

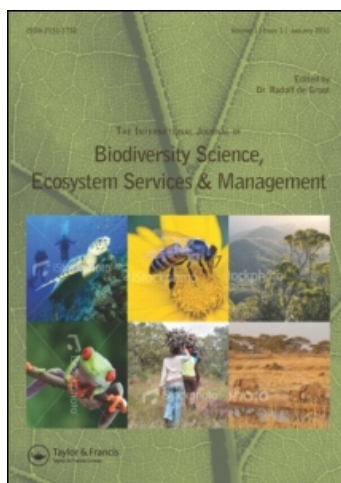
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### Diversity, indigenous uses and conservation prioritization of medicinal plants in Lahaul valley, proposed Cold Desert Biosphere Reserve, India

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## Diversity, indigenous uses and conservation prioritization of medicinal plants in Lahaul valley, proposed Cold Desert Biosphere Reserve, India

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The Cold Desert of India is known for specific topography, severe climate and unique vegetation. The Lahaul valley in Himachal Pradesh, part of a proposed Cold Desert Biosphere Reserve, is rich in medicinal plants, and local people practice the Tibetan System of Medicine. A few studies are available on medicinal plants there are no integrated studies. A total of 354 medicinal plants, belonging to 208 genera and 76 families were recorded. The area ranges in altitude between 2801–3800 m, and shady moist and forested habitats were identified as having the most medicinal plant species. The occurrence of near endemic, endemic, critically endangered, endangered, vulnerable and near threatened species indicates high anthropogenic pressure and that the area has high conservation value. Most of these species are commercially viable. An assessment of populations of threatened species using standard ecological methods, and notification of key areas as medicinal plants conservation areas is suggested. Also, mass reproduction for ex situ conservation and to ensure availability of quality planting material for cultivation, together with education and awareness programmes for large-scale cultivation are suggested.

**Keywords:** medicinal plants; diversity; native; endemic; threat categorization; conservation; prioritization; Cold Desert Biosphere Reserve

### Introduction

The Himalayan region has been identified as a biodiversity hot spot (Myers et al. 2000). The use of plants as medicines for treatment of various diseases has occurred since time immemorial. Among the biogeographic provinces of India, the Indian Himalayan Region (IHR) is well known for its diversity of medicinal plants. There are 1748 medicinal plants that have traditional and modern therapeutic uses (Samant et al. 1998). The region is mostly inhabited by rural and native communities. Tribal cultures hold much ethnobotanical information, and rural and native communities regularly use medicinal plants for treatment of diseases, wounds, fractures and other ailments (Samant et al. 1998; Samant and Palni 2000). People living in the harsh environmental conditions of cold deserts in the IHR have evolved unique traditions and customs that include ethnobotanical dependence. The Larjee/Amchi people of the area usually practice the Tibetan System of Medicine for treatment of various ailments.

A large number of studies have been carried out on medicinal plants of the IHR (Jain 1991; Samant et al. 1998, 2001, 2007b; Rai et al. 2000; Samant and Pal 2003; Kala 2006). However, in Himachal Pradesh studies of medicinal plants are fragmentary and mainly focus on inventory (Bhattacharya and Uniyal 1982; Chauhan 1988, 1999; Kapahi 1990; Badola 2001; Sood et al. 2001; Badola and Pal 2003; Kala 2003, 2006), although a few studies have addressed diversity, distribution patterns, nativity, endemism, rarity and conservation prioritization of medicinal plants (Samant et al. 2007a, b). Himachal Pradesh has 643 medicinal plants, out of which 269 are native, 374

non-native, 17 endemic, 131 near endemic, 12 critically endangered, 21 endangered, 27 vulnerable, two near threatened and three data deficient (Samant et al. 2007a).

The Cold Desert Biosphere Reserve is a proposed reserve in the IHR, with an approximate area of 74,809 km<sup>2</sup>. It includes parts of Ladakh district in Jammu and Kashmir, and Lahaul and Spiti districts in Himachal Pradesh. The cold desert covers 35% of the area of Himachal Pradesh. A review of the literature indicates very few studies on ethnobotany and medicinal plants from the Lahaul valley of the proposed Cold Desert Biosphere Reserve (Aswal and Mehrotra 1987; Chauhan 1999; Sood et al. 2001; Bahar 2002; Kala 2003, 2006). To date, there have been no studies integrating (i) diversity and distribution patterns of medicinal plants; (ii) indigenous uses; (iii) status and distribution patterns of native and endemic medicinal plants; (iv) threat assessment to the diversity of medicinal plants; and (v) prioritization of medicinal plants for conservation. This paper seeks to remedy these deficiencies.

### Study area

The Lahaul valley (31° 44' 57"–32° 59' 57"N, 76° 46' 29"–78° 41' 34"E; total area: 6244 km<sup>2</sup>) is part of the proposed Cold Desert Biosphere Reserve. The altitude ranges from 2400 to 6517 m, asl. The mountains are largely composed of ancient Lurian rocks, chiefly schists, slate, shale, Balaini conglomerates and sandstone (Singh et al. 1995). The area is divided into four valleys: Mayar, Chandra, Bhaga and Chandra-Bhaga. Climate varies from dry temperate to alpine. The area receives heavy snowfall

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(120–400 cm year<sup>-1</sup>) during winter and limited rainfall (10–300 mm year<sup>-1</sup>) in summer. Temperature ranges from –19°C to 32°C (Sinha and Samant 2006). The vegetation is mainly of temperate, sub-alpine and alpine types. The valley is surrounded by high mountains with an average height of 5480 m: the highest peak, Mulkila, reaches 6517 m, and the lowest point (2400 m) lies at the entrance to Chenab in the Pangri valley. The inhabitants of the area are Hindu, Buddhist or mixture of the two. They are largely dependent on local biodiversity for their subsistence.

## Methods

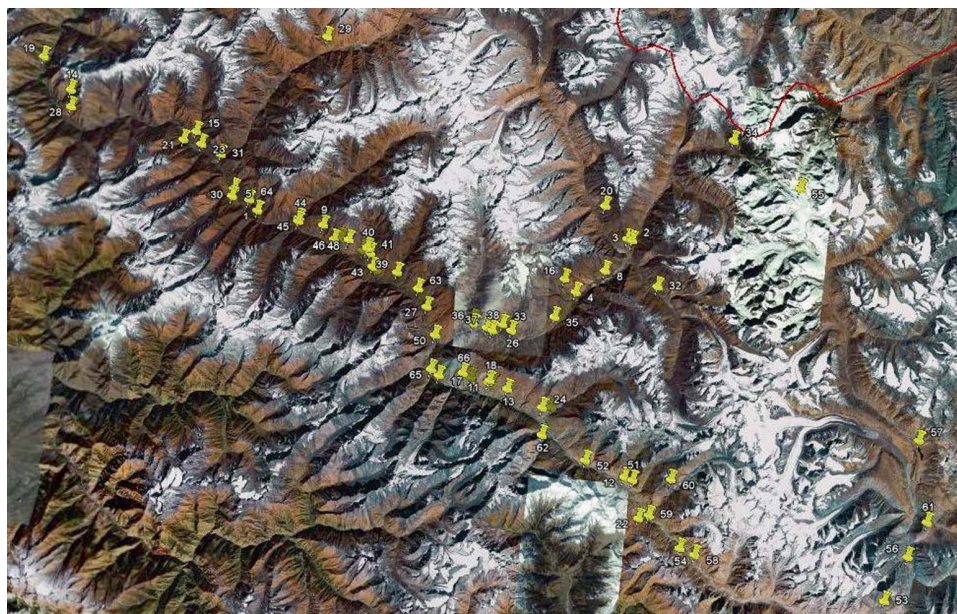
### *Surveys, sampling, data collection and analysis*

The inhabitants of 66 villages in Mayar, Chandra, Bhaga and Chandra-Bhaga valleys were selected and sampled from 2004 to 2008 to generate information on indigenous uses of medicinal plants by the inhabitants (Map 1). Information on medicinal plants was collected through a participatory rural appraisal (PRA) (Samant et al. 2003). Before PRA, the villages were visited two or three times to confirm that they were willing to exchange information. After these interactions, a meeting was convened and inhabitants were interviewed with regard to their utilization of medicinal plants. They were asked about the indigenous uses of medicinal plants, modes of administration and occurrence in the area. Local dialects as well as Hindi were used for effective conversations.

The age of respondents ranged from 25 to 65 years. Those older than 50 years had a rich knowledge base. Among the inhabitants, one person was hired for the survey and collection of medicinal plants from the natural habitat(s) and to provide information on local names, altitudinal range, life forms, habitat(s), part(s) used and use values, including indigenous knowledge and practices. Habitats were identified based on physical features. While most of the species were identified on site, samples of a few species were brought to the G.B. Pant Institute and identified with the help of floras (Polunin and Stainton 1984; Aswal and Mehrotra 1994; Dhaliwal and Sharma 1999; Murti 2001). Species known to have medicinal value from the literature, but not currently utilized by the tribal communities were also listed (Jain 1991; Aswal and Mehrotra 1994; Samant et al. 1998, 2001). The information was compiled and analysed with respect to utilization patterns following Samant et al. (2002): for external use, the plant part is crushed and converted into a paste, which is applied to the affected part; for internal use, the plant part is eaten raw, made into a paste and eaten, or prepared as a decoction (half glass or full glass with water depending upon the condition of patient) and given to the patient.

### *Identification of nativity, endemism, threat category and prioritization for conservation*

The nativity of species denotes the first record or origin, following Anonymous (1883–1970) and Samant et al.



Map 1. Description of study area in Lahaul valley (sites marked from Google Earth, © 2008 Google).

**Abbreviations used:** 1 = Bihadi; 2 = Darcha; 3 = Darcha-Sumdo; 4 = Gemur; 5 = Hinsia; 6 = Jagmurthi; 7 = Jahalma; 8 = Jispa; 9 = Kamring; 10 = Keylong; 11 = Khangsar; 12 = Khoksar; 13 = Khorpani; 14 = Launi; 15 = Madgran; 16 = Meh; 17 = Mooling; 18 = Nukar; 19 = Raoli; 20 = Rarik; 21 = Ratoli; 22 = Rohtang; 23 = Salpat; 24 = Shashen; 25 = Sissu; 26 = Stingri; 27 = Tholang; 28 = Tindi; 29 = Tingret; 30 = Trilokinath; 31 = Udiapur; 32 = Yocha; 33 = Yurnath; 34 = Zingzingbar; 35 = Kwaring; 36 = Kardang; 37 = Namchi; 38 = Lapchang; 39 = Kirting; 40 = Rapring; 41 = Gorma; 42 = Rashil; 43 = Rape; 44 = Thiro; 45 = Jhooling; 46 = Barring; 47 = Nalda; 48 = Junda; 49 = Goundhala; 50 = Goushal; 51 = Gramphu; 52 = Gupha-hotel; 53 = Bada-dara; 54 = Bada-dorne; 55 = Baralacha-pass; 56 = Batal; 57 = Chandertaal; 58 = Chhatru; 59 = Dorne-mode; 60 = Kulti-nallah; 61 = Kunjam-pass; 62 = Siti-nallah; 63 = Lote; 64 = Kishori; 65 = Bargul; 66 = Thorang.

Table 1. Threat assessment of the medicinal plant diversity using different criteria.

Serial No.	Habitat	Distribution	Population (Ind/Location)	Use pattern	Extraction	Native and endemic	Score
1	Single	<500	<250 Ind/ upto 2 locality	4 & >4	Commercial	Native & Endemic	10
2	2–3	500–1000	250–1000 Ind/ 3–5 locality	2–3	Self use	Native or Endemic	6
3	>3	>1000	>1000 Ind/ > 5 locality	Single	No use	Non-native	2

(1998). Endemism of a species was identified based on distribution range of the species and following Dhar and Samant (1993) and Samant et al. (1998). Species restricted to the IHR were considered as endemic, and those with a distribution extending to neighbouring countries (Himalayan regions of Afghanistan, Pakistan, Tibet, Nepal, Bhutan and adjacent states of the IHR) were considered as near endemics. The threat category of a species was identified using six attributes (i.e. habitat preference, distribution range, population size, use pattern, extraction trend, native and endemic species) and following Samant et al. (1998) and Ved et al. (2003). Species with a combination of these criteria (serial number 1, 2 and 3) were given marks accordingly. Species with scores >60 were identified as critically endangered; 56–60 as endangered; 51–55 as vulnerable; 46–50 as near threatened; and <46 as of least concern (Table 1).

