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Ethnomedicinal Survey of Kedarnath Wildlife Sanctuary in Western Himalaya, India

Gajendra Singh and G.S. Rawat
Department of Habitat Ecology
Wildlife Institute of India, Post Box # 18, Chandrabani, Dehradun, Uttarakhand, India
***Author for Correspondence:** E-mail: gajendrawat@yahoo.com

ABSTRACT
The importance of medicinal plants in traditional healthcare practices, providing clues to new areas of research and in biodiversity conservation is now well recognized. However, information on the uses for plants for medicine is lacking from many interior areas of Himalaya *viz.,* Kedarnath Wildlife Sanctuary. The local inhabitants in the outer fringes of Kedarnath WS, Western Himalaya have inherited a rich traditional knowledge on the use of wild plants. Questionnaire surveys, participatory observations and field visits were planned to illicit information on the uses of various plants. Local people either use or had information on uses of 126 species belonging to 104 genera and 51 families. It was found that more than 30 plant species are commonly used by local people for curing various diseases. In most of the cases underground parts (38%) of the plants were used. Most of the plant species are used for common diseases, *i.e.,* skin diseases, dysentery, cough, fever, wounds and rheumatism.

Key Words: Ethnomedicinal, Kedarnath WS, Western Himalaya

INTRODUCTION
The Western Himalaya is a reservoir of many natural resources, of which vegetational aspect is predominant. Its unique setting within the Himalayan region possesses luxuriant and varied vegetation, most of which is important from nutritional, aesthetic and medicinal view point. Medicinal virtues of the western Himalayan plants are well known from the early times of the great epics of Ramayana and Mahabharata. The high hills are the storehouse of numerous bearing herbs which are exploited not only for the pharmaceutical industries in India but outside as well. In fact, a large percentage of crude drugs in the Indian market come from this Himalayan part. It is believed that out of over 1,600 species of medicinal plants traditionally used in India (Uniyal *et al.,* 2002), more than 50% species come from the Himalayan region. In recent years there has been a sudden rise in the demand of herbal products and plant based drugs across the world resulting in the heavy exploitation of medicinal plants. Habitat degradation, unscientific harvesting and over exploitation to meet the demands of illegal trade in medicinal plants have led to the extinction of more than 150 plant species in the wild (Anonymous 1997, Katariya 1998). Today more than 90% of plant species used in the herbal industries are extracted from the wild, majority of which comes from the sub-alpine and alpine regions of the Himalaya (Singh and Dey 2005).

The Kedarnath Wildlife Sanctuary is not only rich in floristic composition and panoramic views but also has enough scope for medicinal stock. Sanctuary has several extensive alpine meadows and quite a few dense broad leave forests in the fringes, which forms various habitats *viz.,* mixed herbaceous meadows, caves and caverns, boulders and scree slopes, stream courses, alpine moist scrub and temperate oak forests for medicinal and aromatic plant species. However, some parts of the sanctuary which are heavily used by human beings for pilgrimage and livestock grazing, a few species have witnessed rapid decline during recent decades *e.g.,* disappearance of oaks, *Taxus, Cyprepidium, Dactylorhiza, Aconites* and *Picrorhiza kurrooa* etc (Singh 2008).

Although there are some floristic reports to the region (Duthie 1906, Gupta 1957, Rau 1963, 1975, Semwal & Gaur 1981, Kala & Gaur 1982, Semwal 1984, Naithani 1984, Negi *et al.* 1985, 1993, Joshi *et al.* 2004, Singh *et al.* 2009), yet exhaustive studies on ethnomedicinal aspects covering several dense forests and alpine meadows of the sanctuary have hardly been conducted. In this paper, an update on the distribution, plant parts used for various diseases by local people residing in the outer fringes of Kedarnath WS, has been presented.

MATERIALS AND METHODS
The Kedarnath Wildlife Sanctuary (KWS) is one of the largest protected area (975 km^2) in the Western Himalaya (Fig 1), located in Chamoli-Rudraprayag districts of Uttarakhand. It is bordered by high mountain peaks *viz.,* Kedarnath (6940m), Mandani (6193m) and Chaukhamba (7068m) and extensive alpine meadows *i.e.,* Trijuginarayan, Kham, Mandani, Pandavshera, Manpai and Bansinarayan in the north, and several dense broad leave oak mixed forests in the south. The sanctuary covers a wide altitudinal range and has sizeable areas with limited human pressure.

