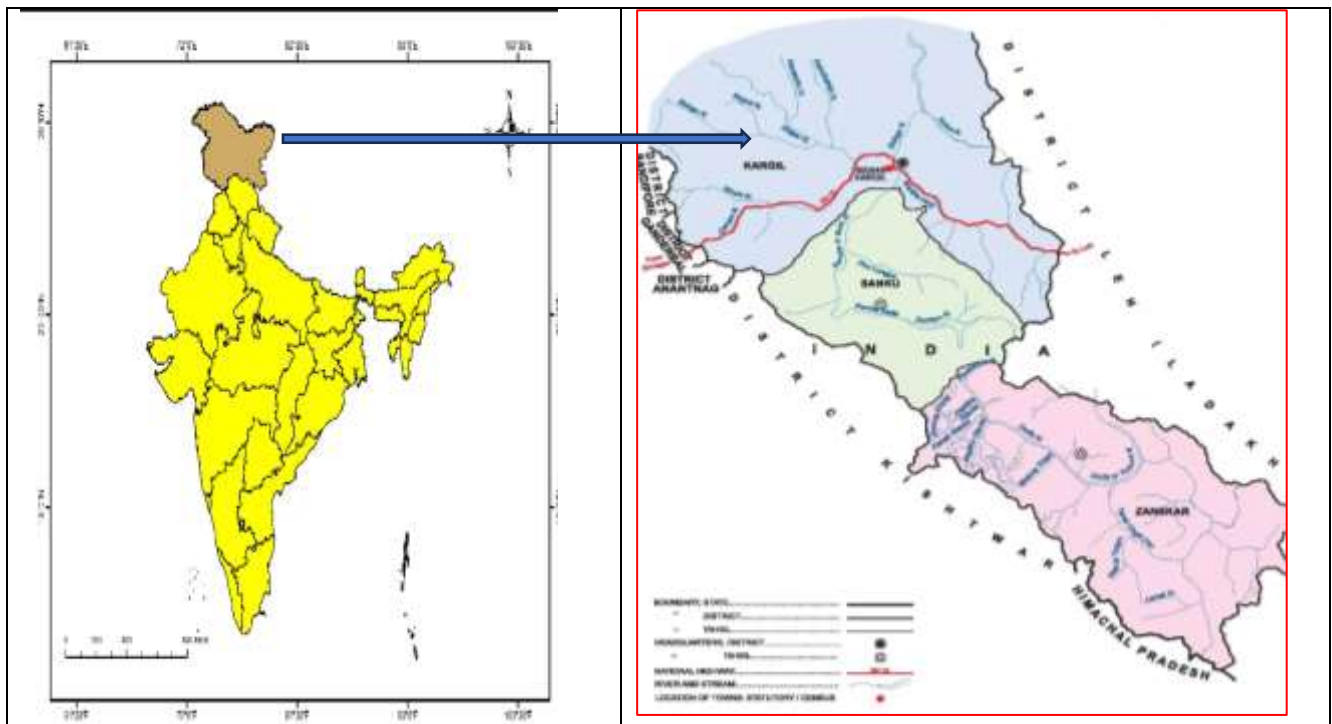


Figure 1: Map of the study area

Socio-economic conditions of the area

The Kargil district is home to 140,802 people overall, 77,785 of them are men and 63,017 of whom are women, according to the 2011 census. Of these, 16,338 are considered urban dwellers while 124,464 are classed as rural folks. There are 127 villages where people live, and one statutory town has the majority of the urban population. Ten people per square kilometre make up the district's population, and there are 810 females for every thousand men. Out of the entire population, 122,336 people, or 86.88% of the district's residents—62,652 men and 59,684 women—are recognised as scheduled tribal members. 86,236 people in the Kargil district were literate as per the 2011 Census, making about 81% of the total population. Out of them, 73,896 people live in rural regions and 12,340 people live in metropolitan areas. In the district, the rates of literacy for men and women are 56,301 and 29,935, respectively. In the Kargil district, Islam is the most common religion, with around 77% of the population practicing it. There are communities that practise Buddhism, Christianity, Sikhism, Jainism, and other religions in addition to Islam.

Field interviews, Collection, identification and deposition of medicinal plants

Ethnomedicinal surveys were conducted from May 2020 and October 2022 in important regions of Kargil including Aryan-valley, Drass, Shargole, Shakar-chiktan, Suru, Rangdum, Zaskar. A total of around 203 locals including Amchis, educated youths, men and women were informants for the study. The ethnomedicinal data were collected by interviewing the informants through open and semi-structured questionnaire and field survey.^{13,14} Only those informants were chosen who gave prior consent for participation. Code of ethics as set by the international society of ethnobiology (2008), were carefully followed for the present study. The primary focus of the questionnaire was on the traditional beliefs and ethnobotanical claims made by the local populations and adjacent individuals. Since the first author is a native of the area, the interviews were done in Local language (Bhoti). Each informant was required to provide the local name, disease cured, plant part(s) used, method of preparation, and administration. To validate the traditional usage of these plants, a thorough review of pertinent literature¹³ was conducted. During field exploration voucher specimen were properly collected under the guidance of Amchi and local users. Following prescribed herbarium procedures advocated by Jain and Rao.¹⁵ (Jain 1977) as well as Seshagirirao,¹⁶ the collected plant specimens were meticulously dried, stored, and processed. These voucher specimens were then included in the KASH herbarium, housed within the Center for Biodiversity and Taxonomy, Botany department University of Kashmir, a sample of which is depicted in table IV. All the collected specimen were identified by the authors with the help of Scientists at KASH herbarium,

University of Kashmir. The world flora online (www.worldfloraonline.org) was followed for correct nomenclature of the collected species.

Data Analysis

The current study conducted the quantitative analysis of the medicinal flora in the Kargil district, including the assessment of Relative Frequency of Citation (Fic), and Use Value (UV), which are the most popular indices in quantitative ethnobotany based on “informant consensus”.¹⁷ It was calculated based on the citations provided by the respondents for each species. Two important indices were calculated including Informant consensus factor (Fic) and Use value (UV).

Informant Consensus Factor

It is calculated for an ailment category. Informant consensus factor (Fic) technique was developed initially by Trotter and Logan, (1986) to test the consistency of informant knowledge regarding plants in treating a particular illness category. It reveals the degree of agreement among the different people interviewed concerning the use of a given resource.¹⁷ Fic value illustrates the cultural coherence of the selection of a set of plants deployed for certain category of uses. This method works well when the researcher is less familiar with the community; less subjective and hence suitable for statistical analysis.¹⁸ It is calculated by:

$$Fic = \frac{Nur - Nt}{(Nt - 1)}$$

Where Nur is the number of use-reports of informants for a particular illness category and Nt refers to the number of species used for the illness category by all informants. Fic values range from 0 to 1. A value close to one indicates a high intra cultural consensus (i.e., most informants use the same species for treatment of the same illnesses).¹⁹ A value close to zero indicates a high variation in the use of species (i.e., informants disagree over which species to use in the treatment within a category of illness.)

Use Value (UV)

Use Value methods simply counts the number of different uses reported for each plant to assign importance. The major objectives associated with such types of studies are to assess the importance of species in a community, the degree of decline of use of popular plants, importance of a species for an informant, the frequency of citation and occurrence of plants, the comparison of important plant groups, etc. Use value²⁰ gives an idea about which species are considered most important by a community. It is calculated using the formula:

$$UV = \frac{\sum US}{N}$$

UVs = Use Value for the species ‘S’.

$\sum US$ = Sum of the uses mentioned for a species ‘S’.

N = Total number of informants.

Informant Use Values are high when there are many use-reports for a plant, implying that the plant is important; it approaches zero when there are few reports related to its use

As per Phillips et al. (1994), the UV is calculated by following formula:

$$UV = \frac{\sum US}{N}$$

Where, “ $\sum US$ ” refers to the number of uses mentioned by the informants for a given species and “N” refers to the total number of informants interviewed. Here a total of 203 persons were interviewed. If a plant has a high UV value that indicates there are many use reports for that plant, while a low value means fewer use reports cited by the informants.

Results

Demographic characteristics of Respondents

A total of 203 people participated in the survey which comprises of different age groups- GP 1 (20-35); GP 2 (36-50) and GP 3 (50 above) with 29.1% (16) male and 70.9% (39) female in GP I, 45.8% (38) and 54.2% (45) in Gp II, 64.6% (42) male and 35.4% (23) female in Gp III respectively. field interview using questionnaire were conducted. The demography of the participants is as shown in the table below.

Table 1: Demography of the participants

AGE GROUP (IN YEARS)	MALE	FEMALE	TOTAL
GP 1 (20-35)	29.1% (16)	70.9% (39)	55 (27%)
GP 2 (36-50)	45.8% (38)	54.2% (45)	83 (40.8%)
GP 3 (50 ABOVE)	64.6% (42)	35.4% (23)	65 (32%)

Total flora

A total of 149 therapeutic plants from 44 families and 107 genera were identified. With 34 species, the Asteraceae family was the most prevalent among the 44 families. Lamiaceae and Ranunculaceae came in second and third, with 13 and 10 species, respectively. Six species were identified within the Fabaceae family, while the Polygonaceae and Scrophulariaceae families each had seven species. There were three families—the Apiaceae, Boraginaceae, and Gentianaceae—each containing five species. The remaining 25 families were divided into the following 5 categories, with 1–4 species totaling for each family, for a total of 65 species. In terms of genera, the three most prominent ones were *Pedicularis* under the Scrophulariaceae, *Nepeta* under the Lamiaceae, and *Artemisia* under the Asteraceae, each having five species. Table 5 summarizes the plant names, scientific names, family names, local names, and traditional applications.

