# Ethnobotanical exploration of medicinal plants in the Himalayan temperate forests of Veshew range, Kulgam, Jammu & Kashmir, India: diversity, utilization, and health significance

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## Research

## Abstract

*Background*: For centuries, medicinal plants have been integral to healthcare, especially in regions with limited modern medical facilities. The Veshew forest range in Kulgam, Jammu and Kashmir, India, has been a significant source of plant-based medicine for local communities, who rely on traditional knowledge to address their healthcare and livelihood needs, including food, fodder, timber, and other essential resources.

*Methods*: This study used field surveys, semi-structured interviews, and questionnaires from the Veshew forest range to document the medicinal uses of plants. Ethnobotanical indices, including the Informant Consensus Factor (ICF) and Use Value (UV), were applied to analyze the efficacy and consensus of traditional knowledge regarding these plants.

*Results*: This study documented 34 medicinally significant plant species distributed across 18 families and 32 genera, with Asteraceae and Lamiaceae emerging as the dominant families. Prominent species included *Portulaca oleracea*, *Iris kashmiriana*, *Taraxacum officinale*, *Solanum nigrum*, *Prunella vulgaris*, *Allium sativum*, *Brassica rapa*, *Trigonella foenumgraecum*, *Trifolium pratense*, and *Lavatera kashmiriana*. Informants frequently cited these plants for their therapeutic applications in treating ailments such as skin irritation, digestive issues, jaundice, and diarrhea. Notably, high ICF values (0.88) for endocrine disorders and 100% fidelity levels (FL) for species like *Lavatera kashmiriana* (skin irritation), *Taraxacum officinale* (jaundice), and *Iris kashmiriana* (diarrhea) underscore their cultural importance and medicinal efficacy within the local healthcare system.

*Conclusions*: This ethnobotanical exploration highlights the rich traditional knowledge of medicinal plants in the Veshew range, stressing the importance of documentation for preserving indigenous practices, bridging generational knowledge gaps, and preventing the loss of valuable plant species. Further pharmacological studies are needed to validate these medicinal uses.

*Keywords*: Herbal medicine, Traditional knowledge, Ethnomedicine, Veshew, Kulgam, Biodiversity, Kashmir Himalaya.

## Background

Forest resources play a vital role in sustaining biodiversity and supporting the livelihoods of local communities, particularly in remote and ecologically rich regions. These ecosystems sustain flora and fauna and preserve cultural practices, forming the foundation for region-specific studies such as the Veshew forest range. These forests provide timber, food, and fodder and serve as reservoirs of medicinal plants that form the foundation of traditional healthcare systems (Langat *et al.* 2016; Singh *et al.* 2018). Medicinal plants have been integral to human healthcare, especially in areas with limited access to modern medical facilities (Nafees *et al*. 2023). Globally, approximately 80% of the population in developing regions relies on traditional herbal medicine due to its accessibility, minimal side effects, and cost-effectiveness (Ahmed *et al*. 2023; Nafees *et al*. 2023). In such regions, indigenous populations often depend on wild-harvested medicinal herbs for primary healthcare, a practice deeply rooted in cultural heritage and historical traditions (Che *et al*. 2024).

In India, particularly in the northern regions, traditional plant knowledge is rich and has supported healthcare for many generations. Indigenous communities demonstrate a deep understanding of herbal remedies that are crucial for treating common ailments (Parveen *et al.* 2020). Of the 8,644 reported plant species in the Indian Himalayan region, approximately 1,748 are estimated to have medicinal significance (Raina & Gautam 2020). The northern Indian Union Territory, Jammu and Kashmir (J&K), alone harbors over 300 species of medicinally significant plants (Tali *et al.* 2019). Knowledge gaps, however, persist in documenting the diversity and utilization of medicinal plants in specific regions, such as the Veshew forest range. These gaps are further exacerbated by ecological transitions, including climate change, habitat degradation, and overexploitation, which threaten biodiversity and cultural heritage (Volenzo & Odiyo, 2020; Mbelebele *et al.* 2024; Karki 2020). Additionally, lifestyle changes, industrialization, and migration have contributed to a decline in the transmission of ethnomedicinal knowledge, as the younger generation shows a reduced interest in these ancestral practices (Parveen *et al*. 2020; Saggar *et al*. 2022).

The Veshew forest range in Kulgam, renowned for its rich biological diversity and cultural heritage, presents a unique repository of medicinal plant knowledge within the Indian Himalayan region. Situated near the iconic Aharbal waterfalls, this range is characterized by its diverse plant species and traditional reliance on ethnomedicinal practices (Riyaz *et al*. 2021; Tali *et al.* 2019). Unlike other Himalayan regions, the Veshew forest range remains underexplored in terms of documented ethnobotanical knowledge, despite being a critical resource for local communities that depend heavily on plant-based remedies because of the limited availability of modern healthcare facilities.

This study hypothesizes that medicinal plants in the Veshew forest range play a crucial role in local healthcare systems and exhibit high cultural relevance based on ethnobotanical indices, such as the Informant Consensus Factor (ICF) and Use Value (UV). To test this hypothesis, the study aims to:

- Document the diversity, utilization, and traditional knowledge associated with medicinal plants in the Veshew forest range using ethnobotanical indices, such as ICF and UV.
- Highlight medicinal plants with high therapeutic value, providing a baseline for conservation strategies, sustainable utilization, and future pharmacological investigations while promoting the preservation of ethnobotanical knowledge and bridging generational gaps

This study seeks to fill this gap by systematically documenting the use of medicinal plants in the Veshew range and analyzing their significance using ethnobotanical indices, such as the Informant Consensus Factor (ICF) and Use Value (UV) (Gazzaneo *et al.* 2005; Phillips *et al.* 1994). This research will highlight the region's distinctive contribution to traditional healthcare and provide a baseline for further pharmacological and phytochemical investigations into its unique flora.

## Materials and Methods

### Area of study

The Veshew forest range, located in South Kashmir, is the largest and most ecologically significant part of the Kulgam Forest Division, spanning an area of 289.6 km² (Fig. 1). It is part of the Aharbal forests of the Kulgam district and is characterized by diverse flora and fauna. The range is traversed by the Veshew River, originating from the glacial Kaunsarnag Lake, which supports its ecosystems and contributes to the agricultural and cultural livelihoods of local communities. With its pristine landscapes, including Chiranbal and Zajimarg, the Veshew forest range provides ideal conditions for the growth of medicinal plants, making it a biodiversity hotspot. The forest range predominantly features temperate coniferous and mixed forests., supporting a rich diversity of flora and fauna. The forests are predominantly coniferous, with dominant species including *Cedrus deodara* (Deodar), *Pinus wallichiana* (Kail), *Abies pindrow* (Fir), and *Picea smithiana* (Spruce). Associations of *Taxus* *wallichiana* (Yew) and traces of *Juniperus recurva* (Junipers) are found locally. Broad-leaved trees occur in patches along Nallas, cooler aspects, and shady ravines, adding to the floral diversity and providing habitats for wild medicinal plants. The faunal diversity of the range is equally rich, featuring mammals, birds, reptiles, and other taxonomic groups. Prominent species include the Black Bear, Common Leopard, Rhesus Macaque, Red Fox, Yellow-Throated Marten, Long-Tailed Marmot, Black-Eared Kite, Himalayan Griffon Vulture, Monal, and Blue Rock Pigeon. This ecological wealth further emphasizes the conservation significance of the Veshew Forest Range (District Kulgam 2024).

