# Ethnobotanical study of traditional knowledge on medicinal plants utilized by Tharu Tribe of Udham Singh Nagar, Uttarakhand, India

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## Research

## Abstract

*Background*: Uttarakhand is immensely rich in biological diversity. Udham Singh Nagar district, located in the Himalayas of Uttarakhand, is populated by two indigenous tribes- Tharu and Buksa. The Tharu tribe is endowed with ethnobotanical knowledge of medicinal plants used for treating human illnesses. The purpose of the study is to investigate and document the utilization of the ethnomedicinal plants by the tribe.

*Methods*: An ethnobotanical study was conducted among 21 Tharu villages in Khatima and Sitarganj blocks. In total, 23 traditional healers and knowledgeable informants were interviewed using a semi-structured questionnaire, and quantitative indices such as Use Value (UV) and Informant Consensus Factor (ICF) were calculated to evaluate the documented plant use data.

*Results*: A total of 71 plant species belonging to 40 families were documented as being used by Tharu community. Fabaceae, Euphorbiaceae, Acanthaceae, Asteraceae, Solanaceae, and Malvaceae were the dominant families that accounted for the largest number of medicinal plants. Leaves were the most commonly used plant part for remedy preparation.

*Conclusions*: The present study emphasizes the significant utilization of medicinal plants by Tharus for the treatment of various ailments. Several earlier studies justified their traditional methods of healing. Additionally, this research also highlights the significance of preserving their traditional knowledge, their heritage and medicinal plants usage. It becomes imperative to carry out studies of pharmacological and biological activities of these plants to scientifically validate the therapeutic potential of these medicinal plants.

*Keywords*: Tharu community, Traditional knowledge, Ethnomedicinal plants, Ethnobotanical knowledge.

## Background

Since the earliest days of human civilization, people have relied on their environment around them in many ways, using its resources to support their daily lives, subsistence and survival. Ethnobotany is the interdisciplinary field that examines the interactions between human societies, especially primitive human societies and tribal communities and plant life, focusing on how humans perceive, utilized and integrate local plants into their cultural practices.

The Indian Himalaya is one of the major regions that has a significant number of medicinal plants, with nearly 1,748 species reported (Kala *et al.* 2006). Uttarakhand (28 ° 44′ & 31 ° 28′ N Latitude and 77 º 35′ & 81 º 01′ East longitude) is a hilly state situated in the central part of the Himalayas, which is well known for its extensive flora. There are almost 1,642 medicinal plants belonging to 177 families and 869 genera recorded here in this state. There are several indigenous communities, such as Jaunsari, Tharu, Bhotia, Buksa, and Raji, who live in this region and have an excellent knowledge about the application of native medicinal plants in health conditions. This knowledge is widely used to alleviate various health conditions in the primary healthcare system.

Out of these, the Tharu is the largest primitive tribal population, which accounts for 33.35% (91,342 individuals) (Rawat and Panwar 2025). Mainly inhabiting the Tarai and Bhabar regions of Udham Singh Nagar, Nainital, and Champawat districts. They have been residing mainly in Sitarganj and Khatima blocks of the Udham Singh Nagar district. The community shares a close relationship with its surrounding environment because the socio-cultural systems within the community have evolved due to long-term interaction with the environment. The rich indigenous knowledge held by them, especially about medicinal plants, has been passed down orally across generations and is still largely undocumented. In the present situation, due to the lack of interest among the new generation toward gaining knowledge regarding their native knowledge or utilising plant resources for healthcare needs, the traditional knowledge is experiencing a considerable decline as passed down from their forefathers. There can be several reasons, such as development, better healthcare facilities, urbanization, inclination towards allopathic medicine, and lack of interest as younger generations move to urban cities for education and employment opportunities. Moreover, there are no major sources of income available to encourage the traditional practitioners. It thus becomes imperative to preserve this wealth of knowledge of plants and document it in a codified form for conservation and future reference.

Several researchers have carried out an ethnobotanical study concerning the Tharus residing in Uttarakhand state, along with the adjacent regions. Sharma *et al.* 2010, Sharma *et al.* 2011, Pandey *et al.* 2012, Kumar *et al.* 2013, Bajpai *et al.* 2016, Mishra & Shrivastava 2018, Singh *et al.* 2020, Sharma *et al.* 2022, Prajapati *et al.* 2025. However, previous studies mostly focused on descriptive documentation, while quantitative analysis with the help of indices such as Use Value (UV) and Informant Consensus Factor (ICF) seems to be comparatively less explored, particularly in Udham Singh Nagar district.

This study, therefore, focuses on a comprehensive evaluation of medicinal plants employed in the ethnomedicinal applications by the Tharu tribe, considering locally occurring medicinal plant species, method of preparation, dosages, treatment, duration and modes of administration and further analyses their importance using Use Value (UV) and Informant Consensus Factor (ICF). The Higher use values depict high informant consensus, highlighting their cultural value and potential pharmacological importance. So, the study aims to ensure the conservation of valuable ethnomedicinal knowledge and supports future research on phytochemistry and pharmacological potential, particularly the identification of novel bioactive compounds.

## Materials and Methods

**Study area**

The present ethnobotanical study was conducted in Udham Singh Nagar, District of Uttarakhand. Lies between 28° 53' N to 29° 23' N latitudes and 78° 45' E to 80° 08' E longitudes. It is located in the Terai region of Kumaon Division. The district is bounded by Nainital District on the north, Champawat on the northeast, Nepal on the east, and Uttar Pradesh on the south and west. The district is a part of the Kumaon Division and is situated in the Terai region. The district is inhabited by two major tribal communities, Tharus and Buksa, viz. scheduled tribe. The district is administratively divided into seven tehsils, some of which are development blocks, namely, Jaspur, Kashipur, Bajpur, Gadarpur, Rudrapur (Kiccha), Sitarganj and Khatima. Of these seven tehsils, the last two, that is, Sitarganj and Khatima, are inhabited by the Tharu (Pant and Pal 2017). They are also settled in the districts of Gonda, Gorakhpur, Bahraich, Lakhimpur, Kheri, and Pilibhit of Uttar Pradesh and Nepal. Among these, the Rana of the Tharus is a prominent subgroup living in the regions of Uttarakhand and Nepal. The region where the Tharu tribal community inhabits in Uttarakhand is called Tharuvaat or Tharvaat. The Tharu tribe of this area speaks western Hindi, which is a mixture of Khariboli and Brajbhashi. The etymology of the word Tharus has been traced to tharua (Knowles, quoted by Srivastava 1958), which means a ‘paddler’ in the local hill dialect. They consider themselves descendants of Rana Pratap (Bisht 2006). Agriculture forms the basic livelihoods of the Tharus, and they also engage in fishing, hunting, and foraging, balancing resource use with environmental conservation. In addition to their rich cultural practices, the Tharu community is noted for adopting a sustainable approach to living (Pant & Pal 2017).

**Field survey**

The present study was carried out during 2022-2025 in 21 villages of Khatima located at a latitude of 28° 55′ 11.4″ N, longitude 79° 58′ 11.8″ E, at an elevation of 299 meters above sea level (980 feet)and Sitarganj Block is located at a latitude of 28° 55′ 48″ N, a longitude of 79° 42′ 0″ E. and situated at 298 metres above sea level (978 feet) of the Udham Singh Nagar district. Both regions have predominantly alluvial soil, which is ideal for agricultural purposes. The vegetation is mostly tropical moist deciduous forests dominated by Shorea robusta (Sal), along with grasslands, agricultural lands, and wetlands that support rich floral diversity. The climate varies from Sub-tropical and sub-humid with three distinct seasons, i.e. summer, monsoon (rainy season) and winter. In Khatima block, villages are Bisota, Jhunkat, Naugawa Thago, Charu beta, Maholiya, Nadanna, Bankatiya, Bhagchuri, Bhura Kishani, Biriya, Diyori, Khetal Sandakham, Kutara, Nagla Tarai, Ratanpur and in the Sitarganj block, villages are Dhayanpur, Karghata, Matiha, Pahsheni, Sunkhari Kalan and Tharu Tisor.

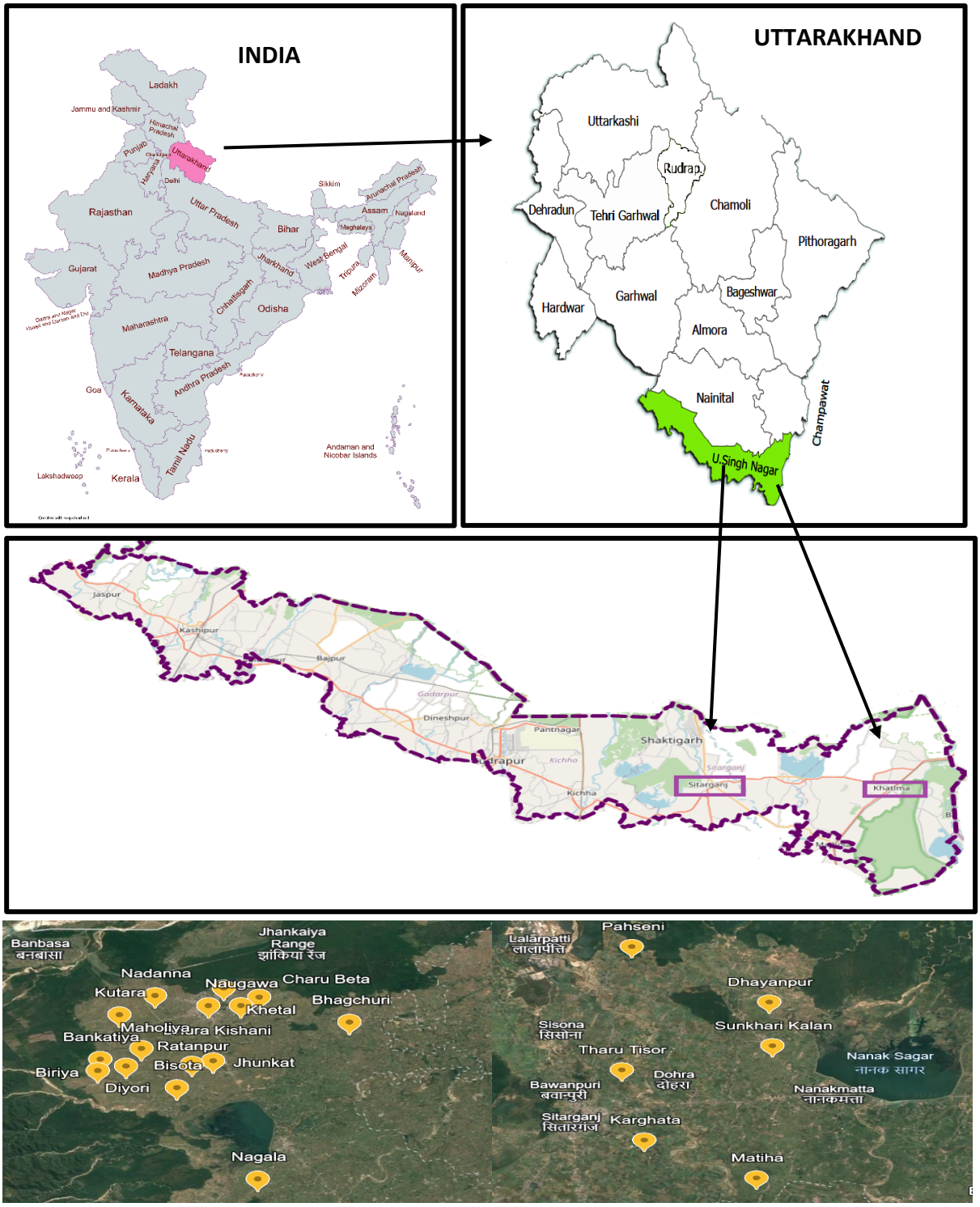


Figure 1. Geographical location of the study area and surveyed villages (Courtesy - tools.paintmaps.com and Google Earth).