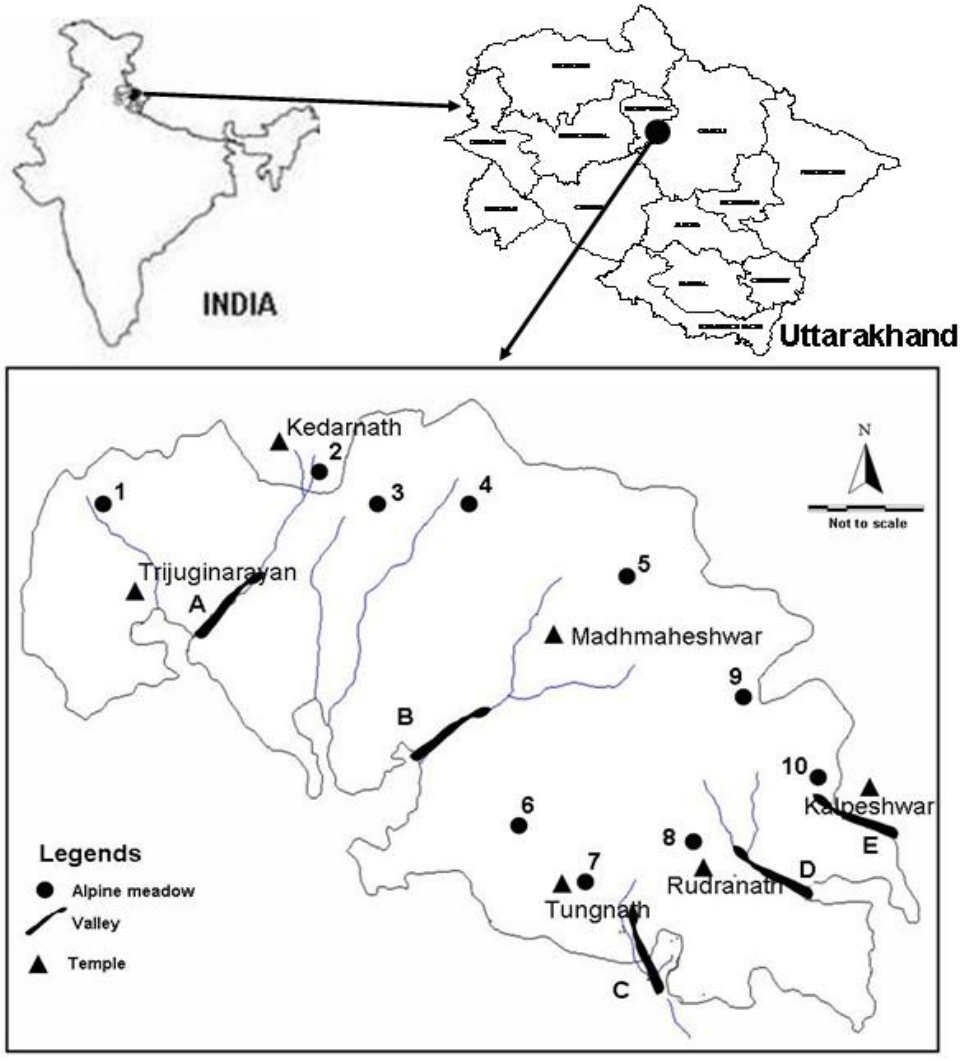

Fig. 1: Important alpine meadows and forests in the Kedarnath WS.

1= Trijuginarayan, 2= Kedaranth, 3= Khanm, 4= Mandani, 5= Pandavshera, 6= Bisuri, 7= Tungnath, 8= Rudranath, 9= Manpai, 10= Bansinarayan (Alpine meadows). A= Kedarnath, B= Madhmaheshwar, C= Mandal, D= Rudranath, E= Urgam (Valleys).

Hence, it harbours a great diversity of flora (more than 2000 species). The forests are mainly dominated by different oak species *viz., Quercus glauca* (Harinj), *Quercus leucotrichophora* (Banj), *Quercus floribunda* (Moru) and *Quercus semecarpifolia* (Kharsu) which form the climax vegetation at different climatic zones. These forests are not only fulfilling the day to day requirements of local inhabitants but also associated with the ecological and hydrological balance and support other species to grow luxuriantly (Singh and Singh 1992).