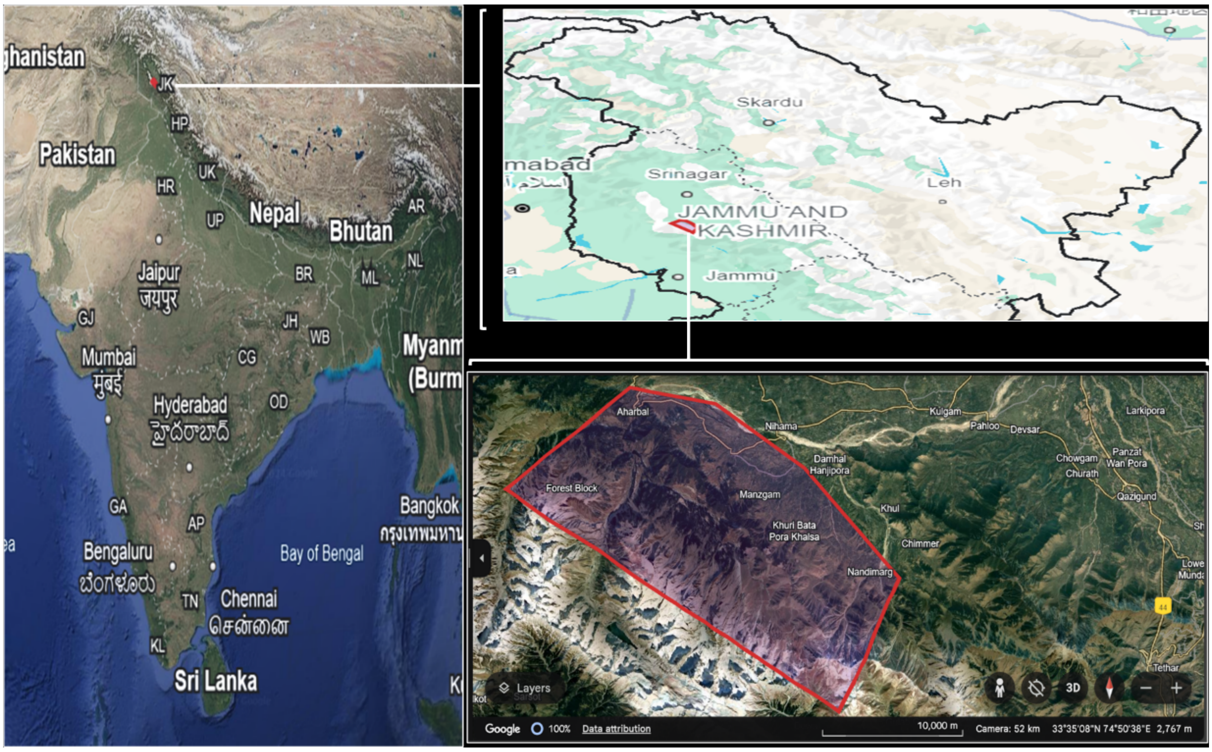

Figure 1. Map depicting the study area (From Google Earth Pro)

The Kulgam Forest Division, established in 2010, covers an area of 440.78 km², representing 41.31% of the geographical area of Kulgam district. It consists of three territorial forest ranges: Veshew, Damhal Hanjipora (116.01 km²), and Kulgam (35.17 km²). Among these, the Veshew forest range is the largest and most productive, particularly for timber extraction, and it has immense ecological and cultural significance. The Veshew forest range is not only ecologically rich, but also culturally important, as it is home to the Gujjar and Bakerwal tribes. These communities have a deep connection with the forest and possess extensive knowledge of medicinal plants that they use to treat various ailments. Agriculture, including crop cultivation and animal husbandry, is the primary livelihood of the region, while some members of the younger generation are involved in eco-tourism. The predominant languages spoken are Kashmiri, Pahari, and Gojri, with Islam being the main religion.

This study highlights the Veshew forest range as a critical area for exploring medicinal plants. Its rich biodiversity, coupled with extensive traditional knowledge of local communities, underscores its importance as a natural repository of medicinal plant diversity. The ethnobotanical survey conducted in this range revealed the intricate relationships between the local population and their environment, emphasizing the region's potential for scientific research and sustainable resource management. Preserving the biodiversity and associated cultural heritage of the Veshew forest range is essential not only for the conservation of its ecological wealth, but also for safeguarding traditional healing practices for future generations.

**Sampling techniques**

An ethnobotanical survey was conducted between March 2022 and November 2023 to document traditional medicinal plant knowledge in the Veshew forest range. A purposive sampling method, a non-probability sampling technique, was employed to select 21 knowledgeable participants. This approach involves deliberately choosing individuals based on specific criteria, such as their expertise and experience in medicinal plant use, to ensure rich and relevant data collection (Tongco 2007; Hussain *et al.* 2018). These informants were identified through consultations with community leaders, elders, and traditional healers to ensure their expertise in medicinal plant use. Geographic representation across the range was prioritized to capture the diversity of plant use and ethnobotanical practices, particularly in areas with distinct ecological and cultural attributes, such as Chiranbal and Zajimarg.

The sample size of 21 respondents was determined based on the principle of data saturation, a point at which additional interviews provided no significant new information. This approach enhances the reliability and comprehensiveness of the documentation process. Before data collection, the participants were briefed on the study objectives and provided informed consent. Ethical considerations were strictly adhered to, and all contributions were anonymized to ensure confidentiality. The study also complied with the principles of the Nagoya Protocol, ensuring fair and equitable sharing of benefits from documentation and potential use of traditional knowledge.

**Data Collection and Validation**

The data collection involved a total of 21 structured questionnaires, featuring identical questions, 10 semi-structured interviews with key informants, three group discussions, and four guided field trips to document medicinal plant usage and traditional knowledge in the Veshew forest range. Structured questionnaires were used to gather detailed information on plant use, including preparation techniques, local names, and therapeutic applications. Semi-structured interviews provided deeper insights into traditional practices and contextual understandings. Group discussions facilitated knowledge sharing and validation among the respondents.

Guided field trips conducted with local guides and informants enabled the documentation of plant species in their natural habitats. During these trips, the informants demonstrated practical applications and identified plants, ensuring accurate data collection. A specimen presentation method was also utilized, in which plant samples were shown to informants for identification and validation. This approach enhances the consistency and reliability of plant documentation. The data was initially recorded in the local dialect and later translated into English for analysis. To ensure validity, the findings were cross-referenced with existing literature from other Himalayan regions. Plant specimens were collected during field visits, authenticated by taxonomists at the Center for Plant Taxonomy, University of Kashmir, and verified against the herbarium specimens at the KASH Herbarium. This rigorous methodology ensured the reliability and comprehensiveness of the documented ethnobotanical knowledge.

**Data analysis**

Ethnobotanical analysis was used to identify therapeutic plants for future in-depth phytochemical and pharmacological investigations. The current study utilized three distinct indices to effectively analyze the collected information.

**Informant consensus factor (ICF)**

The Informant Consensus Factor (ICF) is a quantitative index used to assess the consistency of the data provided by respondents. This factor aids in the identification of plant species that are consistently utilized for phytochemical and pharmacological screening (Gazzaneo *et al.* 2005). The ICF was calculated using the following formula:

$$ICF = \frac{Nur - Nt}{Nur - 1}$$

Nt represents the total number of taxa utilized in a specific disease category and Nur is the total number of usage reports cited for each ailment category. The ICF can range from 0 (indicating a lack of consensus among informants in sharing usage information) to 1 (indicating a high level of consensus on exchanging knowledge).

**Relative frequency of citations (RFC).**

RFC indicates the importance of each species and is calculated based on the frequency of citation 'FC' (the number of informants mentioning the use of species. The FC value was divided by the total number of informants participating in the survey (N), without considering the use categories (Borah & Prasad 2017).

$$RFC = FC/N$$

Where FCs is the number of informants who mentioned using a plant species and N is the total number of informants.

**Use value (UV)**

The Use Value (UV) establishes the significance of a recognized plant and is calculated using the following formula (Phillips *et al.* 1994):

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

Ui = Use reports cited for a particular plant by each informant.
N = Total number of informants who participated in the study.
UV aids in identifying plant species that are most commonly used (or advised) in treating ailments. The higher the number of citations, the higher the use value.

**Fidelity level (FL)**

The Fidelity Level (FL) was determined by the proportion of respondents who mentioned using a specific plant species for a particular serious illness. It was calculated using the following equation (Alexiades & Sheldon 1996):

$$FL (\%) = Ip/ Iu \times 100$$

Ip = Total number of use reports cited for any given main ailment.
Iu = total number of use reports cited for any given plant species.
Low FL is acquired for plants that treat multiple disorders, whereas FL is attained at maximum when nearly every data on usage for a specific condition is reported.

**Ailment categories**

All diseases within the study area were classified into 16 distinct groups based on data obtained from respondents and ethnomedicinal information regarding the Himalayan plants. These categories were further organized for statistical analysis, as shown in Table 1. The categories included Skeletomuscular Disorders (SMD), Respiratory System Disorders (RSD), Poisonous Bites (PB), Nervous System Disorders (NVD), Liver Problems (LP), Haemorrhoids (HEM), Genitourinary Ailments (GUA), General Health (GH), Gastrointestinal Disorders, Endocrine Disorders (ED), Ear, Nose, and Throat (ENT), Fever (FVR), Dermatological Disorders (DD), Dental Care, Cooling Agents (CA), and Circulatory Disorders (Stewart 1981). Disorders were grouped into the same category based on the body systems involved or the specific areas targeted for treatment.