**Data collection**

To collect the relevant data pertaining to the ethnomedicinal plants used by the Tharu community, data concerning the use of medicinal plants was collected. The data was gathered through personal interviews and discussions with the traditional healers or Vaidya (tribal medicine men) practitioners and informants. The study was conducted primarily in Hindi since it was widely understood by most respondents. In order to ensure that communication was effective and that all the details were accurately documented, community members from the Tharu tribe accompanied the researchers during the interview sessions. A semi-structured questionnaire was used as the tool of research for obtaining survey data. Field observation was conducted along with traditional healers and knowledgeable elderly people from the study area. Questionnaire comprising the information about the name of the plant used, along with its local name, for which disease used, the part of the plant used, detailed information regarding the mode of preparation (i.e., decoction, paste, powder and juice, etc.), form of usage, either fresh or dried, Method of preparation of the drug, method of administration and dosages, specific comments, if any. Regular field visits to the study area were made in the different parts of the district for the collection of data. To ensure accurate identification of plant species, field visits were carried out with the assistance of traditional healers who are familiar with the concerned plant species. Several visits were also undertaken to nearby forests and villages, along with traditional healers, to locate, identify, and collect medicinal plant species from their natural habitats, covering all three major seasons - summer, monsoon, and winter, to document seasonal availability and medicinal plant diversity in the study area. The ethnobotanical plant species used by the Tharu tribe of the Udham Singh Nagar district have been enumerated in Table 4, along with the ailments treated, scientific names, local names, family names, associated plant species used in the formulation, parts used, preparation of medicine and dosage. Prior informed consent was obtained verbally from all participants before the commencement of interviews and data collection. The purpose and objectives of the study were clearly explained to each participant. Participants were assured of confidentiality and clearly informed that their participation in the study was entirely voluntary and that they could withdraw from the study at any stage without any consequences.

**Plant identification and herbarium preparation**

The plant specimens that have been collected were identified and authenticated with the help of a plant taxonomist, regional floras and relevant literature, including Polunin and Stainton (1984), Hajra *et al.* (1995a, b), Nayar and Sastry (1990), Gaur (1999), Sharma et al (2011), and Sharma *et al.* (2024). Collection, preservation, and maintenance of specimens in the herbarium were done according to standard procedures explained in Jain & Rao (1977). The scientific name and taxonomic identification of the plant species were validated by accessing the online database POWO (2026). Plants of the World Online, Facilitated by the Royal Botanic Gardens, Kew, and the International Plant Names Index (IPNI). Herbarium specimens were deposited in the Department of Botany, P.N.G. Govt. P.G. College, Ramnagar, Uttarakhand.

**Data analysis**

The information gathered during the field survey on ethnomedicinal plants was analysed using ethnobotanical approaches, Involving quantitative techniques. Data related to ethnomedicinal plant species, their families, plant parts used, habit, method of medicine preparation and the ailments for which the plant is used. All the related information was compiled and tabulated. Quantitative ethnobotanical indices such as Use Value (UV) and Informant Consensus Factor (ICF) were calculated to assess the relative importance of medicinal plant species and the level of agreement among informants regarding the use for the treatment of various ailments.

***Use Value (UV)***

The use Value (UV) was calculated for each documented plant species following the computation technique based on the method adapted by Ferreira *et al.* (2009) from the approach proposed by Phillips *et al.* (2002). This quantitative parameter was applied to ascertain the relative importance of each medicinal plant species in regard to its frequency of citation among the informants.

UV was calculated using the following formula:

$$UV = \sum \frac{U}{n}$$

where *U* is the number of times plant species are cited by the informants, and n is the total number of informants interviewed.

***Informant consensus factor (ICF)***

The ailments identified in this study were classified into 12 distinct ailment categories (Table 2), and the informant consensus factor (ICF) was calculated using statistical values to measure the extent of agreement by the informants about the medicinal usage of certain plants for certain human ailments. It is an assessment of the level of agreement of different informants

concerning the use of the plants, pointing out the homogeneity of the information as well as its reliability in ethnobotany. The Fic was calculated using the following formula:

$$F_{ic}= \frac{n_{ur}- n_t}{n_{ur-1}}$$

where nur represents the number of use reports for a specific ailment category, while nt refers to the number of species used for a specific ailment category by all the informants.

## Results

**Demographic profile of informants in the study area.**

A total of 23 informants were interviewed for this study, comprising traditional healers, practitioners and knowledgeable individuals of the Tharu community. Among them, 16 (69.6%) were male, and 7 (30.4%) were female. The informants ranged in age from 35 years to above 80 years. The informants were categorised into four age groups: 35-50 years, 51-65 years, 66-80 years and above 80 years. The majority of the informants belonged to the age group 35-50 years, i.e., 10 (43.5%), followed by 51-65 years, i.e., 7 (30.4%), 66-80 years, i.e., 4 (17.4%), and above 80 years, i.e., 2 (8.7%) Table 1.

The informants occupational distribution comprised farmers (26.1%), traditional healers (26.1%), housewives (17.4%) and other occupations (30.4%), which accentuates the close relationship between daily livelihood and the medicinal plants usage. Academic background levels range from 30.4% informants having no formal education, primary education (26.1%) or secondary education (30.4%), and only a small proportion of informants gained higher education.

Table 1. Demographic data of the surveyed informants.

| Variables | Categories | Total number of respondents | Percentage distribution of respondents |
|---|---|---|---|
| Gender | Male | 16 | 69.6% |
| | Female | 7 | 30.4% |
| Age groups (in years) | 35-50 | 10 | 43.5% |
| | 51-65 | 7 | 30.4% |
| | 66-80 | 4 | 17.4% |
| | Above 80 | 2 | 8.7 % |
| Occupation | Farmer | 6 | 26.1% |
| | House wife | 4 | 17.4% |
| | Traditional Healer | 6 | 26.1% |
| | Other | 7 | 30.4% |
| Education | Never attended school | 7 | 30.4% |
| | Primary education (Class 1-5) | 6 | 26.1% |
| | Secondary education (Class 6-10) | 7 | 30.4% |
| | Graduate | 2 | 8.7%% |
| | Postgraduate | 1 | 4.3%% |

**Ethnomedicinal plants used by the Tharu community**

The study revealed the ethnobotanical information of 71 ethnomedicinal plant species belonging to 40 families that have been used by the Tharu tribal community for the management of various ailments, such as Fever, typhoid, diabetes, fracture and Jaundice, etc, in the study area. The majority of plants used for treatment were herbs (30 species), followed by trees (25 species) and shrubs (10 species), with climbers being used less frequently (6 species). Figure 3. About 8 plant species were used for Leukorrhea, 7 for hemorrhoids, 6 for diabetes, 5 for boils and bone fracture. 4 plant species each for body pain, fever, cough and cold, flatulence, kidney stone, rickets, typhoid and toothache. 3 plant species each were used for Arthritis, asthma, cuts and wounds, epilepsy, headache and paralysis. 2 plant species each were used to treat blood purifier, canker sore, sunstroke, hypotension, Jaundice, joint pain, lactation insufficiency, liver problems, pimples, splinter or thorn prick, indigestion, swelling and urinary retention. 1 plant species used each for anorexia (loss of appetite), anticoagulant (blood thinners), boost fertility (in males), cataract, constipation, dizziness, fatigue, fever with neck pain, gall bladder stones, goitre, hypertension, knee pain, menstrual disorders, Pelvic inflammatory disorders, pneumonia (Chest indrawing), poor blood circulation, post-traumatic pain, pyorrhoea, ringworm, skin allergy, snakebite, scorpion sting, sore throat, strengthen teeth and gums, thrombocytopenia (Low platelet count) and vomiting. Out of the total 40 families, Fabaceae contributed the

maximum number of species (8), followed by Euphorbiaceae(5), Asteraceae, Malvaceae, Solanaceae, and Acanthaceae (with 4 plant species each), Combretaceae and Liliaceae with (3 plant species each), Myrtaceae, Amaryllidaceae, Apocynaceae, Meliaceae (each represented by two plant species each), the remaining 28 families Amaranthaceae, Anacardiaceae, Annonaceae, Apiaceae, Asparagaceae, Bignoniaceae, Caricaceae, Convolvulaceae, Crassulaceae, Dipterocarpaceae, Equisetaceae, Lauraceae, Menispermaceae, Moraceae, Musaceae, Oleaceae, Orchidaceae, Oxalidaceae, Papaveraceae, Phyllanthaceae, Piperaceae, Poaceae, Rhamnaceae, Rutaceae, Sapotaceae, Verbenaceae, Vitaceae and Zingiberaceae are represented by a single plant species in the study area (Figure 4). Various plant parts, including leaves, roots, rhizomes, flowers, fruits, seeds, latex, gum, wood, stems, bulbs, bark, and even whole plants, are incorporated in several applications. In herbal formulations, leaves were the most preferred plant part, accounting for 44%, followed by fruits (10%), bark (9%), root (9%), flowers (6%), seed 7%, stem (5%), whole plant (3%), Rhizome, bulb and latex 2% each. The remaining part gum, represented by 1% (Figure 2). Herbal medicines are prepared in various forms such as decoctions, pastes, powders, infusions, and juices, etc. Fresh juice was the most dominant method of preparation (33%), followed by powder (20%), paste (16%), raw leaves (9%), decoction (8%), infusion (5%), latex (3%), oil (3%), tablets, poultice and raw flower (1%) each. These preparations generally fall into four main categories: extraction of juice from different plant parts, grinding dried plant materials into powders, application of plant parts as a paste and preparation of decoctions by boiling plant parts with water or other liquids. Fresh plant parts were commonly used in the preparation of herbal medicines. In most instances, the preparations were used fresh, while in certain cases, they were preserved for future use. Plant species have been used either as single preparations or in polyherbal formulations that combine different plant species and their parts to treat specific ailments (Figure 3).

