

Diversity, indigenous uses and conservation status of medicinal plants in Manali wildlife sanctuary, North western Himalaya

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In the mountainous regions human populations are dependent on plants for their sustenance particularly for medicine. In India, more than 95% of the total medicinal plants used in preparing medicines by various industries are harvested from wild. There is a great need to recognise the potential of bioresources at their fullest. Therefore, the present study focused to assess the medicinal plants diversity in Manali wildlife sanctuary of North western Himalaya, identify species preference, native, endemic and threatened medicinal plants and suggests conservation measures. A total of 270 medicinal plants belonging to 84 families and 197 genera were recorded. Maximum medicinal plants were reported in the altitudinal zone, 2000-2800 m and decreased with increasing altitude. Out of the total, 162 medicinal plants were native and 98 were endemic to the Himalayan region. Maximum species were used for stomach problems, followed by skin, eyes, blood and liver problems. Thirty seven species were identified as threatened. *Dactylorhiza hatagirea*, *Aconitum heterophyllum*, *Arnebia benthamii*, *Lilium polyphyllum*, *Swertia chirayita*, *Podophyllum hexandrum*, *Jurinella macrocephala*, *Taxus baccata* subsp. *wallichiana*, etc. were highly preferred species and continuous extraction from the wild for trade has increased pressure which may cause extinction of these species in near future. Identification of active ingredients and mass multiplication of the potential species have been suggested in view of economic importance. Regular monitoring of populations and habitats of threatened medicinal plants, restricted harvesting and habitat protection are suggested.

Keywords: Medicinal plants, Diversity, Indigenous uses, Nativity, Status, Conservation, Manali wildlife sanctuary

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An estimated, 350 million of the world's people depend almost entirely for their sustenance and daily needs on forests¹. In rural India around 200 million people are partially or wholly dependent on forest resources for their livelihood². For centuries temperate forests have experienced intensive human activity³. In the Himalaya, most of the people live in villages and use plants as medicine, edible/food, fodder, fuel, timber, agricultural tools and various other purposes⁴. Age old traditional values attached with the various forest and varieties of forest products have gained tremendous importance in the present century, particularly medicinal plants⁵. India and China are two of the largest countries in Asia, which have the richest array of registered and relatively well-known medicinal plants⁶. In the Indian Himalayan region, about 1748 species of medicinal plants⁷, 675 species of wild edibles⁴, 279 species of fodder⁸, 118 species of essential oil yielding medicinal and aromatic plants⁹ and 155 species of sacred plants¹⁰ have been

recorded. In India, more than 95% of the 400 plant species used in preparing medicine by various industries are harvested from wild populations¹¹. Like other parts of the Himalaya the inhabitants of Himachal Pradesh are also dependent for medicine, food/edible, fodder, fuel and various other purposes on forests. Many poor families in the mountainous regions of Indian Himalaya earn their livelihood by collected medicinal plants from wild.

In Himachal Pradesh, a large number of studies on medicinal plants have been carried out by various workers¹²⁻²¹. However, a very few studies have been carried out in the protected areas of the state²². Understanding the uniqueness, significance and fewer literature of the Manali wildlife sanctuary, present study has been focused to, (i) assess the diversity, distribution, utilization patterns and indigenous uses of medicinal plants, (ii) identify species preference, (iii) identify native, endemic and threatened medicinal plants, and (iv) suggest conservation measures for sustainable management.

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Study area

The Manali wildlife sanctuary (MWLS) (32°13' to 32°17'N Latitudes and 77°03' to 77°10' E Longitudes), one of the 32 notified sanctuaries of the Himachal Pradesh, is located in the Northern part of Kullu district in Himachal Pradesh, North western Himalaya (Fig.1). It covers 29.03 km² area with an altitudinal range, 2030-5100m of msl²³. There is no permanent human settlement inside the sanctuary, however, 20 temporary camping sites called *Thatches* used by the *Gaddies* during their voyage in summer are existing. More than 35% area is inaccessible due to rocky and steep slopes in the forests as well as alpine zones. Soil is black, light brown and dark brown in colour and silty loam to clayey loam in texture. The climate of the area is typically temperate and consists of mainly 3 distinct seasons, i.e. summer season (mid April-mid June), rainy season (mid June-September) and winter season (October-March). However, the autumn (October) and spring (mid March-mid April) seasons also prevail in the area. The vegetation mainly comprises of temperate, sub-alpine and alpine types. Temperate and sub-alpine forests are mainly dominated by

broad leaved and coniferous species, and alpine meadows are dominated by alpine scrubs and herbaceous species.

Methodology

The four villages namely, Manali, Dhungari, Nasogi and Banaun located in the periphery of the sanctuary were selected and surveyed in prevailing three seasons, i.e. winter, summer and rainy for 2 yrs, to generate information on utilization pattern of medicinal plants by the inhabitants. From each village ten knowledgeable persons and local two *Vaidhyas* from each village were interviewed. Among the village experts, one person was hired to survey and collect the plant species used as medicine from the wild habitats. Information on the local names, altitudinal range, life forms, part (s) used, and use values including indigenous knowledge and practices was gathered. On spot identifications of medicinal plants was done with the help of local and regional floras²⁴⁻²⁸. Fresh samples of species which could not be identified were brought to the institute and identified. The indigenous uses mostly based on the surveys, however in case of medicinal plants information on indigenous uses has also been updated with the help of secondary information¹³. Some of the species of medicinal plants are not used by the inhabitants, but their uses as medicine are known from other parts of the state and Indian Himalayan region. Such species have also been included under medicinal plants. The information was compiled and analyzed for the diversity, altitudinal distribution and utilization pattern including indigenous knowledge^{7,20}.

Nativity of the species was identified^{29,30} and endemism was identified based on distribution of the species³¹. Species having origin or reported first from the Himalayan region were considered as native species. Those species with restricted distribution to Indian Himalayan region were considered as endemics and species extended their distribution to neighbouring Himalayan countries and Indian states considered as near endemics. In broad sense (*sensu lato*) endemic and near endemic species to Indian Himalayan region have been considered as endemic to Himalaya. Threat categories of the species were identified based on habitat preference, population size, distribution range and use values and following IUCN criteria³².



Fig. 1— Location map of the Manali wildlife sanctuary

Results

Diversity, distribution and status

Total 270 species (Angiosperms: 262; Gymnosperms: 05; and Pteridophytes: 03) of medicinal plants belonging to 84 families and 197 genera were recorded. Asteraceae (35 spp.); Lamiaceae and Polygonaceae (16 spp. each); Ranunculaceae (13 spp.); Rosaceae and Apiaceae (12 spp. each) were the dominant families. Among the genera, *Swertia* (6 spp.); *Rhododendron* and *Rheum* (4 spp. each) and *Allium*, *Anaphalis*, *Artemisia*, *Berberis*, *Bistorta*, *Polygonatum*, *Viola* and *Plantago* (3 spp., each.) were dominant genera.

Maximum richness of medicinal plants (222 spp.: herbs: 177; shrubs: 29 and trees: 16) were reported in the altitudinal zone, 2000-2800m and decreased with increasing altitude. Some of the important medicinal species of the altitudinal zone, 2000-2800m were *Pinus wallichiana*, *Taxus baccata* subsp. *wallichiana*, *Berberis lycium*, *Podophyllum hexandrum*, *Polygonatum verticillatum*, *Angelica glauca*, *Dioscorea deltoidea*, *Viola canescens*, etc. and altitudinal zone, 2801-3800m were *Betula utilis*, *Rhododendron campanulatum*, *R. anthopogon*, *Arnebia benthamii*, *Dactylorhiza hatagirea*, *Bergenia stracheyi*, *Jurinella macrocephala*, *Rheum australe*, *Picrorhiza kurrooa*, *Aconitum heterophyllum*, *Meconopsis aculeata*, *Viola biflora*, etc. The notable medicinal plants of the altitudinal zone >3800m were *Aconitum heterophyllum*, *A. violaceum*, *Dactylorhiza hatagirea*, *Juniperus recurva*, *J. indica*, *Bergenia stracheyi*, *Rheum moorcroftianum*, *Oxyria digyna*, *Picrorhiza kurrooa*, *Saussurea simpsoniana*, etc.