Table 1. Ailment categories depending on the treatment

| Ailment category | Ailments |
|---|---|
| Skeletomuscular disorders | Joint inflammation, Body pain, Joint pain, Joint swelling, Arthritis. |
| Respiratory system disorders | Dry cough, Bronchodilator, Bronchitis, Lung infection, Breathing problems, Lung disorders, Pneumonia, Cough, Cold, Asthma, Chest pain, Chest congestion. |
| Poisonous bites | Ant sting, Insect bites, Snakebite, Scorpion sting. |
| Nervous system disorders | Debility, Nausea, Brain disorders, Sedative, Headache, Nervous stimulant, Epilepsy. |
| Liver problems | Liver warts, Liver infection, Hepatic disorder, jaundice. |
| Haemorrhoids | Piles, Washing piles injuries |
| Genito-urinary ailment | Insufficient lactation, Leucorrhoea, Swollen testicles, Menstrual disorder, Urine infection, Renal disorder, Lactation, Kidney problems, Menstrual disorder, Urinary diseases, Premature ejaculation. |
| General Health | Anaemia, Tonic after delivery, Body strength, Body ache, General Tonic, Body tonic, Weakness, Fatigue, Overweight, Body weakness, Hair tonic. |
| Gastrointestinal disorders | Diarrhoea, Gut pain, Dysentery, Stomach problems, Constipation, Stomach ulcer, Indigestion, Gastric pain, Diarrhoea pain, Anthelminthic, Intestinal disorder, Stomach cramps, Colic infection, Vomiting, Worms, Vermifuge, Amoebic dysentery. |
| Fever | Typhoid, Malarial fever, Malaria, Fever. |
| Endocrinal disorders | Diabetic related problems, Anti-diabetic, Diabetes. |
| Ear Nose and Tongue | Irritated eyes, Eye pain, Throat discomfort, Eye ailment, Increase vision, Sore throat, Throat infection, Eyewash |

| | |
|---|---|
| Dermatological disorders | Bruises, wounds, and skin conditions, skin sensitivity, boils, itchiness, Inflammation, irritated skin, Sunburn, Burns, the presence of fungi, skin disease, Acute gout, acne |
| Dental care | Teeth whitening, Gum disease, Toothache. |
| Cooling agent | Cooling agent, Body cooling, calming substance |
| Circulatory disorders | High triglycerides, Heart conditions, Low blood pressure, Blood purifier. |

## Results and Discussion

**Informant status and demographic profile**

The investigation identified 34 medicinal plants utilized within the study area, with insights provided by 21 experienced respondents aged between 28 and 65. Notably, this study revealed a surprising trend regarding the correlation between educational status and ethnobotanical knowledge. Despite their lack of formal education, the female respondents demonstrated a remarkable depth of knowledge about medicinal plants. This expertise, which is often acquired through familial knowledge transfer, highlights the role of oral traditions in preserving cultural heritage (Fig. 2). These findings align with the observed negative correlation (Pearson's r = -0.48512) between educational status and the number of citations. Respondents with lower formal education levels often possessed richer ethnobotanical knowledge, potentially because of a closer association with traditional practices and the natural environment.

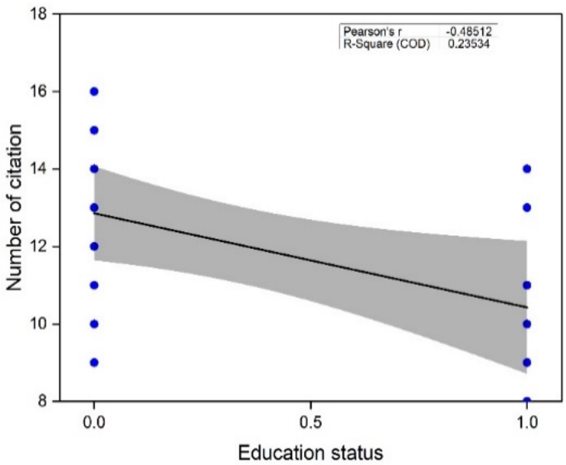


Figure 2. Correlation between education status of the participants interviewed

The correlation between participant age and the number of citations (Fig. 3) further reinforces the generational dynamics of traditional knowledge. Pearson's correlation coefficient (r = 0.49461) indicates a moderately positive relationship, suggesting that older respondents are more likely to possess a greater depth of knowledge, reflected in a higher number of citations. The R-squared value (0.24461) implies that approximately 24.5% of the variability in the number of citations can be explained by age. This trend aligns with ethnobotanical studies that emphasize the accumulation of practical knowledge over time through long-term exposure to traditional practices (Arjona-García *et al*. 2021; Chatterjee & Mukherjee, 2015). Older participants, particularly those in the 50–65 age group, appeared to be custodians of this knowledge, having had prolonged interactions with their environment and cultural traditions. In contrast, the younger subset of respondents (28–35 years) demonstrated a comparatively lower number of citations, which could be attributed to reduced exposure or declining interest in traditional medicinal practices due to modernization and lifestyle changes.

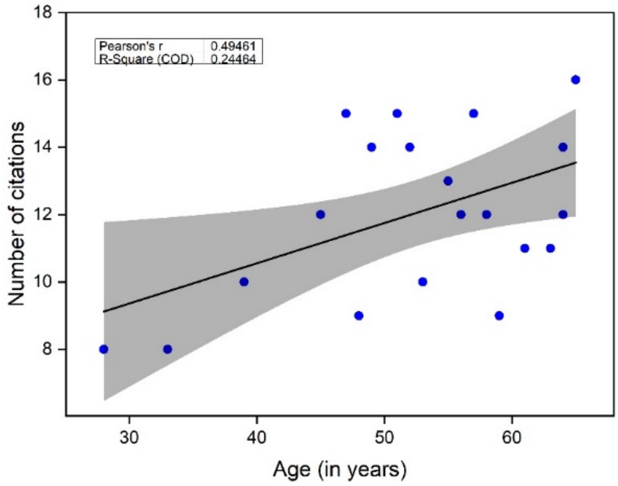

Figure 3. Correlation between age of participant and number of citations

Interestingly, the generational knowledge gap and the increasing vulnerability of indigenous traditions to modernization further highlight the urgency of targeted preservation efforts. This trend aligns with the global patterns identified in ethnobotanical research, where modernization and inadequate documentation threaten the preservation of traditional knowledge systems (Arjona-García *et al*. 2021). The data reiterates the urgent need for initiatives to document oral traditions and encourage intergenerational knowledge transfer, especially in regions such as the Kashmir Valley, where cultural practices risk erosion due to generational divides and urbanization (Chatterjee & Mukherjee, 2015).

Furthermore, the study corroborates the findings of Kayani *et al*. (2014), where uneducated or less formally educated individuals displayed greater expertise in traditional medicinal practices than their more formally educated counterparts. This underscores the importance of recognizing informal knowledge systems and incorporating them into broader conservation frameworks. The observed relationship between educational status, age, and traditional knowledge highlights the value of cultural immersion and direct environmental interactions in fostering expertise independent of formal education.

**Utilization of plant components, preparation techniques, and administration**

The investigation identified that the leaf (37.03%) emerged as the most frequently used plant part for creating herbal remedies. Oral consumption was the predominant method of administration, involving 58 preparations, followed by fruit (13.5%), entire plant (11.1%), seeds (9.8%), rhizomes (9.8%), bulbs (6.1%), flowers (6.1%), roots (3.7%), and aerial portion (2.4%) (Fig. 4). This distribution is consistent with global and regional studies, where the leaf is recognized as the most utilized portion, which is attributed to its ease of collection and higher photosynthetic activity, resulting in elevated secondary metabolite content (Gillani *et al.* 2024a; Gillani *et al.* 2024b; Mushtaq et al. 2024; Dutt *et al.* 2015; Purwanti *et al.* 2020; Srithi *et al.* 2009).

This study highlights the diversity in traditional medicine preparations, documenting 11 distinct methods. The decoction (35.8%) stood out as the most common method, consistent with findings from previous studies that emphasize its simplicity and efficacy in preparing herbal medicine, especially when combined with liquids such as water (Bibi *et al.* 2014; Kffuri *et al.* 2016; Sanz-Biset *et al.* 2009). Other methods included juice (12.3%), paste and powder (11.1% each), boiling (7.4%), infusion (6.1%), raw (4.9%), extract and oil (3.7% each), poultice, spice, and smoke of leaves (1.2%) (Fig. 5).