The sanctuary has relatively high abundance of wild mammals compared to several areas of Western Himalaya. A total of 28 mammalian species are known to occur in Kedarnath WS (Green, 1985). Himalayan musk deer (*Moschus chrysogaster*), Himalayan tahr (*Hemitragus jemhalicus*), Serow (*Nemorhedus sumatraensis*), Himalayan goral (*Nomorhedus goral*), Sambar (*Cervus unicolor*), Barking deer (*Muntiacus muntjak*) and wild pig (*Sus scrofa*) are some noteworthy mammals. About 182 villages are situated around KWS, of which about 50 are located very close to the best wildlife areas. The major pressures in the sanctuary are excessive grazing (sheep/goats, buffaloes, cows and mules), fuelwood collection and unmanaged tourism

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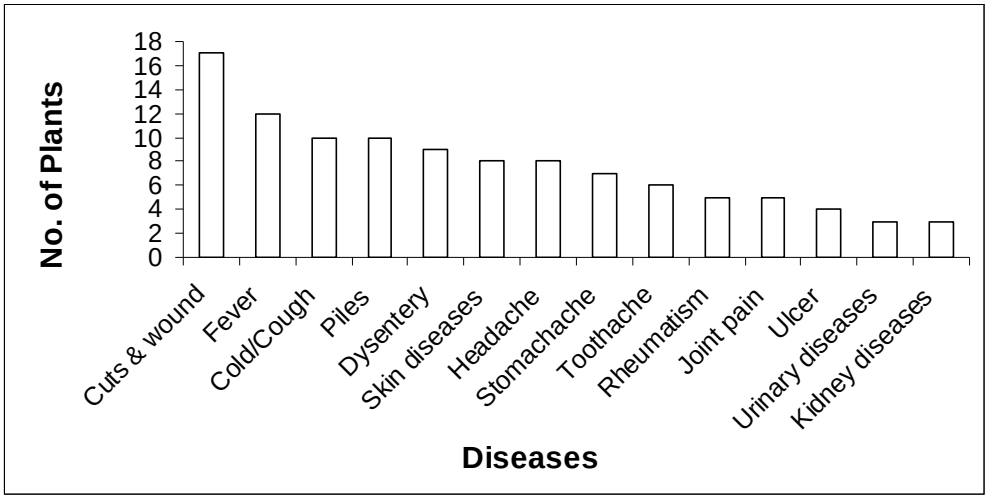

Fig. 2: Plants used for treating various diseases.

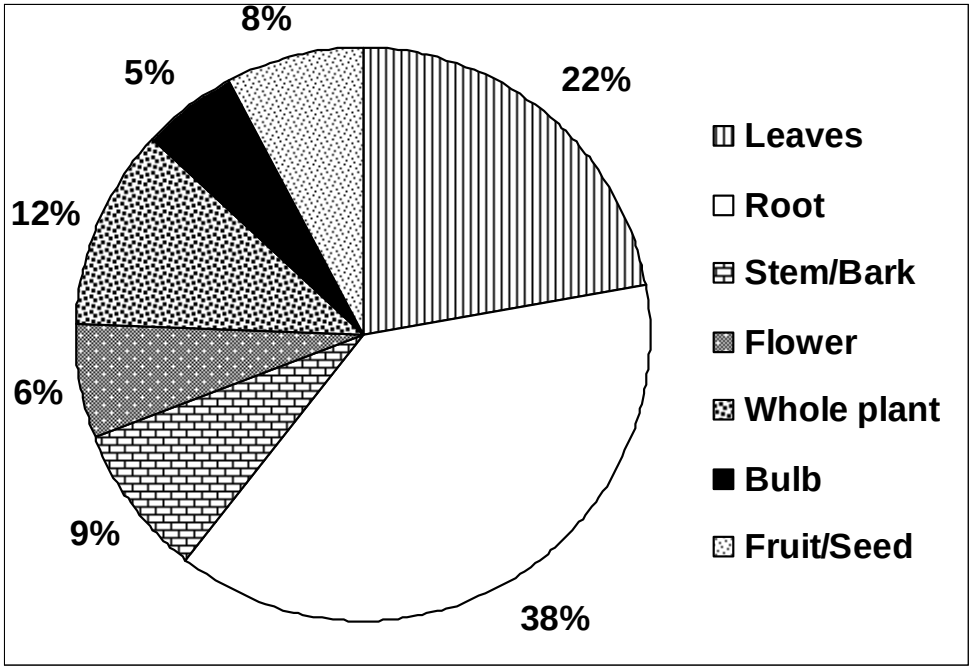

Fig. 3: Statistics of plant parts used.