Of the total medicinal plants recorded, 138 species were native to the Himalayan region and 24 species were native to the Himalayan region and other biogeographical regions, together and remaining species were non-native to Himalayan region. Two species, i.e. *Angelica glauca* and *Pimpinella acuminata* were endemic to Indian Himalayan region and 96 species are near endemic to Indian Himalayan region and endemic to the Himalayan region. Thirty seven species were identified as threatened including 7 critically endangered species (*Dactylorhiza hatagirea*, *Aconitum heterophyllum*, *Arnebia benthamii*, *Lilium polyphyllum*, *Swertia chirayita*, *Delphinium nudatum* and *Malaxis muscifera*); 15 endangered and 14 vulnerable for Himachal Pradesh. Twelve species (critically endangered: 2, endangered: 7 and vulnerable: 3) were also recorded under threatened categories at global level.

Utilization pattern and indigenous uses

Different parts of the medicinal plants were used in treatment of ailments/diseases of different body parts such as bones, bronchitis, ears, eyes, head, kidney, intestine, joints, liver, lungs, muscles, nervous system, sex organs, skin, stomach, teeth, throat, etc. Maximum species were used for stomach problems (37 spp.), followed by skin (32 spp.), eyes (21 spp.), blood (18 spp.) and liver (11 spp.) problems (Table 1). Maximum (41 spp.) had antipyretic properties, followed by analgesic property (15 spp.). The indigenous uses of the species have been given in appendix. For example, amongst medicinal plants, roots of *Aconitum heterophyllum* were used in diarrhoea, digestive complaints, dysentery, fever and gastric; *Arnebia benthamii* in boils, ulcer, heart ailments, fever, headache and tonic for hairs; *Podophyllum hexandrum* in cancer, cough, ulcer, hepatic diseases, fever and diarrhoea; *Rheum australe* in abdominal pain, asthma, bronchitis, eye disease, sprain and dysentery; tubers of *Dactylorhiza hatagirea* used as astringent, expectorant, tonic and in bone fracture; leaves of *Rhododendron anthopogon* used in bronchitis, cold, cough, etc. (Table 2).

Amongst the parts used, leaf (105 spp.), followed by root (87 spp.), flower (36 spp.) and seed (33 spp.) were the major parts (Fig. 2).

Discussion

Indian Himalayan region has been recognised as the best habitat for medicinal plants and 1748 species have been recorded⁷. Since many tribal communities reside in the Himalayan region and rich culture of the inhabitants in the mountain make their dependency inevitable on the plants especially for medicine. Rich knowledge of the plants as medicine may be due to the dependency of inhabitant largely on the native species for treating the diseases/ailments. Due to least side effect and distant primary health centres might be the major causes of their dependence on native medicinal plants. Occurrence of 270 species of medicinal plants in Manali wildlife sanctuary indicated its high socio-economical potential.

Amongst the medicinal plants, *Picrorhiza kurrooa*, *Lilium polyphyllum*, *Aconitum heterophyllum*, *Dactylorhiza hatagirea*, *Jurinella macrocephala*, *Angelica glauca*, *Podophyllum hexandrum*, *Arnebia benthamii*, *Rheum australe*, *Rheum webbianum*, etc. are high value species and exploited for own use and trade by the surrounding villagers. The high

Table 1—Utilization pattern of medicinal plants in different ailments

Ailments/medicinal properties	No. of species	Ailments/medicinal properties	No. of species
Abdominal pain	8	Heart problems	4
Abortifacient	3	Hepatic complaints	1
Analgesic	4	Insecticidal	3
Anthelmintic	15	Intestinal	4
Antidote	7	Joint problems	5
Antifertility	4	Kidney problems	10
Antipyretic	41	Laxative	9
Antiseptic	8	Leucoderma	6
Aphrodisiac	7	Leucorrhoea	3
Asthma	12	Liver complaints	11
Blisters	3	Lungs problems	2
Blood related problems	20	Malaria	4
Boils	20	Menorrhoea	8
Bone	8	Menstrual	4
Bronchitis	13	Muscle pain	3
Burns	7	Nervine problems	9
Carminative	8	Ophthalmic	3
Cholera	2	Pectoral complaints	2
Cancer	2	Piles	6
Cold	19	Pimples	4
Colic	5	Purgative	11
Constipation	2	Rheumatism	16
Cough	26	Ringworm	2
Cuts	14	Sedative	6
Diaphoretic	8	Seminal	2
Diarrhoea	16	Sexual	2
Digestion	2	Skin problems	32
Diuretic	19	Snakebite	8
Dysentery	17	Stomach problems	37
Dyspepsia	6	Swelling	11
Ear complaints	15	Dental problems	13
Eczema	5	Throat complaints	7
Emetic	9	Tonic	25
Epilepsy	7	Ulcer	13
Eye complaints	21	Urine	13
Fever	41	Vermifuge	5
Gastric	13	Vomiting	4
Goitre	2	Wound	29
Haemostat	8	Veterinary problems	9
Headache	13		

Table 2 — Diversity, distribution pattern and indigenous uses of medicinal plants

Botanical name	Local name	Altitudinal range (m)	Life Form	status	Part used	Nativity	Uses
Acanthaceae							
<i>Barleria cristata</i> L.	-	2000-2200	H	-	Rt, Sd	Ind Or Burma	Bronchitis, pneumonia, antidote to snakebite
Adiantaceae							
<i>Adiantum venustum</i> D. Don	-	2000-2700	H (F)	-	Frd	-	Fever
Alliaceae							
<i>Allium humile</i> Kunth*	Farn	3200-4000	H	-	Lf	Reg Himal Ind Or	Digestion
<i>A. wallichii</i> Kunth	-	2500-3200	H	-	Lf, Bb	Reg Himal	Pectoral diseases
<i>A. victoralis</i> L.	-	2500-3000	H	-	Lf, Bb	Europe Caucus Sibir	Cuts, wounds
Achyranthaceae							
<i>Achyranthes bidentata</i> Bl.	Putkanda	2000-2500	H	-	Rt, Lf, WP	As Trop	Blisters in mouth, hemicrania, scrophula, scorpion sting, whooping cough, swelling
<i>A. aspera</i> L.	-	2000-2500	H	-	Rt, Lf	Geront Trop	Antifertility in woman, dysenrery, ear and eye complaints, leucoderma, skin disorder, stomachache, toothache
Amaranthaceae							
<i>Amaranthus spinosus</i> L.	Sariyara	2000-2500	H	-	Lf	Am Bor	Dismenorrhoea
<i>Cyathula capitata</i> Moq.	-	2000-2800	Sh	-	Lf, Sd	Reg Himal	Emetic, abortifacient
<i>C. tomentosa</i> Roth.	-	2000-2500	Sh	-	Lf, Sd	Reg Himal	Emetic, snakebite
Anacardiaceae							
<i>Rhus javanica</i> L.	Titri	2000-2500	T	-	Tw, Lf, Ft	Reg Himal China Ins Sandvic	Cholera, gastric complaints, indigestion, purgative, skin disease, stomachache
Apiaceae							
<i>Angelica glauca</i> Edgew. **	Chaura	2100-3500	H	EN [#]	Rh, Rt	Reg Himal	Dysentery, gastric complaints, menorrhoea, stomach complaints, vomiting
<i>Bupleurum falcatum</i> L.	Nimla	2000-4000	H	-	Rt	Europe Oriens As Bor Reg Himal	Abdominal, fever, liver complaints
<i>Cortia depressa</i> (D. Don) Norman*	-	3500-4300	H	-	WP	Reg Himal	Abdominal pain, antiinflam, rheumatism, sedative, stomachache
<i>Heracleum candicans</i> Wall. ex DC.	Padiyala	2000-4000	H	VU	Rt, WP	Reg Himal	Menstrual complaints, leucoderma
<i>H. wallichii</i> DC.*	-	3000-4000	H	-	Rt	Reg Himal	Aphrodisiac, tonic
<i>Pimpinella acuminata</i> (Edgew.) Cl.**	-	2000-3000	H	-	WP	Reg Himal	Diarrhoea, dysentery
<i>P. diversifolia</i> DC.	-	2200-3000	H	-	Rt	Reg Himal China	Digestive disorder, cold, cough