## Results

### Diversity and distribution patterns

In total, 354 species of medicinal plants belonging to 208 genera and 76 families were recorded. Of these, 27 species were trees, 40 shrubs, 284 herbs and 3 ferns. The families Asteraceae (54 spp.), Polygonaceae (21 spp.), Rosaceae and Lamiaceae (20 spp. each), Fabaceae (19 spp.), Ranunculaceae (18 spp.) and Apiaceae (16 spp.) (Figure 1); and genera *Artemisia* (11), *Polygonum* (10), *Astragalus* and *Nepeta* (7 each) and *Saussurea* and *Thalictrum* (6 each), were rich in medicinal plants (Figure 2). A total of 31 families were monotypic (Table 2).

In terms of altitudinal distribution, the greatest number (337 spp.) of medicinal plants was recorded from 2801–3800 m, followed by the 2400–2800 m zone (176 spp.),

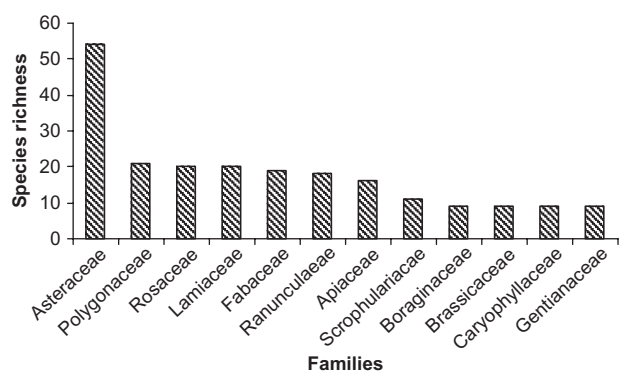


Figure 1. Medicinal plant-rich families of the Lahaul valley in CDBR.

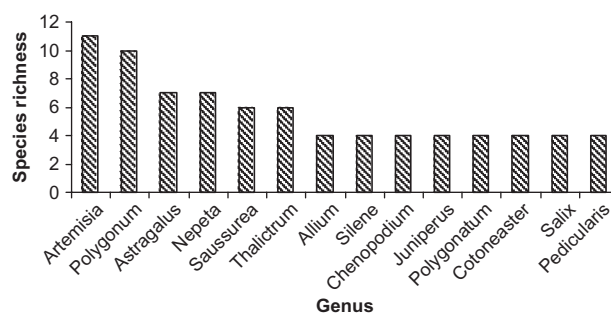


Figure 2. Medicinal plant-rich genera of the Lahaul valley in CDBR.

with the lowest number (90 spp.) in the >3801 m altitudinal zone. The habitat-wise distribution showed maximum diversity of medicinal plants (144 spp.) in shady moist habitats, followed by forest (141 spp.), grassland (108 spp.), dry (96 spp.) and rocky (56 spp.) habitats (Figure 3).

### Utilization pattern

Different parts of plants – leaves (107 spp.), aerial part (97 spp.), whole plants (96 spp.), roots (93 spp.), inflorescences (48 spp.), fruits (33 spp.), seeds (29 spp.), twigs (16 spp.), bark (9 spp.), tubers (6 spp.), rhizomes, bulbs, gum/latex (4 spp., each), fronds (2 spp.), ash from twigs (1 spp.) – were used by the tribal communities for their own use or in trade (Table 2). Of the 354 species of medicinal plant recorded, indigenous uses of 230 species were recorded from information collected from tribal communities and documented for the first time. The indigenous uses of 124 species were based on secondary information. A total of 196 common species was reported. Amongst the medicinal plants, *Aconitum heterophyllum*, *A. violaceum*, *Angelica glauca*, *Allium carolinianum*, *A. victorialis*, *Arnebia euchroma*, *Betula utilis*, *Bergenia stracheyi*, *Bunium persicum*, *Carum carvi*, *Corylus jacquemontii*, *Dactylorhiza hata-girea*, *Dioscorea deltoidea*, *Ephedra gerardiana*, *Gentianella moorcroftiana*, *Hippophae rhamnoides*, *H. salicifolia*, *Hypericum perforatum*, *Hyssopus officinalis*, *Hyoscyamus niger*, *Inula racemosa*, *Juglans regia*, *Juniperus polycarpus*, *Jurinella macrocephala*, *Podophyllum hexandrum*, *Picrorhiza kurrooa*, *Rheum australe*, *R. webbianum*, *Rhododendron anthopogon*, *Saussurea costus*, *S. gossypiphora* and *Taraxacum officinale* were most preferred for indigenous use and trade purposes.

Table 2. Diversity, distribution and indigenous uses of medicinal plants of Lahaul valley of the proposed CDDBR.

Family/Species	Local name	Altitudinal range (m)	Locality	LF	Nativity	Part(s) used	Indigenous uses
<b>Aceraceae</b>							
<i>Acer acuminatum</i> Wall. ex D. Don** <sup>(Sec)</sup>		2490–3000	A, B	T	Reg Himal	AP, Lf, St	Abortifacient
<b>Adiantaceae</b>							
<i>Adiantum capillus-veneris</i> L. <sup>(Pri)</sup>	Hansraj	2640–2930	B, F	F	South Europe	Fronde	Bronchitis, cold, cough, fever, menstrual complaints, throat disease
<i>A. venustum</i> Don <sup>(Sec)</sup>	Raj	2510–3600	B, S	F	Afghan India Border	Fronde	Fever, skin eruption
<b>Apiaceae</b>							
<i>Angelica glauca</i> Edgew. * <sup>(Pri)</sup>	Chaura, Chonra	2700–3510	E, F, S	H	Reg Himal	Rt, Sd	Dysentery, gastric complaints, menorrhoea, stomach disorders, vomiting, bronchitis
<i>Bunium persicum</i> B. Fedtsch <sup>(Pri)</sup>	Jeera, Kalagira	2760–3700	J, P, Q, R, S	H	Persia	Fr, AP, WP, Sd	Abdominal pain, cold, cough, fever, loss of appetite, back pain, liver problems, dysentery in domestic animals
<i>Bupleurum falcatum</i> L. ** <sup>(Sec)</sup>		3010–3855	Q, R, S	H	Europe Oriental Asia, Border Reg Himal	Rt	Abdominal inflammation, fever, liver complaints
<i>Carum carvi</i> L. ** <sup>(Pri)</sup>	Gonyorog, Shingu Jeera, Gsyon	2700–3650	J, P, Q, R	H	Europe Oriental Asia Border	WP, Sd	Carminative, cold, cough, dyspepsia, fever, rheumatism, liver disease, stomach disease, back pain, nose pain, gastric disorders in animals
<i>Chaerophyllum aromaticum</i> L. ** <sup>(Pri)</sup>	Shakkara	3000–3400	S	H	Europe	WP, Rt, Lf	Indigestion
<i>C. reflexum</i> Lindl. <sup>(Pri)</sup>	Ampang, Shakrag	2500–3670	A, B, D, E, F, P, R	H	Reg Himal	AP, Rt	Indigestion
<i>C. villosum</i> Wall. ex DC. ** <sup>(Pri)</sup>	Shakkara, Nyo, Methapatees	2600–3600	B, Q	H	Reg Himal	WP	Indigestion
<i>Cortia depressa</i> DC. ** <sup>(Sec)</sup>		3400–4000	B, R	H	Reg Himal	WP	Rheumatism, sedative, stomach ache
<i>Ferula jaeschkeana</i> (L.) Vatke <sup>(Sec)</sup>	Bakhyot, Kalyash	2600–3400	B	H	Himalaya Border Occ Turkest	Rt, St	Pain in chest or back, despondency, fatigue, rheumatism, poultice
<i>Heracleum thomsonii</i> Cl. * <sup>(Pri)</sup>	Dundu	2700–3520	B, H, J, P, Q, R, S	H	Reg Himal	AP, WP	Oxytoxic
<i>H. candicans</i> Wall. ex DC. <sup>(Pri)</sup>	Dundu, Raswal	2690–3660	F, P, R, S, X	H	Reg Himal Ind Or As Trop	AP, St, Rt	Eczema, ringworm infection, leucoderma, menstrual disorders
<i>Pimpinella diversifolia</i> DC. <sup>(Sec)</sup>		2700–3430	D, J, S, X	H	Reg Himal China	WP	Carminative, stomach disorders, cold, cough
<i>Pleurospermum candollii</i> (DC.) Benth. ex Cl. <sup>(Pri)</sup>		3500–4000	B, H	H	Reg Himal	Rt	Fever
<i>Selinum coniofolium</i> (Wall. ex DC.) Benth. & Hk. ** <sup>(Pri)</sup>	Chatra, Bodangar, Chonra	3200–3540	S, R, X	H	Reg Himal	Rt, Lf	Cough, asthma, hysteria, nervous tonic, sedative, incense, spice, local liquor, antibacterial, analgesic
<i>S. elatum</i> Edgew. ** <sup>(Sec)</sup>		3270–3420	R	H	Reg Himal	Rt	Nervine sedative
<i>S. vaginatum</i> (Edgew.) Cl. <sup>(Pri)</sup>	Matosal	2710–3630	B, J, S	H	Reg Himal	Rh, AP	Nervine sedative, hysteria, dysmenorrhoea, liquor, skin disease
<b>Araliaceae</b>							
<i>Aralia cachemirica</i> Decaisne** <sup>(Sec)</sup>		2600–2800	A, B, F	H	Reg Himal	Rt, AP	Stomach disorders
<i>Hedera nepalensis</i> K. Koch <sup>(Sec)</sup>		2500	A	Sh	Europe Afr Bor AsTemp	AP, Fr	Stimulant, diaphoretic, cathartic, rheumatism, stimulant, emmenagogue, ulcers, dyspepsia

(Continued)

Table 2. (Continued).