Identification of medicinal and aromatic plants and preparation of ethnobotanical notes of the species were mainly based on interviews, informal discussions and extensive field visits. The study area was surveyed during various seasons from 2005-2009, and ethnomedicinal plants were collected and recorded following standard methods (Jain and Rao 1974). Medicinal plant species were identified using standard literature (Naithani 1984, Rawat 2005) and doubtful specimens were later verified at the Herbaria of Forest Research Institute (Dehradun) and Wildlife Institute of India (WII). Structured questionnaires, interviews and participatory observations were used to illicit information from the resource persons using standard methods. Information was collected on local name of the plant, plant part used for curing, methods of dosage and their uses.

Table 1: List of Medicinal plants recorded from Kedarnath WS, distribution and local uses.

Botanical name	Local name	Habit	Distribution	Parts used	Use/ Cure	Altitudinal range (m)
Ranunculaceae						
Aconitum atrox (Bruhl) Mukherjee	Mitha	H	3,4,5,	R	Rheumatism, paralysis	3300-4000
Aconitum heterophyllum Wall. ex Royle	Atees	H	1,2,3,4,5,6,7,8, 9,10	R	Fever, cough & stomachache	3100-3800
Aconitum violaceum Jacq. ex Stapf.	Dudh Atees	H	1,2,3,4,5,6,7, 8,9,10	R	Rheumatism	3400-4000
Anemone rivularis Buch.-Ham.	Ratanjot	H	A,B,C,D	L	Cuts & Wounds	2000-3000
Delphinium vestitum Wall. ex Royle	Nirbishi	H	A,C,D	S	Body swelling	3000-3500
Thalictrum foliolosum DC.	Panglajari	H	A,C,D,E	R	Eye-inflammation, Snake bite	3000-3500
Menispermaceae						
Cissampelos pariera L.	Pari	C	A,B,C,D,E	R,L	Cough, Dysentery, Piles	1500-2000
Paeonaceae						
Paeonia emodi Wallich ex Royle	Chandrain	H	A,B,C	Tu, L	Uterine diseases	1800-2300
Berberidaceae						
Berberis aristata DC.	Kingor	S	A,C,E	Fr,B, R	Rheumatism, fever, eye diseases	2500-2900
Berberis asiatica Roxb. ex DC.	Kingor	S	A,B,C,D,E	Fr, B, R	Ulcers, Jaundice, Fever	1600-2200
Podophyllaceae						
Podophyllum hexandrum Wall. ex Royle	Ban Kakadi	H	2,4,7	R	Septic wounds	2900-4000
Papavaraceae						
Meconopsis aculeata Royle	-	H	1,2,3,4,6,7,8, 9,10	R	Backache	3000-4000
Fumariaceae						
Corydalis cashemeriana Royle	-	H	1,3,4,7,8,9	Wp	Chronic fever	3000-4500
Corydalis govaniana Wall.	Indrajata	H	4,7,8,9,10	Wp	Swelling of the limbs and stomach pain	3000-4000
Corydalis meifolia Wall.	-	H	1,2,4,6,7,8,9,	Wp	Headache, stomach and liver pain	3800-4700