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Botanical name	Local name	Altitudinal range (m)	Life Form	status	Part used	Nativity	Uses
<i>Pleurospermum angelicoides</i> (DC.) Cl.	-	3000-4000	H	DD	Rt	Reg Himal	Anthelmintic, gastric, stomachache
<i>P. candolii</i> (DC.) Cl.	-	3600-4300	H	-	Fr	Reg Himal	Dyspepsia, flatulence, renal pain, stomachache
<i>Selinum candollii</i> DC.*	Bhutkesi	2000-4000	H	-	WP	Reg Himal	Tonic
<i>S. tenuifolium</i> Wall.*	Matoshal	2500-4000	H	-	Rt	Reg Himal	Insecticidal, nervine sedative
<i>S. vaginatum</i> (Edgew.) Cl.	Matoila	2500-4000	H	-	Rt	Reg Himal	Nervine sedative
Araceae							
<i>Arisaema flavum</i> (Forssk.) Schott	Kida alu	2000-2500	H	-	Bb	Arab	Chronic tracheitis, bronchitis, tetanus, epilepsy, skin disease, insecticide
<i>A. tortuosum</i> (Wall.) Schott	Kida alu	2000-3000	H	-	Rt, Sd	Reg Himal	Antifertility, cold, cough, insecticidal, veterinary diseases
<i>A. jacquemontii</i> Bl.*	-	2500-4000	H	-	Bb	Reg Himal	Ringworm, skin diseases
Araliaceae							
<i>Aralia cachemirica</i> Decne*	Bail chaura	2500-4000	H	-	Rt	Reg Himal	Dysentery, gastric complaints, vomiting
<i>Hedera nepalensis</i> K. Koch	Katari	2000-2500	H	-	WP	Europe Afr Bor AsTemp	Stimulant, diaphoretic, cathartic, rheumatism, emmenagogue
Asclepiadaceae							
<i>Vincetoxicum hirsutum</i> Medik.	-	2000-3000	H	-	WP, Juice	Europe Reg Cauc	Diaphoretic, diuretic, emetic, dropsy, boils, pimples
<i>Marsdenia roylei</i> Wt.*	-	2000-2500	H	-	Rt	Reg Himal	Cold, eye complaints, gonorrhoea
Asparagaceae							
<i>Asparagus filicinis</i> Buch.-Ham.	Shatavari	2000-2700	Sh	-	Rt	Reg Himal Burma	Antipyretic, antitussive, diuretic, expectorant, nervine, stomachache, tonic
Asteraceae							
<i>Achillea millefolium</i> L.	Pharangi	2500-3800	H	-	WP	Europe	Cold, diaphoretic, epilepsy, fever, gastric complaints, hysteria, piles, stimulant, tonic, toothache, ulcer, haemorrhagia, worms
<i>Ainsliaea latifolia</i> D. Don	Sath jalari	2000-3000	H	-	Rt	Reg Himal	Colic
<i>A. aptera</i> DC.*	Sath jalari	2000-3000	H	-	Rt	Reg Himal	Fever, painful urination, stomachache
<i>Anaphalis busua</i> (Buch –Ham. ex D. Don) DC.	Bacha	2000-3500	H	-	Lf	Reg Himal	Haematoma
<i>A. contorta</i> (D. Don) Hk.	-	2000-3500	H	-	Fl	Reg Himal	Antibacterial, checks bleeding
<i>A. triplinervis</i> (Sims.) Cl.	-	2400-3500	H	-	Lf, WP	Reg Himal	Diuretic
<i>Arctium lappa</i> L.	Nakli kuth	2500-3500	H	-	Rt	Reg Himal	Gastric, burns
<i>Artemisia roxburghiana</i> Bess.*	Jonkhar	2200-3500	H	-	Lf	Europe	Eczema, pimples, sore
<i>A. nilagirica</i> (Cl.) Pampanini	-	2700-3600	H	-	Lf, Rt, Wp,	Reg Himal	Abscesses, analgesic, antiseptic, anthelmintic, asthma, ear complaints, epilepsy, haemostat, menstrual complaints, peptic ulcer, nervous disorder

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Botanical name	Local name	Altitudinal range (m)	Life Form	status	Part used	Nativity	Uses
<i>A. parviflora</i> Roxb.	Jhau	2000-2800	H	-	Lf, Rt, Sd	Ind Or Burma	Carminative, vermifuge, throat problems
<i>Bidens bipinnata</i> L.	-	2000-2500	H	-	Lf, Rt	Reg Trop	Antibacterial, emmenagogue, bronchial problems, styptic, vermifuge
<i>Cardus eddelburgii</i> Rech.f.*	-	2000-4000	H	-	AP	Afgan	Blood purifier, diuretic, febrifuge
<i>Cirsium wallichii</i> DC.*	Bhoosh	2000-2500	H	-	WP	Reg Himal	Cough, swelling, headache, pneumonia
<i>Conyza stricta</i> Willd.	-	2000-2500	H	-	WP	Ind Or Afr Trop	Bone fracture, swelling
<i>Erigeron bellidioides</i> Benth.*	-	2000-2500	H	-	AP	Reg Himal	Blood purification
<i>E. bonariensis</i> L.	-	2000-2200	H	-	Lf	Am Austr	Lumbago, rheumatism, mouth, throat diseases, skin diseases
<i>E. multiradiatus</i> Benth.	-	2000-3500	H	-	WP	Reg Himal	Brain tonic, renal, stomach pain
<i>Galinsoga parviflora</i> Cav.	Banmara	2000-3000	H	-	Lf	Mexico North Am	Snakebite, stop bleeding
<i>Gerbera gossypina</i> (Royle) Beauv.*	-	2000-3600	H	-	Rt	Reg Magell	Blood pressure, gastric disease
<i>Gnaphalium affine</i> D. Don	Dhoop	2000-3000	H	-	WP	Reg Magell	Antiperiodic, antitussive, expectorant, febrifuge, influenza, sore throat, productive coughing, rheumatoid arthralgia, traumatic injuries, leucorrhoea, seminal emissions, hives, weeping pruritis of the skin
<i>G. hypoleucum</i> DC.	Dhoop	2000-2500	H	-	Paste	As Trop	Cough, backache
<i>Jurinella macrocephala</i> (Royle) Aswal et Goel*	Guggal	3000-4000	H	EN	Rt	Reg Himal	Antiseptic, colic eruption, fever, cardiac, puerperal, laxative
<i>Ligularia amplexicaulis</i> DC. *	-	3000-4000	H	-	St, Lv, Fl	Reg Himal	Digestive, emetic, poultice to sprains & bones
<i>Prenanthes violaeifolia</i> Decne	-	2500-4000	H	-	Sd, Lf	Reg Himal	Menorrhoea
<i>Saussurea heteromalla</i> (D. Don) Hand.-Mazz.*	Kuth	2800-3800	H	-	Sd	Reg Himal	Carminative
<i>S. simpsoniana</i> (Field & Gard.) Lipsch.	Gugumana	3500-4500	H	-	Infl	Reg Himal	Fever, snakebite
<i>Senecio graciliflorus</i> DC.*	-	2500-4000	H	-	Rt, Sd	Reg Himal	Ringworm, ear complaints
<i>S. chrysanthemoides</i> DC.	-	2400-3500	H	-	WP	Reg Himal	Inflammation of mouth, sore throat
<i>Solidago virgaurea</i> L.	-	2500-3500	H	-	WP	Reg BorTemp	Anthelmintic, aromatic, antifungal, anti-inflammatory, carminative, diaphoretic, diuretic, febrifuge
<i>Tagetes minuta</i> L.	-	2000-2300	H	-	WP	Am Trop	Anthelmintic, antispasmodic, aromatic, diaphoretic, diuretic, purgative and stomachic, haemorrhoids, skin infections
<i>Tanacetum dolichophyllum</i> Kitamura*	Ghuggulu	3000-4000	H	-	Lf	Mexico	Fever