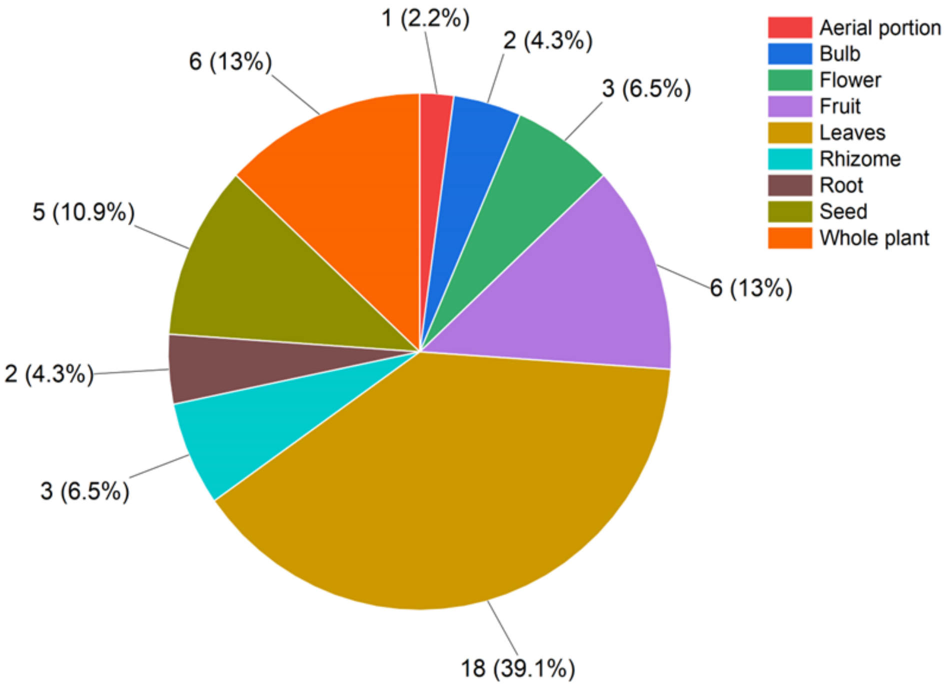


Figure 4. Percentage contribution of plant part(s) used

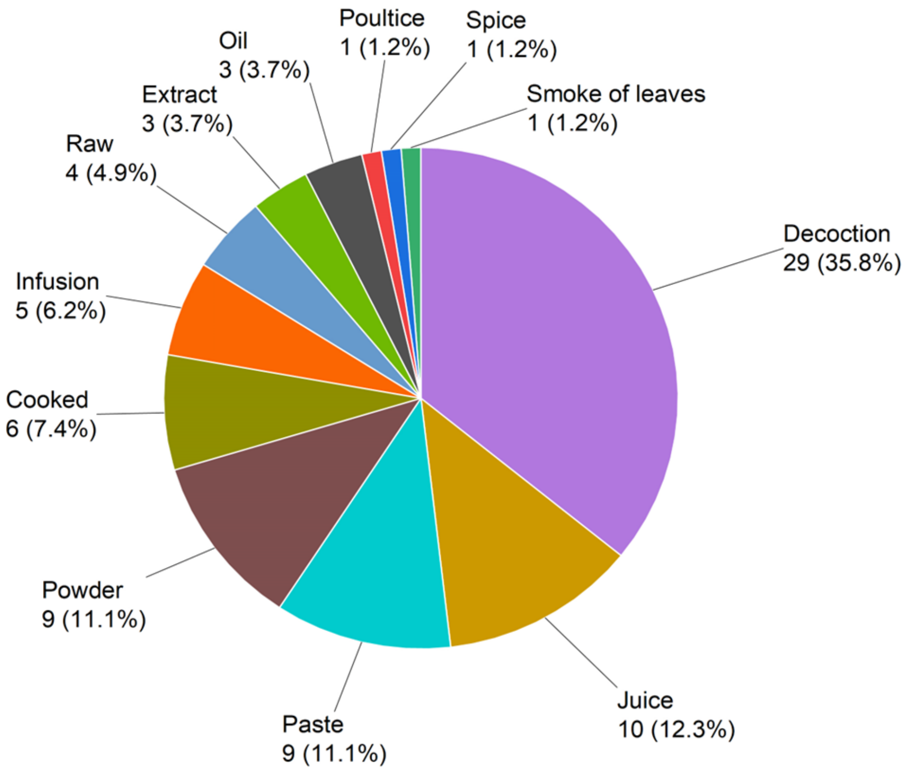


Figure 5. Percentage contribution of herbal remedies

Oral and topical administration techniques predominated in the study area, constituting 71.6% and 23.4%, respectively (Fig. 6). This pattern corresponds with the ethnopharmacological practices observed in other regions, highlighting the cultural significance and effectiveness of oral administration in traditional medicine (Mahmood *et al.* 2012; Rehman *et al.* 2015). Topical application also plays a crucial role in administering herbal medicines for various physical conditions, such as skin issues, wounds, poison bites, muscular pain, and rheumatism (Sureshkumar *et al.* 2017).

In this study, thirty-four plant species used for treating various illnesses were identified. It was found that resources gathered from remote locations and deep forests possessed superior disease-curing abilities in the region's botanical medicine practices. Furthermore, informants often cultivated certain plants in their backyard gardens, along highways, and on farmland, thereby enhancing the accessibility of these medicinal resources. Additionally, individuals seek treatment for various issues by purchasing therapeutic botanical components from vendors or herbalists.

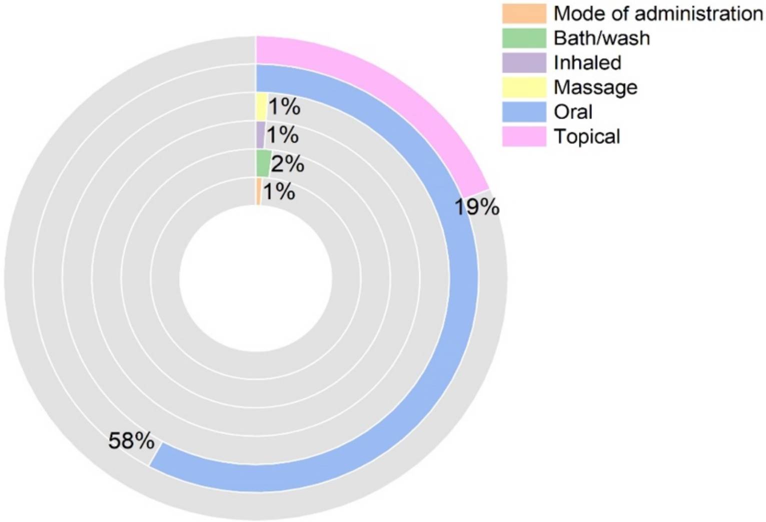


Figure 6. Percentage of mode of administration

**Informant consensus factor (ICF)**

The illnesses identified in this study were classified into 16 distinct ailment categories, and the informant consensus factor (ICF) was calculated to assess the knowledge shared among informants regarding the treatment of each type of ailment. ICF serves as an indicator of cultural adaptation and consensus in the use of specific medicinal plants, with higher values reflecting greater alignment in traditional knowledge and the potential presence of pharmacologically active compounds.

Notably, endocrine disorders exhibited the highest ICF value of 0.88, suggesting a strong consensus among the respondents regarding the effectiveness of specific plants in addressing this category. Similarly, fever (0.85), circulatory disorders (0.82), skeletal muscle disorders (0.77), and respiratory disorders (0.70) showed significant ICF values, indicating a cultural preference for certain medicinal plants for treating these conditions. Other categories, such as general health (0.75), dental care (0.75), and genitourinary disorders (0.64), also demonstrated varying levels of consensus. Conversely, dermatological disorders had the lowest ICF value of 0.40, reflecting less shared knowledge or perceived efficacy among the informants (Table 2).

Table 2. ICF of medicinally important plant species

| Ailment category | Use reports (Nur) | Taxa (Nt) | ICF |
|---|---|---|---|
| Skeletomuscular disorder | 19 | 5 | 0.77 |
| Respiratory system disorder | 21 | 7 | 0.70 |
| Poisonous bites | 6 | 1 | 1 |
| Nervous system disorders | 4 | 1 | 1 |
| Liver problems | 12 | 3 | 0.81 |
| Haemorrhoids | 4 | 1 | 1 |
| Genito-urinary ailments | 15 | 6 | 0.64 |
| General Health | 38 | 10 | 0.75 |
| Gastrointestinal disorders | 73 | 20 | 0.73 |
| Fever | 8 | 2 | 0.85 |
| Endocrinal disorders | 10 | 2 | 0.88 |
| Ear, Nose and Tongue | 10 | 5 | 0.55 |
| Dermatological disorders | 6 | 4 | 0.40 |
| Dental care | 5 | 2 | 0.75 |
| Cooling agent | 3 | 1 | 1 |
| Circulatory disorder | 18 | 4 | 0.82 |

These findings suggest that high ICF values are correlated with the presence of bioactive compounds in commonly used plants, underpinning their therapeutic potential (Sureshkumar *et al*. 2017). Integrating these findings with ethnobotanical indices such as UV (use value) and analyzing their intersections with ICF can provide a more comprehensive understanding of plant selection patterns and their cultural importance. This approach emphasizes the relevance of traditional knowledge systems as a guide for pharmacological discovery, encouraging further investigation into the mechanistic pathways and bioactive compounds contributing to these high ICF values.