Brassicaceae						
Megacarpia polyandra Benth.	Barmoola	H	5	R, L	Fever, Stomachache	3500-4000
Violaceae						
Viola bifora L.	Banfsa	H	1,2,3,4,5,6,7, 8,9,10	L	Constipation	2800-4500
Viola canescens Wall.	Dudibirali	H	A,B,C,D,E	L	Headache, cold, cough & malaria	2000-3000
Malvaceae						
Malva verticillata L.	Ageli	H	A,C,D	R	Urinary complains	1500-3000
Geraniaceae						
Geranium nepalense Sw.	-	H	A,B,C,D,E	Wp	Antibacterial & Astringent	1700-3000
Geranium wallichianum D.Don *ex* Sw.	Kaphla	H	A,B,C,D,E	R	Dysentery and Cold	2300-3000
Geranium polyanthes Edgew. & Hook. f.	Kaphla	H	7,10	L	Ulcers, Headache	2700-3500
Oxalidaceae						
Oxalis corniculata L.	Chalmori	H	D,E	Wp	Fever, Urinary tract infections	1600-2700
Rutaceae						
Boenninghausenia albiflora (Hook.) Meissn.	Upanaya Ghas	H	A,B,C,D,E	R, L	Cuts & Wounds	1700-2700
Skimmia anquetilia Taylor & Airy Shaw	Nair, Kedar Pati	S	1,2,4,7,8,9 10	Fr	Burns	2000-3200
Zanthoxylum armatum DC.	Timur	S	A,B,C,D,E	Sd, B	Toothache, fungal infection in stored grain	1500-1800
Papilionaceae						
Astragalus candolleanus Royle ex Benth.	-	S	4,7,8,9	R	Skin diseases & blood purifier	3000-4500
Caesalpinaceae						
Bauhinia vahlii Wt. & Arn.	Malu	C	C,E	Sd, L	Aphrodisiac	1500
Bauhinia variegata L.	Gwiral	T	A,B,C	Fl	Biliousness, ulcers & Tuberculosis	1500-2000
Rosaceae						
Potentilla fulgens Wall. ex Hook. f.	Chotu Ruins	H	1,4,6,7,8,9,10 A,B,C,D,E	R	Strengthening of teeth	2000-4000
Prinsepia utilis Royle	Bhinkula	S	A,B,C,D,E	R, Sd	Pile, Stomach disorders	1500-2500

Pyrus pashia Buch.-Ham. ex D. Don	Mehal	T	A,B,C,D,E	Fr	Stomach disorders	1500-2000
Rosa sericea Lindl.	Dhur- Kunja	H	A,C,D	Fr	Headaches, Liver complaints	3000-4000
Saxifragaceae						
Bergenia ciliata (Haw.) Strenb.	Silphori	H	1,4,6,7,8,10 A,B,C,D,E,	R	Fevers, Diarrhoea & Pulmonary affections	2000-3500
Bergenia stracheyi (Hook. f. & Thoms.) Engl.	Pashan Bhed	H	2,4,5,6,7,9,10	R, L	Toothache, swelling & sores	2500-4500
Parnassia nubicola Wall. ex Royle	Nirbishi	H	1,2,3,4,5,6,7,8 9,10	R	Boils	2000-4000
Crassulaceae						
Sedum quadrifidum Pall.	Suru	H	1,4,8,9	Ys	Headache, Piles	3200-4500
Apiaceae						
Angelica glauca Edgew.	Chora	H	3,4,5,9	R	Dysentery, Constipation	2500-3500
Centella asiatica (L.) Urban	Brahmi	H	A,B,C,D,E	L		1500-1800
Pleurospermum densiflorum (Lindl.) Clarke	Tagger	H	4	Wp	Medico-Religious	3000-4000
Selinum candollei DC.	Moor	H	1,2,3,4,6,8,9	R	Toothache	3350-3800
Selinum vaginatum Clarke	Bhootkeshi	H	2,4,5,8,9	R	Toothache	2200-4000
Rubiaceae						
Galium aparine L.	Kushkusha	H	1,2,3,4,5,6,7, 8,9,10	Wp	Stop bleeding	2800-3800
Rubia manjith Roxb. ex Flem.	Manjistha	C	A,B,C,D,E	R	Lower blood pressure, kidney stone	1500-3000
Valerianaceae						
Nardostachys grandiflora DC.	Jatamansi	H	1,4,6,7,8,9,10	R	Heart tonic	2800-4000
Valeriana hardwickii Wall.	Shami	H	A,B,C,D	R	Wounds	2000-4000
Valeriana jatamansi Jones	Samewa	H	A,B,C,D,E	R	Wounds and Blister	2000-3000
Dipsacaceae						
Morina longifolia Wall. ex DC.	Bis Kandara	H	1,2,3,4,5,6,7,8, 9,10	R	Burns & Boils	2900-3800
Asteraceae						
Anaphalis triplinervis (Sims.) Cl.	Buglya	H	A,B,C,D	Fl	Dressing wounds	1500-3000
Artemisia nilagirica (Cl.) Pamp.	Kunzu, Paati	H	A,B,C,D,E	L, Fl	Skin diseases	1500-3000