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Botanical name	Local name	Altitudinal range (m)	Life Form	status	Part used	Nativity	Uses
<i>Taraxacum officinale</i> Weber	<i>Kanphul</i>	2000-4000	H	-	Rt, Lf, WP	Reg Temp Bor et Austr	Blisters, blood purifier, bowels, diuretic, dislocation of joints, dysentery, foment, gastric ulcers, headache, kidney disease, liver complaints, tonic vertigo, wounds
<i>Youngia japonica</i> (L.) DC.	-	2000-2500	H	-	WP	As Trop Austr	Galactagogue, urine complaints
<i>Waldheimia glabra</i> (Decne.) Regel.	-	3800-4300	H	-	Lf	Tibet Occ	Burns, heart disease
<i>W. tomentosa</i> (Decne.) Regel.	-	3800-4500	H	-	WP	Tibet Occ	Rheumatism
Athyriaceae							
<i>Diplazium esculentum</i> (Retz.) Sw.	<i>Lingar</i>	2000-2600	H (F)	-	Frd	-	Edible
Balsaminaceae							
<i>Impatiens sulcata</i> Wall.*	-	2000-4000	H	-	Sd, Fr	Reg Himal	Eczema, pimples, abortifacient
<i>I. racemosa</i> DC.*	-	2000-3000	H	-	Sd, Fr	Reg Himal	Cold, cough
Berberidaceae							
<i>Berberis aristata</i> DC.*	<i>Kashambal</i>	2000-2800	Sh	EN	Rt	Ind Or	Snakebite, boils, eye complaints
<i>B. jaeschkeana</i> Schneid.*	<i>Kashambal</i>	2700-4000	Sh	-	Rt, Fr, St, Lf	Reg Himal	Astringent, blood purifier, diuretic, eye disease, jaundice, menorrhoea, skin disease
<i>B. lycium</i> Royle*	<i>Kashamal</i>	2000-2700	Sh	EN	Rt, Fr, Bk, St, Lf	Reg Himal	Dysentery, eye complaints, malaria, stomach diseases
Betulaceae							
<i>Alnus nitida</i> (Spach) Endl.*	<i>Kolsh</i>	2000-2600	T	-	Tw, Lf	Reg Himal	Astringent
<i>Betula alnoides</i> Buch.-Ham. ex D.Don	<i>Shoed</i>	2000-2500	T	-	Bk, Tw, Lf	Reg Himal Japan	Snake antidote
<i>B. utilis</i> D.Don	<i>Bhojpatra</i>	3000-4500	T	EN	Bk, Tw, Lf	Reg Himal Japan	Antiseptic, burns, cuts, contraceptive, ear complaints, hysteria, jaundice, wounds, veterinary ailments
Boraginaceae							
<i>Arnebia benthamii</i> (Wall. ex G.Don) Johnst.*	<i>Rattan jot</i>	3300-4000	H	CR [#]	Rt	Reg Himal Occ	Antiseptic, boils, ulcer, wounds, eye complaints, fever, headache, heart ailments, tonic for hair
<i>Cynoglossum glochidiatum</i> Wall.ex Benth.	<i>Balraj</i>	2000-4000	H	-	WP	Ind Or Burma	Aphrodisiac, muscular pain, dyspepsia, digestive disorder
<i>Eritrichium canum</i> (Benth.) Kitam.*	-	2400-4000	H	-	Lf, Rt	Reg Himal	Facilitate child birth
<i>Lindelofia longiflora</i> (Benth.) Baill.*	-	2800-4500	H	-	Lf	Reg Himal	Diarrhoea, inflammation

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Botanical name	Local name	Altitudinal range (m)	Life Form	status	Part used	Nativity	Uses
Botrychiaceae							
<i>Botrychium ternatum</i> (Thunb.) Stz.	-	2500-3000	H (F)	-	WP	-	Dysentery, vulnerary
Brassicaceae							
<i>Capsella bursa-pastoris</i> Medic.	-	2000-2700	H	-	WP	Reg Temp	Blood pressure, diarrhoea, dropsy
<i>Cardamine impatiens</i> L.	-	2000-2600	H	-	WP, Lf	Reg Himal	Antirheumatic, Stimulent, diuretic
<i>Lepidium apetalum</i> Willd.	-	2000-3000	H	-	WP	Russia Sibir	Skin diseases
<i>Megacarpaea polyandra</i> Benth.*	-	2800-4000	H	-	Rt, Lf	Reg Himal	Fever
<i>Nasturtium officinale</i> R.Br.	-	2000-3000	H	-	WP	Reg Temp	Constipation, goiter, vermifuge
<i>Rorippa indica</i> (L.) Hiern	Petu	2000-2500	H	-	Sd, WP	Ind Or China Malaya	Asthma, bronchitis
<i>Thlaspi arvense</i> L.	-	2000-2600	H	-	Sd, WP	Europe Bor	Backache, gonorrhoea, pulmonary, renal diseases, swelling, wounds
Buxaceae							
<i>Sarcococca saligna</i> (D.Don) Muell.	Chirbeeri	2100-2800	Sh	-	Ft	Ind Or Malaya	Joints pain
Campanulaceae							
<i>Cyananthus lobatus</i> Wall. ex Benth.	-	3000-4000	H	-	Fl, Lf	Reg Himal	Laxative, stomachache, wounds
Cannabaceae							
<i>Cannabis sativa</i> L.	Bhang	2000-2500	H	-	Lf, Sd, Bk	As Centr Himal Bor Occ	Anthelmintic, appetite, bowel complaints, bronchitis, cough, convulsion, cramps, delirium, epilepsy, cuts, dyspepsia, ear and eye complaints, laxative, narcotic, nervine stimulant, sleep pills, tetanus, skin diseases
Caprifoliaceae							
<i>Viburnum cotinifolium</i> D.Don	Thallana	2000-2600	Sh	-	Fr, Lf	Am Bor	Menorrhoea
<i>V. mullaha</i> Buch.-Ham. ex D. Don	Thallana	2000-2500	Sh	-	Fr, Lf, Wd	Reg Himal	Stimulant, stomachache
Caryophyllaceae							
<i>Cerastium fontanum</i> subsp. <i>membranaceum</i> Baug.	-	2000-3000	H	-	Px	Europe As Occ	Fever, cough
<i>Cerastium cerastioides</i> (L.) Britton	-	2500-3500	H	-	WP	Reg Himal	Cough
<i>Gypsophila cerastioides</i> D.Don *	-	2000-4000	H	-	WP	Reg Himal	Boils, wounds
<i>Stellaria media</i> (L.) Villars	-	2000-2600	H	-	WP	Reg Himal	Bone fracture
Celastraceae							
<i>Euonymus tingens</i> Wall.	-	2400-2900	T	-	Bk, Lf	Reg Himal	Eye diseases

Table 2 — Diversity, distribution pattern and indigenous uses of medicinal plants

Botanical name	Local name	Altitudinal range (m)	Life Form	status	Part used	Nativity	Uses
Chenopodiaceae							
<i>Chenopodium album</i> L.	<i>Bathua</i>	2000-2400	H	-	Lf, Sd, WP	Reg Temp et Trop	Revive taste, skin diseases, urine complaints
<i>C. botrys</i> L.	<i>Sokana</i>	2000-2200	H	-	WP	Reg Bor	Anthelmintic, diuretic, headache, laxative, liver complaints, stomachache
Commelinaceae							
<i>Commelina paludosa</i> Bl.	<i>Patugia</i>	2000-3000	H	-	Lf	Ind Or Malaya	Insect sting
Corylaceae							
<i>Corylus jacquemontii</i> Decne.*	<i>Shroi</i>	2100-3000	T	-	Sd, St	Europe Or As Min Reg Himal	Tonic
Crassulaceae							
<i>Sedum ewersii</i> Ledeb.	-	2500-4000	H	-	Lf, St	Reg Himal Sibir Altaic	Toothache, appetite
<i>S. multicaule</i> Wall. ex Lindl.	-	2500-3500	H	-	Lf	Reg Himal China	Insecticidal
<i>Rosularia rosulata</i> (Edgew.) H. Ohba*	<i>Moshu ghas</i>	2000-2800	H	-	Lf	Reg Himal	Skin diseases
<i>Rhodiola heterodonta</i> (Hk.f. & Th.) A.Boriss.*	-	3000-4500	H	VU [#]	Rt	Reg Himal	Sexual potency, stomachache, intestinal discomfort
Cupressaceae							
<i>Juniperus recurva</i> Buch.-Ham. ex D.Don	<i>Baittori</i>	3000-4500	Sh	-	Sd, Lf, Oil	Reg Himal	Emetic
<i>J. communis</i> L.	<i>Bithal</i>	2800-3500	Sh	-	Lf	Reg Himal	Leucorrhoea, dysmenorrhoea, skin ailments
Cucurbitaceae							
<i>Melothria heterophylla</i> (Lour.) Cogn.	<i>Blakakri</i>	2000-2500	H	-	Lf, Ft, Rt,	As Trop et Sub Trop	Antifertility, cold, cuts, diabetes, earache, fever, snakebite, spermatorrhoea, stomachache, sores
Cuscutaceae							
<i>Cuscuta reflexa</i> Roxb.	<i>Amar bel</i>	2000-2400	H	-	Sd, St, WP	Ind Or	Anthelmintic, bilious, bodyache, bone fracture, burns, carminative, eye diseases, headache, itching, jaundice, liver complaints, nervine weakness, swelling of legs, testicles, body, wounds
Dioscoreaceae							
<i>Dioscorea deltoidea</i> Wall.	<i>S-Mingli</i>	2000-2500	H	EN [#]	Rt	Ind Or	Contraceptive, constipation, asthma,
Elaeagnaceae							
<i>Elaeagnus conferta</i> Wall. ex Royle*	<i>Ghiayeen</i>	2000-2600	Sh	-	Fr, Fl	Japan	Pulmonary complaints, sores, ulcers
Equisetaceae							
<i>Equisetum arvense</i> L.	-	2200-3400	H (F)	-	Plant Ash	-	Diuretic, haemostatic, acidity, dyspepsia, dropsy