Employing multiple ethnobotanical indices offers a multidimensional characterization of traditional medicinal practices, reinforcing the importance of integrating local knowledge with modern pharmacological validation to explore the therapeutic efficacy and underlying biochemical properties of these plants (Sureshkumar *et al*. 2017; Cakilcioglu *et al*. 2011).

**Use value (UV)**

Use value, a quantitative ethnobotanical indicator, elucidates the relative importance of plant species within the study area**.** In this study, the UV ranged from 0.09 to 0.76, highlighting diverse usage patterns. Notably, *Portulaca oleracea* (UV=0.76), *Prunella vulgaris* (UV=0.61), *Sassurea costus* (UV=0.57), *Solanum nigrum*, *Allium sativum*, *Brassica rapa*, *Trifolium pratense* (UV=0.52), *Trigonella foenumgraecum*, *Ficus carica*, and *Datura stramonium* (0.47) displayed the highest use values, indicating frequent utilization within the community's healthcare system. Conversely, *Mentha longifolia* had the lowest use value (UV = 0.09) (Table 3). A higher UV signifies greater significance of a plant within traditional medicinal systems, whereas a lower value indicates limited use. However, for some herbs, specific ailments treated remain undefined, requiring further exploration.

This study identified that *Solanum nigrum* is commonly employed by informants for treating jaundice and bodily aches, highlighting its relevance in traditional medicine practices. This finding is supported by previous phytochemical studies (Chen *et al.* 2022; Potawale *et al.* 2008), further validating its pharmacological significance.

Pearson's correlation analysis (Origin 2022) was applied to examine the relationship between the relative frequency of citations (RFC) and the UV of medicinal plants. The results indicated a strong and statistically significant positive correlation (Pearson's r = 0.91399), with a high R-squared value of 0.83538 (Fig. 8). This statistically significant relationship suggests that plants with higher utilization values were frequently cited by informants, reflecting their integral role in local medicinal practices. Notably, the observed correlation between UV and RFC highlights the potential of these plants to contain pharmacologically relevant bioactive compounds. Despite the high utilization values associated with these plants, the specific ailments treated with some herbs remain unclear. Further phytochemical and pharmacological investigations are necessary to identify and validate these bioactive compounds and thereby uncover their therapeutic potential in modern medicine.

**Fidelity level (FL)**

The fidelity level (FL) was calculated to determine the efficacy of a particular plant species in treating a primary ailment. FL values ranged from 11.11% to 100%, reflecting the extent of agreement among informants. Notably, FL values were observed for *Trigonella foenumgraecum* (100% for back discomfort), *Lavetera kashmiriana* (100% for skin irritation), *Taraxacum officinale* (100% for jaundice), and *Iris kashmiriana* (100% for diarrhea). Other high FL values included *Mentha arvensis* (75% for diarrhea), *Viola odorata* (75% for digestion), and *Nasturtium officinale* (66% for gum disease). *Trifolium pratense* (63% for cholesterol), *Brassica rapa* (63% for hair tonic), and *Solanum nigrum* (63% for jaundice) were also notable (Table 4).

Species with FL values below 50% were observed for other ailments. This study considered only species with fidelity levels above 20%. While many plants address multiple ailments, two species were dedicated solely to treating a single illness, achieving an FL of 100%.

Plants with high FL values demonstrate both therapeutic efficacy and cultural relevance as their use is consistently supported by traditional knowledge and practice. The presence of diverse secondary metabolites in these plants likely contributes to their observed biological activity. Further phytochemical and pharmacological investigations are essential to isolate and characterize these bioactive components, to validate their therapeutic potential and mechanistic pathways for disease treatment (Kadir *et al.* 2012; Tahir *et al.* 2023).

Table 3. shows medicinal plant species used by the locals, including their family, botanical name, local name, plant part used, disease treated, mode of use, total number of citations, RFC and use value. (Ailment categories: GD: Gut disorders; CD: Circulatory disorders; RSD: Respiratory system disorders; FVR: Fever; GUA: Genito-urinary disorders; BD: Bovine disorders; NSD: Nervous system disorders; GH: General health; DC: Dental care; DD: Dermatological disorders; SMD: Skeletomuscular disorders; ED: Endocrinal disorders; LP: Liver problems; ENT: Ear, nose and throat).

| Family | Botanical Name /Accession No | Local Name | Habit | Part(s) Used | Ailment Category: Use reports (Ailment treated) | Preparation | Administration | Total Number of Citations | RFC | UV |
|---|---|---|---|---|---|---|---|---|---|---|
| **Amaryllidaceae** | *Allium cepa* L. 9351-KASH | Gande | H | BL<br>BL<br>LF | GID:2 (Stomach pain)<br>ENT:3 (Eye pain)<br>RSD:2 (Cold) | Raw<br>Juice<br>Paste | oral<br>Topical<br>Topical | 7 | 0.58 | 0.33 |
| **Amaryllidaceae** | *Allium sativum* L. 9365-KASH | Rohan | H | BL<br>BL<br>BL | GUA:4(Premature ejaculation)<br>DD:1 (Skin diseases)<br>PB:6(Insect bites) | Paste<br>Paste<br>Paste | Oral<br>Topical<br>Topical | 11 | 0.55 | 0.52 |
| **Apiaceae** | *Coriandrum sativum* L. 9343-KASH | Daniwal | H | AP<br>SD<br>SD<br>AP | RSD:1 (Lung disorders)<br>GID:2 (Indigestion)<br>CA:3(Cooling agent)<br>HEM:4 (Piles) | Cooked<br>Decoction<br>Decoction<br>Infusion | Oral<br>Oral<br>Oral<br>Topical | 10 | 0.55 | 0.47 |
| **Apiaceae** | *Daucus carota* L. 9353-KASH | Gazer | H | LF<br>LF<br>LF<br>RT<br>RT | LP:1(Jaundice)<br>GID:1(Anthelminthic)<br>GID:2(Dysentery)<br>GUA:3(Lactation)<br>GH:1(Fatigue) | Juice<br>Juice<br>Juice<br>Cooked<br>Cooked | Oral<br>Oral<br>Oral<br>Oral<br>Oral | 8 | 0.47 | 0.38 |
| **Apiaceae** | *Foeniculum vulgare* Mill. 9361-KASH | Baediyaan | H | FR<br>FR<br>WP<br>FR<br>FR | GUA:1(Urine formation)<br>ENT:1 (Sore throat)<br>DC:3(Gum disease)<br>ENT:2(Improve eyesight<br>GID:2(Colic infections) | Decoction<br>Decoction<br>Infusion<br>Infusion<br>Decoction | Oral<br>Oral<br>Oral<br>Oral<br>Oral | 9 | 0.69 | 0.42 |
| **Asteraceae** | *Artemisia annua* L. 9364-KASH | Tethwen | H | LF<br>LF | GID: 2(Stomach pain)<br>GID:1(Intestine infection) | Paste<br>Paste | Oral<br>Oral | 3 | 0.15 | 0.14 |
| **Asteraceae** | *Matricaria discoidea* DC. 9356-KASH | Thul baber | H | RT | GID:5(Constipation) | Decoction | Oral | 5 | 0.41 | 0.23 |
| **Asteraceae** | *Taraxacum officinale* F.H.Wigg 9359-KASH | Hand | H | LF | LP:4(Jaundice) | Decoction | Oral | 4 | 0.4 | 0.19 |