Of the 71 documented species, 32 species are cultivated within domestic spaces, including home gardens, kitchen gardens, and vacant lands surrounding households, namely *Allium cepa, Allium sativum, Andrographis paniculata, Annona squamosa, Asparagus racemosus, Azadirachta indica, Bryophyllum pinnatum, Carica papaya, Catharanthus roseus, Citrus medica, Clitoria ternatea, Curcuma domestica, Datura metel, Datura stramonium, Euphorbia neriifolia, Euphorbia tithymaloides, Hibiscus rosa-sinensis, Mangifera indica, Musa paradisiaca, Nyctanthes arbor-tristis, Ocimum sanctum, Phyllanthus emblica, Piper betle, Psidium guajava, Senna sophera, Stevia rebaudiana, Syzygium cumini, Tinospora cordifolia, Trachyspermum ammi, Vanda tessellata, Vitis vinifera, and Withania somnifera.* The remaining 39 species are collected from the wild, including forests, grasslands, and riparian habitats.

Among the 71 documented species, Pterocarpus marsupium Roxb and Shorea robusta C.F. Gaertn. are both categorised as Near Threatened (NT) on the IUCN Red List at the global level. Pterocarpus marsupium Roxb has also been reported as a Near Threatened species in Uttarakhand (Saxena and Prasad, 2014). Additionally, seven species, including *Andrographis paniculata, Asparagus racemosus, Emblica officinalis, Ocimum sanctum L., Solanum nigrum L., Withania somnifera, and Tinospora cordifolia*, are listed under the NMPB (2020b) list of 32 prioritised medicinal plants facing conservation pressure due to high commercial demand and wild collection.

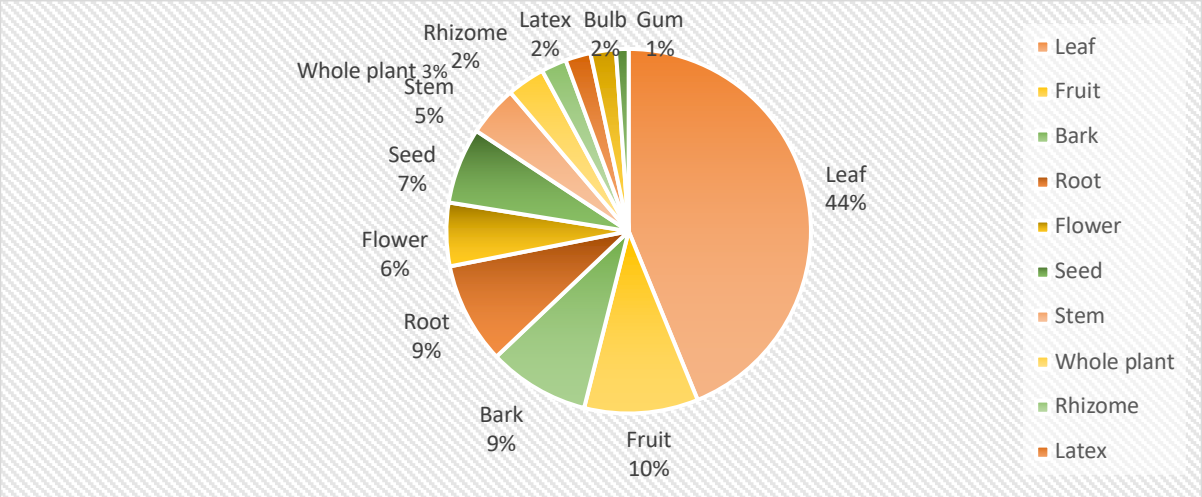


Figure 2. Distribution pattern of plant parts used in ethnomedicinal formulations.

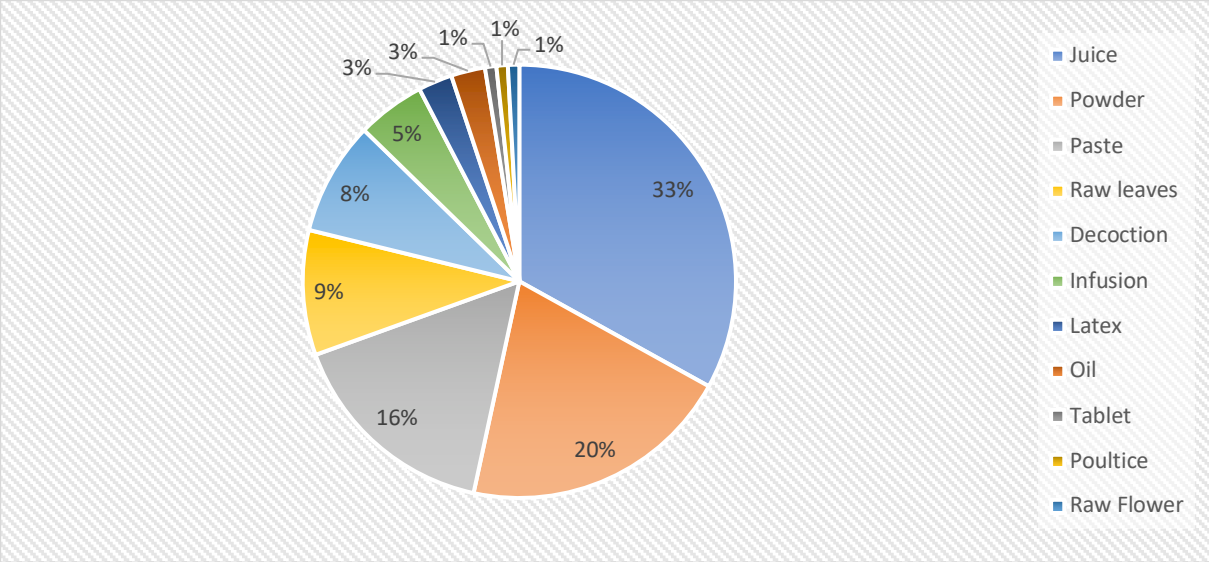


Figure 3. Percentage distribution of different methods used for the preparation of herbal medicinal formulations.

**Quantitative Analysis of Documented plant species Using Use Value (UV) and Informant consensus factor (ICF)**

***Use value (UV)***

The findings of the Use Value (UV) analysis indicated variation in the relative importance of the various plant species used by the informants. Amongst all the plant species recorded in Table 4, *Andrographis paniculata* has the highest Use Value (UV= 0.70), followed by *Achyranthes aspera* Use Value *(UV= 0.61),* showing their significant cultural importance and frequent use amongst the informants. *Abutilon indicum, Datura stramonium, Dysoxylum binectariferum, Euphorbia thymifolia, Mangifera indica, Pterocarpus marsupium, Spilanthes acmella and Withania somnifera* were the plant species that showed moderate Use Value (UV = 0.17). The average Use value recorded in the study is 0.10, with use values ranging between 0.04 and 0.70. Several other plant species had comparatively lower use values, ranging from 0.13 to 0.04, indicating that these plants were mentioned by fewer informants and might have more specific or less commonly known medicinal purposes.

***Informant consensus factor (ICF)***

ICF represents an index showing the degree of informants' agreement about their ethnobotanical knowledge related to a particular disease category (Trotter & Logan, 1986). For each disease category studied, the ICF was calculated based on the results of interviews with informants regarding the frequency of using the mentioned medicinal plants in relation to different disease categories. The medicinal plants studied were divided into twelve disease categories: namely, diseases of the cardiovascular and blood systems, skin diseases, endocrine and metabolic diseases, diseases related to fever, diseases of the gastrointestinal tract and female reproductive system diseases, diseases of the musculoskeletal system, neurological diseases, oral and dental diseases, respiratory diseases, urogenital diseases, and others (Table 2). In total, 159 use reports were received from those disease categories. The highest number of medicinal plants was observed for diseases of the musculoskeletal system (18 medicinal plants used and 23 use reports). 14 plant species were used to treat diseases of the gastrointestinal diseases, with 22 use reports. 12 plant species were applied in treating gynaecological and reproductive diseases with 16 use reports, 12 medicinal plant species were used for skin diseases with 16 use reports, The oral and dental conditions had 6 plant species with 11 use reports, Neurological and respiratory conditions each had 9 plant species with 10 uses. For endocrine and metabolic disorders, 7 medicinal plants with 8 uses are reported and for the other category, cardiovascular and blood system disorders. Febrile disorder: 7 plant species with 18 uses.

The range of ICF values that was derived ranged from 0.11 to 0.65, indicating significant variability in relation to the degree of consensus among the respondents. Febrile ailments (0.65) show the maximum ICF value, followed by oral and dental ailments (0.50), digestive tract ailments (0.36), and urogenital ailments (0.29). Moderate consensus among the respondents was found in gastrointestinal ailments (ICF = 0.36), urogenital ailments (ICF = 0.29), skin ailments (ICF = 0.27) and Gynaecological and reproductive ailments (ICF = 0.27), endocrine and metabolic ailments (ICF = 0.25), and musculoskeletal ailments (ICF = 0.23). Relatively lower consensus values were recorded for cardiovascular and blood ailments (ICF = 0.14), other ailments (ICF = 0.14), neurological ailments (ICF = 0.11), and respiratory ailments (ICF = 0.11), given in Table 3, which indicate relative homogeneity in ethnobotanical knowledge among the respondents for these disease categories.

Table 2. Ailment categories

| | |
|---|---|
| Cardiovascular and blood disorders | Thrombocytopenia (Low platelet count), Anticoagulant (blood thinners), Hypertension, Hypotension, Blood Purifier, Poor blood circulation |
| Dermatological disorder | Pimples, Ringworm, Cuts and wounds, Splinter or thorn injuries, Skin allergy, Cuts and wounds, Splinter or thorn Prick injuries, Boil, Cuts and wounds, Pimples, Boil<br>Abscess |
| Endocrine and Metabolic Disorders | Diabetes, Goitre |
| Febrile Disorders | Fever with neck pain, Typhoid, Fever |
| Gastrointestinal disorder | Hemorrhoids, Jaundice, Anorexia (loss of appetite), Flatulence, Vomiting, Indigestion, Constipation, Gall bladder stone, Jaundice, Flatulence |
| Gynaecological and reproductive disorders | Menstrual disorders, Pelvic inflammatory disorders, Boost fertility (in males), Lactation insufficiency, Leukorrhea |
| Musculoskeletal disorders | Rickets, Bone fracture, Joint pain, Body pain, Bone fracture pain, Knee pain, Old Injury pain, Arthritis |
| Neurological disorder | Headache, Dizziness, Paralysis, Epilepsy |
| Oral and dental disorders | Toothache, Pyorrhoea, Strengthen teeth and gums, Canker sore |
| Other | Cataract, Snakebite, Scorpion sting, Swelling, Fatigue, Sunstroke |
| Respiratory disorder | Cough and cold, Pneumonia, Asthma, Sore Throat |
| Urogenital disorder | Kidney stone, Urinary retention |

Table 3. Table showing data of the Informant Consensus Factor (ICF)

| **Ailment Categories** | **Number of Plants used (Nt)** | **Number of use reports (Nur)** | **ICF value** |
|---|---|---|---|
| Cardiovascular and blood system disorder | 7 | 8 | 0.14 |
| Dermatological disorder | 12 | 16 | 0.27 |
| Endocrine and Metabolic Disorders | 7 | 9 | 0.25 |
| Febrile disorder | 7 | 18 | 0.65 |
| Gastrointestinal disorder | 14 | 22 | 0.36 |
| Gynaecological and reproductive disorders | 12 | 16 | 0.27 |
| Musculoskeletal disorder | 18 | 23 | 0.23 |
| Neurological disorder | 9 | 10 | 0.11 |
| Oral and dental disorders | 6 | 11 | 0.50 |
| Respiratory disorder | 9 | 10 | 0.11 |
| Urogenital disorder | 6 | 8 | 0.29 |
| Other | 7 | 8 | 0.14 |