Table 2 — Diversity, distribution pattern and indigenous uses of medicinal plants

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Ericaceae							
<i>Cassiope fastigiata</i> Wall. *	-	3200-4000	Sh	-	WP	Reg Himal	Itching
<i>Gaultheria nummularioides</i> D.Don*	-	2200-4000	Sh	-	Lf, Ft	Reg Himal	Antiseptic, carminative, neural stimulant
<i>Lyonia ovalifolia</i> (Wall.) Drude	Bheral	2200-2700	T	-	St, Lf	China	Boil, pimples, skin eruptions, worms, wounds
<i>Rhododendron arboreum</i> Sm.	-	2100-2300	T	-	Fl, Lf	Ind Or Reg Himal Zeylan	Dysenrry, fever, headache, rheumatism, wounds
<i>R. anthopogon</i> D.Don*	Talshi	3000-4200	Sh	VU	Lf	As Bor Reg Himal	Bronchitis, cold, cough, aromatic
<i>R. campanulatum</i> D.Don *	Shargal	3000-4000	Sh	VU	Rt, Lf, Fl	Reg Himal	Boils cold, cough, headache, rheumatism, sciatica, skin disease, syphilis, tonic, fever
<i>R. lepidotum</i> Wall.	Talshi	2700-3800	Sh	VU	Lf	Reg Himal	Bronchitis, cold, cough
Euphorbiaceae							
<i>Euphorbia stracheyi</i> Boiss.	Dudhibish	2500-3500	H	-	AP, Latex	Reg Himal	Rheumatism
<i>E. pilosa</i> L.	Dudhi	2000-3300	H	-	WP	Europe As Bor	Fistular sores
Fabaceae							
<i>Paroquetus communis</i> Buch.-Ham. ex D.Don	-	2000-2600	H	-	Lf	Ind Or Malaya Afr Trop	Stomach disease of babies, earache
<i>Trifolium repens</i> L.	Malori	2000-2800	H	-	WP	Geront Bor Temp	Dandruff
<i>Trigonella emodi</i> Benth.	-	2000-3200	H	-	Fl	Reg Himal	Aromatic
<i>Vigna vexillata</i> (L.) A.Rich.	-	2000-3000	H	-	Rt, Sd	Geront Trop	Cholera, ulcer
Fagaceae							
<i>Quercus leucotrichophora</i> A.Camus	Ban	2000-2200	T	-	Sd, Lf, Wd,	Reg Himal	Scabies, skin diseases, urine complaints
Fumariaceae							
<i>Corydalis govaniiana</i> Wall.*	Bhutkeshi	3000-4000	H	-	WP	Reg Himal	Antipyretic, diuretic, eye disease, gastric pain, liver complaints, muscle pain, skin disease, syphilis, tonic
<i>Fumaria indica</i> (Hauskn.) Pugsley	-	2000-2200	H	-	Sd	As Trop	Anthelmintic, blood purification, bodyache, diarrhoea, diuretic, fever, liver complaints
Gentianaceae							
<i>Gentiana carinata</i> Griseb.*	-	2000-4000	H	-	WP	Reg Himal	Fever, headache
<i>Gentianella tenella</i> (Rottb.) Borner	-	3000-4500	H	-	Rt	Reg Bor et Arct	Fever
<i>G. moorcroftiana</i> (Wall. ex G.Don) Airy Shaw*	-	3000-4500	H	-	WP	Reg Himal	Blood purifier, cold cough, fever, headache)

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Table 2 — Diversity, distribution pattern and indigenous uses of medicinal plants

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<i>Swertia angustifolia</i> Ham. ex D. Don	<i>Chirayata</i>	2000-4000	H	-	WP	Reg Himal	Malaria, fever
<i>S. chirayita</i> (Roxb. ex Flem.) Karsten	<i>Chirayata</i>	2000-2500	H	CR	Rt, WP	Reg Himal	Antiemetic for pregnant woman, asthma, bilious, blood purification, bronchitis, fever, gonorrhoea, leprosy, leucoderma, phthisis, scabies, skin diseases, stomachache
<i>S. cordata</i> (G. Don) Wall. ex Cl.*	-	2500-3500	H	-	WP	Reg Himal	Anthelmintic, antiperiodic, appetizer, laxative, stomachic
<i>S. ciliata</i> (G. Don) Burtt*	-	2500-4000	H	-	Lf	Reg Himal	Fever
<i>S. paniculata</i> Wall.*	-	2000-3500	H	-	Px	Reg Himal	Asthma, blood purifier, fever, stomachache
<i>S. petiolata</i> D. Don*	-	3300-4500	H	-	WP	Reg Himal	Bodyache, headache, gall diseases
Geraniaceae							
<i>Geranium nepalense</i> Sw.	<i>Tirahni</i>	2000-3500	H	-	Rt	Ind Or China	Cuts, jaundice, toothache, ulcer, wounds, stomach complaints
<i>G. wallichianum</i> D. Don ex Sw.*	-	2600-3500	H	-	Rt	Reg Himal	Astringent, ear and eye diseases, toothache
Haemodoraceae							
<i>Ophiopogon intermedius</i> D. Don	-	2000-3200	H	-	Fr	Ind Or	Boils, cuts, injuries, rheumatism
Hypericaceae							
<i>Hypericum oblongifolium</i> Choisy*	-	2000-3000	Sh	-	Rt, Ft	Reg Himal	Boils, wounds
Hypoxidaceae							
<i>Hypoxis aurea</i> Lour.	-	2000-2500	H	-	Rt	Cochinch	Aphrodisiac
Hippocastanaceae							
<i>Aesculus indica</i> Coleb. ex Wall.*	<i>Khanor</i>	2000-2800	T	-	Sd, Ft, Bk, Lf, Tw	Reg Himal	Anthelmintic, dislocated joints, diuretic, leucorrhoea, veterinary galactagogue
Iridaceae							
<i>Iris kumaonensis</i> D. Don ex Royle	-	2000-3500	H	-	Rt, Lf	Reg Himal	Fever, urine complaints
Juglandaceae							
<i>Juglans regia</i> L.*	<i>Akhrot</i>	2000-3000	T	-	Bk, Lf, Fr, Tw, St	As Occ Reg Himal	Anthelmintic, astringent, rheumatism, sores, toothache
Lamiaceae							
<i>Ajuga bracteosa</i> Wall. ex Benth.	<i>Neel kanthi</i>	2000-2500	H	-	Rt, Wp	Afr Trop Ind Or As	Anthelmintic, blood purification, burns, boils, cold, fever, gonorrhoea, malaria, purgative, syphilis
<i>Clinopodium umbrosum</i> Koch	-	2000-3000	H	-	WP	Oriens Ind Or	Astringent, carminative, heart tonic
<i>Elsholtzia ciliata</i> (Thunb.) Hyland.	<i>Foran</i>	2000-2800	H	-	Lf, Sd	China	Skin diseases
<i>E. fruticosa</i> D. Don	-	2000-2700	Sh	-	Lf, Sd	China	Anodyne, headache
<i>Leonurus cardiaca</i> L.	-	2000-3200	H	-	Sd, Lf	Reg Bor Temp	Diaphoretic, stomachache

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Table 2 — Diversity, distribution pattern and indigenous uses of medicinal plants