Plant parts used

The part of the plant used were documented carefully. Analysis revealed that leaves accounted for the largest proportion (25%), followed by whole plant (24%), flower (16%), root (15%), stem (10%), seed (5%), fruit (3%), and bulb (1%) used as shown in the figure below

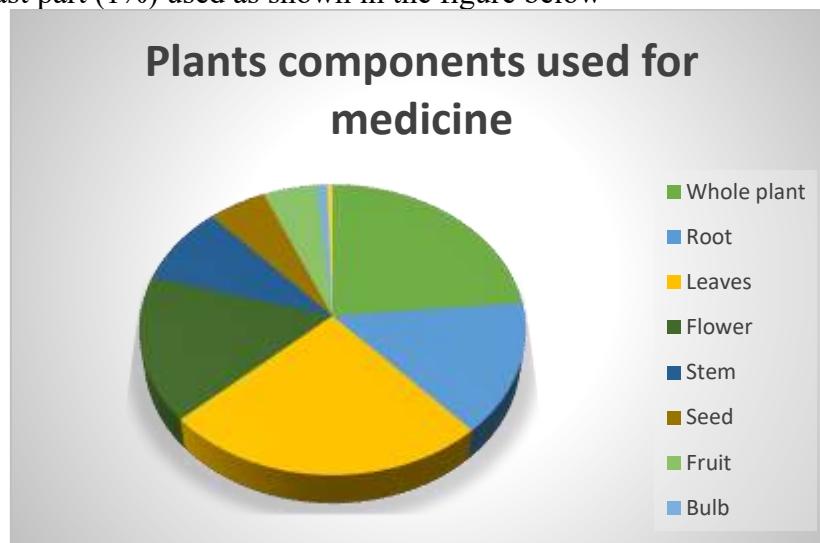


Figure 2: Pie chart showing the components used for medicine for all species.

Plant growth habit

The analysis of growth habits for the identified medicinal plants shows that the herbs (87%) constituted the highest proportion followed by shrubs (11%) and trees (1%). Climbers were the least represented.

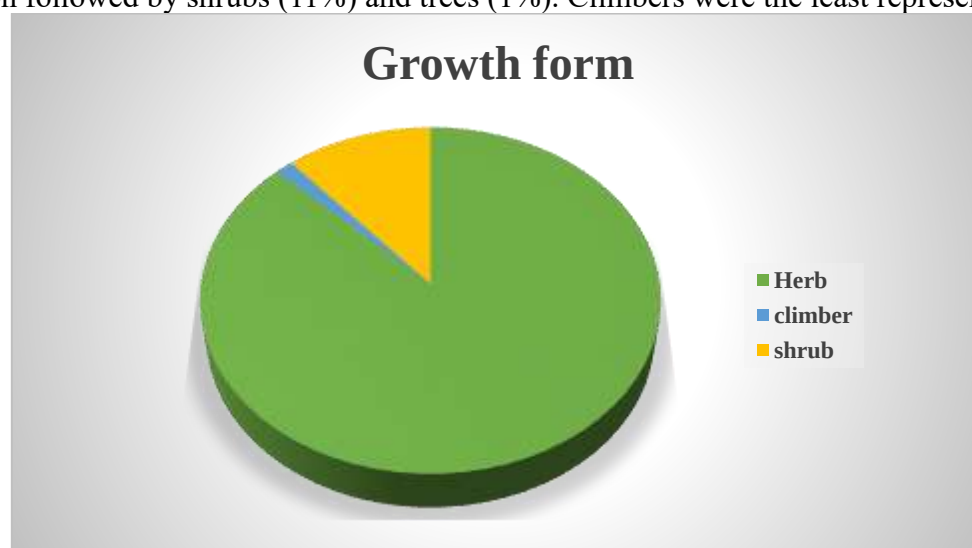


Figure 3: Pie chart showing the growth forms of medicinal plants collected

Administration method and form of administration

According to the survey, the most common forms of medicinal plants were decoction, juice, powder, and paste. Roasted, vapor, boiling, and in traditional meals that were categorized in other categories were fewer common formulas. A few types of plants were also consumed in chewable form. The most often utilized dose form was

discovered to be decoction (56), which was followed by powder (31), paste (23), other (15), juice (10), and raw form (3). It was also discovered that the oral route was the most effective. Figure 5 showed the dose form's diagrammatic depiction.

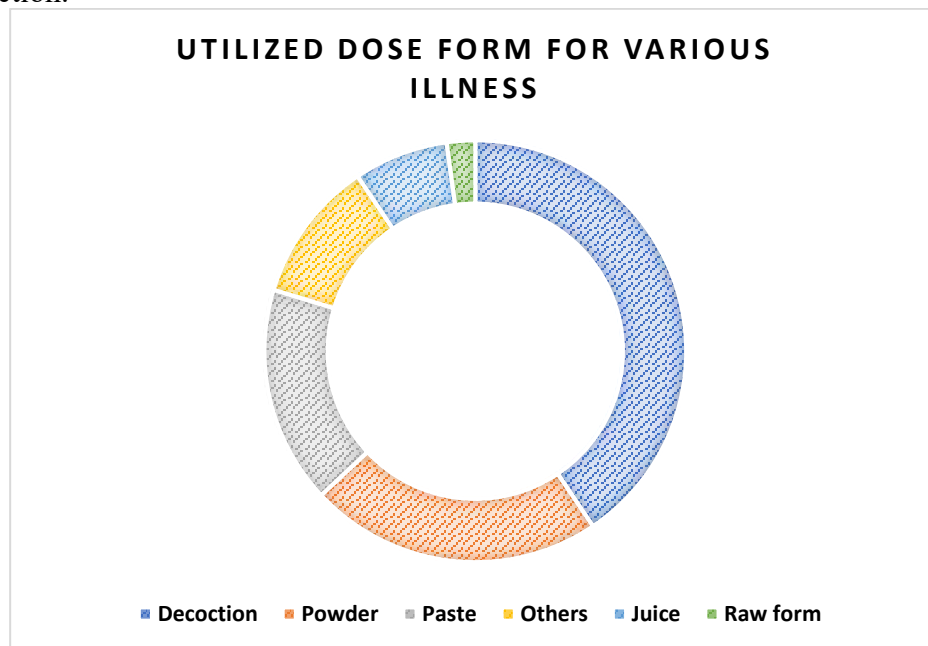


Figure 5: Dose form utilized for all reported categories of medicine

Quantitative analysis

Diseases and (Fic) value

Of the 149 species quoted, 37 diseases category with value higher than 0.6 were sorted and IFC for each disease category is calculated as in the table 2 to find the agreement among all the informants for the treatment of same disease. Prominent among them include blood purification, diarrhea, dysentery, dyspepsia, jaundice, lung infection and stomachache with Fic value higher than 0.85, indicating strong agreement among informants for use of specific plants in treating these ailments. On the other hand, poisoning category has the lowest Fic value of 0.61 depicted in the table 2.

Table 2: Calculation of Informant Consensus Factor (Fic)

Disease category	Total no of		Fic (Informant Consensus Factor)
	Species used Nt (No. of taxa used)	Citation Nur (No. of use report)	
Arthritis	4	11	.70
Asthma	11	61	.83
Improves Blood circulation	2	17	.88
Blood purification	12	68	.83
Blood pressure	4	18	.82
Cancer/tumor	4	20	.84
Cold	17	81	.8
Cough	18	78	.77
Constipation	5	20	.78
Diabetes	4	18	.82
Diarrhea	12	94	.88
Dysentery	9	59	.86
dyspepsia	8	83	.91
Diuretic	12	49	.77
Eye infection	9	35	.76
Fever	25	66	.63
Gums inflammation	2	7	.83
Headache	11	43	.76
Hair tonic	2	28	.96
Intestinal worms	6	27	.80
Jaundice	9	38	.86
Joint pain/ Rheumatism	20	95	.79
Kidney disorder	11	45	.77
Liver disease	15	77	.81
Lung infection	18	80	.86
Menstrual disorder	5	17	.75
Vomiting	4	19	.83
Nerve problem	6	19	.72
Poisoning	6	14	.61
Pneumonia	1	2	1
Peptic ulcer	9	42	.80
Throat disorder	5	23	.81
Stomachache	30	222	.86
Swellings	8	31	.76
Toothache	7	21	.7
Tonic	15	87	.83
Wound healing	24	73	.68

The calculated UV value ranges from .02 to .56. From the calculations, *Carum carvi* (.56) exhibited the highest value, followed by *Thymus linearis* (.38), *Mentha longifolia* (.36) and *Rheum speciforme* (.33). On the other hand *Gentiana squarrosa* (.02) has the lowest UV value.