Eupatorium adenophorum Sprang	Basinga	H	A,B,C,D,E	L	Skin diseases	1500-2600
Jurinea dolomiaea Boiss.	Dhoop	H	1,2,3,4,5,6,7 8,9,10	R	Incense, Fever	3300-4000
Saussurea gossypiphora D. Don	Hiyun Kauni	H	5	Fl	Asthma, Skin diseases	4000-4500
Saussurea obvallata (DC.) Edgew.	Brahm Kamal	H	2,3,4,5,6,8,9	R	Cough	4000-4800
Tanacetum longifolium Wall. ex DC.	Guggal	H	1,2,3,4,5,6,7 8,9,10	L	Stomachache & Indigestion	3400-4000
Taraxacum officinale Weber.	Kan-fulya	H	1,2,3,4,5,6,7,8,9 10,A,B,C,D,E	R	Blood purifier	1500-3000
Ericaceae						
Gaultheria trichophylla Royle.	Bhuinla	H	1,2,3,4,5,6,7,8 9,10	L	Rheumatism, Appetizer	2800-4000
Rhododendron anthopogon D. Don	Kodya	S	5,6,7,9	L	Stimulant for aged people	3500-4000
Rhododendron arboreum Sm.	Burans	T	A,B,C,D,E	Ys	Headache, Blood dysentery	1600-3300
Oleaceae						
Syringa emodi Wall. ex G. Don	Ghiya	S	A,7	Fl, Sd	Fever	3000-3500
Gentianaceae						
Gentiana stipitata Edgew.	Bumlya	H	4,5,9	R	Fever	3000-3500
Swertia chirayita (Roxb. ex Flem.) Karsten	Chirayata	H	A,B,C,D	L	Blood diseases	2300-2600
Swertia ciliata (D.Don ex G.Don) Burt.	Kala Chirayata	H	1,2,4,6,7,8,9 10	L	Blood purifier	2400-3500
Boraginaceae						
*Arnebia euchroma (*Royle) Johnston	Laljari	H	2,7	R	Wounds, Fevers, Bites and Stings	3200-4200
Maharanga emodi (Wall.) DC.	-	H	2,3,7,8	L	Abdominal pain, Fevers, Wounds, Piles	3000-3500
Convolvulaceae						
Cuscuta europaea L.	Akash-laguli	H	4,9	S	Reduce ear pain	2800-3800
Solanaceae						
Datura stramonium L.	Dhataru	H	C,D	Fr, L	Relieve pain & encourage healing	2000-3000

Scrophulariaceae						
Euphrasia platyphylla Pennell	-	H	2,4	L	Eye diseases	3000-3800
Pedicularis hoffmeisteri Klotzsch	-	H	4,7,8,9	Wp	Food poisoning	3000-3500
Picrorhiza kurrooa Royle ex Benth.	Kutaki/Karui	H	1,2,4,5,6,7,8,9 10	R	Fever, Stomachache	3000-4000
Scrophularia himalensis Royle		H	A,B,C,D	L	Headache	1800-3000
Verbascum thapsus L.	Akuluber	H	A,B,C,D,E 2,7,8,10	L, Fl	Ulcers, Tumours & Piles	1500-3500
Acanthaceae						
Dicliptera bupleuroides Nees	Saundi	H	A,B,C,D,E	L	Fever, Stomachache & Skin diseases	1500-2000
Justicia procumbens var. simplex (D. Don) Yamazaki	-	H	A,B,C,D	Ys	Osteoporosis	1500-1800
Lamiaceae						
Ajuga brachystemon Maxim.	Rajpatti	H	A,B,C,D,E	L	Stomachache	1600-3000
Elsholtzia strobilifera Benth.	Pothi	H	2,3,4,7,8,9	Wp	Wounds	3000-3500
Lamium album L.	Tilka	H	A,B,C,D	Fl	Bleeding after childbirth	1500-3000
Leucas lanata Benth.	Guma	H	A,B,C,D,E	L	Wounds, Eye infection	2000-2300
Micromeria biflora (Buch.-Ham ex D. Don) Benth.	Honsala	H	A,B,C,D,E	R	Snake bite, healing	1500-3800
Origanum vulgare L.	Ban-Tulsi	H	A,B,C,D,E 1,2 4,6,7,8,9,10	L	Toothache, Swelling	1500-3800
Prunella vulgaris L.	Phulari	H	A,B,C,D,E	Wp	Wounds, Ulcers, Sores	1600-3000
Salvia hians Royle ex Benth.	Amlya	H	2,7,8	R	Colds, Coughs, Anxiety	2500-3500
Salvia nubicola Wall. ex Sw.	-	H	A,B,C,D	R	Fever	2000-2800
Thymus linearis Benth.	Ban-Ajwain	H	A,B,C,D,E 1,2 4,5,6,7,8,9,10	L, Fl	Cuts & Wounds	2500-4000
Plantaginaceae						
Plantago erosa Wall.	Isabagul	H	A,B,C,D,E	L	Dysentery	1500-2000
Plantago himalaica Pilger in Engl.	Isabagul	H	1,2,3,4,7,8 9,10	L	Dysentery	2800-3500
Amaranthaceae						
Achyranthes bidentata Bl.	Lich-Kuru	H	A,B,C,D,E	R	Muscular cramps	2000