Botanical name	Local name	Altitudinal range (m)	Life Form	status	Part used	Nativity	Uses
<i>Leucas lanata</i> Benth.	-	2000-4500	H	-	WP	Ind Or China	Headache, haemostat, stomachache, wounds
<i>Mentha longifolia</i> (L.) Hudson	Jungli pudina	2000-2800	H	-	WP	Europe As Bor	Antiseptic, carminative, digestive, on wound to kill maggots
<i>Micromeria biflora</i> Benth.	-	2000-4000	H	-	WP	Ind Or Arab Afr Trop	Carminative, postnatal
<i>Nepeta eriostachys</i> Benth.*	Brun	2000-3500	H	-	WP	Reg Himal	Eye complaints
<i>Origanum vulgare</i> L.	Ban tulsii	2000-2800	H	-	WP	Europe As et Afr Bor	Cold, diarrhoea, fever, hysteria, influenza, menstrual complaints, stimulant, tonic
<i>Phlomis bracteosa</i> Royle *	-	2000-4000	H	-	Fl	Reg Himal	Eye disease
<i>Plectranthus rugosus</i> Wall.	-	2000-2500	Sh	-	Lf	Reg Himal	Fever
<i>Prunella vulgaris</i> L.	Pethu ghas	2000-2800	H	-	WP	Reg Himal Temp	Breath problems, lung complaints, liver & cerebral complaints, cold, fever, gastric complaints, headache
<i>Salvia lanata</i> Roxb.*	Gawandru	2000-2500	H	-	Rt	Reg Himal	Astringent, emetic, poultice
<i>S. moorcroftiana</i> Wall. ex Benth.*	-	2000-2500	H	-	Rt	Reg Himal	Astringent, emetic, poultice
<i>Thymus linearis</i> Benth.	Ban ajwain	2000-3000	H	-	WP	Europe As et Afr Bor	Anthelmintic, eye disease, heating affect, labour, postnatal, liver complaints, skin disease, stomachache, vermicial
Liliaceae							
<i>Cardiocrinum giganteum</i> (Wall.) Makino	-	2000-2800	H	-	Sd, Bb	Japan	Poultice
<i>Fritillaria roylei</i> Hk.*	-	2700-3500	H	EN [#]	Bb	Reg Himal	Asthma, antirheumatic, febrifuge, galactagogue, tuberculosis, haemostatic, ophthalmic, oxytocic
<i>Lilium polyphyllum</i> D. Don ex Royle*	-	2300-2700	H	CR	Bb	Reg Himal	Refrigerant, galactagogue, expectorant, diuretic, aphrodisiac, antipyretic, tonic
<i>Polygonatum cirrhifolium</i> (Wall.) Royle	Salam misri	2000-2800	H	EN	Tu, St	Reg Himal As Bor	Fever
<i>P. verticillatum</i> (L.) All.	Salam misri	2000-3500	H	VU	Tu	Europe As Bor	Aphrodisiac, appetite, nervine tonic
<i>P. multiflorum</i> (L.) All.	Salam misri	2000-3000	H	VU	Rt	Europe As Bor	Aphrodisiac, nervine tonic
<i>Trillidium govanianum</i> (Wall. ex D. Don) Kunth*	-	2300-3100	H	-	Tu	Reg Himal	Dysentery
Loranthaceae							
<i>Viscum album</i> L.	Rinni	2000-3000	Sh	-	Lf, WP	Europe As Temp	Abortifacient, antifertility, bodyache, spleen complaints
Malvaceae							
<i>Malva verticillata</i> L.	Siddu ghas	2000-2600	H	-	Sd, Lf	Europe As et Afr Bor	Cough, pectoral complaints, emollient, piles, ulcer, urine complaints
Morinaceae							
<i>Morina longifolia</i> Wall. ex DC.*	-	2500-4000	H	-	Rt	Reg Himal	Boils

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Myrsinaceae							
<i>Myrsine africana</i> L.	-	2000-2500	Sh	-	Lf	Reg Himal Afr Austr et Trop Ins Azor	Cathartic, colic pains, vermifuge
Oleaceae							
<i>Jasminum humile</i> L.	-	2000-2800	Sh	-	Lf, Bk	As Trop	Sinus, skin disorder
<i>Syringa emodi</i> Wall. ex Royle	-	2600-3300	Sh	-	Lf, Ft	Reg Himal	Stomach disorder
Onagraceae							
<i>Epilobium angustifolium</i> L.	-	2000-3000	H	-	AP	Europe As Bor Am	Abdominal pain, hepatic, intestinal, renal disorder
<i>E. royleanum</i> Haussk.	-	2000-2500	H	-	Lf, Ft	Reg Himal	Astringent
Orchidaceae							
<i>Calanthe tricarinata</i> Lindl.	-	2000-3000	H	-	Lf, Bb	Reg Himal	Sores, eczema, aphrodisiac
<i>Dactylorhiza hatagirea</i> (Don) Soo*	Panja	2800-4000	H	CR	Rt, Tu	Reg Himal	Astringent, bone fracture, Fme expectorant, tonic, wounds
<i>Goodyera repens</i> (L.) R.Br.	-	2000-3000	H	-	Bb	Reg Bor temp	Appetite, stomachache, cold, kidney, female disorder, stotoothache
<i>Herminium lanceum</i> Thunb. ex Sw.	-	2000-3000	H	-	Bb	Java	Urination problems
<i>Malaxis muscifera</i> (Lindl.) Kuntz.	-	2200-3500	H	CR	Bb	Reg Himal	Tonic
Oxalidaceae							
<i>Oxalis corniculata</i> L.	Malori	2000-2500	H	-	Lf, WP, Fr	Amphig Temp et Trop	appetizer, cough, cuts, dysentery, epilepsy, eye complaints, fever, insect bite, swelling stomachache
Papaveraceae							
<i>Meconopsis aculeata</i> Royle*	-	3000-4000	H	EN [#]	WP	Reg Himal	Analgesic, febrifuge, colic, renal pain, tonic, narcotic
Parnassiaceae							
<i>Parnassia nubicola</i> Wall. ex Royle*	-	3000-4000	H	-	Tu	Reg Himal	Food poisoning, snakebite
Phytolaccaceae							
<i>Phytolacca acinosa</i> Roxb.	Jharka	2000-3000	H	-	Lf, Tw	Reg Himal China	Body pain
Pinaceae							
<i>Cedrus deodara</i> G.Don*	Dyar	2000-2500	T	-	Oil, Wd, Lf	Reg Himal	Anthelmintic, rheumatism, ulcers
<i>Pinus wallichiana</i> A.B.Jack.*	Kail	2000-2500	T	-	Oil, Wd, Lf	Reg Himal	Abcesses, dislocation of joints, ulcer, unconciuosnes
Plantaginaceae							
<i>Plantago lanceolata</i> L.	Isabagol	2000-2800	H	-	Lf	Europe As Bor	Blood purification

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<i>P. erosa</i> Wall.	<i>Isabagol</i>	2000-3200	H	-	Rt, Lf	Europe As et Am Bor	Bone fracture, inflammation, cooling agent
<i>P. depressa</i> Willd.	<i>Isabagol</i>	2000-3000	H	-	Lf	Sibir	Dysentery
Podophyllaceae							
<i>Podophyllum hexandrum</i> Royle	<i>Ban kakri</i>	2000-4000	H	EN [#]	Rt, Fr	Reg Himal	Cancer, cough, cuts, wounds, diarrhoea, fever, gastric ulcer, hepatic diseases, purgative, skin diseases
Polygalaceae							
<i>Polygala sibirica</i> L.	-	2000-2500	H	-	Rt, Lv	As Temp et Trop	Analgesic, diuretic, expectorant, coughs, bronchitis, infantile, insomnia, convulsions, amnesia, sexual impotency sedative
Polygonaceae							
<i>Aconogonum rumicifolium</i> (Royle ex Bab.) Hara*	-	3000-4000	H	-	WP	Europe As Austr Bor	Abscesses, blood purification, boils, skin disease
<i>Bistorta amplexicaulis</i> (D.Don) Greene	<i>Dori ghass</i>	2000-2800	H	-	Rt, Rh, Lf	Nepal, India, Bhutan, China	Cough, dysentery, haemostasis, tonic
<i>B. affinis</i> (D.Don) Greene*	<i>Roti muhin</i>	3000-4000	H	-	Rt, Sd	Reg Himal	Cold, diarrhoea
<i>B. vacciniifolia</i> (Wall. ex Meissn.) Greene*	-	3000-4000	Sh	-	Rt	Reg Himal	Tuberculosis
<i>Fagopyrum debotrys</i> (D.Don) Hara	<i>Ban Paphra</i>	2000-2800	H	-	Rt	Reg Himal China	Vermicide
<i>Oxyria digyna</i> (L.) Hill	<i>Kailashi</i>	2500-4000	H	-	WP	Reg Bor Alp et Arct	Appetite, fever, laxative
<i>Persicaria nepalensis</i> (Meisn.) Gross	<i>Trod</i>	2000-3500	H	-	WP	As et Afr Trop et Sub Trop	Swelling
<i>P. capitata</i> (D.Don) Gross	<i>Kalovar</i>	2000-2500	H	-	WP	Reg Himal	Antidote in snakebite and insect sting, boils
<i>Polygonum plebium</i> Br.	-	2800-3400	H	-	Rt	Reg Himal	Baldness
<i>P. recumbens</i> Royle ex Bab.*	-	2000-3000	H	-	Lf, WP	Reg Himal	Abscess, blood purification, boils, skin diseases, nodule formation
<i>Rheum australe</i> D.Don*	<i>Chuchi</i>	2500-3300	H	EN [#]	Rt, Rh	Reg Himal	Abdominal pain, appetite, asthma, bronchitis, fever, cuts, dysentery, laxative, eye disease, piles skin disease, sprain, swelling ulcer, wounds
<i>R. speciforme</i> Royle*	-	3000-4500	H	VU	Rt	Reg Himal	Purgative, stomacheche
<i>R. moorcroftianum</i> Royle*	-	3200-4500	H	EN	Rt	Reg Himal	Cuts, wounds, appetite
<i>R. webbianum</i> Royle*	<i>Chuchi</i>	2500-4000	H	VU [#]	Rt, Lf	Reg Himal	Abdominal disease, appetite, boils, astringent, purgative, wounds
<i>Rumex acetosa</i> L.	<i>Albar</i>	2000-3500	H	-	Lf, Fr	Reg Himal	Laxative, stomach disease
<i>R. nepalensis</i> Spreng.	<i>Albar</i>	2000-3500	H	-	Lf, Rt, Tw	Europe As Bor	Boils, colic, cooling, diuretic, purgative, scurvy, swelling of muscle