Table 3: Calculation of Use Value

Species name	No. of uses mentioned by the informants(Σ US)	UV Value
<i>Aconitum heterophyllum</i>	53	.26
<i>Aconitum violaceum</i>	29	.14
<i>Corydalis gowaniana</i>	25	.12
<i>Lepidium latifolium</i>	22	.11
<i>Capparis spinosa</i>	38	.2
<i>Cicer microphyllum</i>	30	.15
<i>Rosa webbiana</i>	49	.24
<i>Bergenia stracheyi</i>	22	.11
<i>Rhodiola wallichiana</i>	23	.11
<i>Carum carvi</i>	113	.56
<i>Heracleum pinnatum</i>	24	.12
<i>Taraxacum officinale</i>	39	.19
<i>Codonopsis clematidea</i>	19	.09
<i>Arnebia euchroma</i>	81	.39
<i>Arnebia guttata</i>	18	.09
<i>Physiochliana praelta</i>	24	.12
<i>Thymus linearis</i>	78	.38
<i>Nepeta longibracteata</i>	54	.27
<i>Mentha longifolia</i>	74	.36
<i>Aconogonium tortusum</i>	42	.21
<i>Rheum speciforme</i>	66	.33
<i>Hippophae rhamnoides</i>	93	.46
<i>Urtica hyerborea</i>	40	.19
<i>Dactylorhiza hatagirae</i>	23	.11
<i>Allium prezwalskianum</i>	32	.16
<i>Ephedra gerardiana</i>	49	.24

Figure 4: photo of the plants and the herbarium sheets



Aquilegia fragrans



Aconitum rotundifolium



Aconitum heterophyllum



Aconitum violaceum



Aconitum chasemanthum



Delphinium brounonianum

Table 4: Comprehensive catalog of medicinal Plants identified in Kargil district Ladakh, India: their parts, local names, families, treated ailments, and mode of administration.

Botanical Name & Voucher specimen Number	Family	Local Name	Part Used	Uses	Mode of administration and preparation
<i>Chenopodium foliosum</i> Asch. 4464-KASH	Amaranthaceae	Sansti	Lf and Fl	Treat indigestion.	Decoction administered orally
<i>Allium humile</i> Kunth 8285-KASH	Amaryllidaceae	Skotse	Lf	Goitre, asthma, stomach ache.	Cooked and eaten; Fried leaf is topically applied.
<i>Allium oreoprasum</i> Schrenk 4477-KASH	Amaryllidaceae	Skotse	Bl	Antidiabetic, anticarcinogenic, antihypertensive, antiatherosclerosis.	Cooked/boiled and orally taken
<i>Allium przewalskianum</i> Regel 4498-KASH	Amaryllidaceae	Skotsse, Luk-sgok-pa	Bl	Headache, Dysentery stomach ache and wind diseases.	Boiled and administered orally; paste is applied topically.
<i>Bupleurum longicaule</i> Wall. & DC. 4441-KASH	Apiaceae	Sah-kukchak; zeera karmo	Wh Pl	Gastrointestinal disorders, renal colic, hepatitis, tonic, inflammation, colic, dysentery, diarrhea, and constipation.	Powder is taken orally.
<i>Carum carvi</i> L. 4424-KASH	Apiaceae	kosngyot	Sd	Gonorrhoea, chronic diarrhea, dyspepsia, indigestion.	Seeds orally taken with water
<i>Coriandrum sativum</i> L. 8256-KASH	Apiaceae	Ussu	Lf and Ft	Stomach problems, Indigestion, ophthalmic diseases, and lung disorders.	Decoction taken orally
<i>Heracleum pinnatum</i> C.B. Clarke 4418-KASH	Apiaceae	Spruma	Rt and sht	Boils, leprosy, inflammation, fever, abdominal cramps.	Paste applied topically, decoction orally taken.
<i>Pleurospermum candollei</i> (Wall. ex DC.) Benth. 4450-KASH	Apiaceae	Supka	Ft	Renal pain, dyspepsia, stomach-ache.	Decoction orally administered.
<i>Prangos pabularia</i> Lindl. 4505-KASH	Apiaceae	Prangos	Ft	Body ache, Diuretic, stomach-ache, gynaecological disorders, diarrhea, rheumatism; laxatives, menstrual cycle regulation.	Boiled and taken orally. Paste topically applied.
<i>Achillea millefolium</i> L. 8258-KASH	Asteraceae	Chuang	Wh Pl	Urinary problems, inflamed gums, tonic, burns, and bruises.	Boiled and administered orally

<i>Anaphalis nubigena</i> DC. 4513-KASH	Asteraceae	Phulu mentok/Spr -rgod	Fl	Wounds and genital problems.	Paste topically applied
<i>Anaphalis virgata</i> Thomson 4519-KASH	Asteraceae	Sinsula	Wh Pl	High blood pressure, heart pains, fever, breathing troubles.	Decoction orally administered
<i>Arctium lappa</i> L. 4466-KASH	Asteraceae	Pizums	Rt, Sd and Lf	Burning urination, nerve disorders, uterus tumours, urinary bladder cysts, and anti-cancer activity.	Paste is topically applied and decoction administered orally
<i>Artemisia desertorum</i> Spreng. 4305-KASH	Asteraceae	Khamlol	Lf and Fl	Intestinal worms, antimicrobial properties, urinary tract issues and kidney pain.	Decoction administered orally
<i>Artemisia gmelinii</i> Web. ex Stechm 8302-KASH	Asteraceae	Khampa shridi	Lf and Fl	Cold, cough, abdominal pain, headache.	Decoction is administered orally
<i>Artemisia tournefortiana</i> Rchb. 4569-KASH	Asteraceae	Khampa- nakpo	Lf and Bd	Intestinal worms.	Boiled and taken orally
<i>Artemisia sieversiana</i> Ehrh. ex Willd. 4525-KASH	Asteraceae	Tshar- bong, khampu	Lf and Fl	Intestinal worms, antimicrobial activity, urinary tract issues and kidney pain.	Decoction administered orally
<i>Artemisia stracheyii</i> Hook.f. & Thomson ex C.B.Clarke 4436-KASH	Asteraceae	Rumonlo	Lf and Fl	Toothache treatment.	Decoction administered orally
<i>Aster flaccidus</i> Bunge 4439-KASH	Asteraceae	Lugmig chunwa	Lf and Fl	Malarial fever, lung infections, eye disorder.	Decoction is orally taken
<i>Calendula officinalis</i> L. 4484-KASH	Asteraceae	Hattu	Fl and Lf	Abscesses of eyelids, pneumonia.	Decoction orally taken, paste applied topically.
<i>Carduus edelbergii</i> Rech.f. 4508-KASH	Asteraceae	Tser	Fl	Blood purifier.	Decoction is administered orally
<i>Cremanthodium decaisnei</i> C.B.Clarke 4451-KASH	Asteraceae	Luku- mentok	Wh Pl	Body ache, sedative, fever treatment.	Powder taken orally
<i>Cremanthodium ellisii</i> (Hook.f.) Kitam. 8290-KASH	Asteraceae	Ming-chen- serpo	Wh Pl	Analgesic properties, contagious diseases, painkiller.	Powder taken orally

<i>Crepis flexousa</i> (Ledeb.) Benth. ex C.B. Clarke 4455-KASH	Asteraceae	Remang	Lf	Muscular pain.	Decoction is administered orally
<i>Echinops cornigerus</i> DC. 8271-KASH	Asteraceae	Aczema	Rt, Lf and Sd	Septic wounds, Jaundice, skin eruptions.	Paste is topically applied and decoction administered orally
<i>Erigeron multiradiatus</i> (Lindl. ex DC.) Benth. & Hook.f. 8311-KASH	Asteraceae	Lukmik	Lf	Burning sensation in the stomach.	Decoction is administered orally
<i>Inula obtusifolia</i> A. Kern. 4444 -KASH	Asteraceae	Rupmuk	Lf	Internal wounds, rheumatoid arthritis, larynx and gastrointestinal infections.	Decoction orally taken.
<i>Inula rhizocephala</i> Schrenk ex Fisch. & C.A.Mey 4539-KASH	Asteraceae	Riamko	Rt	Cold, cough, chest pain.	Decoction orally administered
<i>Jurinea ceratocarpa</i> Benth. & Hook.f. 4501-KASH	Asteraceae	Pashakha/C hholmong	Lf	Asthma, Tuberculosis and bronchitis, eye complaints, back ache.	Decoction administered orally
<i>Lactuca dissecta</i> D.Don. 4566-KASH	Asteraceae	Spang tsa	St and Lf	External genital organ infection in females.	Paste is topically applied.
<i>Lactuca lassertiana</i> (DC.) C. B. Clarke 4445-KASH	Asteraceae	Chumaseo/ Thaakman	Wh Pl	Skin diseases.	Paste is topically applied.
<i>Leontopodium ochroleucum</i> Beauverd 4444 -KASH	Asteraceae	Palu	Fl	Cough, fever, Wound treatment.	Decoction orally taken.
<i>Richteria pyrethroides</i> Kar. & Kir. 4497-KASH	Asteraceae	Serpan	Fl	Rheumatism, high fever treatment.	Powder taken orally.
<i>Saussurea costus</i> (Falc.) Lipsch. 4440-KASH	Asteraceae	Spangtsee Jarbaak	Lf and Fl	Gastric problems, dysentery, Lung infections, jaundice.	Decoction and powder orally administered, paste applied topically.
<i>Saussurea jacea</i> (Kl.) C.B. Clarke 4470-KASH	Asteraceae	Pashuk	Sht	Diuretic, stomach-ache.	Boiled and taken orally.