Table 4. Plant species used by the Tharu community for the treatment of various human ailments.

| Name of the plant species (Collection Number, Accession number) | Vernacular name (Tharu dialect) | Family | Habit | Parts used | Name of the plant supplemented | Uses and Preparation of Medicine | Use value |
|---|---|---|---|---|---|---|---|
| *Abutilon indicum* (L.) Sweet (C. No. ND19, PNGPGRMR-01) | **Kanghi (कंघी)** | Malvaceae | H | Leaf<br><br>Leaf<br><br>Root | *Bryophyllm pinnatum* (Lam.) Oken*.*, *Syzygium aromaticum* (L.) Merr. & L.M. Perry<br><br>*Piper nigrum* L.<br><br>— | **Kidney stones**: Juice prepared by mixing fresh leaves with *Bryophyllum pinnatum* and 5–6 cloves taken twice daily on an empty stomach.<br><br>**Leukorrhea**: Extract of the crushed leaves mixed with some black pepper seeds and powdered sugar, a small amount of the juice diluted in water and taken twice a day over four-day intervals.<br><br>**Leukorrhea:** Root juice was extracted and mixed with rock sugar. Taken orally on an empty stomach in the morning. | 0.17 |
| *Achyranthes aspera* L. (C. No. ND06, PNGPGRMR-04) | **Chirchita (चिरचिटा), Ultisajji (उल्टसज्जी), apamarga (अपामार्ग)** | Amaranthaceae | H | Leaf<br><br>Root<br><br>Root<br><br>Leaf, Root | *Asparagus racemosus* Willd., *Calotropis gigantea* (L.) W.T. Aiton*, Vanda tessellata* (Roxb.) Hook. ex G. Don*., Allium sativum* L*., Tinospora cordifolia* (Willd.) Hook.f. & Thomson, *Curcuma domestica* Valeton*.*<br><br>*Piper nigrum* L*., Zingiber officinale* Roscoe.<br><br>—<br><br>— | **Arthritis:** Combined with leaves of *Calotropis gigantea, Vanda tessellata, Asparagus racemosus* root, *Tinospora cordifolia* stem, fresh Curcuma *domestica* rhizome and dried *Allium sativum* bulb. Heated in mustard oil to make medicated oil. Prepared oil was massaged into the affected area twice daily.<br><br>**Asthma:** Crush fresh root, add black pepper and ginger; then boil in 1 litre of water till it reduces to half a litre. Take half a cup of this decoction in the morning and evening as tea.<br><br>**Fever:** The dried root powder was administered orally, one teaspoon twice daily on an empty stomach.<br><br>**Hemorrhoids:** The leaves and roots were dried, ground into fine powder, and the powder was consumed orally with lukewarm water on an empty stomach twice daily. | 0.61 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Leaf | *Xanthium strumarium* L.*, Piper nigrum* L. | **Jaundice:** Leaves of both plants were co-ground with black pepper, the juice was extracted by straining and administered orally twice daily for one month. | |
| | | | | Root, leaf | *Piper nigrum* L. | **Jaundice:** Five leaves and 20 g fresh root were mixed with four black peppercorns, and the mixture was strained, and half a cup of the juice was taken twice daily. | |
| | | | | Root, leaf | *Piper nigrum* L. | **Liver problems:** Leaves and fresh root, along with four black peppercorns, were ground and prepared as juice, taken orally twice daily. | |
| | | | | Stem | — | **Rickets:** A stem is worn around the neck as an amulet. | |
| | | | | Leaf | — | **Snake bite:** Fresh leaves are rubbed externally as an antidote to the spot of snakebite. | |
| | | | | Leaf | — | **Scorpion sting:** Fresh leaves were applied externally as an antidote or administered orally. | |
| | | | | Root | — | **Urinary Retention:** Root was crushed to extract juice, which was taken orally on an empty stomach twice daily. | |
| *Ageratum houstonianum* Mill. (C. No. ND05, PNGPGRMR-06) | **Gidhauna (गिधौना)** | Asteraceae | H | Leaf | — | **Cuts and wounds:** Fresh leaf juice or leaf paste were applied externally and covered with a clean cotton cloth. | 0.09 |
| *Allium cepa* L. (C. No. ND43, PNGPGRMR-07) | **Piyaz(प्याज)** | Amaryllidaceae | H | Bulb | — | **Sunstroke:** The onion is kept in the pocket. | 0.04 |
| *Allium sativum* L. (C. No. ND32, PNGPGRMR-08) | **Lehsun (लहसुन)** | Amaryllidaceae | H | Bulb | *Zingiber officinale* Roscoe. | **Hypertension:** A paste was prepared from leaves and juice extracted; equal proportions of *Allium sativum*, *Zingiber officinale,* apple cider vinegar and honey were added in small quantities, and one teaspoon of the preparation was administered orally twice daily. | 0.04 |

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| *Andrographis paniculata* (Burm.f) Wall.ex Nees (C. No. ND03, PNGPGRMR-11) | **Kalpanaath, kalmegh (कालमेघ), chiretta (चिरायता)** | Acanthaceae | H | Leaf<br><br>Leaf<br><br>Whole plant<br><br>Leaf<br><br>Leaf<br><br>Leaf<br><br>Whole plant<br><br>Leaf | —<br><br>—<br><br>—<br><br>*Piper nigrum* L.<br><br>—<br><br>—<br><br>—<br><br>— | **Headache:** Leaf juice was administered orally.<br><br>**Toothache:** Fresh leaf placed under the affected tooth.<br><br>**Blood Purifier:** The whole fresh plant was crushed and the juice administered orally twice daily for one week.<br><br>**Canker sore:** Leaves were ground into a fine paste, mixed with black pepper powder, and applied externally to the affected area twice daily.<br><br>**Fever:** Leaves are chewed in the morning on an empty stomach, with or without water. Once daily.<br><br>**Hemorrhoids:** Leaf juice is consumed orally once daily or externally applied to the affected area.<br><br>**Poor blood circulation:** Juice extracted from the freshly ground whole plant is administered orally. One teaspoon of the juice with half a glass of water is taken on an empty stomach, thrice a day for one week on an empty stomach.<br><br>**Typhoid:** Extract juice from the leaves. One tablespoon of the juice mixed with water and taken thrice a day on an empty stomach, before brushing. | 0.70 |
| *Anisomeles indica* (L.) Kuntze (C. No. ND71, PNGPGRMR-12) | **Masapindi (मसापिंडी)** | Lamiaceae | H | Leaf | — | **Cuts and wounds:** A paste prepared from fresh leaves is crushed and applied to the affected area. | 0.04 |
| *Annona squamosa* L. (C. No. ND20, PNGPGRMR-13) | **Sarifa (शरीफा)** | Annonaceae | T | Leaf | — | **Diabetes:** 4 to 6 leaves chewed raw daily on an empty stomach. | 0.04 |

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| *Argemone mexicana* L. (C. No. ND56, PNGPGRMR-14) | **Oontkateri (ऊँटकटेरी), kateela (कटीला)** | *Papaveraceae* | H | Leaf | — | **Cataract:** Leaf juice is extracted and used as eye drops, administered twice daily for three months. | 0.04 |
| *Asparagus racemosus* Willd. (C. No. ND34, PNGPGRMR-15) | **Satavar, Shataavari (शतावरी)** | Asparagaceae | S | Root<br><br>Root | *Cuminum cyminum* L., *Vicia lens* (L.) Coss. & Germ.<br><br>— | **Lactation insufficiency:** Raw and roasted cumin, along with *Shatavari* root, are crushed and cooked with red lentils (masoor dal) to prepare a formulation that is administered twice daily during the postpartum period to enhance lactation in nursing mothers.<br><br>**Leukorrhea:** The shade-dried root was powdered. One teaspoon of the preparation was administered orally twice daily, in the morning and evening. | 0.13 |
| *Azadirachta indica* A. Juss. (C. No. ND70, PNGPGRMR-16) | **Neem (नीम)** | Meliaceae | T | Leaf<br><br>Leaf | *Lawsonia inermis* L.<br><br>— | **Skin allergy:** Leaves of *Azadirachta indica* were combined with *Lawsonia inermis* leaves and prepared as a decoction and consumed on an empty stomach for one month.<br><br>**Diabetes:** Raw **l**eaf consumption started with one leaf daily on an empty stomach, gradually increased by one leaf per day up to 21 leaves, and then decreased stepwise back to one leaf. | 0.09 |
| *Barleria prionitis* L. (C. No. ND60, PNGPGRMR-19) | **Katsaraiyaa (कटसरैया)** | Acanthaceae | S | Leaf<br><br>Leaf | —<br><br>— | **Pyorrhoea:** Leaves are boiled, and the resulting decoction is used as a mouthwash, administered twice daily in the morning and evening.<br><br>**Strengthen teeth and gums:** Fresh leaves are chewed or applied as a paste to the affected gums to alleviate pain, and the leaf decoction is used as a mouthwash to strengthen teeth. | 0.09 |
| *Bombax ceiba* L. (C. No. ND13, PNGPGRMR-22) | **Semal (सेमल)** | Malvaceae | T | Root<br><br>Flower | *Piper nigrum* L., *Zingiber officinale* Roscoe.<br><br>— | **Leukorrhea:** Roots are crushed and combined with black pepper and dry ginger (sonth) powder, and the prepared mixture is consumed with lukewarm water in the morning for about one month.<br><br>**Paralysis:** The flower is prepared as a boiled vegetable and consumed. | 0.13 |