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|---|---|---|---|---|---|---|---|---|---|---|
| **Asteraceae** | *Saussurea costus* (Falc.) Lipsch.<br>9338-KASH | Kuth | H | RH<br>RH<br>RH | SMD:3(Joint pain)<br>GID:3(Dysentery)<br>FVR:6(Fever) | Powder<br>Powder<br>Powder | Topical<br>Topical<br>Topical | 12 | 0.75 | 0.57 |
| **Boraginaceae** | *Arnebia benthamii* (Wall. exG.Don) I.M.Johnst<br>9358-KASH | Kah-Zaban | H | RH<br>RH<br>RH | CD:3(Blood purifier)<br>RSD:4(Cold)<br>FVR:2(Fever) | Decoction<br>Decoction<br>Decoction | Oral<br>Oral<br>Oral | 9 | 0.6 | 0.42 |
| **Brassicaceae** | *Brassica rapa* L.<br>9344-KASH | Tilgogul | H | SD<br>SD<br>SD | GH:7(Hair tonic)<br>RSD:3(Cold)<br>RSD:1(Cough) | Oil<br>Oil<br>Oil | Topical<br>Topical<br>Topical | 11 | 0.61 | 0.52 |
| **Brassicaceae** | *Nasturtium officinale* W.A.Aiton<br>9366-KASH | Nag joi | H | WP<br>WP | DC:2(Gum disease)<br>DD:1(Wound healing) | Cooked<br>Poultice | Oral<br>Topical | 3 | 0.3 | 0.14 |
| **Cannabaceae** | *Cannabis sativa* L.<br>9348-KASH | Bhangi | H | LF | GID:6(Diarrhoea) | Extract | Oral | 6 | 0.37 | 0.28 |
| **Cucurbitaceae** | *Cucurbita maxima* Duchesne<br>9339-KASH | Pathir al | C | FR<br>SD | GH:5(Overweight)<br>GUA:4(Premature ejaculation) | Raw<br>Raw | Oral<br>Oral | 9 | 0.45 | 0.42 |
| **Cucurbitaceae** | *Laginaria siceraria* (Molina) Standl.<br>9367-KASH | Al | C | FR | ED:8(Diabetes) | Raw | Oral | 8 | 0.5 | 0.38 |
| **Dipsacaceae** | *Dipsacus inermis* Wall<br>9357-KASH | Vopal haak | H | LF | GH:9(After delivery) | Decoction | Bath | 9 | 0.45 | 0.42 |
| **Fabaceae** | *Trifolium repens* L.<br>9340-KASH | Chat bat | H | LF<br>LF<br>LF | RSD:2(Dry cough)<br>DD:1(Gout)<br>ENT:1(Eyewash) | Infusion<br>Decoction<br>Powder | Oral<br>Oral<br>Topical | 4 | 0.57 | 0.19 |
| **Fabaceae** | *Trifolium pretense* L<br>9368-KASH | Chat bat | H | FL<br>FL | GID:4(Indigestion)<br>CD:7(Cholesterol) | Juice<br>Juice | Oral<br>Oral | 11 | 0.17 | 0.52 |
| **Fabaceae** | *Trigonella foenumgraecum* L.<br>9345-KASH | Meth | H | LF<br>LF | SMD:9(Back pain)<br>GID:1(Indigestion) | Extract<br>Spice | Topical<br>Oral | 10 | 0.62 | 0.47 |
| **Iridaceae** | *Iris kashmiriana* Baker<br>9341-KASH | Mazar mund | H | RH<br>RH | GID:6(Diarrhoea)<br>GID:1(Abdominal pain) | Decoction<br>Decoction | Oral<br>Oral | 7 | 0.46 | 0.33 |

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|---|---|---|---|---|---|---|---|---|---|---|
| **Lamiaceae** | *Ajuga bracteosa* Wall. ex Benth. 9349-KASH | Jan e adam | H | WP | GH:5(Hair pathogen) | Decoction | Wash | 5 | 0.29 | 0.23 |
| **Lamiaceae** | *Mentha arvensis* L. 9350-KASH | Footne | H | LF<br>WP | GID:3(Diarrhoea)<br>CD:1(Blood purifier) | Powder<br>Decoction | Oral<br>Oral | 4 | 0.25 | 0.19 |
| **Lamiaceae** | *Mentha longifolia* L. 9347-KASH | Yene | H | LF<br>LF | GUA:1(Menstrual disorder)<br>GID:1(Indigestion) | Decoction<br>Powder | Oral<br>Oral | 2 | 0.14 | 0.09 |
| **Lamiaceae** | *Prunella vulgaris* L. 9337-KASH | Kalle weuth | H | FL<br>LF<br>FL | NVD:4(Brain disorder)<br>GID:5(Diarrhoea)<br>SMD:4(Joint Pain) | Decoction<br>Decoction<br>Decoction | Oral<br>Oral<br>Topical | 13 | 0.72 | 0.61 |
| **Malvaceae** | *Malva neglecta* Wallr. 9363-KASH | Sotsal | H | LF | GH:3(Body pain) | Cooked | Oral | 3 | 0.27 | 0.14 |
| **Malvaceae** | *Althea rosea* (L.) Cav. 9362-KASH | Sazposh | H | FL | DD:4(Skin irritation) | Paste | Topical | 4 | 0.3 | 0.19 |
| **Moraceae** | *Ficus carica* L. 9354-KASH | Anjeer | T | LF<br>FR<br>FR | RSD:5(Cold)<br>RSD:2(Cough)<br>GID:3(Stomach pain) | Decoction<br>Decoction<br>Infusion | Oral<br>Oral<br>Oral | 10 | 0.55 | 0.47 |
| **Moraceae** | *Morus nigra* L. 9355-KASH | Tul kul | T | FR<br>FR | ENT:2(Sore throat)<br>GID:5(Anthelminthic) | Paste<br>Paste | Oral<br>Oral | 7 | 0.41 | 0.33 |
| **Poaceae** | *Cynodon dactylon* (L) Pers. 9342-KASH | Dramun | H | LF<br>LF<br>LF<br>LF | ED:2(Diabetes)<br>GID:4(Indigestion)<br>ENT:1(Eye ailment)<br>GUA:2(Kidney problem) | Juice<br>Juice<br>Decoction<br>Juice | Oral<br>Oral<br>Oral<br>Oral | 9 | 0.43 | 0.42 |
| **Portulacaceae** | *Portulaca oleraceae* L. 9360-KASH | Nuner | H | SD<br>WP<br>WP<br>WP | CD:5(Blood purifier)<br>GID:4(Constipation)<br>CD:2(Heart diseases)<br>GH:5(Weakness) | Decoction<br>Decoction<br>Decoction<br>Cooked | Oral<br>Oral<br>Oral<br>Oral | 16 | 0.8 | 0.76 |
| **Solanaceae** | *Datura stramonium* L. 9369-KASH | Datur | H | WP<br>LF<br>SD | GH:2(Hair tonic)<br>RSD:5(Breathing problem)<br>SMD:3(Back pain) | Extract<br>Smoke of leaves<br>Powder | Massage<br>Inhaled<br>Topical | 10 | 0.52 | 0.47 |
| **Solanaceae** | *Solanum nigrum* L. 9352-KASH | Kaambiye kul | H | LF<br>FR | LP:7(Jaundice)<br>GH:4(Body pain) | Decoction<br>Juice | Oral<br>Oral | 11 | 0.64 | 0.52 |

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|---|---|---|---|---|---|---|---|---|---|---|
| **Utricaceae** | *Utrica dioca* Hill 9370-KASH | Soi | H | LF | GID:5(Indigestion) | Decoction | Oral | 7 | 0.53 | 0.33 |
| | | | | LF | GH:2(Body pain) | Decoction | Oral | | | |
| **Violaceae** | *Viola odorata* L. 9346-KASH | Banafsha | H | RH | GID:3(Diarrhoea) | Decoction | Oral | 4 | 0.36 | 0.19 |
| | | | | RH | GID:1(Abdominal pain) | Decoction | Oral | | | |