<i>Saussura nepalensis</i> Spreng. 8275-KASH	Asteraceae	Konpa-gyab-skes	Wh Pl	Blood-related problems.	Powder taken orally
<i>Saussurea schultzii</i> Hook.f. 4440-KASH	Asteraceae	Spangtsee Jarbaak	Lf and Fl	Boils, cough, fever, Lung infections, jaundice.	Decoction is administered orally, paste applied topically.
<i>Scorzonera virgata</i> DC. 8256-KASH	Asteraceae	Omazilli/Rt sa-mrikhs	Sht	Intestinal problems.	Decoction administered orally
<i>Tanacetum dolichophyllum</i> (Kitam.) Kitam. 4402-KASH	Asteraceae	Gorgu	Fl and Ft	Wounds, lung disorders, cancer, renal diseases.	Decoction administered orally
<i>Tanacetum gracile</i> Hook. f. & Thomson 8287-KASH	Asteraceae	Khamchu	Lf and Fl	Intestinal worms.	Boiled and taken orally
<i>Tanacetum tibeticum</i> Hook.f. & Thomson ex C.B.Clarke 4457-KASH	Asteraceae	Khamchu	Lf and Fl	Intestinal worms, febrifuge properties.	Decoction administered orally
<i>Taraxacum officinale</i> F.H.Wigg. 4416-KASH	Asteraceae	Khurmang	Wh Pl	Febrifuge, analgesic, diuretic, tonic, and blood purifier.	Powdered/ boiled and taken orally
<i>Waldheimia glabra</i> Decne. Regel 4550-KASH	Asteraceae	Sa-Palu	Wh Pl	Septic wounds.	Paste topically applied.
<i>Impatiens sulcata</i> Wall 4518-KASH	Balsaminaceae	Perennial	Sd	Urticaria, abortifacient, eczema, pimples.	Paste topically applied.
<i>Podophyllum hexandrum</i> Royle 4463-KASH	Berberidaceae	Demokushu	Wh Pl	Gynaecological disorders, menstrual problems, blood circulation improvement, constipation, childbirth aid, cancer, skin issues.	Decoction administered orally
<i>Arnebia euchroma</i> I.M.Johnst. 4408-KASH	Boraginaceae	Demok (Dremog)	Rt, Lf	Lung disorder, blood purification, cold and cough, wounds, cuts, hair tonic.	Paste topically applied; Decoction taken orally; Root extract in oil is applied on hair
<i>Arnebia guttata</i> Bunge. 4532-KASH	Boraginaceae	Demok	Rt	Blood purification, Baldness, hair tonic, lung disorder.	Paste topically applied; Decoction taken orally;

					Root extract in oil is applied on hair
<i>Cynoglossum wallichii</i> G.Don 8293-KASH	Boraginaceae	Spang-ngon	Wh Pl	Vomiting treatment.	Cooked and decoction administered orally
<i>Eritrichium canum</i> (Benth.) Kitam. 8257-KASH	Boraginaceae	Changser/Tukse	Wh Pl	Facilitates childbirth.	Decoction is administered orally
<i>Lindelofia anchusoides</i> (Lindl.) Lehm. 4489-KASH	Boraginaceae	Makpen/Shapur	Lf	Boils, hypertension, swellings.	Paste is topically applied.
<i>Capsella bursa-pastoris</i> Medik. 4420-KASH	Brassicaceae	Sogka pa	Wh Pl	Kidney disorders, lung, nerve disorders, diuretic.	Cooked and decoction is taken orally.
<i>Lepidium capitatum</i> Hook.f. & Thomson 4420 -KASH	Brassicaceae	Taga	Wh Pl	Bone fractures, bleeding.	Boiled and taken orally; powder is topically applied. Pasted lk thst
<i>Lepidium latifolium</i> L. 4426-KASH	Brassicaceae	Shang-sho	Wh Pl	Kidney hemorrhage, stomach ache, diabetes, rheumatism.	Cooked and decoction orally taken.
<i>Codonopsis clematidea</i> C.B.Clarke 4421-KASH	Campanulaceae	Brkutung	Sd	Stomach ulcer, liver disorder, chest conjunction, rheumatism, nerve disorder, skin boils, Leprosy.	Decoction and powder is taken orally; paste is applied topically.
<i>Capparis spinosa</i> Linn. 4575-KASH	Capparidaceae	Kappa	Wh Pl	Hepatitis, liver cirrhosis, liver infections, rheumatism, epilepsy, stomachache, hyperacidity.	Boiled and taken orally; powder is topically applied.
<i>Lonicera microphylla</i> Willd. ex Schult. 4490-KASH	Caprifoliaceae	Phang-ma	Fl and Bry	Asthma, fever, Gynaecological disorder and headache.	Decoction orally administered.
<i>Morina coulterina</i> Royle. 8269-KASH	Caprifoliaceae	Kare	Rt	Eye complaints, worm infestation.	Paste is topically applied and decoction administered orally
<i>Silene himalayensis</i> (Edgew.) Majumdar 4465-KASH	Caryophyllaceae	Pipisha/Sukpa-lak-sug	Rt, Lf and Fl	Wound wash, mental disorder.	Boiled and taken orally.

<i>Silene vulgaris</i> (Moench) Garcke 4459-KASH	Caryophyllaceae	Ra sug	Wh Pl	Skin diseases, diuretic, cleaner, ophthalmia, constipation, intestinal pain, antidote in poisoning.	Cooked and decoction is orally administered.
<i>Convolvulus arvensis</i> L. 4468-KASH	Convolvulaceae	Tik-tik mo	Wh Pl	Cataract, cuts, wounds, rheumatic pain.	Paste topically applied and decoction taken orally
<i>Rhodiola tibetica</i> (Hook.f.&Thom.) Fu 4446-KASH	Crassulaceae	Rholo-Marpo	Wh Pl	Urogenital disorders, expectorant, health tonic, headache, laxative.	Cooked and decoction is orally administered.
<i>Rhodiola wallichiana</i> (Hook.) Fu 4445-KASH	Crassulaceae	Shrolo karmo	Rt and Sht	Lung disorders, health tonic, restore memory.	Cooked and decoction is orally administered.
<i>Sedum ewersii</i> Ledeb. 4514-KASH	Crassulaceae	Shurupa	Wh Pl	Wounds, dysentery.	Boiled and taken orally.
<i>Juniperus macropoda</i> Boiss. 8266-KASH	Cupressaceae	Shukpa	Ft	Urinary/kidney disorders, controls urine discharge, cardiac problem.	Decoction orally taken
<i>Cuscuta reflexa</i> Roxb. 4429-KASH	Cuscutaceae	Teekta-stanzin	Wh Pl	Migraine, genealogical disorder.	Powder orally administered
<i>Hippophae rhamnoides</i> L. 4544-KASH	Elaeagnaceae	Tsesta-lulu	Wh Pl	Blood purifier, peptic ulcer, tonic, lung disorders, diabetes, cancer, ulcers, joint pain.	Decoction leaf and fruit is administered orally; fruit juice extract is taken orally.
<i>Ephedra gerardiana</i> Wall. ex Klotzsch & Garcke 4435-KASH	Ephedraceae	Tsepad	Wh Pl	Bleeding, hepatic disorder, rheumatism, bronchial asthma, menstrual irregularities.	Decoction and powder orally taken, paste is topically applied and medicinal bath.
<i>Ephedra regeliana</i> Florin 4567-KASH	Ephedraceae	Tsepad	Wh Pl	Bleeding, hepatic disorder, fever, rheumatism, bronchial asthma.	Decoction is administered orally
<i>Equisetum arvense</i> L. 4509-KASH	Equisetaceae	Dgu-rtsak	Sht	Genitourinary diseases, haemorrhage, hepatitis, prostatitis, ulcers, wound healing, musculoskeletal diseases, profuse menstruation, strengthens bones.	Decoction orally taken
<i>Rhododendron anthopogon</i> D.Don 4411-KASH	Ericaceae	Palu	Lf and Fl	Diphtheria, chest pain, lungs fever, bronchitis, dermatological disorder, expectorant.	Decoction administered orally

<i>Euphorbia tibetica</i> Boiss. 4543-KASH	Euphorbiaceae	Tharnu/Ke kchua	Rt	Anti-inflammatory and purgative properties.	Powder is taken orally
<i>Astragalus nivalis</i> Kar. & Kir. 4456-KASH	Fabaceae	Rhadkar	Rt	Blood purification.	Decoction orally taken
<i>Astragalus tecti-mundi</i> Freyn 4527-KASH	Fabaceae	Sarma	Wh Pl	Skin diseases.	Paste topically applied.
<i>Chesneya cuneata</i> (Benth.) Ali 4486-KASH	Fabaceae	Tata kanou	Rt and Ft	Skin infections.	Paste is applied topically
<i>Cicer microphyllum</i> Royle ex Benth. 4564-KASH	Fabaceae	Seri	Lf and sd	Jaundice, tongue infection, blood purification.	Raw, cooked and boiled and administered orally.
<i>Oxytropis densa</i> Benth. ex Bunge 4483-KASH	Fabaceae	Tsag sha karmo	Lf	Stop bleeding, infectious fever, treat wounds, swellings.	Decoction orally taken; paste topically applied
<i>Oxytropis microphylla</i> (Palls.) DC. 8263-KASH	Fabaceae	Rechakpa/ Stag sha	Lf	Treats wounds, nerve channel, bleeding, swelling, fever, and meat poisoning antidote.	Decoction is orally administered
<i>Gentiana squarrosa</i> Ledeb 4423-KASH.	Gentianaceae	Tikta	Rt	Diuretic, sedative.	Powder is taken orally with water
<i>Swertia petiolata</i> D.Don 4526-KASH	Gentianaceae	Tikta	Wh Pl	Fever, headache, body ache.	Decoction is orally administered.
<i>Gentiana tianschanica</i> Rupr. 4529-KASH	Gentianaceae	Bara-Tikta	Wh Pl	Gastro-related disorders.	Administered orally with local alcoholic drink (Chhang)
<i>Gentianopsis paludosa</i> (Hook.f.) Ma 4487-KASH	Gentianaceae	Teekta	Lf and Fl	Blood purifier, throat ache, fever, Jaundice treatment.	Powder is taken orally with water
<i>Lomatogonium caeruleum</i> (Royle) Harry Sm. ex B.L.Burt 4409-KASH	Gentianaceae	Serchen ngonpo/	Rt	Diuretic.	Decoction administered orally
<i>Biebersteinia odora</i> Stephen ex. Fischer 4556-KASH	Geraniaceae	Lchatsa/ Drakspos	Wh Pl	Ulcers, wounds, urinogenital disorders, stomach ache, antiseptic, blood purification.	Powder is topically applied and decoction is taken orally