Family/Species	Local name	Altitudinal range (m)	Locality	LF	Nativity	Part(s) used	Indigenous uses
<b>Asclepiadaceae</b>							
<i>Vincetoxicum hirundinaria</i> Medik. <sup>(Sec)</sup>		2480–3500	F	H	Europe Reg Caucas	WP	Poisonous to livestock, antitoxic against snake and scorpion bite, emetic
<b>Asteraceae</b>							
<i>Achillea millefolium</i> L. <sup>(Pri)</sup>	Chabu, Shugumentog	2700–3600	B, E, P, R, S, X	H	Europe As Am	Fl, WP	Carminative, tonic, stimulant, toothache, cough, cold, insect repellent, aromatic, diaphoretic
<i>Anaphalis busua</i> (Buch. -Ham. ex Don) DC. <sup>(Pri)</sup>		2710–3600	B, F, G, H, J, R, S, X	H	Reg Himal	Fl, Lf	Antibacterial, checks bleeding
<i>A. contorta</i> (D. Don) Hk. <sup>(Pri)</sup>	Telgang	2700–4000	F, J, L, Q, R, S	H	Reg Himal	WP	Cold, cough, insect repellent
<i>A. nepalensis</i> (Spreng.) Hand. <sup>(Sec)</sup>	Tawa	3300–3520	S	H	Reg Himal	WP	Spermatorrhoea
<i>Arcium lappa</i> L. <sup>(Pri)</sup>	Pichawag	3200–3420	R	H	Europe	Rt, Inf	Gastric, burns
<i>Artemisia biennis</i> Willd. <sup>(Pri)</sup>	Karkatang, Khampa	2510–3950	A, Q, R, S	H	Am Bor Sibir Reg Himal	AP, Lf	Anti-obesity
<i>A. dracunculula</i> L. <sup>(Pri)</sup>	Chamary, Burtse	2500–4000	A, B, F, H, L, Q, R, S, X	H	Europe Or Oriens Reg Himal	WP	Carminative for animals, throat infection, toothache, menstrual cycle
<i>A. gmelinii</i> Web. ex Stechm. <sup>(Pri)</sup>	Nurcha, Karkatang	2510–4000	A, B, F, H, J, L, P, Q, R, S	H	USSR (Sibir)	Lf	Carminative, vermifuge
<i>A. laciniata</i> Willd. <sup>(Pri)</sup>	Bintso	2510–3450	A, F, H, L, R, S	H	Reg Himal Sibir	Lf	Cuts, wounds, antiseptic cure foot infections of livestock
<i>A. macrocephala</i> Jacq. ex Bess. <sup>(Pri)</sup>	Khampa	2700–3520	B, S	H	Afghan Tibet As Centr	AP, Lf	Rheumatism, joint pain, skin eruption, aromatic
<i>A. maritima</i> L. <sup>(Pri)</sup>	Seski, Nyurcha, Garpeg, Sensi	2600–3800	B, F, H, J, L, P, R, S	H	Europe Reg Caucas Sibir	Lf, Fl	Tonic, abdominal parasites, antiseptic, blood purifier, gastric disorders
<i>A. minor</i> Jacq. ex Bess. <sup>(Pri)</sup>	Seski, Phurang	3000–3500	L	H	Reg Himal (Tibet)	AP, Lf	Indigestion, dermatitis, appetizer
<i>A. nilagarica</i> (Cl.) Pamp. <sup>(Pri)</sup>	Chirmara	2990–3490	L	H	Reg Temp Bor	WP	Abscess, analgesic, anthelmintic, antiseptic, antispasmodic, asthma, ear complaints, epilepsy, haemostat, headache, menstrual complaints, nervous disease, peptic ulcer, skin disease, sores, stomach ache, tonic, wounds
<i>A. parviflora</i> Buch. -Ham. ex D. Don <sup>(Pri)</sup>	Gaprek, Nireha	3230–3600	H, P, Q	H	Ind Or Burma	Lf, Fl, Sd	Carminative, vermifuge, throat infection, insecticide, aromatic
<i>A. salsoloides</i> Willd. <sup>(Sec)</sup>		2730–3460	F, H, R	H	Reg Caucas Tibet Sibir	AP	Intestinal problems
<i>A. sieversiana</i> Ehrh. ex Willd. <sup>(Pri)</sup>	Khamchu	2720–3100	B	H	Corea	Lf, Fl, Rt	Intestinal worms, bronchitis, aphrodisiac, jaundice, joint pain, antiseptic
<i>Aster falconeri</i> (Cl.) Hutch. ** <sup>(Pri)</sup>	Ba-sha-ka	3300–3820	H, S	H	Ind Or	Lf	Anemia
<i>A. flaccidus</i> Bunge <sup>(Sec)</sup>	Lugmig Chunwa	3200–4000	B, J	H	Sibir	Lf, Fl	Pulmonary infection, malaria
<i>A. indamellus</i> Grierson ** <sup>(Pri)</sup>		2760–3310	J	H	Ind Or	Rt	Cough
<i>Chrysanthemum pyrethroides</i> (Kar & Kir) B. Fedtsch. <sup>(Pri)</sup>		3430–3750	S	H	Soongar Tibet Occ	Fl, WP	Rheumatism, poultice for boils, fever, arthritis, antiseptic
<i>Cichorium intybus</i> L. <sup>(Pri)</sup>		2710	F	H	Europe Oriens	Sd	Fever, headache, vomiting, diarrhoea, joint pain, blood purifier
<i>Cirsium verutum</i> (D. Don.) Spreng. ** <sup>(Pri)</sup>	Khibsha	2990–3570	L, P, R	H	Reg Himal	Ft, Rt	Constipation, dyspepsia, skin ailments, chest pain, tonic
<i>C. wallichii</i> DC. var. <i>glabratum</i> (Hk.) Wendelbo ** <sup>(Pri)</sup>	Chawag	2810–3430	B, L, R, S	H	Reg Himal	St, Lf	Dysentery, chest pain, quench thirst

<i>Cousinia thomsonii</i> Cl. (Pri)	Changchher, Bacha, Chawag, Khibsha	2720–4000	F, L, Q, R, S	H	Reg Himal	WP, Ft	Body pain, swelling due to sprain, diuretic
<i>Cremanthodium arnicoides</i> Good (Sec)	Rekonpa	2600–3750	A, B, S, X	H	Reg Himal	Fl	Peptic ulcer, dysentery, liver disease
<i>C. decaisnei</i> Cl. (Sec)	Rhend	2900–3800	L, S	H	Reg Himal	AP	Body pain
<i>Echinops cornigerus</i> DC. ** (Pri)	Chawag	2520–3500	A, F, H, L, R, S	H	Ind Or	WP	Cold, cough, promote teeth of infants, fever, urinary trouble, tonic, septic, food poisoning
<i>Erigeron alpinus</i> L. ** (Pri)	Bashakar	3370–3850	B, H, G, R, S	H	Reg Bor et Arct	AP	Cough, cold
<i>E. bellidioides</i> (D. Don) Benth. ex Cl. ** (Pri)	Pa-sa-ka	2790–3580	J, X	H	Reg Himal	WP	Blood purifier
<i>E. canadensis</i> L. (Pri)	Patil	2700–3650	B, E, F, L, P, R, S	H	Amphig	AP	Diarrhoea, dysentery
<i>E. multiradiatus</i> (DC.) Benth. ex Cl. (Pri)	Shipuk	2730–3760	F, S	H	China	AP	Stomach pain
<i>Galinsoga parviflora</i> Ruiz & Pav. (Sec)		2720–3565	B, D, F, S	H	Am Austr	WP	Antidote to snake poison and nettle stings, checks bleeding
<i>Inula grandiflora</i> Willd. ** (Pri)	Mano, Kuth	3300–3520	S, X	H	Reg Himal et Caucas	WP	Medicinal
<i>I. racemosa</i> Hk. ** (Pri)	Manurucha	2600–3655	B	H	Reg Himal	Rt	Asthma, blood purifier, stomach disease, rheumatism, liver complaint, fever, headache, aromatic
<i>Jurinea macrocephala</i> (Royle) Aswal ** (Pri)	Dhoop	Above 3630	B, S	H	Reg Himal	Rt	Antiseptic, colic, fever during childbirth, laxative, skin eruptions
<i>Lactuca lessertiana</i> (DC.) Cl. ** (Sec)		2740–3510	J, S	H	Reg Himal Malaya	AP	Renal colic
<i>Picris hieracioides</i> L. (Sec)		3200–3710	J, L, P, Q, R, S	H	Europe As Temp Austr N Zel	AP	Purgative
<i>Prenanthes brunoniana</i> Wall. ex DC. ** (Sec)	Kumochanu	2500–3300	S, B	H	Reg Himal	WP	Poultice, sores, wounds
<i>Saussurea albescens</i> (DC.) Sch.-Bip. ** (Sec)	Bacha-Shang, Drapada, Prabachi	2810–3320	E, P, R	H	Reg Himal	Lf	Spasmolytic, bronchitis, skin eruption
<i>S. costus</i> (Decne.) Sch.-Bip. * (Pri)	Kuth	2600–3450	A, B, D, E, F, G, H, J, L	H	Reg Himal	Rt	Asthma, blood purifier, headache, stomach pain, bronchitis, dysentery, skin disease, ulcers, toothache, pain, rheumatism, insect repellent, laxative
<i>S. gnaphalodes</i> (Royle) Sch.-Bip. (Pri)		2800–4000	D, L, S	H	Reg Himal	WP	Kidney problems, cough, cold
<i>S. gossypiflora</i> D. Don. (Pri)		3800–4300	X	H	Reg Himal	WP	Tibetan medicine
<i>S. obvallata</i> DC. Edgew. (Sec)	Bramkamal	3600–3700	Y	H	Reg Himal	WP	Paralysis of the limbs, cerebral ischaemia
<i>S. taraxacifolia</i> Wall. ex DC. (Pri)		3450–4000	S	H	Reg Himal	WP	Ulcers, cold, headache
<i>Scorzonera virgata</i> (L.) DC. (Pri)	Thumbu	3570–3800	P	H	China Mongol	AP	Constipation
<i>Senecio graciliflorus</i> (L.) DC. ** (Pri)	Zerjum	3210–3860	B, Q, R, S	H	Reg Himal	WP	Antidote to insect bite, ringworm, ear infection, poisonous to cattle
<i>S. krascheninnikovii</i> Schisch. (Sec)		2920–3690	J, L, P, R, S	H	Reg Himal	Disc floret	Antiseptic
<i>S. laetus</i> Edgew. (Pri)	Paapat, Sangebala	3190–3340	S	H	Reg Himal	WP	Fever, abdominal pain, inflammation of mouth, sore throat
<i>Solidago virga-aurea</i> L. (Sec)		2800–3580	D, H, J	H	Reg Bor Temp	Lf	Antiseptic, diuretic
<i>Sonchus oleraceus</i> L. (Pri)	Panu Aag	2640–3830	B, H, Q, R, S	H	Cosmop	Fl, AP, Lf, Latex	Febrifuge, jaundice, galactagogue, liver complaints, tonic

(Continued)

Table 2. (Continued).

Family/Species	Local name	Altitudinal range (m)	Locality	LF	Nativity	Part(s) used	Indigenous uses
<i>S. wightianus</i> DC. <sup>(Pri)</sup>		2580–3740	B, L, P, Q, R, S	H	Europe As bor	Lf, Latex, Rt	Cough, bronchitis, asthma, jaundice
<i>Tanacetum dolichophyllum</i> Kitam. <sup>(Pri)</sup>	Khampa	3400–4000	B, S	H	Mexico	WP	Nasal drops, headache, body ache, incense, insecticide
<i>Taraxacum officinale</i> Wigg. <sup>(Pri)</sup>	Paranbala, Quantli, Sarkhen Mentok, Dudhi	2710–3800	A, E, H, L, P, Q, R, S	H	Reg Temp Austr	WP	Cuts, headache, fever, kidney, chronic digestive disease, jaundice, loss of appetite, food poisoning, antibiotic, tonic, blood purifier, hepatitis, migraine
<i>Youngia tenuifolia</i> (Willd.) Babcock & Stebbins <sup>(Pri)</sup>		3200–3600	B, P, S,	H	Reg Himal As Bor	Lf, Fl	Jaundice
<b>Balsaminaceae</b>							
<i>Impatiens brachycentra</i> Kar & Kir. <sup>(Pri)</sup>		2500–3510	A, H, J	H	As Centr	Lf, Sd	Dye
<i>I. glandulifera</i> Royle <sup>**</sup> (Pri)	Mewa	2500–3510	A, L	H	Reg Himal	Fl, Sd	Cooling, tonic, dye
<i>I. sulcata</i> Wall. <sup>**</sup> (Pri)		3100–3620	S	H	Reg Himal	Sd	Urticaria, eczema, pimples, abortifacient
<b>Berberidaceae</b>							
<i>Berberis jaeschkeana</i> L. <sup>**</sup> (Pri)	Kaymali	Above 3000	P	Sh	Reg Himal	Rt, Ft	Eye trouble, fever, stomach disorders, skin diseases, blood purifier, astringent, diuretic, jaundice, menorrhoea
<i>B. pachyacantha</i> Koehne <sup>(Pri)</sup>	Karpa	2500–3640	A, P	Sh	Europe As Temp	Ft, Rt	Stomach trouble, fever, dye
<i>B. pseuumbellata</i> Parke <sup>**</sup> (Pri)	Pakkad	2600–3630	B, F, L, P, Q, R, S	Sh	Ind Or	Ft, Rt, Lf	Intestinal disorders, eye trouble, oxytocic, throat ache
<b>Betulaceae</b>							
<i>Betula utilis</i> D. Don <sup>(Pri)</sup>	Bhojpatra, Shag, Bhuj	3050–4000	A, B, F, H, S, X, T	H	Reg Himal Japon	St, Br, Bk, Lf	Eye redness, antiseptic, burns, cuts, contraceptive, ear complaints, hysteria, jaundice, abortifacient
<b>Boraginaceae</b>							
<i>Arnebia euchroma</i> Royle ex Benth. <sup>(Pri)</sup>	Ratanjot, Khomig	2650–4000	B, S	H	Reg Himal Turkest	Rt	Abortifacient, hair tonic, blood pressure, backache, headache
<i>Cynoglossum lanceolatum</i> Forssk. <sup>(Pri)</sup>		2600–3520	L, Q, R	H	Arabia	WP	Aphrodisiac, cold, cough, wounds
<i>C. wallichii</i> G. Don var. Benth. <sup>**</sup> (Sec)	Kochi Shuwer	2700–3740	F, R, S	H	Ind Or Burma	Rt	Dyspepsia, digestive disorders
<i>Eritrichium canum</i> (Benth.) Kitamura <sup>**</sup> (Pri)	Changser, Tukse	3420–3460	S	H	Chili Ind Or	WP	Hasten child birth
<i>E. canum</i> (Vill.) Schrad. ssp. <i>villosum</i> (Ledeb.) Brand <sup>**</sup> (Pri)		2820–3650	J, S	H	Ind Or	WP	Facilitates children birth
<i>Hackelia uncinata</i> (Royle ex Benth.) Fischer <sup>(Sec)</sup>		2600–3450	Q, A	H	Reg Himal	Rt	Piles
<i>Lappula barbata</i> (M. Bieb.) Gureke <sup>(Sec)</sup>		3010–3450	H	H	Marocco Oriens Sibir	Rt	Fever