Chenopodiaceae						
Chenopodium botrys L.	Bithhu	H	A,B,C,D,E	L	Diuretic	1800-3800
Polygonaceae						
Aconogonum tortuosum (D.Don) Hara	-	H	3,4,5,6,9	R	Headache and Diarrhoea	3800-4500
Bistorta affinis (D. Don) Greene	Kukhari	H	1,2,3,4,5,6,7,8 9,10	R	Dysentery	3000-4500
Bistorta vivipara (L.) S.F. Gray	Makhuri	H	1,2,3,4,5,6,7, 8,9,10	R	Dysentery	3300-4500
Rheum australe D. Don	Archa	H	4,5,9	R	Internal wounds	3400-4000
Rheum moorcroftianum Royle	Dolu	H	1,2,3,4,5,6,7,8 9,10	R	Dysentery, Internal wounds	3200-4000
Rumex nepalensis Spr.	Jangli Palak	H	1,2,3,4,5,6,7,8,9 10, A,B,C,D,E	L	Etching	1500-3500
Oxyria digyna Hill	Kailashi almorha	H	2,4,5,6,7,	L	Wounds, Rheumatism	3400-4000
Lauraceae						
Cinnamomum tamala (Buch.-Ham.) Nees & Eberm.	Dalchini	T	A,B,C	L	Cold, nausea & Vomiting	1800
Elaeagnaceae						
Hippophe salicifolia D. Don	Tarwa	S	A,C	Fr	Cardiac trouble	2500-3000
Euphorbiaceae						
Euphorbia pilosa L.	Mahavir, Daya	H	A,B,C,D,E	Sd, L	Food poisoning	1600-2800
Phyllanthus urinaria L.	Bhuinanwalah	H	B,C	L	Kidney stones, Urinary tract infection	1500-1800
Sarcococca saligna (D. Don) Muell.	Geru	S	A,B,C,D,E	R	Bawasher	1600-2600
Urticaceae						
Girardinia diversifolia (Link.) Friis	Dud-Kanali	S	A,B,C,D,E	Wp	Diuretic	1600-2200
Urtica dioica L.	Kandali	S	A,B,C,D,E	R	Boils	1500-3000
Juglandaceae						
Juglans regia L.	Akhor	T	C,D	B, R	Toothache	1600-3000
Myricaceae						
Myrica esculenta Buch.-Ham. ex D.Don	Kaphal	T	A,B,C,D,E	L, Fr	Skin disease, Wounds	1500-2500
Betulaceae						
Carpinus viminea Lindl.	Chamkharik	T	A,B,C	L	Bone fracture	2300-2600
Orchidaceae						