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| | | | | Bark | __ | **Toothache:** The dried bark is boiled in water, and the resulting decoction is used as a mouthwash. | |
| *Bryophyllm pinnatum* (Lam.) Oken. (C. No. ND36, PNGPGRMR-23) | **Pattharchata (पथरचट्टो)** | Crassulaceae | H | Leaf | *Piper nigrum* L. | **Kidney stone:** Two leaves are chewed with black pepper on an empty stomach once daily. | 0.04 |
| *Butea monosperma* (Lam.) Kuntze (C. No. ND28, PNGPGRMR-24) | **Dhaak (ढाक), Palash (पलाश)** | Fabaceae | T | Flower | __ | **Urinary Retention:** Flower paste is applied below the navel to promote urinary flow. | 0.04 |
| *Calotropis gigantea* (L.) W.T.Aiton (C. No. ND23 PNGPGRMR-25) | **Aak, akaua (अकौवा)** | Apocynaceae | S | Flower<br><br>Leaf<br><br>Latex | *Syzygium aromaticum* (L.) Merr. & L.M.Perry. *Piper nigrum* L., *Amomum subulatum* Roxb.<br><br>__<br><br>__ | **Asthma:** Dried flower powder is combined with black pepper,4 to 5 dried cloves, and black cardamom powder, and consumed once daily with lukewarm water.<br><br>**Joint pain:** The leaf is gently warmed over a low flame, mustard oil is applied to one side of the leaf, and the oiled surface is placed over the affected area. Then secured with a clean cloth or bandage.<br><br>**Splinter or thorn prick:** Latex is topically applied to the affected area to facilitate the removal of splinters or thorns. | 0.13 |
| *Carica papaya* L. (C. No. ND09 PNGPGRMR-27) | **Papita (पपीता)** | Caricaceae | T | Root<br><br>Leaf<br><br>Leaf | *Piper nigrum* L.<br><br>__<br><br>__ | **Kidney stone:** The freshly extracted root juice is administered orally after mixing with a small amount of rock salt and black pepper. The preparation is taken once daily on an empty stomach.<br><br>**Ringworm:** A paste is prepared from the leaves and applied topically to the affected area.<br><br>**Thrombocytopenia (Low platelet count):** Fresh leaf juice consumed orally twice daily for a duration of 3–4 days. | 0.13 |
| *Catharanthus roseus* (L.) G. Don. | **Sadabahar (सदाबहार)** | Apocynaceae | H | Leaf | __ | **Pimples:** The leaf paste is applied externally to the affected area. | 0.09 |

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| (C. No. ND49 PNGPGRMR-29) | | | | Leaf | — | **Boil:** Leaves are crushed into a fine paste and applied topically to the affected area. | |
| *Citrus medica* L. (C. No. ND08 PNGPGRMR-33) | **Bada neembu (बड़ा नींबू)** | Rutaceae | T | Fruit | — | **Kidney stone:** One teaspoon of fruit juice, combined with rock salt, is administered orally once daily on an empty stomach. | 0.04 |
| *Clerodendrum viscosum* Vent. (C. No. ND33 PNGPGRMR-34) | **Bhatan (भटान)** | Lamiaceae | S | Leaf | *Haldina cordifolia* (Roxb.) Ridsdale, *Piper nigrum* L. | **Leukorrhea:** Seven fresh leaves are combined with equal quantities (seven leaves each) of *Haldina cordifolia* and *Euphorbia hirta*, along with seven black pepper seeds, and ground to form a fine paste. The mixture is filtered, and the resulting juice is taken orally with water twice daily for 7–8 days. | 0.04 |
| *Clitoria ternatea* L. (C. No. ND58 PNGPGRMR-35) | **Aparajita (अपराजिता), neelkanth (नीलकंठ)** | Fabaceae | C | Seed<br><br>Leaf | —<br><br>— | **Boost fertility:** Seeds are consumed with milk to enhance fertility in males.<br><br>**Fever with neck pain:** Leaf juice is applied externally over the neck region. | 0.09 |
| *Curcuma domestica* Valeton (C. No. ND47 PNGPGRMR-36) | **Haldi (हल्दी)** | Zingiberaceae | H | Rhizome | *Citrus aurantifolia* (Christm.) Swingle | **Swelling:** Grind fresh turmeric, add a little salt and mustard oil to it, then squeeze in some lemon juice. Apply this paste to the area where there is swelling and pain, and cover it with a cloth or bandage. | 0.04 |
| *Cuscuta reflexa* Roxb. (C. No. ND69 PNGPGRMR-37) | **Sarag baboor (सरग बबूर)** | Convolvulaceae | C | Stem | *Achyranthes aspera* L. | **Fever:** The stems of both plants are to be tied around the neck as an amulet. | 0.04 |
| *Cynodon dactylon* (L.) Pers. (C. No. ND26 PNGPGRMR-38) | **Durva (दूर्वा)** | Poaceae | H | Whole plant<br><br>Whole plant | —<br><br>*Achyranthes aspera* L. | **Cuts and wounds:** A leaf paste is prepared by crushing the whole plant, then applied to the affected area and secured with a cloth or bandage.<br><br>**Headache:** The plant is crushed along with the leaves of *Achyranthes aspera*, and the juice is extracted. A piece of cotton is then soaked in the juice and used for inhalation. | 0.09 |
| *Dalbergia sissoo* Roxb ex DC. (C. No. ND68 PNGPGRMR-39) | **Sisham (शीशम)** | Fabaceae | T | Leaf | — | **Typhoid:** The leaves are soaked in water overnight, and the resulting infusion is used for bathing. | 0.04 |

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| *Datura metel* L. (C. No. ND50 PNGPGRMR-40) | **Kalo dhaturo (कालो धतूरो)** | Solanaceae | H | Leaf | __ | **Knee pain:** A small amount of mustard oil is applied to the leaf, which is then gently warmed over a low flame. It is placed on the affected area and secured with a cloth or bandage. | 0.04 |
| *Datura stramonium* L. (C. No. ND24 PNGPGRMR-41) | **Dhatura (धतूरा)** | Solanaceae | H | Leaf<br><br>Leaf<br><br>Leaf | *Withania somnifera* (L.) Dunal *, Spilanthes acmella* (L.) L., *Nardostachys jatamansi* (D.Don) DC., *Trachyspermum* ammi (L.) Sprague*.,* *Zingiber officinale* Roscoe, *Allium sativum* L., *Nardostachys jatamansi* (D.Don) DC.<br><br>*Allium sativum* L.<br><br>__ | **Arthritis:** Fresh leaves are combined with the roots of *Spilanthes acmella*, Nardostachys jatamansi leaf, Fresh leaves and root of Withania somnifera, dried powder of rhizomes of Zingiber officinale, seeds of Trachyspermum ammi, Linum usitatissimum and dried Allium sativum bulbs. All these ingredients are added to mustard oil and infused, which can be applied to the affected part.<br><br>**Body pain:** Datura leaves and *Allium sativum* bulbs are ground into a paste and boiled in mustard oil until the mixture turns black. The oil is then strained and applied to the soles of the feet or calves twice daily.<br><br>**Leukorrhea:** Two drops of leaf juice are mixed with milk and administered twice daily for a duration of one to two months. | 0.17 |
| *Dysoxylum binectariferum* (Roxb.) Hook.f. ex Bedd. (C. No. ND10 PNGPGRMR-42) | **Ookalkaat (ऊकलकाट)** | Meliaceae | T | Fruit<br><br>Seed<br><br>Fruit | __<br><br>__<br><br>__ | **Boil:** The fruit is ground into a paste and applied topically around the opening twice daily.<br><br>**Goitre:** The seed is tied around the neck as an amulet.<br><br>**Vomiting:** The fruit peel is ground into a paste and administered orally by licking. | 0.17 |
| *Eclipta prostata* (L.) L. (C. No. ND59 PNGPGRMR-43) | **Bhringaraaj (भृंगराज), bhringa (भृंगो)** | Asteraceae | H | Leaf | __ | **Toothache:** The juice extracted from the leaves is applied as two drops into the ear opposite to the affected ear, twice daily. | 0.04 |
| *Equisetum ramosissimum* Desf. (C. No. ND38 PNGPGRMR-45) | **Harjudi (हरजुड़ी)** | Orchidaceae | H | Stem | *Vanda tessellata* (Roxb.) Hook. ex G.Don*,* *Litsea glutinosa* (Lour.) C.B.Rob. | **Bone Fracture:** The stem is mixed with the leaves of *Vanda tessellata* and the bark of *Litsea glutinosa* to form a paste. The paste is gently warmed in a small amount of mustard oil and | 0.04 |

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| | | | | | | applied as a poultice. The area is then covered with a clean cloth. | |
| *Euphorbia hirta* L. (C. No. ND48 PNGPGRMR-46) | **Badi dudhi (बड़ी दुद्धी)** | Euphorbiaceae | H | Leaf<br><br>Leaf | —<br><br>— | **Lactation insufficiency:** Fresh leaves are crushed to extract juice, which is taken twice daily for four consecutive days on an empty stomach.<br><br>**Swelling:** The juice extracted from crushed leaves is administered orally on an empty stomach twice daily. | 0.09 |
| *Euphorbia neriifolia* L. (C. No. ND35 PNGPGRMR-47) | **Sehud (सेहुंड)** | Euphorbiaceae | S | Latex<br><br>Latex | —<br><br>— | **Boil:** Latex milk is applied around the boil, avoiding the head (opening) area.<br><br>**Splinter or thorn prick:** Latex is applied to the affected area to facilitate the expulsion of the thorn. | 0.09 |
| *Euphorbia thymifolia* L. (C. No. ND55 PNGPGRMR-48) | ***Choti dudhi (छोटी दुद्धी)*** | Euphorbiaceae | H | Leaf<br><br>Whole plant<br><br>Leaf<br><br>Leaf | —<br><br>—<br><br>—<br><br>*Euphorbia hirta* L. | **Blood Purifier:** Leaf juice is consumed once daily.<br><br>**Pelvic inflammatory disorders:** Powder of the dried whole plant is consumed once daily with lukewarm water for 15–20 days<br><br>**Pimples:** Leaves juice is applied externally**.**<br><br>**Rickets:** One teaspoonful of juice extracted from the leaves of both plants is mixed with half a cup of milk and administered orally once daily. | 0.17 |
| *Euphorbia tithymaloides* L. (C. No. ND51 PNGPGRMR-73) | **Koredhantar (कोरधंतर), Dardmar (दर्दमार)** | Euphorbiaceae | S | Leaf | *Rosa indica* L. | **Boil:** leaves were crushed into a poultice with rose leaves and placed around the opening area. | 0.04 |
| *Ficus religiosa* L. (C. No. ND57 PNGPGRMR-49) | **Peepal (पीपल)** | Moraceae | T | Bark<br><br>Bark | *Piper nigrum* L.<br><br>— | **Cough and cold:** A fine powder prepared from the dried bark is mixed with 7–8 black pepper. One teaspoonful of the mixture is taken with honey three times daily, with or without food, for one week. | 0.09 |