<i>Geranium himalayense</i> Klotzsch 4419-KASH	Geraniaceae	Forlo	Rt	Gynecological disorder, genito-urinary disorder, poisoning problems.	Decoction orally taken
<i>Ribes orientale</i> Desf. 4482-KASH	Grossulariaceae	Askuta	Rt, lf , St and Fr.	Joint pain, diuretic.	Raw fruit orally taken.
<i>Dracocephalum heterophyllum</i> Benth. 8284-KASH	Lamiaceae	Zinker	Lf and Fl	Cough and headache treatment, hypertension, eye ailment.	Decoction orally administered.
<i>Mentha longifolia</i> L. 4493-KASH	Lamiaceae	Phololing	Wh Pl	Dysentery, antiseptic, diarrhea, vomiting, stomach-ache, stomach-related disorders.	Paste is mixed with salt, garlic and consumed orally
<i>Nepeta discolor</i> Royle ex Benth. 4433-KASH	Lamiaceae	Nyomalo	Lf	Cold and cough, Fever,	Decoction is administered orally
<i>Nepeta floccosa</i> Benth. 4515-KASH	Lamiaceae	Shamalolo	Lf	Cold and cough, fever.	Decoction is administered orally
<i>Nepeta glutinosa</i> Benth. 8278-KASH	Lamiaceae	Gimanko	Lf and Fl	Diarrhea, stomach-ache.	Decoction is administered orally
<i>Nepeta leucolaena</i> Benth. ex Hook.f.	Lamiaceae	Zatuk pa	Wh Pl	Nerve tonic, skin diseases.	Decoction is administered orally
<i>Nepeta longibracteata</i> Benth. 4549-KASH	Lamiaceae	Spiang-kuru	Wh Pl	Cold and cough, kidney ailment, liver disorder, headache, sore throat, blood purifier, body ache, Stomach ache.	Decoction is administered orally
<i>Perovskia abrotanoides</i> Kar. 4491-KASH	Lamiaceae	Skiling	Lf	Painful urination, stool, stomach-ache.	Decoction is orally administered.
<i>Scutellaria heydei</i> Hook. f. 4459-KASH	Lamiaceae	Yakima	Wh Pl	Pus treatment, Joint pain, Fever.	Paste applied topically; powder taken orally
<i>Stachys tibetica</i> Vatke 8267-KASH	Lamiaceae	Yakzes	Wh Pl	Mental disorders.	Decoction is administered orally
<i>Thymus linearis</i> Benth. 4412-KASH	Lamiaceae	Mahse/Tu mbarak	Wh Pl	Cold and cough, cramps, postpartum bleeding, Liver complaints, stomach ache, intestinal disorder.	Cooked and decoction administered orally.
<i>Epilobium angustifolium</i> L. 8261-KASH	Onagraceae	Utpal-wangmo	Sht	Renal complaints, arthritis, stomach-ache, pimples.	Decoction is orally administered

<i>Epilobium latifolium</i> L. 4434-KASH	Onagraceae	Utpal wanmo	Fl	Edema, Stomach ache, Arthritis, Renal pain.	Decoction is orally administered
<i>Orobanche cernua</i> Loebl. 4488-KASH	Orobanchaceae	Gro-shang-rtse	Wh Pl	Swelling, boosts immunity.	Decoction and powder orally taken, paste is topically applied.
<i>Dactylorhiza hatagirea</i> (D.Don) Soo 4491-KASH	Orchidaceae	Ambolakpa	Tbr and Rt	Kidney/urinary problems, diarrhea, Round worm, weakness of the nervous system.	Powdered, soaked overnight and administered orally. Root extract is administered orally.
<i>Corydalis flabellate</i> Edgew. 8254-KASH	Papaveraceae	Lepum	Lf	Bleeding, liver, gall bladder disorders, blood purifier.	Decoction is administered orally
<i>Corydalis govaniana</i> Wall. 4454-KASH	Papavaraceae	Stongzil	Rt and Lf	Diuretic, antipyretic, febrifuge, back pain, constipation, liver disorder, gastric issues, purify impure blood.	Decoction is taken orally and paste is applied topically.
<i>Corydalis moorcroftiana</i> Wall. ex Hook.f. & Thomson 4452-KASH	Papavaraceae	Stongzil	sht (Fl and Lf)	Back pain, kidney disorders, bone swelling and pain.	Powder is orally administered
<i>Meconopsis aculeata</i> Royle 4401-KASH	Papavaraceae	Achak tsernon	Wh Pl	Lung disorder, ulcer, backache, spinal cord disorder, gastric discomforts.	Boiled and administered orally
<i>Parnassia nubicola</i> Wallich ex Royle 8280-KASH	Parnassiaceae	Nyul-tik	St, Lf and Fl	Minimize side effects of wrong medication, low blood pressure, gastric problems.	Decoction orally taken
<i>Plantago depressa</i> Willd. 4474-KASH	Plantaginaceae	Tharam	Wh Pl	Cold, cough, fever, bleeding, diarrhea, dysentery and inflammation.	Boiled and taken orally.
<i>Acantholimon lycopodioides</i> (Girard) Boiss. 4572-KASH	Plumbaginaceae	Longze	Wh Pl	Cardiac disorder.	Powdered form is taken orally
<i>Aconogonum tortuosum</i> (D. Don) H. Hara 4413-KASH	Polygonaceae	Ngyalo	Rt, St, Lf	Respiratory disorders, ENT problems, urinary disorder, dysentery, diarrhoea.	Decoction administered orally
<i>Bistorta affinis</i> (D.Don) Greene 4405-KASH	Polygonaceae	Langna	Rh and Sht	Back pain, abdominal pain, lung disorders, ulcer, dysentery.	Decoction administered orally
<i>Rheum speciforme</i> Royle 4438-KASH	Polygonaceae	Lachhu	Rt	Bronchitis, indigestion, constipation, toothache, bone fracture, wounds, piles, swellings, rheumatism.	Decoction and powder orally taken, paste is topically applied.

<i>Rheum webbianum</i> Royle 4407-KASH	Polygonaceae	Lachu	Rt, St, Lf, Stk	Abdominal diseases, indigestion.	Powdered and taken orally
<i>Rumex nepalensis</i> Spreng. 4473-KASH	Polygonaceae	Shoma	Fl	Rheumatism.	Powder is taken orally with warm water.
<i>Rumex acetosa</i> L. 4472-KASH	Polygonaceae	Shoma	Lf	Laxative, back pain.	Raw and decoction administered orally; Paste is topically applied.
<i>Oxyria digyna</i> (L.) Hill 4460-KASH	Polygonaceae	Chulchum/ Lamanchu	Lf	Gastritis, stomach inflammation.	Decoction is taken orally
<i>Primula microphylla</i> D.Don 4422-KASH	Primulaceae	Khilche- Karpo	Lf and Rt	Cold and cough.	Decoction administered orally
<i>Aconitum chasmanthum</i> Stapf ex Holmes 4538-KASH	Ranunculaceae	Bona	Rt	Neurological problems, rheumatism.	Decoction orally taken, powder topically applied.
<i>Aconitum heterophyllum</i> Wall ex Royle 4476-KASH	Ranunculaceae	Buma- Karpo	Rt	Gastric problems, Anti-diabetic, cough, toothache, vomiting.	Boiled and taken orally.
<i>Aconitum rotundifolium</i> Kir. & Kar. 4443-KASH	Ranunculaceae	Bonkar	Rt	Jaundice, rheumatism.	Decoction orally taken, powder topically applied.
<i>Aconitum violaceum</i> Jacq.ex Staph 4523-KASH	Ranunculaceae	Buma- nagpo	Rt	Cough, Asthma, gastric disorder.	Powdered, boiled and taken orally.
<i>Anemone rupicola</i> Cambess. 4520-KASH	Ranunculaceae	Simaso	Wh Pl	Stomachache, diuretic, liver disorder.	Decoction administered orally
<i>Aquilegia fragrans</i> Benth 4520-KASH	Ranunculaceae	Ama nama	Wh Pl	Antiscorbutic, diaphoretic, diuretic, stomach ache	Decoction is administered orally.
<i>Clematis orientalis</i> L. 4479-KASH	Ranunculaceae	Emong Nakpo	Wh Pl, St	Skin problems, Indigestion, pain relief.	Boiled and administered orally; paste topically applied.
<i>Delphinium cashmerianum</i> Royle 4563-KASH	Ranunculaceae	Lunde kaown	Wh Pl	Wounds, cold and cough, Diarrhea with bleeding.	Boiled and taken orally; paste is applied topically.
<i>Delphinium brunonianum</i> Royle 4406-KASH	Ranunculaceae	Lunde- Kaown	Wh Pl	Antiseptic, cold and cough, Malaria, Snakebite,	Boiled and taken orally; paste is applied topically.