Table 2. (Continued).

Family/Species	Local name	Altitudinal range (m)	Locality	LF	Nativity	Part(s) used	Indigenous uses
<b>Caryophyllaceae</b>							
<i>Cerastium cerastioides</i> (L.) Britton Mem.**(Pri)		3060–3420	S	H	Reg Bor Temp et Arct	WP	Backache, headache, renal pain, cough
<i>Gypsophila cerastioides</i> D.Don.**(Sec)		3000–3410	P	H	Reg Himal	WP	Boils, wounds
<i>Sagina saginoides</i> (L.) Karsten <sup>(Sec)</sup>	Kanganchoo	3300–3600	P	H	Reg Bor et Arct	WP	Headache
<i>Silene edgeworthii</i> Bocquet <sup>(Pri)</sup>	Gandoli	2500–4000	B, H, J, L, Q, R, S, X	H	Reg Himal	AP, Lf	Eye infection
<i>S. gonosperma</i> (Rupr.) Bocquet** <sup>(Sec)</sup>	Sukpa	3300–4000	B, S	H	Turkest	AP	Rheumatic pain, soap
<i>S. indica</i> Roxb. ex Orth** <sup>(Sec)</sup>		3310–4000	P, S, X	H	Reg Himal (Nepal)	Rt, AP	Dysentery
<i>S. moorcroftiana</i> Wall. ex Benth.** <sup>(Sec)</sup>		3300–3830	R	H	Reg Himal	AP	Fever, dysmenorrhoea, puerperal infection
<i>S. vulgaris</i> (Moench) Garcke <sup>(Pri)</sup>	Gandoli	2950–3400	R, S	H	Europe Afr Bor Reg Himal	In	Bronchitis, asthma
<i>Stellaria media</i> L. <sup>(Sec)</sup>	Shichi	2600–3450	B, H, S	H	Louisiana (South Eastern USA Northern America)	WP	Burns, boils, bone fracture, wounds
<b>Chenopodiaceae</b>							
<i>Chenopodium album</i> L. <sup>(Pri)</sup>	Em, Ear, Ayar	2610–3855	F, H, J, L, P, R, S	H	Reg Temp et Trop	Lf, Br	Indigestion
<i>C. album</i> L. var. <i>opulifolium</i> (Schrad.) Aswal <sup>(Pri)</sup>	Am, Ayar	2610–3460	B, J, Q, R, S	H	Reg Bor	Sd, Lf, Fl	Constipation
<i>C. botrys</i> L. <sup>(Pri)</sup>	Sokam, Sanyek	2510–3550	A, F, J, Q, S	H	Reg Bor	Lf, Fl	Gastric disorder, headache due to gall bladder, liver disease, anthelmintic, diuretic, laxative
<i>C. foliosum</i> (Moench) Aschers. <sup>(Sec)</sup>	Khupalda, Sanyek	2890–3650	P, S, J, F	H	Iran	Lf, Fl	Indigestion
<i>C. hybridum</i> L. <sup>(Pri)</sup>	Sukna	3120–3450	J, P, R, S	H	Reg Temp Bor	Lf, AP	Indigestion
<b>Convolvulaceae</b>							
<i>Convolvulus arvensis</i> L. <sup>(Sec)</sup>	Grachi	2730–3720	F, J, L, P, Q, R	H	Geront Temp	WP	Laxative, purgative, burns, bruises
<i>Ipomoea eriocarpa</i> R. Br. <sup>(Pri)</sup>	Martunga	3020	L	H	Geront Temp	AP	Rheumatic pain, cuts, wounds, poison
<i>I. purpurea</i> Roth <sup>(Sec)</sup>		3230	L	H	Am Calid	Sd, WP	Purgative
<b>Corylaceae</b>							
<i>Corylus jacquemontii</i> L.** <sup>(Pri)</sup>	Thangi, Tilyanj	2490–2900	A, B	T	Europe Or As Min Himal	WP	Tonic
<b>Crassulaceae</b>							
<i>Rhodiola heterodonta</i> (Hk. & Th.) A. Boriss.** <sup>(Pri)</sup>	Churupa	2930–4000	J, R	H	Reg Himal	AP	Cough, lung infection
<i>Sedum ewersii</i> H. Ohba <sup>(Pri)</sup>	Shrollo	2600–4000	B, Q, R, S	H	Reg Himal Sibir Altaic	Lf, St	Toothache, appetite, soothing
<b>Cucurbitaceae</b>							
<i>Diplocyclos palmatus</i> (L.) Jeffrey <sup>(Pri)</sup>		3400–3720	P	H	Ind Or	Sd	Diabetes
<b>Cupressaceae</b>							
<i>Juniperus communis</i> L. <sup>(Pri)</sup>	Petada, Shukpa, Dhup	2500–4000	A, B, E, F, H, J, L, Q, R, S, X	Sh	Reg Bor Temp et Arct	WP, St, Fr	Kidney, liver, bladder, heart disease, nervous disorder, dropsy mucous discharge, antibiotic for animals, insect repellent

<i>J. indica</i> Bertol. <sup>(Pri)</sup>	Dhoop	3300–4000	H, X	Sh	Soongar Reg Himal	WP, AP, Fr	Asthma, bronchitis, aphrodisiac, anthelmintic, abdominal pain, tumors, piles
<i>J. polycarpus</i> Boiss. <sup>(Pri)</sup>	Shur, Leyur	2500–4000	F, H, J, L, P, Q, R, S	T	Persia Reg Himal	Lf, WP, Fr	Asthma, antibiotic for animals, insect repellent, nervous disorder, stomach cramp
<i>J. recurva</i> Buch.-Ham. ex D. Don <sup>(Pri)</sup>	Shurr	3500–4000	B	Sh	Reg Himal	Rt, WP, Br	Kidney trouble
<b>Cuscutaceae</b>							
<i>Cuscuta approximata</i> Babington <sup>(Sec)</sup>		2800–3200	E	H	Ind Or	WP	Swellings of testicles, headache, warts
<b>Cyperaceae</b>							
<i>Carex obscura</i> Nees <sup>** (Sec)</sup>		3300–3640	H	Sg	Reg Himal	AP	Antiviral
<b>Datisaceae</b>							
<i>Datisca cannabina</i> L. <sup>(Pri)</sup>		3200–3500	H	H	Oriens Reg Himal	Rt, AP	Fever, gastric
<b>Dioscoreaceae</b>							
<i>Dioscorea deltoidea</i> Wall. ex Kunth <sup>(Sec)</sup>	Kinsh, Singli-mingli	2490–3000	A, B	H	Ind Or	Tb	Oral contraceptive
<b>Dipsacaceae</b>							
<i>Dipsacus mitis</i> D. Don <sup>(Pri)</sup>		2730–2900	B	H	Reg Himal	AP	Indigestion
<b>Elaeagnaceae</b>							
<i>Elaeagnus parvifolia</i> Wall. ex Royle <sup>(Pri)</sup>		2490–2700	A	Sh	Japon	Fr, AP, Lf, Sd	Cough, bronchitis, febrifuge, expectorant
<i>Hippophae rhamnoides</i> L. <sup>(Pri)</sup>	Gartsak, Tirkug, Chharma, Sarla Sarla	2800–3650	H, L, P, Q, R, S	Sh	Europe As Temp	WP	Aphrodisiac, lung disease, indigestion, oxytoxic, blood pressure, wounds, cough, antibacterial
<i>H. salicifolia</i> D. Don <sup>** (Pri)</sup>		3100–3640	P, Q	T	Reg Himal (Nepal)	Fr, Br	Cuts, ulcers, wounds, cough, fever, dandruff, skin disease
<b>Ephedraceae</b>							
<i>Ephedra Gerardiana</i> Wall. ex Stapf <sup>** (Pri)</sup>	Kiok, Buchchur, Chhe, Somlata	2500–3900	B, J, R, S	Sh	China	WP, Fr	Asthma, blood purifier, cardiac ailments, cough, bronchitis, headache, hepatic disease, pneumonia fever, rheumatism
<b>Euphorbiaceae</b>							
<i>Euphorbia pilosa</i> L. <sup>(Sec)</sup>	Dudawaj	2630–3000	B	H	Europe As Bor	WP	Constipation, emetic, wounds
<i>E. stracheyi</i> Boiss. <sup>(Sec)</sup>		2700–2800	F	H	Reg Himal	AP, Latex	Boils, rheumatism
<b>Equisetaceae</b>							
<i>Equisetum arvense</i> L. <sup>(Sec)</sup>	Khin	2800–3560	P, S	F	Alaska (Sub Arctic Am Northern Am)	Ashes of plants	Diuretic haemostatic, kidney disease, dropsy, dyspepsia
<b>Ericaceae</b>							
<i>Cassiope fastigiata</i> (Wall.) D. Don <sup>** (Pri)</sup>	Salu	3410–4000	B, H, X	Sh	Reg Himal	WP	Itching
<i>Rhododendron anthopogon</i> D. Don <sup>** (Pri)</sup>	Balu	3410–4000	B, H, S, X	Sh	As Bor Reg Himal	Lf	Aromatic, bronchitis, cold, cough, gonorrhoea, stomach ailment, tea, reduce birth pains, delivery
<i>R. campanulatum</i> D. Don <sup>** (Pri)</sup>	Radukpa	3400–4000	H, S, X	Sh	Reg Himal	Rt, Inf, Lf, Fl	Dysentery, fever, headache, boils, piles, bone fracture of animals
<b>Fabaceae</b>							
<i>Astragalus chlorostachys</i> Royle ex Benth. <sup>** (Pri)</sup>		3010–3450	D, X	H	Reg Himal	AP	Tonic, febrifuge, tuberculosis
<i>A. grahamianus</i> Royle ex Benth. <sup>(Sec)</sup>	Rangchawag	2720–3120	J	Sh	Reg Himal	Rt, Lf	Skin disease

(Continued)

Table 2. (Continued).