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| | | | | | | **Menstrual irregularities:** The dried bark is boiled in water and taken twice daily for three months for Menstrual clots and oligomenorrhea. | |
| *Helicteres isora* L. (C. No. ND15 PNGPGRMR-50) | **Marorphali (मरोड़ फली** | Malvaceae | T | Fruit | — | **Epilepsy:** A left-sided twisted fruit is worn around the neck as an amulet. | 0.04 |
| *Hibiscus rosa-sinensis* L. (C. No. ND42 PNGPGRMR-51) | **Gudhal (गुड़हल)** | Malvaceae | S | Flower | — | **Sunstroke:** The flower is administered orally with water once daily. | 0.04 |
| *Kigelia pinnata* (Jacq.) DC. (C. No. ND67 PNGPGRMR-54) | **Balamkheera (बालम खीरा)** | Bignoniaceae | T | Bark | *Pterocarpus marsupium* Roxb., *Withania somnifera* (L.) Dunal, *Andrographis paniculata* (Burm.f.) Wall. ex Nees | **Arthritis:** A fine powder is prepared from the dried bark of *Kigelia pinnata* and *Pterocarpus marsupium*, and is mixed with powdered dried leaves of *Withania somnifera* and *Andrographis paniculata*, along with 7–8 black pepper and a small quantity of black salt. One teaspoonful of the formulation is administered orally twice daily after meals with lukewarm water. | 0.04 |
| *Litsea glutinosa* (Lour.) C.B. Rob. (C. No. ND53 PNGPGRMR-57) | **Maida tree (मैदालकड़ी)** | Lauraceae | T | Bark | *Curcuma domestica* Valeton | **Bone Fracture:** The bark is ground with the fresh rhizome of *Curcuma domestica* to form a paste, which is applied topically to the affected area and covered with a cloth or bandage. | 0.04 |
| *Madhuca longifolia* (L.) J.F.Macbr. (C. No. ND66 PNGPGRMR-58) | **Mahua (महुआ)** | Sapotaceae | T | Bark | *Litsea glutinosa* (Lour.) C.B.Rob. | **Bone Fracture:** Dried bark paste is mixed with the bark of Litsea glutinosa (Maida tree) and applied on the affected area and secured with a clean cotton cloth. | 0.04 |
| *Mangifera indica* L. (C. No. ND65 PNGPGRMR-60) | **Aam (आम)** | Anacardiaceae | T | Bark<br><br>Leaf<br><br>Bark | —<br><br>*Piper nigrum* L., *Zingiber officinale* Roscoe.<br><br>— | **Anorexia (loss of appetite):** The bark of a mature tree is boiled in water, and the resulting steam is inhaled twice daily.<br><br>**Cough and cold:** Finely powdered dried leaves are combined with dry ginger (*Sonth*) powder and honey, and administered orally twice daily.<br><br>**Leukorrhea:** The dried bark is powdered and mixed with sugar candy. One teaspoonful of the powder is taken orally once daily with moderately warm water. | 0.17 |

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| *Mimosa pudica* L. (C. No. ND61 PNGPGRMR-61) | **Chhuimui छुईमुई), sharmili (छुईमुई ), Lajwanti (लाजवंती)** | Fabaceae | H | Leaf | __ | **Hemorrhoids:** A fresh leaf paste is applied topically to the affected area once daily. | 0.04 |
| *Mucuna pruriens* (L.) DC. (C. No. ND12 PNGPGRMR-65) | **Kainch, kaunch (कौंच)** | Fabaceae | T | Fruit | __ | **Paralysis:** After removal of fruit hairs, the material is crushed, blended with buttermilk, and taken orally twice daily. | 0.04 |
| *Musa paradisiaca* L. (C. No. ND39 PNGPGRMR-66) | **Kela (केला)** | Musaceae | H | Rhizome | *Piper nigrum* L. | **Gall bladder stone:** The rhizome was ground and mixed with black peppercorns and a small amount of water, diluted in half a glass of water, and administered orally once daily. | 0.04 |
| *Nyctanthes arbor-tristis* L. (C. No. ND41 PNGPGRMR-67) | **Harasingaar (हर्षिंगार)** | Oleaceae | T | Leaf | __ | **Body pain:** One glass of water was boiled with leaves to make a decoction. The number of leaves was increased daily up to 21, then decreased to the initial count. The decoction was taken once daily. | 0.04 |
| *Ocimum tenuiflorum* L. (C. No. ND11 PNGPGRMR-70) | **Tulsi (तुलसी)** | Lamiaceae | H | Leaf<br><br>Leaf<br><br>Leaf | __<br><br>*Citrus aurantifolia* (Christm.) Swingle<br><br>__ | **Dizziness:** Leaf juice was mixed with sugar and administered three times daily.<br><br>**Headache:** Leaf juice and lemon juice were combined in equal parts and taken thrice a day.<br><br>**Typhoid:** Leaf decoctions consumed as tea twice daily. | 0.13 |
| *Oxalis corniculata* L. (C. No. ND29 PNGPGRMR-71) | **Amlola (अमलोला), khatti- meethi booti (खट्टी-मीठी बूटी)** | Oxalidaceae | H | Leaf<br><br>Leaf | __<br><br>__ | **Canker sore:** The leaves were crushed into a paste and applied externally to the affected area.<br><br>**Leukorrhea:** Two teaspoons of leaf extract were given orally four times daily on an empty stomach for a duration of 3 to 4 days. | 0.13 |
| *Peristrophe bicalyculata* (Retz.) Nees (C. No. ND64 PNGPGRMR-74) | **Banpatrang (बनपत्रंग)** | Acanthaceae | H | Leaf | __ | **Bone Fracture:** The juice extracted from the leaves is consumed twice daily on an empty stomach. | 0.04 |

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| *Phyla nodiflora* (L.) Greene (C. No. ND62 PNGPGRMR-75) | **Jala pipali (जल पीपली)** | Verbenaceae | H | Leaf | __ | **Hemorrhoids:** A fresh leaf paste was prepared and used as a topical application around the anal area to reduce discomfort and inflammation associated with hemorrhoids. | 0.04 |
| *Phyllanthus emblica* L. (C. No. ND31 PNGPGRMR-44) | **Amla (आँवला)** | Phyllanthaceae | T | Fruit<br><br><br><br><br><br>Fruit<br><br><br><br>Fruit | *Terminalia bellirica* (Gaertn.) Roxb*.,* *Terminalia chebula* Retz.<br><br><br>*Terminalia bellirica* (Gaertn.) Roxb*.,* *Terminalia chebula* Retz*.,* *Trachyspermum ammi* (L.) Sprague<br><br><br>*Terminalia bellirica* (Gaertn.) Roxb*.,* *Terminalia chebula* Retz. *,* *Trachyspermum ammi* (L.) Sprague | **Flatulence:** The dried fruit is mixed with *Terminalia bellirica* and *Terminalia chebula* bark, along with a small amount of black salt. The mixture is powdered, and one teaspoon is taken with lukewarm water twice daily.<br><br>**Indigestion:** A powdered formulation is prepared using the dried fruit of *Phyllanthus emblica*, seeds of *Trachyspermum ammi*, and the bark of *Terminalia chebula* and *Terminalia bellirica*. The powder is administered orally with lukewarm water twice daily.<br><br>**Constipation:** The ingredients are blended into a powdered mixture from the dried fruits of *Phyllanthus emblica*, seeds of *Trachyspermum ammi*, and bark of *Terminalia chebula* and *Terminalia bellirica*. The powder is taken once daily on an empty stomach. | 0.13 |
| *Piper betle* L. (C. No. ND54 PNGPGRMR-76) | **Paan (पान)** | Piperaceae | C | Leaf | *Sida cordifolia* L. | **Rickets:** Fresh leaves of Piper betle and *Sida cordifolia* were crushed to extract their juice, which was mixed with a small amount of edible lime (chuna) paste. The resulting mixture was applied over the entire body and gently massaged, left for a short duration, and then washed off. Subsequently, the root of *Sida cordifolia* was worn around the neck. | 0.04 |
| *Psidium guajava* L. | **Bihi (बिही), Amrud (अमरूद )** | Myrtaceae | T | Leaf | __ | **Sore throat:** Rock salt is applied to the tender green leaves and taken twice daily for 2- 3 days. | 0.04 |
| *Pterocarpus marsupium* Roxb. (C. No. ND52 PNGPGRMR-79) | **Bijaysaar (विजयसार)** | Fabaceae | T | Bark | __<br><br><br><br>__ | **Body pain:** Soak the bark overnight in one glass of water kept in a copper or brass vessel, and drink the resulting water the next morning before food. | 0.17 |

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| | | | | Bark<br><br>Bark<br><br>Bark | —<br><br>— | **Diabetes:** Soak the bark overnight in one glass of water kept in a copper or brass vessel, and drink the water in the morning on an empty stomach.<br><br>**Post-traumatic pain:** The bark is soaked in water overnight, and the infused water is taken in the following morning before breakfast, for 6 months.<br><br>**Leukorrhea:** The bark is soaked in water overnight. The soaked water is consumed the next morning before meals orally. | |
| *Ricinus communis* L. (C. No. ND45 PNGPGRMR-82) | **Arandi (अरंडी)** | Euphorbiaceae | T | Leaf<br><br>Leaf | —<br><br>— | **Boil:** Both sides of the leaf are coated with mustard oil and gently warmed-over low heat. Then place it on the boil, and make a small cut in the leaf where the head of the boil is located. And cover it with a cloth or bandage.<br><br>**Joint pain:** Warm the leaf lightly over a low flame, place it on the painful area to keep the leaf in place, and secure it using a cloth or bandage. | 0.09 |
| *Senna occidentalis* (L.) Link (C. No. ND27 PNGPGRMR-84) | **Pawad (छोटी पवाड़)** | Fabaceae | S | Seed | — | **Pneumonia:** Seeds were processed into a fine paste and applied to the ribs, or a warm compress was gently applied to the area using mild heat, for chest indrawing (chest retractions) in children. | 0.04 |
| *Senna* sophera (L.) Roxb. (C. No. ND06 PNGPGRMR-85) | **Pawad (पवाड़)** | Fabaceae | T | Leaf | — | **Hemorrhoids:** Four to five leaves were chewed with water in the morning before a meal. | 0.04 |
| *Shorea robusta* C.F.Gaertn. (C. No. ND16 PNGPGRMR-86) | **Sal (साल)** | Dipterocarpaceae | T | Gum | — | **Hemorrhoids:** The dried gum is powdered and combined with mustard oil, and the resulting formulation is used as a topical application to the affected area to alleviate pain and swelling. | 0.04 |
| *Solanum nigrum* L. (C. No. ND63 PNGPGRMR-87) | **Makaiya (मकईया)** | Solanaceae | H | Root | — | **Jaundice:** The fresh root was ground to extract its juice, and one teaspoon of this juice was administered daily. | 0.09 |

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| | | | | Seed | __ | **Liver problems:** The seeds were dried and consumed once daily on an empty stomach. | |
| *Spilanthes acmella* (L.) L.<br>(C. No. ND07 PNGPGRMR-90) | **Akarkara (अकरकरा)** | Asteraceae | H | Root<br><br><br><br>Flower, Leaf | __<br><br><br><br>__ | **Epilepsy:** The dried root was ground into a fine powder, filled into golden raisins, and taken with milk twice daily.<br><br>**Toothache:** A flower or a leaf is placed under the affected tooth. | 0.17 |
| *Stevia rebaudiana* (Bertoni) Bertoni<br>(C. No. ND44 PNGPGRMR-91) | **Meethi tulsi (मीठी तुलसी)** | Asteraceae | H | Leaf | __ | **Diabetes:** Two to three fresh leaves were chewed once daily in the morning empty stomach. | 0.04 |
| *Syzygium cumini* (L.) Skeels<br>(C. No. ND17 PNGPGRMR-92) | **Jamun (जामुन)** | Myrtaceae | T | Seed<br><br><br><br>Fruit<br><br><br><br>Seed | __<br><br><br><br>__<br><br><br><br>__ | **Asthma:** The powdered form of dried seeds was administered orally with water, once daily before a meal.<br><br>**Epilepsy:** Vinegar is prepared from the fruit and is taken once daily.<br><br>**Hypotension:** The powder of dried seeds is administered with water on an empty stomach twice daily. | 0.13 |
| *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.<br>(C. No. ND37 PNGPGRMR-94) | **Arjun (अर्जुन)** | Combretaceae | T | Bark<br><br><br><br>Bark | __<br><br><br><br>__ | **Diabetes:** The dried bark is boiled in water, and the resulting decoction is consumed as tea twice daily.<br><br>**Hypertension:** One teaspoon of freshly extracted bark juice is taken orally twice daily. | 0.09 |
| *Terminalia bellirica* (Gaertn.) Roxb.<br>(C. No. ND21 PNGPGRMR-95) | **Baheda (बहेड़ा)** | Combretaceae | T | Fruit<br><br><br><br>Fruit | *Terminalia chebula* Retz.<br><br><br><br>*Terminalia chebula* Retz. | **Anticoagulant (blood thinners):** The dried fruits are finely ground into a powder and consumed once daily.<br><br>**Cough and cold:** The dried fruit is grounded to powder of both, and one teaspoon of the mixture is consumed with honey twice daily. | 0.13 |