<i>Thalictrum foetidum</i> L. 8300-KASH	Ranunculaceae	Hiachinsha	Rt, Lf and Fl	Eye disorder, Fever.	Decoction administered orally.
<i>Dasiphora dryadanthoides</i> Juz. 8279-KASH	Rosaceae	Khiamgar	Fl	Gynecological disorders.	Decoction orally administered.
<i>Rosa foetida</i> var. <i>persiana</i> (Lem.) Rehder 8265-KASH	Rosaceae	Sia-serpo	Fl	Diarrhea, gum swellings, wound infections.	Raw and decoction is orally administered.
<i>Rosa webbiana</i> Wall. ex Royle	Rosaceae	Sia	Fl and ft	Food poisoning, hepatitis, jaundice.	Boiled and taken orally. Paste topically applied
<i>Sorbaria tomentosa</i> (Lindl.) Rehder 8262-KASH	Rosaceae	-	Ft and St	Asthma.	Decoction orally administered.
<i>Rubia cordifolia</i> L. 4478-KASH	Rubiaceae	Tsod	St and Rt	Blood diseases, menstrual disorders, skin discoloration, stomach ache, ulcers, urinary complaints.	Powdered and taken orally
<i>Bergenia stracheyi</i> (Hook.f. & Thomson) Engl 4512-KASH	Saxifragaceae	Gatikpa	Rt	Stomach diseases, febrifuge, anti-inflammatory, kidney stones treatment.	Fresh or dry root is chewed. Powder is topically applied
<i>Saxifraga stenophylla</i> Royle 4410-KASH	Saxifragaceae	Yenhau	Wh Pl	Lung infections and tooth ache.	Decoction orally administered, root paste applied topically.
<i>Euphrasia officinalis</i> L. 8262-KASH	Scrophulariaceae	Kangchuk	Wh Pl	Eye conjunctivitis, tonic, Astringent, jaundice.	Decoction administered orally.
<i>Lancea tibetica</i> Hook.f. & Thomson 4481-KASH	Scrophulariaceae	Spaying rtsa ba	Wh Pl	Lung infection, cardiac disorders, tonic, menstrual problems.	Decoction orally taken.
<i>Pedicularis bicornuta</i> Klotzsch 4437-KASH	Scrophulariaceae	Lukra- mentok	Wh Pl	Rheumatism, Gout, inflammation.	Decoction is orally administered.
<i>Pedicularis cheilanthisfolia</i> Schrenk 4505-KASH	Scrophulariaceae	Lug-ru- serpo	Wh Pl	Stomach ache treatment.	Decoction is orally administered .
<i>Pedicularis longiflora</i> subsp. <i>Tubiformis</i> (Klotzsch) Pennell 4524-KASH	Scrophulariaceae	Lugru- serpo	Fl	Diuretic, gall bladder, liver inflammation, seminal discharge, oedema.	Decoction is orally administered.

<i>Pedicularis pyramidata</i> Royle ex Benth. 4447-KASH	Scrophulariaceae	Shakku	Wh Pl	Kidney disorders	Decoction is orally administered.
<i>Pedicularis rhinanthoides</i> Schrenk ex Fisch. & C.A.Mey. 4427-KASH	Scrophulariaceae	Lugrumarpo	Sht	Dental, skeletal, ENT problems.	Powder is orally administered.
<i>Verbascum thapsi</i> L. 4574-KASH	Scrophulariaceae	Dandashal	Lf and Sd	Asthma, chest pain, breathing problem, mental relaxation.	Decoction is administered orally; Smoked leaf is inhaled.
<i>Datura stramonium</i> L. 4573-KASH	Solanaceae	Langthang	Lf and Fl	Asthma, skin eruption, diarrhea.	Smoke from leaf is inhaled; Decoction is orally administered.
<i>Hyoscyamus pusillus</i> L. 4469-KASH	Solanaceae	Gya-Langtang	Lf and Sd	Pharyngitis, ulcers, asthma.	Decoction is orally administered; Smoke from leaf is inhaled.
<i>Physochlana praealta</i> (Decne.) Miers 4522-KASH	Solanaceae	Lanhthang	Lf and Sd	Ulcer, eye disease, stomach-ache, intestine infection, exorcism.	Powder is orally taken with water. Fruit juice applied topically.
<i>Myricaria elegans</i> Royle 4458-KASH	Tamaricaceae	Umbu	St and Lf	Blood purification, lung fever, arthritis, stomachache, diarrhea.	Decoction orally taken
<i>Myricaria germanica</i> (L.) Desv. 4458-KASH	Tamaricaceae	Umbu	Lf and Fl	Poisoning, diarrhea, stomach pain, blood purification.	Decoction orally taken.
<i>Urtica dioica</i> L. 8274-KASH	Urticaceae	Zatsot, Achoka	Wh Pl	Antiseptic, jaundice.	Cooked and decoction is administered orally.
<i>Urtica hyperborea</i> Jacq. Ex. Wedd. 8259-KASH	Urticaceae	Zatsot	Lf and Fl	Rheumatism, stomach ache, blood diseases.	Cooked and decoction is administered orally.
<i>Peganum harmala</i> L. 4459-KASH	Zygophyllaceae	Sepan	Lf and Sd	Fever, stomach-ache.	Powdered and orally taken

Abbreviations: Rt-Root; St-Stem; Lf-Leaf; Sht-Shoot; Fl-Flower; Br- Berry; Bl-Bulb; Sd-Seed; Wh pl-Whole plant; Rh-Rhizome; Ft-Fruit; Tbr-Tuber.

Discussion

Records from the Asteraceae and Fabaceae families, which are renowned for their large genera and species, indicate a higher prevalence of valuable plant species in the Ladakh region. A popular theory proposes a connection between plant usage and knowledge and variables including habitat diversity, plant density, and plant variety. Plant usage tends to be more consistent in less diverse places than it is in biodiverse ones. Residents of Kargil area exhibit a deep understanding of ethnomedical traditions, mostly utilising plant-based cures for common health conditions including respiratory, musculoskeletal, gastrointestinal, and cardiovascular ailments. Consistent with results from prior studies, gastrointestinal remedies were the most commonly used botanicals. These problems are frequently caused by unclean eating practices, tainted food sources, and irregular eating patterns.

Infectious, pulmonary, and diarrheal illnesses are among the problems Ladakh suffers. These problems are made worse by sociological and topographical complexity, which particularly affects rural regions. Health issues are becoming worse as traditional knowledge disappears. When people practise poor cleanliness, they are more likely to be vulnerable to infections and may overlook small health risks due to a lack of health information. Furthermore, certain skin conditions brought on by fungi acquired through soil contact further affect the populace. Physical strain and trauma are major causes of musculoskeletal problems. Due to the region's inhospitable climate and inadequate access to healthcare, kidney and urine problems are prevalent in Ladakh. A significant part of the tribal population's traditional healthcare system is played by the indigenous herbalists. They have a great deal of expertise with wild medicinal plants, which they frequently mix with minerals, stones, and other exotic herbs to create herbal cures. Native Americans rely heavily on medicinal herbs for both sustenance and revenue creation. The native harvesters are very interested in the medicinal plants since they have an impact on the way of life, economy, and culture of the indigenous populations across the province. While there is much potential for increasing revenue via the commercialization of medical plants, the majority of the district's medicinal plant collectors currently rely only on subsistence earnings. It was discovered that traditional healers and the elderly have a wealth of ethnomedical knowledge and were more concerned with plant conservation than younger generations. Regarding the usage of medicinal herbs, they lacked official written documentation. The possibility that their indigenous wisdom may disappear worried very few individuals in this area. A small percentage of interviewees said that traditional healers were acknowledged for their services but did not get compensation. The oral prescription is the only way that these indigenous people's existing ethnomedical knowledge has been passed down.

Comparison of the reported uses

Numerous mentioned medicinal plants were shown to be effective in treating more than one category of primary diseases. For example, *H. rhamnoides* was found to be beneficial in treating ulcers, diabetes, blood circulation issues, digestive problems, and health tonics.^{21,22,23} *A. rotundifolium* was used to cure rheumatism and jaundice, *E. cornigerus* was considered an antiseptic and used to treat jaundice²⁴ and *E. latifolium* was used to treat fever, stomach aches, renal discomfort, and urinary disorders.^{25,26} *C. flabellate* is used to treat wounds, bleeding, heat disorders linked to the blood, liver, and gall bladder, as well as to stop the spread of tainted blood.²⁷ *A. fragrans* root is combined with buttermilk to make the traditional meal Dantur, which is said to treat stomachaches.²⁸ Powdered *A. heterophyllum* root tuber is given half a teaspoonful with a glass of milk in the morning on an empty stomach to treat stomach disorders, toothaches, and intestinal worms. *A. heterophyllum* root decoction is used to treat diarrhea, fever, headaches, and diabetes.^{21,22} The powdered root *A. violaceum* is used to treat lung difficulties, rheumatism, and intestinal parasites^{21,22} and when combined with lukewarm water, it improves stomach issues and asthma.^{21,25,29} The roots of *A. chasmentum* were used to cure rheumatism and neuralgia,³⁰ but the interviewees never indicated the method of administration, they only noted that it was an oral remedy. The entire herb is said to be beneficial for a specific therapeutic purpose in certain plants, and *A. rotundifolium* was used exclusively to treat rheumatism and jaundice.³¹ The entire plant of *M. aculeate* is used to treat spinal cord disorders,²² (Rinchen & Pant 2014), lung conditions, ulcers, and backaches.³⁰ Its root is also used as a narcotic. *A. rupicola* works well for liver disorders and stomachaches.³¹ The entire plant of *L. latifolium* is used for healing wounds, rheumatism, and renal hemorrhage²² whereas *S. stenophylla* is employed to treat lung infections.³² *B.*

longicaule is used to treat diarrhea, constipation, dysentery, colic, and inflammation as well as acting as an antidote.³³