Family/Species	Local name	Altitudinal range (m)	Locality	LF	Nativity	Part(s) used	Indigenous uses
<i>A. himalayanus</i> Klotzsch ** <sup>(Sec)</sup>	Kayaba Chhutup	2650–3800	H, Q, S	H	Reg Himal	Sd, Fl	Colic, leprosy, stangury
<i>A. ladakensis</i> Balak. <sup>(Pri)</sup>	Serpang	3200–3450	H	H	Reg Himal	AP	Diuretic
<i>A. nivalis</i> Kar & Kir. <sup>(Sec)</sup>	Zomoshing	2990–3500	L, R	H	Tibet Occ Soongar	Rt	Blood purifier
<i>A. rhizanthus</i> Royle ex Benth. ** <sup>(Pri)</sup>	Zomoshing	3000–3800	P, Q, R, S	H	Reg Himal	Rt	Heart stimulant, skin disease
<i>A. subuliformis</i> DC. <sup>(Sec)</sup>	Zomoshing	3320–3650	L	H	Reg Caucas Tibet / Afghan Sibir	Gum	Diuretic
<i>Caragana versicolor</i> (Wall.) Benth. <sup>(Sec)</sup>	Bramswak, Zomoshing	2900–4000	F, P, Q, R, S	Sh	Reg Himal As Bor	Rt	Dysmenorrhea
<i>Cicer microphyllum</i> Benth. <sup>(Pri)</sup>	Banyarts, Vanyarcha, Chiri	2600–3800	D, H, R, S	H	Soongar Reg Himal Bor Occ	Fr, Lf, Sd, AP	Sore mouth in cattle, tongue infection, jaundice
<i>Indigofera heterantha</i> Wall. ex Brand. <sup>(Sec)</sup>		2500–3220	A, B, J	Sh	Reg Himal	Lf, St, Br	Diarrhoea, dysentery, cough, wounds
<i>Lathyrus sativus</i> L. <sup>(Sec)</sup>		3050–3240	D	H	Europe Oriens	Sd, AP	Narcotic
<i>Lespedeza juncea</i> (L. f.) Pers. <sup>(Sec)</sup>		2700–3500	E, F, L	Ush	Reg Himal As Bor	WP	Oxytoxic
<i>Lotus corniculatus</i> L. <sup>(Pri)</sup>		2700–3650	F, L, Q, S	H	Europe	AP	Anti-inflammatory
<i>Medicago lupulina</i> L. <sup>(Pri)</sup>	Gunyok	2980–3600	L, Q, R, S	H	Geront Bor Temp	AP	Liver & lung disease, kidney disorder, pneumonia
<i>Oxytropis lapponica</i> (Wahl.) Gay. <sup>(Pri)</sup>		3200–3400	Q	H	Europe As Bor	AP	Joint pain
<i>O. tatarica</i> Camb. ex Bunge <sup>(Sec)</sup>		2700–3200	B, J	H	Reg Himal Turkest	AP	Diuretic
<i>Trifolium pratense</i> L. ** <sup>(Sec)</sup>		2990–3650	L, Q, R, S	H	Europe As Temp	AP	Cough, bronchitis, venereal disease
<i>T. repens</i> L. <sup>(Sec)</sup>		2500–3400	A, H, S	H	Geront Bor Temp	AP	Astringent
<i>Trigonella emodi</i> Benth. <sup>(Pri)</sup>	Tuljima, Kuchona, Buksup, Ampang	3250–3400	P	H	Reg Himal	AP, In	Aromatic, pest repellants especially wood borer, poison
<b>Fumariaceae</b>							
<i>Corydalis cornuta</i> Royle <sup>(Pri)</sup>		2700–2900	F	H	Reg Himal	Rt	Swelling, inflammation, fever
<i>C. govaniensis</i> Wall. ** <sup>(Pri)</sup>		2710–3650	B, Q, X	H	Reg Himal	WP	Antipyretic, diuretic, eye disease, gastric disease, liver, muscle pain, skin disease, syphilis, tonic, leprosy, rheumatism
<i>C. vaginans</i> Royle <sup>(Sec)</sup>		3300–3630	S	H	Reg Himal	AP	Eye complaints
<b>Gentianaceae</b>							
<i>Gentiana argentea</i> (D. Don) Griseb. ** <sup>(Pri)</sup>	Pungen karmo	3300–3900	H, X	H	Reg Himal China	Lf, Fl	Sore throat
<i>G. coronata</i> Royle ** <sup>(Pri)</sup>	Ziang	3300–4000	B	H	Reg Himal	Rt	Stomach pain, febrifuge
<i>G. kurroo</i> Royle ** <sup>(Sec)</sup>		3200–3500	H, S	H	Reg Himal	Rt	Appetite, stomachic, fever, urinary complaints, cough
<i>Gentianaella moorcroftiana</i> (Wall. ex G. Don) Airy Shaw ** <sup>(Pri)</sup>	Ticta	3450–3710	S	H	Reg Himal	AP	Febrifuge, blood purifier, fever, cough, rheumatism, gastric
<i>G. tenella</i> (Rottb.) Borner ** <sup>(Pri)</sup>		3500–3900	B	H	Reg Bor et Arct	WP	Tibetan medicine

<i>Jaeschkea oligosperma</i> (Criseb.) Knobl. ** <sup>(Pri)</sup>	Ticta	3500–4000 B	H	Reg Himal	WP, AP	Febrifuge, blood purifier
<i>Sweritia ciliata</i> (G. Don) Burr. ** <sup>(Sec)</sup>		2710–3600 B, E, Q, S	H	Reg Himal	AP, Lf	Malaria
<i>S. cordata</i> (G. Don) Cl. <sup>(Pri)</sup>		2740–3620 D, E, J, L, R	H	Reg Himal	WP	Anthelmintic, appetite, laxative, stomachic, blood disease, febrifuge
<i>S. petiolata</i> Royle ex D. Don ** <sup>(Pri)</sup>		3300–4000 H, S	H	Reg Himal	AP	Tonic, liver
<b>Geraniaceae</b>						
<i>Geranium himalayense</i> Klotz. <sup>(Sec)</sup>	Porlo	3020–3670 S	H	Europe As Bor	Rt, Fl	Bruises, stomache
<i>G. nepalense</i> Sw. <sup>(Pri)</sup>	Laljari, Gajalihar	2900–4000 H, L, S	H	Ind Or China	Rt	Cuts, jaundice, toothache, ulcers, wounds, stomach complaints
<i>G. pratense</i> L. <sup>(Pri)</sup>	Porlo	2800–4000 B, F, R, S	H	Europe As Bor	AP	Black dye, poultice to bruises, cough, jaundice, gastric disorder, headache
<b>Grossulariaceae</b>						
<i>Ribes orientale</i> Desf. <sup>(Sec)</sup>	Nyangada	3400–3800 R	Sh	Oriens Reg Himal	Lf, Fr	Diuretic
<b>Hypericaceae</b>						
<i>Hypericum perforatum</i> L. <sup>(Pri)</sup>	Basant	2500–2900 B, F	H	Europe Pratis	WP	Cuts, immunity, malaria, antidepressant, anti-tumour, anti-cancer, anti-viral
<b>Hydrangeaceae</b>						
<i>Deutzia staminea</i> R. Br. e x Wall. ** <sup>(Sec)</sup>		2490–2860 A	Sh	Reg Himal	AP, Lf	Diuretic
<b>Iridaceae</b>						
<i>Iris kemaonensis</i> D. Don ex Royle <sup>(Pri)</sup>	Praynal	3000–3900 L, P, Q, S, X	H	Reg Himal	Rt, Lf, Sd	Epilepsy, fever, toothache
<b>Juglandaceae</b>						
<i>Juglans regia</i> L. ** <sup>(Pri)</sup>	Akhrot, Ka, Kaboot	2500–3000 A, B, F, L	T	As Occ Reg Himal	Br, Lf, Fr	Tooth cleaning, skin disease, anthelmintic, astringent, toothache, fungicide, insecticide
<b>Lamiaceae</b>						
<i>Ajuga bracteosa</i> Wall. ex Benth. <sup>(Pri)</sup>	Karku, Neelkanthi	2600–3200 H	H	Afr Trop Ind Or As Or	Lf, WP	Malaria, tonic, astringent, febrifuge
<i>Clinopodium vulgare</i> L. <sup>(Pri)</sup>		2630–3500 J, R, S, X	H	Europe Canada	AP	Astringent, carminative, heart tonic
<i>Elsholtzia ciliata</i> (Thunb.) Hyland. <sup>(Sec)</sup>		2540–3420 A, B, S	H	Japon (Eastern As, As Temp)	As Fl	Skin disease
<i>E. strobilifera</i> Benth. <sup>(Sec)</sup>	Ruli	3100–3800 Q	H	Reg Himal	Fl, Inf	Bruises, internal burns, wounds
<i>Hyssopus officinalis</i> L. <sup>(Pri)</sup>	Jip-Chi, Chibu	2720–3410 F, J, L,	H	Europe As Temp	WP	Stimulant, carminative, nervous disorders, toothache, digestive, urterine, vermifuge, wounds, sprains, rheumatism
<i>Mentha longifolia</i> (L.) Huds. <sup>(Pri)</sup>	Takchi, Marimi, Madaen	2710–3560 B, F, Q, R, S	H	Reg Bor Temp	WP	Antiseptic, carminative, digestive, kill maggots
<i>Nepeta eriostachya</i> Benth. ** <sup>(Pri)</sup>		3010–3850 L, R, S	H	Reg Himal	WP	Eyes, diuretic
<i>N. discolor</i> Royle ex Benth. <sup>(Pri)</sup>		2700–3805 B, L	H	Reg Himal	WP	Eyes injury & infection, cold, cough
<i>N. floccosa</i> Benth. ** <sup>(Pri)</sup>		2700–3655 B, L, S	H	Reg Himal	Fl, Lf	Blood purifier, fever, cold
<i>N. glutinosa</i> Benth. ** <sup>(Pri)</sup>		3310–3855 R	H	Reg Himal	WP	Diarrhoea, pneumonia, fever
<i>N. longibracteata</i> Benth. <sup>(Pri)</sup>		2760–4000 H, J	H	Reg Himal	AP	Liver disorder, stomach ache, indigestion
<i>N. leucophylla</i> Benth. ** <sup>(Sec)</sup>		3300–3520 R	H	Reg Himal	Lf	Malaria
<i>N. podostachys</i> Benth. <sup>(Sec)</sup>		2720–3790 B, P, Q, R	H	Afghan	Rt, St	Kidney complaints
<i>Origanum vulgare</i> L. <sup>(Pri)</sup>	Lamay masha, Massow	2700–3600 B, F, P, R, S	H	Europe As et Afr Bor	Lf, AP	Antiseptic, bronchitis, colic, diarrhoea, childbirth

(Continued)

Table 2. (Continued).