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Primulaceae							
<i>Primula denticulata</i> Sm.	-	2500-4000	H	-	Fl	Reg Himal	Diabetes, urinary ailments
Ranunculaceae							
<i>Aconitum heterophyllum</i> Wall.ex Royle*	<i>Patish</i>	3000-4200	H	CR [#]	Rt	Reg Himal	Anthelmintic, cough, diarrhoea, digestive complaints, dysentery, fever, gastric, stomachache, vomit
<i>A. violaceum</i> Jacq. ex Stapf *	<i>Atish</i>	3500-4000	H	VU [#]	Rt, Tu	Reg Himal	Gastrointestinal complaints, renal pain, rheumatism, stomachache)
<i>Actaea spicata</i> L. var. <i>acuminata</i> (Wall. ex Royle) Hara	-	2000-3400	H	-	Lf, Fl	Reg Bor Temp	Nerve sedative, sciatica, body inflammation); dye
<i>Anemone obtusiloba</i> D.Don *	<i>Mamiri</i>	2000-4000	H	-	Rt	Reg Himal	on contusions, menorrhoea, rheumatism, purgative
<i>A. rivularis</i> Buch.-Ham.	<i>Jakri</i>	2000-3600	H	-	WP	Ind Or	Ear complaints, maggots in sores, fracture
<i>Caltha palustris</i> L.*	<i>Shomalap</i>	2500-3800	H	-	Rt, Lf	Reg Bor Temp et Arct	Gonorrhoea
<i>Clematis barbellata</i> Edgew.*	<i>Chabru</i>	2000-2800	Sh	-	Rt, Lf	Reg Himal	Itching, skin disease
<i>Delphinium denudatum</i> Wall. ex Hk. f. & Th.*	<i>Laskar</i>	2000-2600	H	CR	Rt	Reg Himal	Abdominal pain, anthelmintic, respiratory complaints, toothache, ulcer; veterinary lice and ticks
<i>D. vestitum</i> Wall. ex Royle*	-	2500-3000	H	-	WP	Reg Himal	Antidote, cuts, wounds, diarrhea, fever
<i>Ranunculus diffusus</i> DC.	-	2000-2200	H	-	WP	Ind Or Malaya	Boils
<i>R. hirtellus</i> Royle	<i>Goodi seripetali</i>	2000-2500	H	-	AP	Reg Himal	Anthelmintic, cooling, vermicial
<i>Thalictrum foliolosum</i> DC.*	<i>Mamiri</i>	2000-3300	H	VU	Rt	Reg Himal	Abdominal pain, blood purification, boils, earache, eczema, eye diseases, fever, leucoderma, piles, rheumatism, gout, tonic, toothache
<i>T. reniforme</i> Wall.*	<i>Mamiri</i>	2000-3500	H	-	Rt	Reg Himal	Cataract
Rhamnaceae							
<i>Rhamnus purpureus</i> Edgew.	<i>Chaunsha</i>	2000-2200	Sh	-	St, Fr, Lf	Reg Himal	Purgative
<i>R. triqueter</i> (Wall.) Brandis*	-	2000-2200	Sh	-	Fr, Bk, Tw	Reg Himal	Blood purification, boils, scabies, skin diseases, veterinary tonic
Rosaceae							
<i>Agrimonia pilosa</i> Ledeb.	<i>Kuri</i>	2000-3000	H	-	WP	Am Austr	Cough, diarrhoea, suppressed urination
<i>Cotoneaster microphyllus</i> Wall. ex Lindl.	<i>Kalashada</i>	2400-3500	H	-	Fr, Rh	Reg Himal	Astringent
<i>Geum elatum</i> Wall. ex G. Don*	-	2000-4000	H	-	Rt	Reg Himal	Astringent, dysentery, diarrhea

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Table 2 — Diversity, distribution pattern and indigenous uses of medicinal plants

Botanical name	Local name	Altitudinal range (m)	Life Form	status	Part used	Nativity	Uses
<i>Potentilla atrosanguinea</i> Lodd.*	<i>Dori</i>	2800-4200	H	-	Lf	Reg Himal	Wounds as analgesic
<i>P. fruticosa</i> L. var. <i>rigida</i> (Wall. ex Lehm) Wolf.	-	2800-4000	Sh	-	Lf	Reg Bor Temp	Astringent
<i>Prinsepia utilis</i> Royle	<i>Bhekhal</i>	2000-2900	Sh	-	Ft, Rt	Reg Himal	Burns, cuts, rheumatic
<i>Prunus armeniaca</i> L.	<i>Shada</i>	2000-2200	T	-	Sd, Ft	Reg Caucas	Massage oil
<i>P. cornuta</i> (Wall. ex Royle) Steud.	<i>Jamun</i>	2000-3100	T	-	Ft, Tw	Reg Himal Occ	rheumatism, wounds
<i>Rosa brunonii</i> Lindl.	<i>Kuja</i>	2000-2500	Sh	-	Rt	Oriens	Pain
<i>R. macrophylla</i> Lindl.*	<i>Kuja</i>	2100-3200	Sh	-	Fl, Ft, Tw	Reg Himal China	Stomachache
<i>Rubus paniculatus</i> Sm.*	-	2000-2500	Sh	-	Fr	Reg Himal	Diarrhoea, stomach disorder
<i>R. nivues</i> Thunb.	<i>Aachha</i>	2000-3500	Sh	-	Fr, Rt, Lf	Reg Himal	Stomachache
Rubiaceae							
<i>Galium acutum</i> L.*	-	2000-3000	H	-	WP	Reg Himal	Antiscorbic, diuretic, skin disease
<i>G. rotundifolium</i> L.	-	2000-3500	H	-	AP	Europe As Temp	Bronchitis, sorethroat, tonsil, wounds
<i>Leptodermis lanceolata</i> Wall.	-	2500-3000	Sh	-	Rt	Reg Himal	Boils, blisters in mouth
<i>Rubia manjith</i> Roxb. ex Fleming*	-	2000-2600	H	-	Rt, St	As Trop et Temp Afr Trop	Antidote, astringent, chest complaints, leucoderma, inflammation, jaundice, liver complaints, menorrhoea, menstrual diseases, stomachache, tonic, liver, urine complaints
Rutaceae							
<i>Boenninghausenia albiflora</i> (Hk.f.) Reichenb. ex Meissn.	<i>Pessumar</i>	2000-2800	H	-	Rt, AP	Reg Himal Japan	Toothache, wounds, insecticide
Salicaceae							
<i>Populus ciliata</i> Wall.	<i>Popular</i>	2000-2200	T	-	Lf, Tw	Reg Himal	Bone fracture
Saxifragaceae							
<i>Astilbe rivularis</i> Buch.-Ham. ex D. Don	<i>Phah</i>	2400-3800	H	-	Lf	Reg Himal	Blood purification, toothache
<i>Bergenia ligulata</i> Blatter.*	<i>Pashan ved</i>	2000-3200	H	-	Rt, Rh, Lf	Reg Himal	Asthma, boils, cuts, wounds, burns, fever, liver complaints, ophthalmia, piles, thirst, kidney stones, urine complaints, diarrhoea of cattle
<i>B. stracheyi</i> (Hk. f. & Th.) Engl.*	<i>Pashan ved</i>	2800-4000	H	VU	Rt, Lf	Reg Himal	Antiscorbic, astringent, diuretic, fever, ophthalmia, tonic, cuts, wounds
<i>Saxifraga parnassifolia</i> D. Don *	-	2500-3800	H	-	Rt	Reg Himal	Vermifuge
Scrophulariaceae							
<i>Euphrasia himalaica</i> Wettst.	-	2400-4000	H	-	Lf	Reg Himal	Eye disease

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Table 2 — Diversity, distribution pattern and indigenous uses of medicinal plants