Despite the seasonal availability of flowers, in some medicinal plants they were ethnobotanically valuable according to some reports. Flower juice of *D. cashmerianum* and *D. brounonianum* was antiseptic and used to cure colic disorder²¹ and shoot of this herb was used to treat diarrhea with bleeding.²⁶ Juice made up of aerial shoot in *S. vulgaris* is used as an antidote.³⁴ Flowers of *D. dryandanthoides* was used in gynecological disorders³⁵ and the decoction of *P. nubicola* flower was used to treat high blood pressure which was common in nowadays world and to treat gastric troubles.³⁶ *E. lattifolium* flower was used to treat renal pain²⁵ its paste is used against edema.²⁶ Leaf decoction of *D. brounonianum* was used to cure malaria,²⁵ snake bite poisoning and *C. spinosa* leaf decoction was used to cure stomach ache and acidity²² and to treat epilepsy. To reduce discomfort, *C. orientalis* leaf latex was administered to the inflammatory region at regular intervals of five to six hours.²² The main issue while choosing edible fruit was not knowing how to distinguish between a fruit's medical impact and its toxic activity, but the traditional people were well aware of this since they knew that fruits had medicinal worth. The fruit of *P. hexandrum* is used to treat gynecological disorders, bowel problems, septic wounds²³ and has anticancer benefits.²³ Skin infections were treated with cooked *C. cuneata* fruits.²⁵ When combined with water, fresh *M. aculeate* leaf powder is useful to treat headaches.²⁵ Ariel shoot decoction, which includes *C. govaniana*'s leaves and flowers, has been utilized to treat joint discomfort, back pain, colds, coughs, stomach pain, constipation, and gastrointestinal difficulties.²³ Similarly, *E. gerardiana* decoction is used to treat bronchial issues and irregular menstruation.²² *E. angustifolium*'s upper stalk and flower were used to treat arthritis, acne, and renal problems.^{35, 37, 38} Kidney stones are treated using a combination of *C. bursa-pastoris* leaf powder and other herbs.²³ *O. microphylla* leaves are used as an antidote for meat poisoning and to treat wounds, open nerve channels, decrease bleeding, reduce swelling, and reduce infectious fever.²⁷ Although *B. odora* is sometimes misinterpreted as a fern, these indigenous people know it has therapeutic benefits, and its rootstock is utilized as a blood cleanser and a controller of urogenital problems.³⁷ Locals in Kargil employed the two *Rhodiola* genus medicinal plants, and their therapeutic use is consistent with previous research findings.³⁹ Amchis are traditional women with medical expertise who treat a variety of illnesses. They employed *J. macropoda* to treat kidney, heart, and nerve ailments. *E. gerardiana* was one of the excellent medicinal plants found in the Kargil area; the flowers were used to cure rheumatism and bronchial asthma, and the powdered stem is useful against fever when combined with *Punica granatum* seeds and ginger rhizomes.^{25, 29} Another medical herb, *D. hatagirae*, has several uses. It is combined with other medicinal plants to make pills that are used to treat fevers,²⁹ and the decoction of the roots is used as an energy booster.²⁵ *V. thapsi* leaves are used to relieve mental tension.³⁰

The paper states that several plants were especially utilized to treat stomach issues, a claim that was further supported by studies that were published from Ladakh. The root decoction of *R. webbiana* was used to treat dysentery, diarrhea, and black motion,²⁵ while the leaves are used to treat gastrointestinal disorders, indigestion, and as a laxative.²³ In addition to its decoction being used to treat stomach-related diseases,²² the leaf paste of *M. longifolia* is used to reduce vomiting, diarrhea, and stomachaches.²³ In Ladakh, where raising cattle is prevalent, using plants as medication for cattle has proven beneficial. *T. linearis*, for example, is used to treat cow dehydration.²² Thus, the traditional knowledge of many species was mentioned in previous studies around Ladakh, however, not reported species were novel to this study. As a result, many of the therapeutic applications were documented in past research, and many of the uses included in the table were novel to the literature. There are notable differences in the traditional therapeutic use of medicinal plants in Kargil compared to other areas surrounding Ladakh. It's interesting to note that our research revealed previously unreported medical applications for several plants. Variations in vegetation and regional differences may be the cause of this range of usage. Furthermore, previous data on the biological activity and chemical components of several of the plants in our study were available. These are very consistent with the medical claims made in our area, demonstrating their dependability. As a result, more research is necessary for enhanced pharmacological screening and possible medication development on ethnomedicinal plant species that have scientific justification.

Novelty and future impact

The current study emphasizes the function of herbal remedies in the Kargil district's community health care system. According to the study, different types of medicinal plants have historically been utilized to treat similar

illnesses. Combining several plant species may improve their pharmacological potential for treating and preventing certain illnesses. Because they are more affordable, readily accessible, and often self-administered than allopathic treatments, traditional remedies are utilized instead of allopathic ones. The findings were cross-referenced with previously published ethno-botanical research in order to identify new traditional applications of medicinal plant species for the treatment of a certain illness that is exclusive to the area. To the best of our knowledge, several plant species in the Kargil, Ladakh study region are being used for the first time in folklore. The current study demonstrated the continued prevalence of traditional usage of medicinal plants in the examined areas and the importance of documenting indigenous knowledge in order to preserve this varied resource.

Conclusion

Indigenous people of the Kargil district, possess an important ethnomedical knowledge base pertaining to ancient treatment methods. This study emphasizes how important it is to use medicinal herbs in the treatment of a wide range of illnesses, from respiratory problems to gastrointestinal problems. This information is passed down from generation to generation, mostly orally, which emphasizes the urgency of recording and preserving it. The results illustrate the vast biodiversity of the area and not only confirm the medical effectiveness of many plant species but also throw light on therapeutic uses that had not before been documented. However, because of changing lifestyles, restricted access to formal education, and socioeconomic developments, this treasure of traditional wisdom is quickly in risk of being lost. It will need coordinated efforts incorporating government funding for conservation, sustainable harvesting methods, and programmes encouraging the growing of medicinal plants to preserve this unique legacy. Maintaining these customs not only guarantees the survival of successful medical practices but also presents chances for socioeconomic growth in certain localities. On the basis of our results, it is recommended that plants with high Fic and UV receives further pharmacologic and phytochemical investigations. to fully realise the pharmacological potential of these plants in addition to validating the use of these plants in traditional medicine. This unique cultural legacy may be preserved while also providing a viable path for the creation of novel drugs through the integration of ancient knowledge with contemporary scientific confirmation.

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Conflict of Interest

None

References

1. Abbas Z, Khan SM, Alam J, Khan SW, Abbasi AM. 2017. Medicinal plants used by inhabitants of the Shigar Valley, Baltistan region of Karakorum range-Pakistan. *J. Ethnobiol. Ethnomed.* 13(1):1-15.
2. Adam AA, Othman N, Halim AA. Indigenous knowledge documentation: Perspectives of Dusun and Bajau communities in Kota Belud, Sabah, Malaysia. *Int. J. Acad. Res. Bus. Soc. Sci.* 2022; 12(10):162-175.
3. Albuquerque UP, Lucena RF, Monteiro JM, Florentino AT, Cecília de Fátima CBR. 2006. Evaluating two quantitative ethnobotanical techniques. *Ethnobotany Research and Applications* 4:051-060.
4. Alexiades MN. Collecting ethnobotanical data: an introduction to basic concepts and techniques. *Adv. Econ. Bot.* 1996; 10:53-94.
5. Angmo R, Gurmet P, Dolma T, Stobgais T, Angdus T, Dawa S, Kunphel S. 2019. Studies on some medicinal plants of Suru Valley of Ladakh used in Sowa-Rigpa system of medicine. *Int. J. Curr. Microbiol. Appl. Sci.* 2019; 8(2):257-269.
6. Aslam MS, Ahmad MS. Analgesic and anti-inflammatory activity of genus *Aconitum*: A phytochemical and ethnopharmacological review. *Recent Adv. Biol. Med.* 2016; 2(2016):923.
7. Ballabh B, Chaurasia OP. 2007. Traditional medicinal plants of cold desert Ladakh--used in treatment of cold, cough and fever. *Journal of Ethnopharmacology* 112(2):341-349.
8. Bashir A, Singh C, Chauhan N, Rani A, Singh C. A review: Ethnobotanical study on medicinal plants of Kargil district, Ladakh, India. *J. Emerg. Technol. Innov. Res.* 2018; 5(12):181-196.