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| | | | | Fruit | *Terminalia chebula* Retz. | **Flatulence:** A powder is prepared by mixing the dried fruits of *Terminalia bellirica* and *Terminalia chebula*, and it is consumed once daily. | |
| *Terminalia chebula* Retz. (C. No. ND22 PNGPGRMR-96) | **Harad (हरड़)** | Combretaceae | T | Fruit<br><br><br><br><br><br><br>Fruit | *Phyllanthus emblica* L.*, Terminalia bellirica* (Gaertn.) Roxb., *Trachyspermum ammi* (L.) Sprague<br><br><br><br>*Phyllanthus emblica* L.*, Terminalia bellirica* (Gaertn.) Roxb.*, Trachyspermum ammi* (L.) Sprague | **Flatulence:** A powder is prepared by mixing the dried fruits of Terminalia chebula, *Phyllanthus emblica*, Terminalia bellirica, along with seeds of Trachyspermum ammi and a small amount of black salt. One teaspoon of the mixture is administered orally twice daily with fresh water.<br><br>**Indigestion:** A powder is prepared by mixing the dried fruits of *Terminalia chebula*, *Terminalia bellirica*, and *Phyllanthus emblica*, along with seeds of *Trachyspermum ammi*, a small amount of black salt, and asafoetida. One teaspoon of the mixture is taken with warm water on an empty stomach twice daily. | 0.09 |
| *Tinospora cordifolia* (Willd.) Hook.f. & Thomson (C. No. ND02 PNGPGRMR-97) | **Giloe (गिलो)** | Menispermaceae | C | Stem<br><br><br><br>Stem<br><br><br><br><br>Stem | —<br><br><br><br>—<br><br><br><br><br>*Ocimum tenuiflorum* L. | **Fever:** Stem juice is extracted and taken once daily before a meal.<br><br>**Body pain:** A fresh stem is ground to obtain the juice, which is then strained and diluted with a small amount of water. The preparation is administered orally on an empty stomach, twice daily.<br><br>**Typhoid:** The stem is crushed and soaked overnight with *Ocimum tenuiflorum* leaves in water. The infused water is consumed orally once daily in the morning for 5–7 days. | 0.21 |
| *Trachyspermum ammi* (L.) Sprague (C. No. ND40 PNGPGRMR-98) | **Ajwain ((अजवाइन))** | Apiaceae | H | Seed<br><br><br><br><br>Seed | *Myristica fragrans* Houtt.*, Piper nigrum* L.<br><br><br><br><br>*Phyllanthus emblica* L., *Terminalia bellirica* (Gaertn.) Roxb. | **Cough and cold:** A powder of *Trachyspermum ammi, Myristica fragrans*, seeds and black peppercorns is prepared; a pinch is given to infants, and adults receive half a teaspoon twice daily.<br><br>**Flatulence:** Seeds are roasted in ghee and mixed with dried fruit powders of *Phyllanthus emblica* and *Terminalia bellirica. One* teaspoon is administered twice daily with lukewarm water. | 0.13 |

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| *Vanda tessellata* (Roxb.) Hook. ex G. Don (C. No. ND04 PNGPGRMR-100) | **Harjudi (हरजुड़ी)** | Orchidaceae | H | Leaf | — | **Bone Fracture:** A freshly prepared paste of leaves is applied to the affected area and secured with a clean cloth. | 0.13 |
| *Vitis vinifera* L. (C. No. ND14 PNGPGRMR-102) | **Angoor (अंगूर)** | Vitaceae | C | Leaf | — | **Paralysis:** Leaf juice is mixed with rock salt and administered orally as two teaspoons twice daily. | 0.04 |
| *Withania somnifera* (L.) Dunal (C. No. ND01 PNGPGRMR-103) | **Ashwagandha (अश्वगंधा)** | Solanaceae | S | Leaf, Root<br><br>Root | —<br><br>— | **Diabetes:** 2-3 fresh leaves are chewed once daily in the morning; alternatively, a decoction prepared by crushing the fresh root and boiling it in water is taken once daily on an empty stomach.<br><br>**Fatigue:** Dried root powder is mixed with sugar drop candy and taken one teaspoon with lukewarm water once daily. | 0.17 |
| *Xanthium strumarium* L. (C. No. ND30 PNGPGRMR-104) | **Bada Chirchita (बड़ा चिरचिटा)** | Asteraceae | H | Leaf | *Achyranthes aspera* L., *Cynodon dactylon* (L.) Pers., *Piper nigrum* L. | **Hemorrhoids:** Leaves of *Xanthium strumarium* Linn., *Achyranthes aspera* L., and *Cynodon dactylon* Pers. are taken in equal proportions, crushed, and formed into tablets; two tablets are taken twice daily. | 0.04 |
| *Ziziphus mauritiana* Lam. (C. No. ND25 PNGPGRMR-106) | **Ber (बेर)** | Rhamnaceae | S | Fruit | — | **Rickets:** The dried fruit is ground into a powder and taken twice daily with lukewarm water. | 0.04 |

## Discussion

**Demographic characteristics of the informants**

The predominance of middle-aged informants (35-50 years) suggests that ethnomedicinal knowledge within the Tharu community is largely acquired through long-term experience and active involvement in traditional healthcare practices, wherein a considerable proportion of informants had attained only primary or no formal education. Consequently, oral transmission remains the primary means of perpetuating traditional medicinal knowledge within the community rather than formal education. Similar observations have been reported in previous ethnobotanical studies, highlighting the importance of intergenerational knowledge transfer in preserving traditional medicinal practices.

**Ethnomedicinal plant diversity and utilization patterns**

The present study documented 71 ethnomedicinal plant species belonging to 40 families used by the Tharu community for the treatment of a wide range of ailments, reflecting their rich ethnomedicinal knowledge and continued reliance on plant-based traditional healthcare. Although several species documented in the present study are known to contain bioactive compounds with toxic potential and therefore warrant careful attention with respect to their preparation and dosage. These include *Argemone mexicana* L. (Srinivasan N et.al., 2024). *Calotropis gigantea* (L.) W.T.Aiton (Y.-L. He *et al.* 2021), *Datura metel* L. (T. Islam *et al.* 2023), *Datura stramonium* L. (Gaire *et al.* 2012), *Euphorbia neriifolia* L. (Sultana *et al.* 2022) and *Euphorbia tithymaloides* L. (Parvin *et al.* 2015). The Tharu traditional healers, locally known as Vaidhyas, possess generational knowledge of appropriate dosage, plant parts to be used, methods of preparation, and contraindications associated with these species, which enables their safe and effective use within the traditional healthcare system.

**Quantitative analysis of documented plant species using Use Value (UV) and Informant Consensus Factor (ICF)**

**Use Value (UV)**

The high Use Value recorded for Andrographis paniculata (UV = 0.70) and Achyranthes aspera (UV = 0.61) reflects their broad therapeutic versatility and widespread recognition among the Tharu informants, likely owing to their accessibility and established efficacy across multiple ailment categories. Their frequent citation by the informants suggests widespread recognition of their therapeutic usefulness and reflects their cultural significance within the local ethnomedicinal system. Conversely, plant species with lower Use Values were cited less frequently, which may indicate their use for more specific ailments or knowledge restricted to a smaller number of informants.

**Informant Consensus Factor (ICF)**

The high Informant Consensus Factor recorded for febrile ailments (ICF = 0.65) suggests strong agreement among informants regarding the medicinal plant used to manage fever, likely reflecting its high prevalence within the community. Similarly, the relatively high consensus observed for oral and dental ailments (ICF = 0.50) indicates a consistent and well-established therapeutic approach within the community for these conditions. In contrast, the comparatively low ICF values recorded for neurological (ICF = 0.11) and respiratory ailments (ICF = 0.11) may indicate greater variability in plant selection and therapeutic practices among the informants, possibly reflecting a broader range of medicinal plant choices or less uniform ethnomedicinal knowledge for these disease categories.

**Comparison of the Present Study with Previous Ethnobotanical Studies**

The ethnomedicinal uses documented in the present study were systematically compared with previously reported ethnobotanical studies conducted in the study area of Khatima and Sitarganj of Udham Singh Nagar district (Singh and Maheshwari 1994; Sharma *et al.* 2011; Sharma *et al.* 2014; Sharma and Lata, 2022), as well as studies from Uttarakhand and adjoining regions (Uttar Pradesh and Nepal) to evaluate similarities, differences, variations in plant use patterns, and potential novelty in traditional knowledge systems.

Singh and Maheshwari (1994) documented a total of 63 medicinal plant species, of which 18 species (28.6%) were also recorded in the present study. Among these shared species, 14 exhibited differences in ethnomedicinal applications, suggesting variations in traditional plant use across time periods. Four species showed concordance in therapeutic application between the two studies: *Peristrophe bicalyculata* (Retz.) Nees*, Equisetum ramosissimum* Desf. *and Vanda tessellata* (Roxb.) Hook. for the treatment of bone fractures. and *Tinospora cordifolia* (Willd.) Hook.f. & Thomson for Fever. Such an agreement may reflect the continuity of well- established traditional medicinal practices among the Tharu community across different time periods, whereas the divergence observed in the remaining 14 species may indicate the inherently dynamic nature of ethnomedicinal knowledge transmission.

Sharma *et al.* (2011) documented a total of 53 species, of which 19 species (35.8%) were also recorded in the present study. Among these shared species, 18 exhibited different ethnomedicinal applications across the two studies. Only one species, *Solanum nigrum* L., showed the same therapeutic application for the treatment of jaundice and liver-related disorders in both investigations. This similarity may indicate the persistence of this traditional therapeutic practice within the Tharu community of the region.

Sharma *et al.* (2014) documented 90 species used for the treatment of skin diseases, of which 19 species (21.1%) overlapped with the findings of the present study. Of these shared species, 17 were employed for different ailments between the two studies. Two species exhibited full agreement in both taxonomic identity and therapeutic use: Anisomeles indica (L.) Kuntze for wound healing and Cynodon dactylon (L.) Pers. for the management of cuts and wounds. The relatively lower overlap percentage with this dataset, despite the larger number of species documented therein, may be attributed to the distinct thematic scope of the two investigations, as Sharma *et al.* (2014) was restricted exclusively to skin-related ailments, whereas the present study encompasses a substantially broader range of ethnomedicinal therapeutic categories.