Family/Species	Local name	Altitudinal range (m)	Locality	LF	Nativity	Part(s) used	Indigenous uses
<i>Phlomis bracteosa</i> Royle ex Benth. <sup>**</sup> (Pri)		3240–3820	P, Q, S, X	H	Reg Himal	Fl, AP	Eye tonic, common household remedy
<i>Plectranthus rugosus</i> Wall. ex Benth. <sup>(Sec)</sup>	Sees	2500–3030	B, H	Sh	Reg Himal	Lf	Abdominal pain, fever, worms, gastric
<i>Salvia hians</i> Royle ex Benth. <sup>**</sup> (Sec)		2400–3000	B	H	Reg Himal	Lf	Swelling, arthritic pain, eczema
<i>S. nubicola</i> Wall. ex Sw. <sup>**</sup> (Sec)		2730–3150	B	H	Europe Austr Oriens Reg Himal	Lf, Rt	Wounds, cough, cold
<i>Scutellaria prostrata</i> Jacq. ex Benth. <sup>**</sup> (Sec)		3310–3640	Q	H	Reg Himal	AP	Fever, jaundice, nerve tonic
<i>Thymus linearis</i> Benth. <sup>(Pri)</sup>	Kochi masha	2730–3800	B, F, J, P, Q, R, S	H	Pakistan	WP	Antifungal, antibacterial, pain during childbirth, whooping cough, epilepsy, skin eruption, excessive bile secretion, alopecia, phlegm, spasmodic pain, stomachic, cold, toothache, hookworms, liver compliant, heating effect
<b>Liliaceae</b>							
<i>Allium carolinianum</i> DC. <sup>(Pri)</sup>	Keor, Lo-adh, Jimboo	3300–4000	A, B	H	Carolina USA	Lf, Bb	Stimulant, diuretic, given with milk after delivery
<i>A. humile</i> Kunth <sup>**</sup> (Pri)	Forn, Jangli Pyaz	3500–4000	B	H	India Or	Lf, Bb	Indigestion
<i>A. victorialis</i> L. <sup>(Pri)</sup>	Gokpa	3400–3800	S	H	Europe Caucasus Siberia	Lf, Bb	Anti-diarrhoea
<i>A. wallichii</i> Kunth. <sup>(Sec)</sup>		3300–3500	H	H	Reg Himal	Bb, Lf	Flatulence, bile complaints
<i>Asparagus filicinus</i> Buch.-Ham. ex D. Don <sup>(Sec)</sup>		2490–2600	B	Sh	Reg Himal Burma	Rt	Diabetes, diarrhoea, dysentery
<i>Lilium polyphyllum</i> D. Don <sup>**</sup> (Sec)		2900–3200	D	H	Reg Himal	AP, Rt	Galactagogue, expectorant, aphrodisiac, diuretic, antipyretic, tonic, cough, bronchitis, strangury, hyperdipsia, fever, rheumatism
<i>Polygonatum cirrhifolium</i> (Wall.) Royle <sup>(Sec)</sup>		3050–3120	S	H	Reg Himal As Bor	Tb, Rt, Lf	Aphrodisiac, appetite, blood purifier, nervine tonic, fever
<i>P. geminiflorum</i> Decne <sup>(Pri)</sup>		3200–3600	S, X	H	Reg Himal	Rt, WP	Tonic, washing of wool
<i>P. multiflorum</i> L. <sup>(Pri)</sup>		2590–3610	B, H, S	H	Europe As Bor Afghan	Tb, AP	Tonic, urogenital disorders
<i>P. verticillatum</i> L. <sup>(Pri)</sup>		2500–3650	A, B, D, E, H, S, X	H	Europe As Bor	Rhm, Tb	Appetite, nervine tonic, kidney trouble, wounds
<b>Malvaceae</b>							
<i>Malva neglecta</i> Wall. <sup>(Pri)</sup>	Sotsal	3100–3350	R, S, X	H	Europe	AP	Malaria, bladder, kidney disorder, laxative
<i>M. sylvestris</i> L. <sup>(Pri)</sup>	Sotsal	3100–3600	P, Q	H	Hungary	Fl	Stomach cramp, whooping cough
<i>M. verticillata</i> L. <sup>(Pri)</sup>	Mikanchi	2700–2990	F	H	Europe As et Afr Bor	Sd, Lf, Rt	Whooping cough, bladder & kidney disorders, emetic
<b>Morinaceae</b>							
<i>Morina coulteriana</i> Royle <sup>**</sup> (Pri)	Dayela, Chaawag	2960–3455	R	H	Reg Himal	Fl, Rt, WP	Eye complaints
<i>M. longifolia</i> Wall. <sup>**</sup> (Pri)	Sibsha	3210–3650	P, R	H	Reg Himal	Rt	Boils, wounds, unconsciousness
<b>Oleaceae</b>							
<i>Fraxinus micrantha</i> Ling. <sup>**</sup> (Sec)	Shunu	2500–2810	A, B	T	N Mexic	St, Lf, Br	Fever, dysentery
<i>F. xanthoxyloides</i> (G. Don) DC. <sup>**</sup> (Pri)	Thrung, Sanjal, Shunu	2500–3210	A, B, F, H, J	T	Reg Himal	Blk, St	Veterinary medicine

<i>Jasminum humile</i> L. <sup>(Pri)</sup>	2510–3300	A, B, H, J	H	As Trop	Br, Rt, Fl, Lf	Sinus, skin disorder, blood, heart disease, diabetes
<i>Syringa emodi</i> Wall. ex Royle <sup>** (Pri)</sup>	2500–3430	A, S	Sh	Reg Himal	Sd, Fl, Br	Fever, stomach disorder
<b>Onagraceae</b>						
<i>Epilobium hirsutum</i> L. <sup>(Pri)</sup>	3200–3450	R, S	H	Europe As Bor	AP	Poisonous to cattle
<i>E. royleanum</i> Hausskn. <sup>(Pri)</sup>	2720–2830	E	H	Reg Himal	Lf, Rt	Cattle warts, ringworm, poisonous to livestock
<b>Orchidaceae</b>						
<i>Dactylophiza hatagirea</i> (D. Don.) Soo <sup>** (Pri)</sup>	3000–3400	H, S	H	Europe Afr Bor Oriens Reg Himal	Tb	Antibiotic, wounds, fractures, cough, cold, cuts, sexual disability, rheumatism, blood purifier, tonic, expectorant
<i>Epipactis helleborine</i> (L.) Crantz <sup>(Pri)</sup>	2500–3640	A, B, Q, R, X	H	Europe As Bor	Lf, Rh	Fever, blood purification, aphrodisiac
<i>Herminium monorchis</i> (L.) R. Br. <sup>(Sec)</sup>	2400–2900	B	H	Europe As Bor	Tb	Antiseptic, kidney complaints
<i>Malaxis muscifera</i> (Lindl.) Ktze. <sup>(Sec)</sup>	3000–3200	X	H	Europe	Rt	General tonic
<b>Oxalidaceae</b>						
<i>Oxalis corniculata</i> L. <sup>(Pri)</sup>	3000–3300	X	H	Amphig Temp et Trop	WP	Appetite, corns, cuts, dysentery, fever, jaundice, rickets, scurvey, stomach ache, swelling, warts, cataracts, conjunctivitis
<b>Papaveraceae</b>						
<i>Meconopsis aculeata</i> Royle <sup>** (Pri)</sup>	3200–4000	A, H, S, X	H	Reg Himal	WP	Backache, colic, renal pain, tonic
<b>Phytolaccaceae</b>						
<i>Phytolacca acinosa</i> Roxb. <sup>(Sec)</sup>	2500	A	H	Reg Himal China	Lf, Rt	Stomach cramps, dysentery, wounds, cattle pneumonia, local beverages
<b>Pinaceae</b>						
<i>Abies pindrow</i> Royle <sup>** (Sec)</sup>	2500–3890	A, B, H	T	Reg Himal	AP, St, WP	Fever, asthma, bronchitis
<i>Cedrus deodara</i> (Roxb. ex D. Don) G. Don <sup>** (Sec)</sup>	2550–3200	B, D, F	T	Ind Or	WP, St	Skin disease, anthelmintic, rheumatism, ulcers
<i>Picea smithiana</i> (Wall.) Boiss. <sup>** (Sec)</sup>	2550–3600	B, D, F, H, J	T	Reg Himal	WP	Cuts, sores, body pain
<i>Pinus wallichiana</i> A. B. Jack. <sup>** (Sec)</sup>	2500–4000	B, F, H, S	T	Reg Himal	WP, St, Sd, Lf	Abscess, dislocation, rheumatism, ulcers, unconsciousness
<b>Plantaginaceae</b>						
<i>Plantago depressa</i> Willd. <sup>(Pri)</sup>	2610–3410	B, S	H	Sibir	WP	Dysentery, wounds, piles, infant health
<i>P. himalaica</i> Pilger <sup>** (Pri)</sup>	2710–3420	F, H, R	H	Reg Himal	WP	Diarrhoea, dysentery, sedative, headache, renal colic, backache
<i>P. major</i> L. <sup>(Pri)</sup>	2600–3450	S, H, B	H	Europe naturalized in Cuba	Sd, Lf	Fever, cough, gastric disorders, wounds
<b>Poaceae</b>						
<i>Avena fatua</i> L. <sup>(Sec)</sup>	2680–4000	F, L, P, R, Q, S	H	Europe Oriens As Bor	AP	Wounds
<i>Eragrostis minor</i> Host. <sup>(Pri)</sup>	2500–4000	A, B, H, J, L, Q, R, S, X	H	Reg Trop et Temp	Rt, AP	Stomach complaints

(Continued)

Table 2. (Continued).

Family/Species	Local name	Altitudinal range (m)	Locality	LF	Ind Or	Nativity	Part(s) used	Anthelmintic	Indigenous uses
<i>Phacelurus speciosus</i> (Steud.) C.E. Hubb. <sup>(Pri)</sup>		3200–3520	Q	H			AP		
<b>Podophyllaceae</b>									
<i>Podophyllum hexandrum</i> Royle <sup>(Pri)</sup>	Bankakri, Omoshey, Braburchoi, Pindiyali	2500–3700	A, B, H, S, X	H	Ind Or	As Trop	WP		Cough, purgative, chronic constipation, tuberculosis, hepatic, stimulant, vermifuge, gynecological disorder, warts, tumors, cancer, childbirth, cuts, wounds, diarrhea, gastric ulcer, hepatic disease
<b>Polygonaceae</b>									
<i>Bistorta affinis</i> Greene <sup>** (Pri)</sup>	Chunru, Kapad	2700–4000	F, H, Q, R, S	H	Reg Himal		AP, Rt, Sd		Cold, diarrhoea, flatulence, dysentery
<i>Fagopyrum dibotrys</i> Meisn. <sup>(Sec)</sup>		2500	A	H	Reg Himal	China	Rt, Lf	Antibiotic	
<i>F. esculentum</i> Moench <sup>(Pri)</sup>	Brafo	2490–3700	A, B, E, F, G, H, J, L, P, Q, R, S, X	H	Europe	As Bor	Lf, Fr	Sunburn, protects skin, colic, abdominal complaints	
<i>F. tataricum</i> (L.) Gaertn. <sup>(Pri)</sup>	Brafo	2490–3700	A, B, E, F, G, H, J, L, P, Q, R, S, X	H	Europe	As Bor	Lf, Fr	Colic, sunburn, protect skin	
<i>Oxyria digyna</i> (L.) Hill <sup>(Pri)</sup>	Surjilap	2960–3855	R, S	H	Reg Bor	Alp et Arct	WP	Appetite, fever, laxative	
<i>Polygonum alpinum</i> All. <sup>(Pri)</sup>	Alipap	3010–3650	P, Q, R, S	H	Europe	Austr As Bor	St	Rheumatic pain	
<i>P. amplexicaule</i> D. Don <sup>(Pri)</sup>		2600–3855	B, G, J, S, X	H	Reg Himal		Rt, Lf	Cough, dysentery, haemostasis, tonic, abortion, wounds, heart burn	
<i>P. hydropiper</i> L. <sup>(Pri)</sup>		2500–3020	A	H	Reg Temp	Bor et Austr	Lf	Tongue infection in cattle	
<i>P. paronychioides</i> C. A. Mey. <sup>(Sec)</sup>		3530–3700	Q	H	Reg Caucas	et Himal	WP	Diarrhoea, dysentery	
<i>P. plebium</i> R.Br. <sup>(Sec)</sup>		2700–3810	F, J, L, P, Q, R, S	H	Geront	Trop et Temp	AP, Rt	Baldness, lung disease, diarrhoea, dysentery	
<i>P. polystachyum</i> Wall. ex Meisn. <sup>(Pri)</sup>		3030–3525	R, S, X	H	Ind Or	(Indian Subcontinent, As Trop)	AP	Acidity, indigestion	
<i>P. recumbens</i> Royle ex Bab. <sup>** (Pri)</sup>		2500–3300	F	H	Reg Himal		AP	Skin disease, blood purifier, carbuncle, healing	
<i>P. somdevae</i> Aswal et Mehrotra <sup>** (Pri)</sup>	Nyello	2640–4000	A, B, L, S	H	Reg Himal		Lf, Rt, Fl	Abscess, antidote to aconite, thirst, diarrhoea, giddiness, headache, deodorizer	
<i>P. tortuosum</i> D. Don <sup>(Sec)</sup>	Nyolo	3460–3750	H	H	Reg Himal		AP, Rt	Blood purifier	
<i>P. vacciniifolium</i> Wall. ex Meisn. <sup>** (Sec)</sup>		3000–4000	B, Q, R	H	Reg Himal		Rt, Lf	Tuberculosis	
<i>Rheum australe</i> Spreng. <sup>** (Pri)</sup>	Archo	3015–3910	Q, R, S	H	Austr		St, Lf, AP	Abdominal pain, appetite, asthma, bronchitis, fever, cuts, dysentery, laxative, eye disorder, sprain, swelling, ulcers, wounds	
<i>R. moorcroftiana</i> Royle <sup>** (Pri)</sup>	Revenchini, Rhubarb	3520–4000	R	H	Reg Himal		Rt	Internal injury	
<i>R. webbianum</i> Royle <sup>** (Pri)</sup>	Archo	3350–3600	X	H	Reg Himal		Rt, Lf	Abdominal disorder, boils, astringent, purgative, wounds	
<i>Rumex acetosa</i> L. <sup>(Pri)</sup>	Surjilove	2900–3470	E, L, P, Q	H	Europe	As Bor	Lf, AP, Fr	Appetizer, laxative, stomach disease	
<i>R. hastatus</i> D. Don <sup>(Sec)</sup>		3220–3630	Q, R	H	Reg Himal		Lf	Cuts, wounds, nettle sting	
<i>R. nepalensis</i> Spreng. <sup>(Pri)</sup>	Napchati	2500–3680	A, B, F, H, S	H	As Occ	Ind Or Malaya Afr Austr	Lf, Rt, Tw	Boils, colic, cooling, diuretic, dymenorhoea, purgative, scurvy, swelling of muscle, stomach ache	





Table 2. (Continued).