Table 4. Fidelity level of common medicinal plants used by local traditional healers by ailment category

| Ailment category | Most preferred species with major ailment treated | Number of citations | FL% |
|---|---|---|---|
| **Skeletomuscular disorders** | *Datura stramonium* (Back pain) | 3 | 30 |
| | *Prunella vulgaris* (Joint pain) | 4 | 30.76 |
| | *Trigonella foenumgraecum* (Back pain) | 9 | 90 |
| | *Sassurea costus* (Joint pain) | 3 | 30 |
| **Respiratory disorders** | *Allium cepa* (Cold) | 2 | 28.57 |
| | *Datura stramonium* (Breathing problem) | 5 | 50 |
| | *Brassica rapa*(Cold) | 3 | 27.27 |
| | *Ficus carica* (cold) | 5 | 50 |
| | *Arnebia benthami* (Cold) | 4 | 44.44 |
| **Poisonous bites** | *Allium sativum* (Insect bites) | 6 | 54.54 |
| **Nervous system disorders** | *Prunella vulgaris* (Brain disorder) | 4 | 30.76 |
| **Liver problems** | *Taraxacum officinale* (jaundice) | 4 | 100 |
| | *Solanum nigrum* (Jaundice) | 7 | 63.63 |
| **Hemorrhoides** | *Coriandrum sativum* (piles) | 4 | 40 |
| **Genito-urinary disorder** | *Allium sativum* (Premature ejaculation) | 4 | 36.36 |
| | *Cucurbita maxima* (Premature ejaculation) | 4 | 44.44 |
| **General Health** | *Brassica rapa* (Hair tonic) | 7 | 63.63 |
| | *Cucurbita maxima* (Overweight) | 5 | 55.55 |
| | *Portulaca oleraceae* (Weakness) | 5 | 31.25 |
| | *Datura stramonium* (Hair tonic) | 2 | 20 |
| | *Solanum nigrum* (Body pain) | 4 | 36.36 |
| **Gastrointestinal disorders** | *Portulaca oleraceae* (Constipation) | 4 | 25 |
| | *Prunella vulgaris* (Diarrhoea) | 5 | 38.46 |
| | *Cynodon dactylon* (Indigestion) | 4 | 44.44 |
| | *Mentha arvensis* (Diarrhoea) | 3 | 75 |
| | *Ficus carica* (Cold) | 3 | 30 |

| | | | |
|---|---|---|---|
| | *Viola odorata* (Indigestion) | 3 | 75 |
| | *Iris kashmiriana* (Diarrhoea) | 6 | 85.71 |
| **Fever** | *Sssurea costus* (Fever) | 6 | 50 |
| | *Arnebia benthami* (Fever) | 2 | 22.22 |
| **Endocrinal disorders** | *Laginaria siceraria* (Diabetes) | 8 | 100 |
| | *Cynodon dactylon* (Diabetes) | 2 | 22.22 |
| **Ear Nose Tongue** | *Allium cepa* (Eye pain) | 3 | 42.85 |
| | *Foeniculum vulgare* (Improve eyesight) | 2 | 22.22 |
| | *Morus nigra* (Sore throat) | 2 | 28.5 |
| | *Cynodon dactylon* (Eye ailment) | 1 | 11.11 |
| **Dermatological disorders** | *Althea rosae* (Skin irritation) | 4 | 100 |
| | *Trifolium repense* (Gout) | 1 | 25 |
| **Dental care** | *Foeniculum vulgare* (Gum disease) | 3 | 33.33 |
| | *Nasturtium officinale* (Gum disease) | 2 | 66.66 |
| **Cooling agent** | *Coriandrum sativum* (Cooling agent) | 3 | 30 |
| **Circulatory disorders** | *Trifolium pratense* (Cholesterol) | 7 | 63.63 |
| | *Portulaca oleraceae* (Blood purifier) | 5 | 31.25 |

**Medicinal Plant Diversity, Ethnobotanical Knowledge, and Conservation Priorities**

Our survey identified 34 medicinal plant species across 18 families and 32 genera, with Asteraceae and Lamiaceae being the most dominant, each contributing four species (11.7%). Other families, such as Fabaceae and Apiaceae (8.8% each), and smaller groups like Amarylidaceae, Brassicaceae, and Solanaceae (5.8% each), also reflect significant diversity. Rare families like Boraginaceae, Cannabaceae, Dipsacaeae, Iridaceae, Portulacaceae, Poaceae, Utricaceae, and Violaceae, each contributing one species (2.9%) emphasize ecological distinctiveness (Fig. 7). The prevalence of Asteraceae aligns with global findings in ethnic communities, underscoring its dominance in the region, which is likely attributed to its herbaceous life form, extensive distribution, and richness in the study area (Dutt *et al.* 2015). The recorded life forms were consistent with J&K flora (Singh 2002). Herbs dominated the identified species (88.2%), followed by trees and climbers (5.8% each) (Fig. 8), and these findings align with other studies (Beykaso *et al.* 2024; Malik *et al.* 2015; Malik *et al.* 2015).

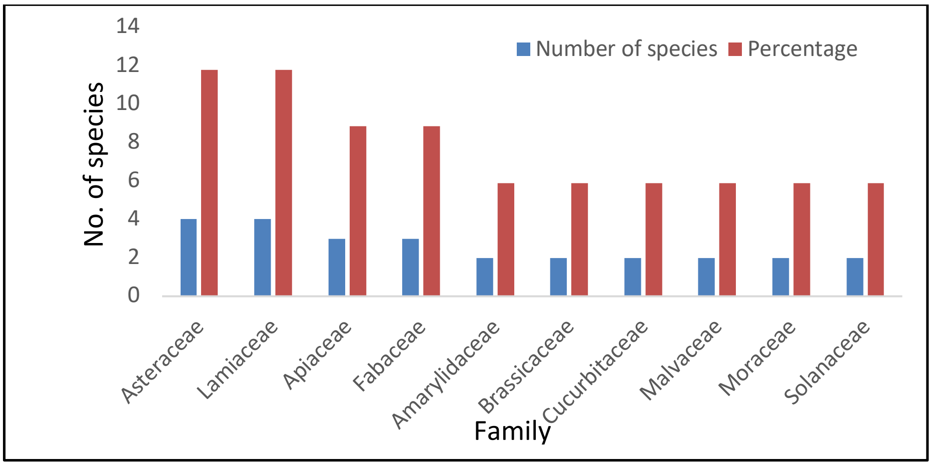


Figure 7. Number and percentage of species and genera in dominant families

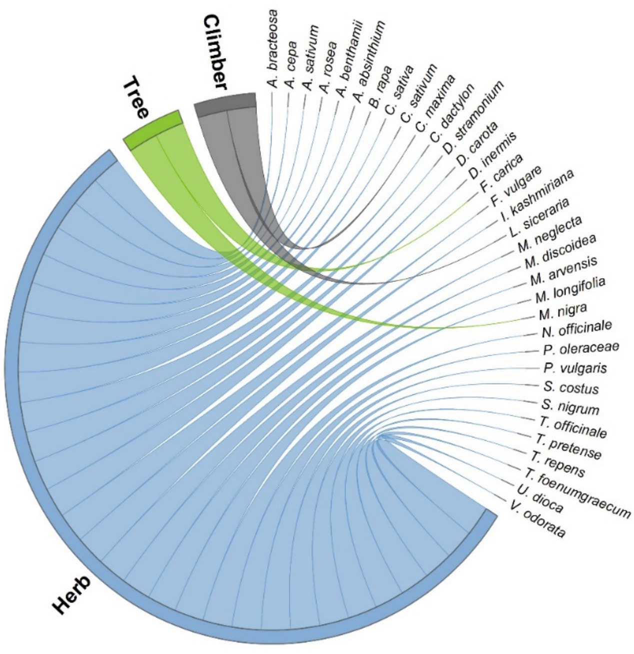


Figure 8. Percentage of plant species based on life form

Notable species, such as *Portulaca oleracea*, *Prunella vulgaris*, *Sassurea costus*, *Solanum nigrum*, *Allium sativum*, *Brassica rapa*, *Trifolium pratense*, *Trigonella foenumgraecum*, *Ficus carica*, and *Datura stramonium* are widely recognized for their ethnomedicinal importance. However, the identification of unique species, such as *Lavetera kashmiriana* (used for skin irritation) and *Iris kashmiriana* (used for diarrhea), underscores the distinct ecological and cultural attributes of the Veshew range.

The ethnobotanical use of these plants highlights the importance of traditional knowledge systems, especially among indigenous tribes such as Gujjars and Bakerwals. Species such as *Trigonella foenumgraecum*, *Lavetera kashmiriana*, *Taraxacum officinale*, *Iris kashmiriana*, *Solanum nigrum*, *Mentha arvensis*, *Viola odorata*, *Brassica rapa*, *Trifolium pratense*, and *Ficus carica* are used to treat ailments such as back discomfort, skin irritation, jaundice, diarrhea, digestive issues, gum diseases, cholesterol, and hair tonics, which is consistent with broader medicinal practices in J&K. Our findings contribute to the existing dataset of 1123 ethnomedicinal plant species in J&K (Tali *et al.* 2019), emphasizing Veshew-specific practices that both converge and diverge from regional trends.