Dactylorhiza hatagirea (D. Don) Soo	Hathajadi	H	1,2,4,7,8,9,10	R	Cuts, stop bleeding, Aphrodisiac	2500-4000
Pholidota articulata Lindl.	Harjojan	H	A,B,C	Wp	Bone Fracture	1500-1700
Satyrium nepalense D. Don	Salam misri	H	1,7,8,10	Tu	Malaria & Dysentery	1600-3800
Zinziberaceae						
Hedychium spicatum Buch.-Ham ex Sm.	Sed	H	A,B,C,D	R	Piles, Snake-bites	1500-2300
Roscoea alpina Royle	Garud Panja	H	1,2,3,4,5,6,7,8 9,10	R	Urinary diseases & Tuberculosis	2500-3200
Roscoea purpurea Sm.	Garur Panja	H	C,D	R	Urinary diseases	2000-2600
Dioscoriaceae						
Dioscorea deltoidea Wall. ex Griseli.	Gethi	C	A,B,C,D	Tu	Bronchial cough	2000-2500
Liliaceae						
Allium stracheyi Baker	Faran	H	1,2,4,5,6,7,8 9,10	Wp	Cold, Spices	2500-3300
Allium wallichii Kunth	Ban Lahsun	H	4,7,8,9	Ys	Indigestion	3000-3500
Asparagus curilius Buch. - Ham. ex Roxb.	Jhirana	S	A,C,D,E	L, R	Sexual debility	1500-1800
Fritillaria roylei Hook.	Kakoli	H	4,5,7,8	Bb	Stimulant	2800-4000
Nomocharis oxypetala (Royle) E.	Ban Pyaj	H	2,4	Bb	Vigorous	3300-3800
Paris polyphylla Sm.	Satwa	H	A,C,D	R	Used as nerve tonic	1500-3000
Polygonatum verticillatum (L.) All.	Mahamaida	H	A,B,C,D	R	Gastric complaints	2500-3400
Polygonatum cirrhifolium (Wall.) Royle	Maida	H	B,C,D	R	Blood purifier, cold, cough	1500-3600
Trillidium govanianum (D. Don) Kunth.	Satawa	H	4,7,8,9	Tu	Energetic	2700-3800
Araceae						
Acorus calamus L.	Vachha	H	C,D	L, R	Cough, kidney & Skin diseases	1600
Arisaema jacquemontii Bl.	Meen	H	A,B,C,D,E	Tu	Cough, kidney & Skin diseases	2000-3000
Taxaceae						
Taxus baccata L. sub sp. w*allichiana*	Thuner	T	C,E	B	Breast pile	2500-3300

Adiantaceae						
Adiantum capillus-veneris L.	Sinku	Fr	A,B,C,D,E	Wp	Nee pain, Piles	1600-2400
Aspleniaceae						
Asplenium dalhousiae Hook.	Kirjari	Fr	A,B,C,D,E	R	Snake bite	1600-2000

(*Abbrv*. Habit: H=Herb, S=Shrub, T=Tree, C=Climber, Fr=Fern. **Distribution:** 1= Trijuginarayan, 2= Kedaranth, 3= Khanm, 4= Mandani, 5= Pandavshera, 6= Bisuri, 7= Tungnath, 8= Rudranath, 9= Manpai, 10= Bansinarayan (Alpine meadows). A= Kedarnath, B= Madhmaheshwar, C= Mandal, D= Rudranath, E= Urgam (Valleys). **Parts used:** B= Bark, R= Roots, L= Leaves, S= Stem, Sd= Seed, Bb= Bulb, Fl= Flowers, Fr= Fruits, Tu= Tubers, Wp= Whole plant, Ys= Young Shoots)

RESULTS AND DISCUSSIONS

Information thus collected has been summarized in Table 1. Study reveals that even the latest health facilities are available near the sanctuary; still many local communities prefer using herbal drugs. A total of 126 species of medicinal plants belonging to 104 genera and 51 families were recorded from Kedarnath WS (Table 1), of which more than 30 plants were commonly used by the local communities of the region. These plants were used for curing more than 35 diseases ranging from simple stomach-ache to highly complicated male and female disorders. Most of the plants species used by the local people to cure skin diseases, dysentery, cough, fever, wounds, female disorders, joint pain, gastric problems, nasal bleeding, cold, piles, anti poison, ear problems, eye problems, stones and rheumatism (Fig 2). It was also found that a single plant may be used for curing many ailments. Maximum number of plants used was for curing cut & wounds (17 species) followed by fever (12), cold/cough (10) and piles (10) which are common diseases found in the villages. In most of the cases (Fig 3) underground parts (38%) of the plants (perennial plants) are used to cure several diseases followed by leaves (22%) and whole plants (12%). Few species *i.e.*, *Centella asiatica* and *Rhododendron arboreum* are exploited at commercial level by making juice with the help of NGOs (Non Governmental Organisations).

Interviews with the local people revealed ambiguity in the identification of plants by the locals. They use different names for same plant or *vice versa*. Similarly it was seen that people use substitute of one medicinal plant in place of other if that particular plant is not available. The colour of flowers plays important role in the local nomenclature of plant species. Local people collect medicinal plants from the nearby areas of the villages. Local shepherds collect most of the medicinal plants from high passes and pastures while feeding their goats and sheep. Apart from higher plants, lower plant species such as lichens collected from temperate forests are also used commercially (spices and Dyes). During the survey and interviews in the sub-alpine and alpine regions of the sanctuary, it was observed that in some areas (Kham, Tungnath, Bansinarayan) excessive grazing by buffaloes, cows, mules, sheep, goats; and unmanaged tourism is the major cause of decline in density and natural habitats of medicinal plants

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