Family/Species	Local name	Altitudinal range (m)	Locality	LF	Nativity	Part(s) used	Indigenous uses
<i>Potentilla argyrophylla</i> Wall. ex Lehmann** <sup>(Pri)</sup>		3200–4000	B, H, S	H	Reg Bor Temp	Rt, Fl	Angina, toothache, gingivitis, wound as analgesic
<i>Prunus armeniaca</i> L. <sup>(Pri)</sup>	Khumani	3000–3200	L	T	Reg Caucas	Lf, Sd, AP	Fever, body massage
<i>P. cerasoides</i> D.Don <sup>(Pri)</sup>		2790–3200	L	T	Reg Himal	St, Br, Lf, Fr, Fl	Psycho-medicine, swelling, contusion
<i>P. cornuta</i> (Wall. ex Royle) Steud. <sup>(Pri)</sup>	Krun, Khimor	2500–3300	A, B, F, L, S	T	Ind Or	AP, Fr, Sd, Lf, St	Rheumatism, wounds
<i>Pyrus pashia</i> Buch.-Ham. D.Don** <sup>(Sec)</sup>		2810–2950	F	T	Reg Himal	Lf, Fr	Eye disorder, digestive disorder
<i>Rosa brunonii</i> Lindl. <sup>(Sec)</sup>		3200–3500	X	Sh	Oriens	Lf, Fl, AP	Wounds, ophthalmia, diarrhoea
<i>R. webbiana</i> Wall. ex Royle <sup>(Pri)</sup>	Chawag	2500–3800	A, B, F, J, L, P, Q, R, S, X	Sh	Reg Himal	Fl, Fr, AP	Hepatitis, jaundice, stomach ache
<i>Rubus paniculatus</i> Sm.** <sup>(Sec)</sup>		2500–2700	A	Sh	Reg Himal	Lf, Fr	Diarrhoea, stomach disorder
<i>Sorbaria tomentosa</i> (Lindl.) Rehder <sup>(Pri)</sup>	Kamyat	2600–3000	B, F	Sh	Reg Himal As Bor	Fr, St	Asthma
<i>Sorbus aucuparia</i> L. <sup>(Sec)</sup>		3000–3200	L	Sh	Europe As Bor	Fr	Cough, cold
<i>S. ursina</i> (Wenzing.) Decne <sup>(Pri)</sup>		3200–3600	H	Sh	Reg Himal	Bk	Wounds
<i>Spiraea canescens</i> D.Don** <sup>(Pri)</sup>	Kati, Sagal	2500–2900	A, B, H	Sh	Reg Himal	Br, St	Sores, wounds
<b>Rubiaceae</b>							
<i>Galium aparine</i> L. <sup>(Sec)</sup>		2500–3600	A, B, H, Q	H	Reg Bor Temp et Magell	Lf, WP	Astringent, skin disease
<i>G. asperifolium</i> Wall. <sup>(Pri)</sup>		2700–3650	L, D, E, H, J, S	H	Europe As Temp	WP	Skin disease, diuretic, urinary problems
<i>G. rotundifolium</i> L. <sup>(Sec)</sup>		2760–3470	F, G, J	H	Europ As Temp	WP	Colic, dyspepsia, jaundice
<i>Rubia cordifolia</i> L.** <sup>(Sec)</sup>		2500–3210	A, B, R, S	H	As Trop et Temp Afr Trop	Rt, St	Dye, tonic, astringent, antidote to snake bite, bacillary dysentery
<b>Salicaceae</b>							
<i>Populus ciliata</i> Wall. ex Royle <sup>(Pri)</sup>	Pak butra	2700–3500	F, H, L, S, P, Q, R	T	As et Am Temp	St, Br, Inf, Lf	Fractures of man and animals, tonic, stimulant, blood purifier
<i>Salix acmophylla</i> Boiss. <sup>(Sec)</sup>		3200–3300	S, H	T	Oriens Ind Or	Bk, AP	Febrifuge
<i>S. alba</i> L. <sup>(Sec)</sup>	Chanker	3000–3500	F, L, P, R, S	T	Europe As Bor	WP	Febrifuge
<i>S. fragilis</i> L. <sup>(Pri)</sup>	Shen-bhut	2500–3800	A, B, E, F, G, H, L, P, Q, R, S	T	Europe As Bor	WP	Scouring teeth
<i>S. tetrasperma</i> Roxb. <sup>(Sec)</sup>		3100–3600	S, L	T	Ind or Malaya	AP	Fever
<b>Saxifragaceae</b>							
<i>Bergenia ligulata</i> Haw. Stemb.** <sup>(Pri)</sup>	Silpayi	3400–4000	S	H	Reg Himal	Rt, Lf	Asthma, boils, cuts, wounds, burns, fever, liver complaints, ophthalmia, piles, kidney stones, urine complaints, diarrhoea of cattle
<i>B. stracheyi</i> Hk. & Th.** <sup>(Pri)</sup>	Silpayi	3300–4000	H, S, X	H	Baja California Sur (Mexico, Northern America)	Rt, Lf	Kidney stone, poultice, stiff joints, diuretic, scurvy, astringent, fever, ophthalmia, tonic, wounds



Table 2. (Continued).

Family/Species	Local name	Altitudinal range (m)	Locality	LF	Nativity	Part(s) used	Indigenous uses
<b>Tamaricaceae</b>							
<i>Myricaria germanica</i> (L.) Desv. (Sec)	Hombuk, Hombug	2700–3200	F, R, S	Sh	Europe Oriens As Bor	St, Br	Rheumatism
<b>Taxaceae</b>							
<i>Taxus baccata</i> L. subsp. <i>wallichiana</i> (Zucc.) Pilger (Pri)	Sangdang	2500–3000	A, B, D, G	T	Reg Bor Temp	St, Bk, AP	Anticancer, blood purifier, swelling, fever, asthma
<b>Ulmaceae</b>							
<i>Celtis australis</i> L. ** (Pri)	Khidak	2500–3000	B, F	T	Europe As Temp Ind Or	WP	Fracture, pimples, contusions, sprains, joint pain
<i>Ulmus wallichiana</i> Planch. ** (Sec)		2490–2790	A, B	T	Ind Or	AP, St, Lf, Br	Fracture, dislocation of joints
<b>Urticaceae</b>							
<i>Urtica dioica</i> L. (Pri)	Achoka, Ann	2950–3500	L, P, R, S	H	Reg Bor Temp	Lf	Blood purifier, jaundice, skin eruption
<b>Valerianaceae</b>							
<i>Nardostachys grandiflora</i> DC. (Pri)	Jatamansi	3300–4000	S	H	Reg Himal	Rt	Blood purifier, cooling, cough, diuretic, tonic, ulcer, snakebite
<i>Valeriana hardwickii</i> Wall. (Pri)	Nakhniani	2990–3210	D, E	H	Reg Himal Malaya	Rt	Antidote to insect & scorpion sting, epilepsy, neurosis, skin disease, insecticide
<i>V. jatamansi</i> Jones (Pri)	Jatamansi	2750–3420	B, S	H	Reg Himal	Rt	Aphrodisiac, mental disorder, local beverage, aromatic, insecticide
<b>Violaceae</b>							
<i>Viola biflora</i> L. (Pri)	Banaksha	3310–4000	H, X	H	Reg Bor Temp	Lf, Fl, Sd	Antiseptic, antispasmodic, cold, cough, diaphoretic, laxative, leucoderma, skin disease
<i>V. canescens</i> Wall. ex Roxb. ** (Sec)	Banafsha	3300–3510	H	H	Ind Or Malaya China	Lf, Fl, Rt	Asthma, bronchitis, cold, cough, eye disorder, malaria, emetic, demulcent, cuts, wounds
<i>V. pilosa</i> L. (Pri)	Banafsha	2520–3500	A, B, D	H	Ind Or Malaya China	WP	Antipyretic, bilious, cold, cough, diaphoretic, fever, headache, lung disorder, purgative

**Abbreviations:** A = Raoili; B = Tindi; D = Ratoli; E = Salpat; F = Udaipur; G = Hinsa; H = Bihadi; L = Kamring; P = Keylong; Q = Yumath; R = Sitingri; S = Mooling; X = Rohtang; LF = Life Form; H = Herb; T = Tree; Sh = Shrub; F = Fern; Rt = Root; AP = Aerial Part; Sd = Seed; WP = Whole Plant; Lf = Leaf; Fl = Flower; Rhm = Rhizome; Fr = Fruit; Inf = Inflorescence; St = Stem; Br = Branch; Bk = Bark; Tb = Tuber; Bb = Bulb; \* = Endemic; \*\* = Near Endemic; Reg Himal = Himalayan Region; As = Asia; et = And; Am = America; Bor = Borealis; Arct = Arctic; Min = Minor; Ind Or = Indian Oriental; Siber = Siberia; Trop = Tropical; Oco = Occidental; Afr = Africa; USSR = Former Soviet Union; USA = United States of America; Centr = Centre; Amphig = Amphigaea; Austr = Australia; Malaya = Malaysia; NZel = New Zealand; Mongol = Mongolia; Cosmop = Cosmopolitan; Orient = Oriental; Japon = Japan; Turkest = Turkestan; Temp = Temperate; Mediterr = Mediterranean; Russia = Russia; Afghan = Afghanistan; Geront = Geronia; Norveg = Norway; Mt = Mountain; Afghan = Afghanistan; N Mexic = North Mexico; Alp = Alpine; Corea = Korea; Soongar = Soongarica; Caucas = Caucasus; Ross Asiat = Russia Asiatic; Pri = Primary record; Sec = Secondary literature record.

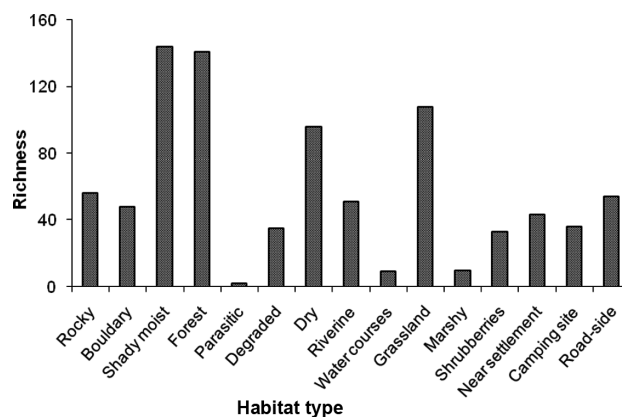


Figure 3. Habitat-wise distribution of medicinal plants in Lahaul valley.