Sharma and Lata (2022) documented 51 medicinal plant species belonging to the family Asteraceae, of which only four species (7.8%) were common in both investigations, representing the lowest overlap among all four comparisons. Three of these shared species were used for different ailments across the two studies, while only one species, Ageratum houstonianum Mill., showed agreement in therapeutic application, being employed for the treatment of cuts and wounds in both investigations. The substantially lower overlap with the most recent study may indicate that variation in medicinal applications may be attributed to the distinct scope of the two studies, because this study documented Asteraceae species across a wide range of use categories, including ethnomedicinal, fodder, food, ornamental, veterinary, and ceremonial purposes.

A broader comparison with available ethnobotanical literature from Uttarakhand and adjoining Tharu-inhabited Terai regions of Uttar Pradesh and Nepal revealed several additional plant-ailment associations not previously documented in the regional literature. For instance, *Abutilon indicum* (L.) Sweet has previously been reported for the treatment of boils and leprosy; Similarly, *Achyranthes aspera* L. for boils, toothache, asthma, diarrhoea, lower abdominal pain in women, urinary disorders, skin eruption, intermittent fever, easy delivery, dysentery. *Andrographis paniculata* (Burm.f) Wall.ex Nees for Malaria fever and fever. *Asparagus racemosus* Willd. has previously been reported for urinary disorders and enhancement of lactation in nursing mothers. Likewise, *Butea monosperma* (Lam.) Kuntze. previously used for liver disorders, leucoderma, skin ailments and fever. *Carica papaya* L. was earlier reported for toothache, dysentery and skin disorders. *Clerodendrum viscosum* Vent., used for fever, skin diseases, cuts, spermatorrhoea and for leucorrhoea. *Eclipta prostrata* (L.) L. for cuts and wounds, skin disorders, jaundice and hair-related problems. Furthermore, *Euphorbia hirta* L. and *Euphorbia thymifolia* L. are traditionally used mainly for gastrointestinal and dermatological disorders. The use of *Vitis vinifera* L. for paralysis *and Piper betle* L*. and Sida cordifolia* L. for rickets also represents notable plant–ailment associations. However, direct pharmacological evidence supporting these traditional applications remains limited.

Additionally, some plants were previously reported from previous state ethnobotanical studies, but not from the Tharu community, such as *Barleria prionitis* L., for skin ailments (Sharma *et al.* 2011), and for Toothache, gum bleeding and pyorrhea by Jaunsari tribe of Uttarakhand (Phondani *et al.* 2010, Bombale *et al.* 2026). *Phyla nodiflora* (L.) Greene for ethnoveterinary purposes to treat cataract, and *Stevia rebaudiana* (Bertoni) Bertoni for diabetes (Arora 2009), *Bombax ceiba* L. for Leukorrhea ( Pandey *et al.* 2017). However, these plants are not reported by ethnomedicinal records from the Tharu community.

To the best of our knowledge, based on the reviewed literature, these findings demonstrate that the present study contributes substantial additional ethnomedicinal information to the existing regional knowledge base of the Tharu community of Uttarakhand and adjoining Terai regions. These additional plant–ailment associations have not been previously documented from Uttarakhand and adjoining Tharu-inhabited Terai regions of Uttar Pradesh and Nepal, hereby enriching the existing regional ethnomedicinal knowledge base.

**Novel ethnomedicinal uses and their pharmacological relevance**

The present ethnobotanical survey revealed several ethnomedicinally significant findings; the documented plant uses were further evaluated based on available pharmacological studies to assess their scientific relevance. Several of these medicinal plants possess diverse bioactive properties that support their traditional therapeutic applications used in the present study. *Abutilon indicum* (L.) Sweet leaf for the treatment of kidney stones was previously reported by Prachi et.al. (2008) from Muzaffarnagar district, Uttar Pradesh. Further pharmacological studies have demonstrated its urolithiatic activity (Velraj and

Ravichandran, 2015) and diuretic activity (Sharma et.al., 2013), thereby supporting its traditional use in the management of kidney stones. Achyranthes aspera L. leaves for the treatment of scorpion bites (Mahalingam et. al. 2025, Ganesh *et al.* 2021), which possess activities like Antioxidants, anti-inflammatory action, anti-allergic, and various other pharmacologically important activities. *Andrographis paniculata* (Burm.f) Wall. ex. Nees ' whole plant is traditionally used for blood purification and pimples. Due to the presence of andrographolide, the main bioactive compound, it exhibits diverse pharmacological properties including anti-inflammatory, antioxidant properties and hepatoprotective effects (Hossain *et al.* 2014). Leaf for Hemorrhoids (Liang *et al.* 2024) and canker sores (Okhuarobo *et al.* 2014). *Asparagus racemosus* Willd. The treatment of Leukorrhea is due to the presence of Shatavarin (Sharma and Bhatnagar 2011), which possesses antimicrobial, anti-inflammatory and antioxidant (Rafiq *et al.* 2022). *Barleria prionitis* L. leaf for Pyorrhoea and to strengthen teeth and gums. The plant was found to have potent anti-inflammatory activity, analgesic, anti-arthritic, antimicrobial, antioxidant, wound healing, hepatoprotective and antidiabetic properties (Bombale *et al.* 2026, Jaiswal *et al.* 2010). *Butea monosperma* (Lam.) Kuntze. Flower to treat Urinary Retention because of the presence of diuretic activity, which increases the rate of urine flow (Anurag *et al.* 2013, Mehar *et al.* 2021). *Bombax ceiba* L. root is traditionally used for the treatment of Leukorrhea. Asimilar ethnomedicinal use has previously been documented among indigenous communities of South West Bengal, India. ( DC das *et al.* 2015). Furthermore, the flowers for paralysis (Depani *et al.* 2019, Sati and Kumari 2021). Phytochemical studies have revealed the presence of Flavonoids, terpenoids, tannins, phenolic compounds, saponins, carbohydrates, and glycosides among the phytoconstituents found in Bombax ceiba flower extract. Pharmacological studies have further demonstrated that the flower extract possesses analgesic, anti-inflammatory, antioxidant, and antibacterial activity. *Carica papaya* L., to treat Thrombocytopenia (Low platelet count) leaf has been scientifically proven to possess therapeutic potential against thrombocytopenia due to the presence of bioactive components Carpaine, Quercetin and Antioxidants (Munir *et al.* 2022). *Clerodendrum viscosum* Vent. Leaf for Leukorrhea is supported by the study for female health care in Assam (India) (Bora *et al.* 2016), which showed potent antibacterial, antimicrobial, and antioxidant activity ( Kar *et al.* 2014). *Eclipta prostrata* (L.) L. leaf for toothache reported from Mumbai, India, for its anti-microbial activity(Vaidya and Sambhare 2016). *Euphorbia hirta* L. leaf for the treatment of lactation insufficiency previously reported from Nigeria, and *Euphorbia thymifolia* L. for pimples (Kumar *et al.* 2017) from Muzaffarnagar, Uttar Pradesh, India. *Phyla nodiflora* (L.) leaf for the treatment of hemorrhoids revealed that the medicinal plants possessed anodyne, antibacterial, emmenagogue, parasiticide, refrigerant and febrifuge. *Stevia rebaudiana* (Bertoni) Bertoni, for diabetes, contains active components Steviolglycosides, stevioside, which helps to reduce blood sugar level (Gorain *et al.* 2024).

The use of *Piper betle L. and Sida cordifolia* L. leaf for the treatment of rickets and *Vitis vinifera* L. leaf for paralysis. Direct pharmacological evidence validating these uses in humans is lacking. For bone-related applications, emerging evidence suggests plausible mechanisms: hydroxychavicol from *Piper betle* L. inhibits osteoclastogenic differentiation (Srihirun *et al.* 2024), and *Sida cordifolia* L. extracts exhibit osteogenic activity, though the active chemical constituents responsible remain uncharacterized (Patel *et al.* 2022), supporting a preliminary scientific basis for rickets-related uses. However, the traditional paralysis claims for *Vitis vinifera* L. lack comparable mechanistic validation; while its neuroprotective properties against aluminium-induced oxidative stress are documented (Lakshmi *et al.* 2014; Micheli *et al.* 2018), these mechanisms do not directly address the heterogeneous aetiology of traditional paralysis presentations. Further experimental and clinical investigations are required to substantiate efficacy, safety, and underlying mechanisms for all three plants for traditional applications.

## Conclusions

The study area of this investigation has an extensive floral diversity, and the Tharu community people have great knowledge of locally available ethnomedicinal plants. A total of 71 medicinal plant species belonging to 40 families are used for managing diverse human ailments. Used by the Tharu community residing in the Udham Singh Nagar district holds rich ethnobotanical knowledge and depends on the medicinal plants present in their surrounding environment for basic healthcare practices, thus reflecting the close interdependence between the indigenous community and native plants. *Andrographis paniculata* and *Achyranthes aspera* were the most valuable plant species in terms of their maximum use to treat diverse ailments among local communities, suggesting their widespread acceptance and medicinal potential. Herbs were the most common life form used in medicine preparation. Around 17 plant species have more than one plant part used in the preparation of medicine. whereas leaves were the most predominantly used plant part.

Quantitative analysis of the collected data obtained through using the Use Value (UV) and Informant Consensus Factor (ICF) revealed the significance of medicinal plants used by the Tharu community and the level of consensus among informants about the medicinal uses of these plants. The higher ICF values of febrile, oral and dental ailments category indicated a significant level of agreement about the medicinal plants used for the treatment of these disorders. *Andrographis paniculata*

and *Achyranthes aspera* are the two plant species that exhibit the highest use values, i.e. 0.70 and 0.61, respectively, suggesting their widespread utilization by the Tharu tribe healers and Knowledgeable informants. The study also emphasizes the importance of conserving traditional knowledge practices and the use of the plants occurring in the vicinity of the tribe for posterity, as this knowledge is progressively declining due to changing lifestyles and modernization of the younger generation. As a result, the transmission of traditional knowledge has been reduced. The younger generation is increasingly losing interest in learning the practices of their forefathers because allopathic medicine provides quick relief and effective results. Hence, it is necessary to require proper scientific validation of these findings to ensure the safety and efficacy of such treatment procedures and the usage of medicinal plants by these tribes through detailed pharmacological and ethnobotanical research.

## Declarations

**List of abbreviations:** H-Herb, T- Tree, S- Shrub, C- Climber, ICF- Informant Consensus Factor, UV – Use Value.

**Ethics approval and consent to participate:** The research objectives and purpose were discussed with all the informants before the interviews. Oral consent was obtained from all participants before the interviews commenced.

**Consent for publication:** Not applicable

**Availability of data and materials:** The voucher specimens were deposited at the Department of Botany, P.N.G Govt. P.G College, Ramnagar, Nainital, Uttarakhand.

**Competing interests:** The authors declare that they have no competing interests.

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**Author contributions:** Both authors contributed equally.

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