Compared to other Himalayan regions, the Veshew forest range is notable for its unique ecological, cultural, and ethnobotanical characteristics. For instance, while Mir *et al*. (2021) documented a broader diversity of 82 medicinal plant species across 73 genera in the Doodhganga forest range in Budgam, they emphasized general trends in plant usage for ailments such as gastrointestinal disorders (ICF = 0.77). In contrast, this study of Veshew documented culturally significant species and reported a higher ICF value (0.88) for endocrine disorders, reflecting regional healthcare priorities. Similarly, Ahad *et al.* (2023) focused on 87 plant species used for both medicinal and culinary purposes in the Gurez study in the Kashmir Valley, emphasizing multipurpose species, such as *Juglans regia*. In contrast, the Veshew study exclusively emphasizes medicinal plants, particularly underreported species, such as *Iris kashmiriana* and *Lavetera kashmiriana*. The unique preparation methods documented in Veshew, such as smoke inhalation (*Datura stramonium*) and poultices for wound healing (*Nasturtium officinale*), further underscore its cultural distinctiveness compared with other regions.

Studies in the Daksum forest range documented 42 medicinal plant species across 30 families, with Asteraceae (7 species) and Lamiaceae (3 species) as dominant families, paralleling the Veshew range, which recorded 34 species primarily from Asteraceae and Lamiaceae (Mushtaq *et al.* 2024). While herbs emerged as the dominant growth form in both regions, differences were observed in preparation methods, with Daksum emphasizing paste and decoction, whereas Veshew prioritized decoctions (35.8%) and juices (12.3%). Both regions also reported a decline in knowledge transfer among younger generations, highlighting the need for targeted conservation efforts to preserve traditional practices.

Ethnobotanical studies in Ganderbal district documented 87 plant species from 52 families, dominated by Asteraceae, Lamiaceae, Rosaceae, and Polygonaceae compared to Veshew's 34 species across 18 families (Aijaz *et al*. 2024). Ganderbal highlighted root-based preparations, while Veshew prioritized decoctions (35.8%) and juices (12.3%). Despite lower species richness, Veshew emphasized site-specific plants like *Portulaca oleracea* (UV = 0.76) and *Prunella vulgaris* (UV = 0.61), reflecting its ecological and cultural distinctiveness (Fig. 9).

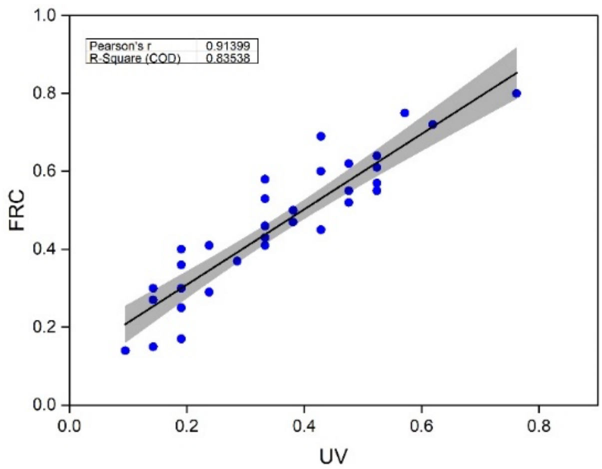


Figure 9. Scatter plot representing the correlation between relative frequency of citation (RFC) and Use Value (UV) of the plant

Ethnobotanical studies in Muzaffarabad documented 72 medicinal plant species across 51 genera and 16 families, with Lamiaceae and Apiaceae dominating the flora (Gillani *et al*. 2024a). Similarly, Gillani *et al*. (2024b) reported 57 species from 34 families, predominantly from Polygonaceae, Lamiaceae, and Rosaceae in rural Muzaffarabad. Both studies emphasized herbs as the dominant growth form (90.3% and 64.91%, respectively) and leaves as the most frequently used plant parts, aligning with Veshew findings. Gillani *et al*. (2024a) highlighted *Saussurea costus* and *Angelica cyclocarpa* with high Use Values (1.38 and 0.68), while Gillani *et al*. (2024b) identified *Mentha longifolia* (UV = 1.71) and *Bergenia ciliata* (RFC = 0.72) as key medicinal species. Despite the lower species richness, Veshew displayed unique ecological and cultural attributes, prioritizing species such as *Portulaca oleracea* (UV = 0.76) and *Prunella vulgaris* (UV = 0.61). These variations reflect regional differences in species availability and cultural preferences, emphasizing Veshew's role in site-specific conservation.

Similarly, while Gupta *et al*. (2013) highlighted the economic potential of plants through trade and scientific cultivation in the Paddar Valley of Kishtwar, the Veshew study focused on the preservation of traditional medicinal knowledge and sustainable utilization. This emphasis is particularly important, given the decline in intergenerational knowledge transfer among the Gujjar and Bakerwal tribes. Unlike inventory-driven studies, such as those in Doodhganga (Mir *et al*. 2021) or Trikuta Hills (Kumari *et al.* 2013), the Veshew study integrates actionable strategies, including community-driven conservation programs and pharmacological validation of plants with high use values, such as *Trigonella foenumgraecum* (FL = 100% for back pain). These strategies not only contribute to the preservation of biodiversity but also provide a foundation for future research and sustainable utilization.

The unique ecological attributes of the Veshew forest range, such as its fertile meadows and glacial streams, support species not commonly reported in other parts of the Himalayas. These ecological conditions, coupled with the traditional practices of indigenous communities, make Veshew a critical repository of genetic resources and ethnobotanical knowledge. Although our findings align with general trends in the Himalayas, such as the dominance of *Asteraceae* and *Lamiaceae* families, they emphasize the distinctiveness of the Veshew range in terms of species diversity, cultural practices, and conservation needs (Masoodi *et al.* 2020; Dar & Khuroo, 2020). This study contributes to filling critical gaps in the documentation of the biodiversity of J&K and provides region-specific insights that can support the pharmacological exploration and sustainable management of medicinal plants.

## Conclusion

Plants have played a vital role in healthcare, particularly in regions with limited access to modern medical facilities. This study documented the medicinal flora of the Veshew forest range in Kulgam, Jammu, and Kashmir and identified 34 significant plant species across 18 families and 32 genera. Notable species, such as *Portulaca oleracea*, *Iris kashmiriana*, *Taraxacum officinale*, *Solanum nigrum*, *Prunella vulgaris*, *Allium sativum*, *Brassica rapa*, *Trigonella foenumgraecum*, *and Trifolium pratense*, have emerged as essential components of traditional healthcare, with high Fidelity Level (FL) and Use Value (UV) scores, reflecting their importance in local therapeutic practices. Additionally, underreported species such as *Iris kashmiriana* and *Lavetera kashmiriana* highlight the unique contribution of the Veshew forest range to regional biodiversity and cultural heritage. The findings emphasize the urgent need to document and preserve traditional knowledge systems, particularly as modernization and shifting lifestyles threaten their continuity. The elderly remain custodians of this knowledge, but generational gaps underscore the need for targeted conservation efforts. Furthermore, habitat degradation poses a risk to the survival of many medicinal plants, making region-specific strategies imperative. To safeguard these invaluable resources, we recommend community-driven conservation programs and further phytochemical and pharmacological research on high FL and UV species. These steps will not only validate traditional medicinal practices but also support the sustainable utilization of the unique biodiversity of the Veshew forest range, ensuring that this heritage continues to benefit future generations.

## Declarations

**List of abbreviations: ICF**: Informant Consensus Factor, **RFC**: Relative Frequency of Citation, **UV**: Use Value, **FL**: Fidelity Level, **BL**: Bulb, **CA**: Cooling agent, **CD**: Circulatory disorders, **DD**: Dermatological disorders, **ENT**: Ear, Nose, and Throat, **FR**: Fruit, **GH**: General Health, **GID**: Gastrointestinal disorders, **LP**: Liver Problems, **LF**: Leaf, **NVD**: Nervous System Disorders, **PB**: Poisonous bites, **RSD**: Respiratory System Disorders, **SMD**: Skeletomuscular Disorders, **WP**: Whole Plant.

**Declaration of competing interest:** None

**Ethics approval and consent to participate:** Prior to data collection, all participants were thoroughly briefed on the objectives of the study and provided informed consent. Ethical considerations were strictly adhered to, and explicit permission was obtained before conducting the interviews and recording observations. All contributions were anonymized to ensure confidentiality. Additionally, the study complied with the principles of the Nagoya Protocol, ensuring fair and equitable sharing of benefits arising from documentation and potential use of traditional knowledge.

**Consent for publication:** Not applicable.

**Availability of data and materials:** All the data are available only to the authors.

**Financial Support:** Nil

**Author contributions:** Latif Ahmad Peer: Conceptualization, Methodology, Data curation, Project administration, Writing - original draft. Aamir Mansoor: Conceptualization, Methodology, Writing -review and editing. Bilal Ahmad Mir, Shahar Banoo and Maqsooma Banoo: Conceptualization, Methodology, Writing -review and editing.

**Conflict of interest:** The authors declare no conflicts of interest.

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