### Nativity and endemism

Of the total species recorded, 146 were native to the Himalayan region. These included 126 near-endemic species and seven species endemic to the IHR (*Angelica glauca*, *Heracleum thomsonii*, *Saussurea costus*, *Berberis pseudumbellata*, *Codonopsis clematidea*, *Corydalis vaginans* and *Lagotis cashmeriana*) (Table 2). The remaining 208 species were non-native, from different biogeographic domains of the world (Table 2).

### Threat categorization and conservation prioritization

Thirteen species were identified as critically endangered, 27 as endangered, 40 as vulnerable, 81 species as near threatened and 193 as of least concern (Table 3). The species identified as critically endangered, endangered and vulnerable have been prioritized for conservation. Of these species, 68 face habitat degradation, 10 over-exploitation and 81 both habitat degradation and over-exploitation. Amongst the prioritized species for conservation, critically endangered, endangered and vulnerable categories species – *Aconitum heterophyllum*, *A. violaceum*, *Angelica glauca*, *Allium humile*, *A. victoralis*, *Dactylorhiza hatagirea*, *Dioscorea deltoidea*, *Hippophae rhamnoides*, *H. salicifolia*, *Hypericum perforatum*, *Hyoscyamus niger*, *Jurinella macrocephala*, *Ephedra Gerardiana*, *Podophyllum hexandrum*, *Picrorhiza kurroo*, *Rheum australe*, *R. webbianum* – and some of near threatened species – *Bunium persicum*, *Carum carvi* and the cultivated species *Inula racemosa*, *Saussurea costus* were recommended for commercial cultivation in the Lahaul valley based on their market potential (Table 3; own criteria).

### Discussion and conclusions

The IHR is well known for its diversity of medicinal plants (Jain 1991; Samant et al. 1998, 2001, 2007a, b).

However, studies on medicinal plants at catchment, watershed and valley levels are not available, although these are the prerequisites for the developmental planning of such geographical entities. The present study provides a comprehensive database that provides baseline information for developing management plans for the conservation of medicinal plant diversity in Lahaul valley of the proposed Cold Desert Biosphere Reserve, in particular, and cold deserts of the IHR in general.

The occurrence of 354 species of medicinal plants in the area indicates that its environmental conditions, particularly shady moist and forest habitats, are suitable for the growth and development of such species. These habitats require regular monitoring to understand the dynamics of the vegetation. The altitudinal range 2801–3800 m has the most medicinal plant species. The occurrence of 41.4% of native species, 35.7% of near endemic species and 2.0% of endemic species shows the high conservation value of the area. Habitat degradation and over-exploitation of these species may lead to their early extinction in this area. The over-exploitation of both whole medicinal plants and plant parts – roots, rhizomes, tubers, inflorescences, fruits and seeds – may lead to poor regeneration and extirpation of these plants.

An area-specific threat categorization of species is very important for short- or long-term management planning. The present study represents such an attempt in this area, using information on different attributes. The occurrence of critically endangered, endangered and vulnerable medicinal plants indicates high anthropogenic pressure on these species. If over-exploitation and habitat degradation of these species continues, they may disappear from the area within a few years. Population assessment of these species using standard ecological methods and notification of key areas as medicinal plants conservation areas (MPCAs) for in situ conservation, with the involvement of the Forest Department and tribal communities, are suggested. In addition, mass reproduction using conventional (vegetative and seeds) methods, establishment and maintenance of herbal gardens and medicinal plants nurseries for ex situ conservation and ensuring the availability of quality planting material for cultivation, together with education and awareness programmes for large-scale cultivation are suggested.

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Table 3. Status of recorded species under threat in Lahaul valley and comparison to other places.

Area	Critically endangered	Endangered	Vulnerable	Near threatened
Lahaul Valley (Based on present study)	<i>Aconitum violaceum</i> , <i>Angelica glauca</i> , <i>Bergenia ligulata</i> , <i>Corylus jacquemontii</i> , <i>Jurinea macrocephala</i> , <i>Juniperus recurva</i> , <i>Lilium polyphyllum</i> , <i>Nardostachys grandiflora</i> , <i>Pyrus pashia</i> , <i>Rheum moorcroftiana</i> , <i>Sabia baccata</i> subsp. <i>wallichiana</i>	<i>Acer acuminatum</i> , <i>Aconitum heterophyllum</i> , <i>Allium humile</i> , <i>A. victoriae</i> , <i>A. wallichii</i> , <i>Aralia cachemirica</i> , <i>Celtis australis</i> , <i>Dioscorea deltoidea</i> , <i>Fagopyrum dibotrys</i> , <i>Fraxinus micrantha</i> , <i>Gentiana kurroo</i> , <i>Hippophae salicifolia</i> , <i>Inula grandiflora</i> , <i>Juglans regia</i> , <i>Juniperus indica</i> , <i>Malus baccata</i> , <i>Onosma hispidum</i> , <i>Phytolacca acinosa</i> , <i>Physoclaena praealta</i> , <i>Polygonatum cirrhifolium</i> , <i>Rheum webbianum</i> , <i>Rhododendron campanulatum</i> , <i>Saussurea gossypiphora</i> , <i>Sorbus ursina</i> , <i>Ulmus wallichiana</i> , <i>Valeriana jatamansi</i> , <i>Vincetoxicum hircundinaria</i>	<i>Ajuja bracteosa</i> , <i>Arnebia euchroma</i> , <i>Berberis jaeschkeana</i> , <i>Bergenia stracheyi</i> , <i>Betula utilis</i> , <i>Buxus wallichiana</i> , <i>Codonopsis clematidea</i> , <i>Corydalis gowaniana</i> , <i>Dactylorhiza hatagirea</i> , <i>Datisca cannabina</i> , <i>Delphinium cashmerianum</i> , <i>D. denudatum</i> , <i>Deutzia staminea</i> , <i>Ephedra gerardiana</i> , <i>Euphorbia pilosa</i> , <i>Ferula jaeschkeana</i> , <i>Fraxinus xanthoxyloides</i> , <i>Gentianella moorcroftiana</i> , <i>Hippophae rhamnoides</i> , <i>Hypericum perforatum</i> , <i>Hyoscyamus niger</i> , <i>Lonicera angustifolia</i> , <i>L. heterophylla</i> , <i>Meconopsis aculeata</i> , <i>Podophyllum hexandrum</i> , <i>Polygonatum geminiflorum</i> , <i>Picrorhiza kurrooa</i> , <i>Prunus cerasoides</i> , <i>Rheum australe</i> <i>Rhododendron anthopogon</i> , <i>Rubia cordifolia</i> , <i>Saussurea albescens</i> , <i>Selinum conifolium</i> , <i>Silene gonosperma</i> , <i>Spiraea canescens</i> , <i>Syringa emodi</i> , <i>Swertia petiolata</i> , <i>Thalictrum minus</i> , <i>Viburnum cotinifolium</i> , <i>Viola canescens</i>	<i>Abies pindrow</i> , <i>Anemone rupicola</i> , <i>Asparagus filicinus</i> , <i>Arctium lappa</i> , <i>Artemisia macrocephala</i> , <i>A. maritima</i> , <i>A. minor</i> , <i>A. sieversiana</i> , <i>Aster falconeri</i> , <i>Astragalus grahamianus</i> , <i>A. himalayanus</i> , <i>Bunium persicum</i> , <i>Bupleurum falcatum</i> , <i>Cassiope fastigiata</i> , <i>Campanula aristata</i> , <i>C. pallida</i> var. <i>tibetica</i> , <i>Cedrus deodara</i> , <i>Codonopsis ovata</i> , <i>C. rotundifolia</i> , <i>Cortia depressa</i> , <i>Carum carvi</i> , <i>Chaetophyllum villosum</i> , <i>Cichorium intybus</i> , <i>Clematis barbellata</i> , <i>Cremanthodium decaisnei</i> , <i>Cerastium cerastoides</i> , <i>Corydalis cornuta</i> , <i>C. vaginans</i> , <i>Cotoneaster microphyllus</i> , <i>Cuscuta reflexa</i> , <i>Dipsacus mitis</i> , <i>Diplocyclos palmatus</i> , <i>Elaeagnus parvifolia</i> , <i>Erigeron bellidioides</i> , <i>Eriogonum canum</i> , <i>Erophila verna</i> , <i>Epilobium royleanum</i> , <i>Gentiana argentea</i> , <i>G. coronata</i> , <i>G. depressa</i> , <i>Herminium monorchis</i> , <i>Heracleum thomsonii</i> , <i>H. candicans</i> , <i>Hedera nepalensis</i> , <i>Hyssopus officinalis</i> , <i>Indigofera heterantha</i> , <i>Jaeschkea oligosperma</i> , <i>Juniperus polycarpus</i> , <i>Lonicera spinosa</i> , <i>Lepidium latifolium</i> , <i>Malaxis muscifera</i> , <i>Morina coulteriana</i> , <i>Oxytropis tatarica</i> , <i>Pedicularis hoffmeisteri</i> , <i>P. pectinata</i> , <i>P. pycnantha</i> , <i>Picea smithiana</i> , <i>Pinus</i>

wallichiana, *Polygonum hydropiper*,  
*P. vacciniifolia*, *Polygonatum*  
*multiflorum*, *P. verticillatum*, *Prunus*  
*cornuta*, *Ribes orientale*, *Rhodiola*  
*heterodonta*, *Rhamnus virgatus*, *Rubus*  
*paniculatus*, *Saussurea roylei*, *S.*  
*taraxacifolia*, *Salix tetrasperma*, *Salvia*  
*nubicola*, *Sambucus adnata*,  
*Scrophularia calycina*, *Smilax aspera*,  
*Solanum nigrum*, *Silene moorcroftiana*,  
*Sorbus aucuparia*, *Tanacetum*  
*dolichophyllum*, *Thalictrum reniforme*,  
*Valeriana hardwickii*, *Viola biflora*  
*Artemisia maritima*, *Hippophae salicifolia*

Himachal Pradesh (Ved et al. 2003)	<i>Aconitum heterophyllum</i> , <i>Arnebia euchroma</i> , <i>Dactylorhiza hatagirea</i> , <i>Gentiana kurroo</i> , <i>Lilium polyphyllum</i>	<i>Angelica glauca</i> , <i>Betula utilis</i> , <i>Datisca cannabina</i> , <i>Dioscorea deltoidea</i> , <i>Ephedra Gerardiana</i> , <i>Hyoscyamus niger</i> , <i>Jurimella macrocephala</i> , <i>Juniperus polycarpus</i> , <i>Meconopsis aculeata</i> , <i>Nardostachys grandiflora</i> , <i>Picrorhiza kurroo</i> , <i>Polygonatum cirrhifolium</i> , <i>Podophyllum hexandrum</i> , <i>Rheum australe</i> , <i>R. moorcroftiana</i> , <i>Taxus baccata</i> subsp. <i>wallichiana</i> , <i>Meconopsis aculeata</i> , <i>Rheum australe</i>	<i>Aconitum violaceum</i> , <i>Bergenia stracheyi</i> , <i>Bunium persicum</i> , <i>Ferula jaeschkeana</i> , <i>Heracleum candicans</i> , <i>Hypericum perforatum</i> , <i>Hyssopus officinalis</i> , <i>Rhodiola heterodonta</i> , <i>Hippophae rhamnoides</i> , <i>Polygonatum multiflorum</i> , <i>P. verticillatum</i> , <i>Physoclaena praecalla</i> , <i>Rhododendron anthopogon</i> , <i>R. campanulatum</i> , <i>Rheum webbianum</i> , <i>Valeriana jatamansi</i>
Global (Ved et al. 2003)	<i>Aconitum heterophyllum</i> , <i>Gentiana kurroo</i> , <i>Saussurea costus</i>	<i>Aconitum violaceum</i> , <i>Rheum webbianum</i>	–

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