Botanical name	Local name	Altitudinal range (m)	Life Form	status	Part used	Nativity	Uses
<i>Lagotis cashmiriana</i> (Royle) Rupr. *	-	3300-4500	H	-	Sd, Rt	Reg Himal	Adulterant, fever, dyspepsia
<i>Pedicularis bicornuta</i> Klotz.*	-	3000-4000	H	-	Fl	Reg Himal	Vaginal & seminal discharge
<i>P. pectinata</i> Wall. ex Benth.*	-	2500-3500	H	-	WP	Reg Himal	Bodyache, sedative
<i>Picrorhiza kurrooa</i> Royle	Karroo	3000-4200	H	EN [#]	Rt, Rh	Reg Himal	Abdominal pain, anaemia, antispasmodic, cold dyspepsia, diarrhoea, influenza, jaundice, promotes bile secretion, purgative, dysentery, fever
<i>Verbascum thapsus</i> L. Smilacaceae	Budi logad	2000-2500	H	-	Lf, Infl	Europe Or Reg Himal	Asthma, cough, skin disease
<i>Smilax aspera</i> L. Solanaceae	-	2000-2500	Sh	-	Rt, St	Europe Ind Or	Skin eruption, sores and wounds
<i>Datura stramonium</i> L.	Dhaturo	2000-2200	H	-	Lf, Fr	Cosmo Trop et Temp	Asthma, dislocation of joints, jaundice, rheumatism, stomache complaints, toothache, veterinary lactation
<i>Nicotiana tabacum</i> L.	Tambakhu	2000-2700	H	-	Lf, Sd	Am Austr	Eczema, itching, snakebite, toothache, wounds, veterinary anthelmitic
<i>Solanum nigrum</i> L.	Makoi	2000-2500	H	-	Fr, Sd, Lf	Amphigaea	Antidote opium toxic, boils, cough, diarrhea, dysentery, eyecomplaints, fever, goiter, heart ailments, inflammation of scrotum, testicles, kidney, bladder, Jaundice, liver complaints, piles, sores, throat troubles, ulcer in mouth, urine complaints
Symplocaceae							
<i>Symplocos chinensis</i> (Lour.) Decne.	Lojh	2100-2600	T	-	Lf, Br	Japan	Astringent, diarrhoea
Taxaceae							
<i>Taxus baccata</i> L. subsp. <i>wallichiana</i> (Zucc.) Pilger*	Rakhal	2500-3300	T	EN	Bk, Lf	Reg Himal	Anti cancer, swelling, contraceptive
Thymelaeaceae							
<i>Daphne papyracea</i> Wall. ex Steud.*	Gandiri	2000-2500	Sh	-	Lf	China	Intestinal complaints
Urticaceae							
<i>Girardinia diversifolia</i> (L.) Friis	Jharan	2000-3000	H	-	Lf, Tw	Ind Or Malaya	Gonorrhoea
<i>Pouzolzia zeylanica</i> L.	-	2000-2500	H	-	WP, Lf	As et Austr Trop	Bone fracture, eye diseases, swelling, syphilis
<i>Urtica dioica</i> L.	Aan	2000-2800	H	-	Lf, WP	Reg Bor Temp	Anthelmitic, antiseptic, boils, wounds, dandruff, diarrhea, gout, rheumatism, sciatica, jaundice, nephritis, sprain, throat diseases

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Table 2 — Diversity, distribution pattern and indigenous uses of medicinal plants

Botanical name	Local name	Altitudinal range (m)	Life Form	status	Part used	Nativity	Uses
<i>U. hyperborea</i> Jacq. ex Wedd. Valerianaceae	-	3000-4000	H	-	WP	Reg Himal	Rheumatism, stomachache
<i>Valeriana hardwickii</i> Wall.	<i>Nihanu</i>	2400-3400	H	-	WP	Reg Himal Malaya	Antidote to poisonous stings of insects, scorpion, epilepsy, hysteria, neurosis, skin disease
<i>V. jatamansi</i> Jones	<i>Nihani</i>	2000-3000	H	VU	Rt	Reg Himal	Epilepsy, hysteria, urine complaints, hair oil
Violaceae							
<i>Viola biflora</i> L.	<i>Banafsha</i>	2700-3500	H	-	Lf, Fl, Rt, Sd	Reg Bor Temp	Antiseptic, antispasmodic, cold, cough, diaphoretic, emetic, fever, laxative, leucoderma, psoriasis, skin disease
<i>V. canescens</i> Wall. ex Roxb.*	<i>Banafsha</i>	2000-2700	H	-	Lf, Fl	Reg Himal	Asthma, bronchitis, cold, cough, eye diseases, malaria
<i>V. serpens</i> Wall. ex Roxb.	<i>Banafsha</i>	2000-2600	H	-	Fl, WP, Rt	Ind Or Malaya China	Antipyretic, bilious, cold, cough, diaphoretic, fever, lung diseases, purgative
Zingiberaceae							
<i>Hedychium spicatum</i> Sm.*	<i>Ban haldi</i>	2000-2500	H	VU	Rt, Lf	Reg Himal	Asthma, blood purification, bronchitis, eye diseases, gastric disorder, tonic, check, vomit
<i>Roscoea alpina</i> Royle*	-	2500-3500	H	-	Rt	Reg Himal	Tonic, veterinary

Abbreviations used: LF=Life form; H=Herb; Sh=Shrub; T=Tree; F=Fern; CR=Critically Endangered; EN=Endangered; VU=Vulnerable; Afghan=Afghanistan; Afr=Africa; Alp= Alpine; Am= America; Amphig=Amphigaea; Arab= Arabia; Arct=Arctic; As=Asia; Austr=Australia; Bor=Boreal; Caucas=Caucasus; Centr=Central; Cosmop=Cosmopolitan; et=And; Geront=Gerontia; Himal=Himalayan; Ind=Indian; Mongol=Mongolia; Occ=Occidentalis; Or=Oriental; Orient=Oriental; Reg=Region; Subtrop=Subtropical; Temp=Temperate; Trop=Tropical; Polynes=Polynesia; Ins=Insular; min=Minor; **= Endemic, *=Near Endemic; AP=Aerial part; Bb=Bulb; Br=Bark; Fl=Flower; Fr= Fruit; Frd=Frond; Infl=Inflorescence; Lf=Leaf; Pet= Petiole; Rh=Rhizome; RT=Root; SD=Seed; St=Stem; Tu=Tuber; Tw=Twig; WP=Whole plant, H=Herbs; Sh=Shrub; T=Tree; and Fn=Fern.

Species with global threatened status

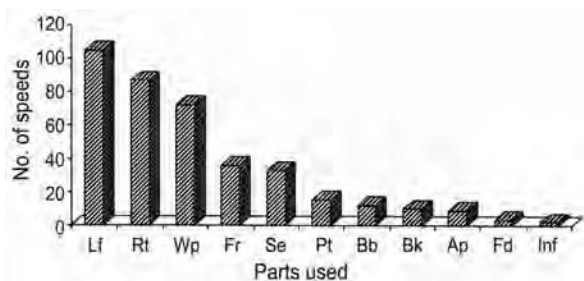


Fig. 2— Plant parts used in different ailments; (Rt=Root; Wp=Whole plant; Lf=Leaf; Bb=Bulb; Fr=Flower; Fd=Frond; Bk=Bark; Ap=Aerial part; and Inf=Inflorescence)

preference of these species and continuous illegal extraction from the wild for trade has caused increased pressure which may lead to extinction of these species from the area in near future inspite of notified protected area. Cultivation of such medicinal herbs in the

surrounding villages and other private lands may reduce the extinction pressure on the wild habitats. Success of such practices will provide enough time for these species to regenerate in the natural conditions. The alpine meadows have been subjected to grazing by the migratory animals of transhumance, i.e. horses, sheep, buffaloes and goats of Gujjars and Gaddies from May to September. Due to unplanned grazing, ecology of the alpine meadows has been seriously affected. Regular monitoring of the populations and habitats of native, endemic and threatened medicinal plants using ecological methods have been suggested.

In addition, identification of active ingredients would help identifying the potential species for marketing. Mass multiplication of the commercially viable medicinal plants through conventional (vegetative and seeds) and in-vitro (tissue culture) methods, establishment of these species in natural habitats and ex-

situ conditions mainly cultivation in marginal lands of the inhabitants and capacity building of the inhabitants for the cultivation and sustainable utilization of medicinal plants have been suggested. The state medicinal plant board and forest department may implement the above suggestions for the development of medicinal plant sector. Such type of studies are also required in other parts of the Indian Himalayan Region so that comprehensive database of medicinal plants could be developed and utilized in identification and notification of medicinal plant conservation areas and develop location and region specific management plan.

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