9. Begossi A, Hanazaki N, Tamashiro JY. Medicinal plants in the Atlantic Forest (Brazil): knowledge, use, and conservation. *Human Ecology*.2002; 30:281-299.
10. Chandra Sekar K, Rawat B. Diversity, utilization and conservation of ethnomedicinal plants in Devikund- A high altitude, sacred wetland of Indian Himalaya. *Medicinal plants- Int. J. Phytomed. Relat. Ind.* 2011; 3(2): 105-112.
11. Choudhury PR, Choudhury MD, Ningthoujam SS, Das D, Nath D, Talukdar AD. Ethnomedicinal plants used by traditional healers of North Tripura district, Tripura, North East India. *J. Ethnopharmacol.* 2015; 166:135-148.
12. Dawa S, Gurmet P, Stobgais T, & Rinchen T. Survey and ethno-botanical study of medicinal plants of some selected villages of singay-lalok region of Leh (UT Ladakh Region). *Asian J. Res. Bot.* 2021; 5(2):60-75.
13. Gairola S, Sharma J, Bedi YS. 2014. A cross-cultural analysis of Jammu, Kashmir and Ladakh (India) medicinal plant use. *J. Ethnopharmacol.* 2014; 155(2):925-986.
14. Ghorbani A, Langenberger G, Feng L, Sauerborn J. Ethnobotanical study of medicinal plants utilised by Hani ethnicity in Naban river watershed national nature reserve, Yunnan, China. *J. Ethnopharmacol.* 2011; 134(3):651-667.
15. Hadi A, Singh S. Ethno-botanical studies of some threatened medicinal plants and local perception of its population decline in Kargil, Ladakh UT. *J. Med. Plants Stud.* 2021; 9:44-50.
16. Haq SM, Yaqoob U, Calixto ES, Rahman IU, Hashem A, Abd_Allah EF, Ijaz F. Plant resources utilization among different ethnic groups of Ladakh in Trans-Himalayan Region. *Biology.* 2021; 10(9):827.
17. Haque MI, Chowdhury AA, Shahjahan M. Harun MGD. Traditional healing practices in rural Bangladesh: a qualitative investigation. *BMC Complement Altern Med.* 2018; 18:1-15.
18. Heinrich M, Ankli A, Frei B, Weimann C, Sticher O. Medicinal plants in Mexico: Healers' consensus and cultural importance. *Soc Sci Med.* 1998; 47(11):1859-1871.
19. Hussain S, Sharma S, Bhatti RC, Singh AN. Floral diversity expedition in Ladakh: An insight into the exploration, distribution pattern, ethnobotanical, phytochemical studies and conservation strategies. *Ethnobot Res Appl.* 2023; 26:1-32
20. Jain, S.K., 1977. Handbook of field and herbarium methods.
21. Jan M, Mir TA, Ganie AH, Khare RK. Ethnomedicinal use of some plant species by Gujjar and Bakerwal community in Gulmarg Mountainous Region of Kashmir Himalaya. *Ethnobot Res Appl.*2021; 21:1-23.
22. Janes CR. The health transition, global modernity and the crisis of traditional medicine: the Tibetan case. *Soc Sci Med.* 1999; 48(12):1803-1820.
23. Jishtu V, Chauhan A, Bano H. Medicinal Flora of the Trans-Himalayan Cold Desert in Ladakh, India. In *Biosynthesis of Bioactive Compounds in Medicinal and Aromatic Plants: Manipulation by Conventional and Biotechnological Approaches*:257-286. Cham: Springer Nature Switzerland. 2023.
24. Jishtu V, Chauhan A, Bano H. Ethnomedicinal and Ceremonial Plants of Kukshow-Veiled Village of the Trans-Himalayan Cold Desert of Ladakh. *J Plant Resour.* 2022; 20(2):180-189.
25. Kala CP, Dhyani PP, Sajwan BS. Developing the medicinal plants sector in northern India: challenges and opportunities. *J Ethnobiol Ethnomed.* 2006; 2:1-15.
26. Kala, CP. Medicinal plants of the high-altitude cold desert in India: diversity, distribution and traditional uses. *Int J Biodivers Sci Manage.* 2006; 2(1):43-56.
27. Kaul MK. Medicinal plants of Kashmir and Ladakh: temperate and cold arid Himalaya. Indus publishing. 1997.
28. Kayne SB. Introduction to traditional medicine. *Complementary and Alternative Medicine*, 2nd Edition, Pharmaceutical Press, London:1-24. 2009.
29. Kayani S, Ahmad M, Sultana S, Shinwari ZK, Zafar M, Yaseen G, ... Bibi T. Ethnobotany of medicinal plants among the communities of Alpine and Sub-alpine regions of Pakistan. *J. Ethnopharmacol.* 2015; 164:186-202.

30. Thakur M, Sharma PK, Asrani RK, Patil RD, Gautam H. Traditional therapeutic uses of some important medicinal and aromatic plants of the tribal area of Lahaul valley of Himachal Pradesh, India. *Indian J Tradit Knowl*. 2020; 19(4):761-775.
31. Kristensen M, Mette Lykke A. Informant-based valuation of use and conservation preferences of savanna trees in Burkina Faso. *Economic Botany*. 2003; 57(2):203-217.
32. Kumar GP, Gupta S, Murugan MP, Bala Singh S. 2009. Ethnobotanical studies of Nubra Valley-A cold arid zone of Himalaya. *Ethnobot Leaflets*. 2009; 2009(6):9.
33. Lamo T, Stobgais T, Gurmet P, Dolma T, Dawa S, Angdus T, Chosdup T. Medicinal Plants Biodiversity of some Selected Villages of Zaskar Valley (Ladakh region). *Int J Curr Microbiol Appl Sci*. 2019; 8(1):829-837.
34. Malik ZA, Bhat JA, Ballabha R, Bussmann RW, Bhatt AB. Ethnomedicinal plants traditionally used in health care practices by inhabitants of Western Himalaya. *J. Ethnopharmacol*. 2015; 172:133-144.
35. Marathe PA, Kamat SK, Tripathi RK, Raut SB, Khatri NP. Over-the-counter medicines: Global perspective and Indian scenario. *J Postgrad Med*. 2020; 66(1):28.
36. Maurya S, Rai SK, Sharma CP, Rawat S, Chandana KR, Dhahi AJ, Bhushan R. Sarangi S. Paleo-vegetation and climate variability during the last three millennia in the Ladakh, Himalaya. *Catena*. 2022; 217: 106500.
37. Pan SY, Litscher G, Gao SH, Zhou SF, Yu ZL, Chen HQ, Zhang SF, Tang MK, Sun JN, Ko KM. 2014. Historical perspective of traditional indigenous medical practices: the current renaissance and conservation of herbal resources. *Evidence-based complementary and alternative medicine*, 2014.
38. Phillips RB. Fielding culture: Dialogues between art history and anthropology. *Museum Anthropology* 1994; 18(1):39-46.
39. Rahman IU, Ijaz F, Afzal A, Iqbal Z, Ali N, Khan SM. Contributions to the phytotherapies of digestive disorders: Traditional knowledge and cultural drivers of Manoor Valley, Northern Pakistan. *J. Ethnopharmacol*. 2016; 192: 30-52.
40. Rangari GM, Bhaisare RG, Korukonda V, Chaitanya YL, Hanumanth N. Prevalence of self-medication in rural area of Andhra Pradesh. *J Fam Med Prim Care*. 2020; 9(6):2891.
41. Ravishankar B, Shukla VJ. Indian systems of medicine: a brief profile. *Afr J Tradit Complement Altern Med*. 2007; 4(3):319-337.
42. Reyes-García V, Huanca T, Vadez V, Leonard W, Wilkie D. Cultural, practical, and economic value of wild plants: a quantitative study in the Bolivian Amazon. *Economic botany*. 2006; 60(1):62-74.
43. Rinchen T, Pant S. Ethnopharmacological uses of plants among inhabitants surrounding Suru and Zaskar valleys of cold desert, Ladakh. *nt. J. Pharma Biosci*. 2014; 5:486-494.
44. Ross N, Medin DL. Ethnography and experiments: Cultural models and expertise effects elicited with experimental research techniques. *Field Methods*. 2005; 17(2):131-149.
45. Salanță LC, Cropotova J. An update on effectiveness and practicability of plant essential oils in the food industry. *Plants*. 2022; 11(19):2488.
46. Salmerón-Manzano E, Garrido-Cardenas JA, Manzano-Agugliaro F. Worldwide research trends on medicinal plants. *Int. J. Environ. Res. Public Health*. 2020; 17(10):3376.
47. Seshagirao K, Harikrishnanaik L, Venumadhav K, Nanibabu B, Jamir K, Ratnamma BK, Jena R, Babarao DK. Preparation of herbarium specimen for plant identification and voucher number. *Roxburghia*. 2016; 6:111-119.
48. Shah A, Bharati KA, Ahmad J, Sharma MP. New ethnomedicinal claims from Gujjar and Bakerwals tribes of Rajouri and Poonch districts of Jammu and Kashmir, India. *J. Ethnopharmacol*. 2015; 166:119-128.
49. Singh B, Sultan P, Hassan QP, Gairola S, & Bedi YS. 2016. Ethnobotany, traditional knowledge, and diversity of wild edible plants and fungi: a case study in the Bandipora district of Kashmir Himalaya, India. *J. Herbs Spices Med. Plants*. 2016; 22(3):247-278.
50. Singh K, Kumar B, Sharma J, Gairola S. 2020. Medicinal plants used to manage CNS and memory-related problems by indigenous communities of Jammu & Kashmir (UT) and Ladakh (UT), India. *Plant Archives* 20(2):1959-1974.

51. Singh MR, Singh D.eds. *Phytopharmaceuticals and Herbal Drugs: Prospects and Safety Issues in the Delivery of Natural Products*. Elsevier. 2023.
52. Singh NK, Trivedi N, Elnour AA, Patel I. Evaluation of knowledge, attitude and practice about self-medication among rural and urban north Indian population. *Age*. 2015; 18(30):31-40.
53. Solanki P, Sultana Y, Singh S. Traditional medicine: exploring their potential in overcoming multi-drug resistance. In *Strategies to Overcome Superbug Invasions. Emerging Research and Opportunities*: 118-129 IGI Global. 2021.
54. Trotter RT, Logan MH. Informant consensus: a new approach for identifying potentially effective medicinal plants. I In: Etkin, N.L. (Ed.), *Plants in Indigenous Medicine and Diet, Behavioural Approaches*. Redgrave Publishing Company, Bredford Hills, New York: 91–112. 1986.
55. Uniyal, M. R., Bhat, A. V., & Chaturvedi, P. N. Preliminary observations on medicinal plants of Lahaul Spiti forest division in Himachal Pradesh. *Bull. Med. Ethnobot. Res.* 1973; 3, 1-26.
56. World Health Organization, WHO guidelines on good agricultural and collection practices [GACP] for medicinal plants. World Health Organization, Geneva, Switzerland. 2003
57. Zarger R, Stepp J. 2004. Persistence of botanical knowledge among Tzeltal Maya children. *Curr. Anthropol.* 2004; 45(3):413-418.