

# Ethnomedicinal Plants Used for Respiratory and Musculo-Skeletal Disorders in Spiti Valley of Trans-Himalayan Region of India\*

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## Abstract

Spiti valley is situated in cold desert of Trans Himalayan region of India and inhabited by *Bhot* or *Bhotia* tribal community. The average elevation of Spiti valley is about 4000 m and climate of the area is rugged, desolate and inhospitable. Many respiratory disorders such as cough, cold, asthma, pneumonia, chest infection, chronic bronchitis etc. and musculo-skeletal disorders such as joint pain, body pain, headache, muscular pain, backache are common in the area. Local people have strong belief in traditional system of medicine and still prefer to the use of herbal medicines prescribed by local herbal healers (*Amchi*). In order to study the traditional medicinal plants used for respiratory and musculo-skeletal problems in Spiti valley, the area was surveyed from 2009 to 2014. First-hand information on ethnomedicinal plants were gathered by taking interviews of local knowledgeable residents, women, elderly people, village headmen and *Amchi* (traditional doctors). A total of 88 plant species belonging to 69 genera and 30 families are reported from the study area which are used to cure various respiratory and musculo-skeletal diseases and conditions as folk treatment.

**Keywords:** Cold desert, Traditional folk knowledge, Medicinal plants, Trans-Himalayan region, Spiti valley.

## Introduction

The Indian Himalayan Region (IHR) accounts for more than 50% of India's forest (Bahuguna *et al.*, 2010 and Rodgers & Panwar, 1988). The typical topography, large altitudinal range (200-8000 m), and unique climatic conditions of the area support 18,440 species of plants out of which 1748 species are medicines (Hasan *et al.*, 2009 and Samant *et al.*, 1998).

The cold arid region of the Himalayas is called "Trans Himalayan region". It comprises Ladakh in Jammu and Kashmir, Lahaul and Spiti, Kinnaur, Pangi Valley of district Chamba in Himachal Pradesh, and Niti and Nelong Valley of Uttarakhand (Murti, 2001 and Srivastava, 2010). Spiti valley is a desert mountain valley in the Trans-Himalayan belt of cold desert of Himachal Pradesh which covers 7591 Km<sup>2</sup> area and lies between 31<sup>o</sup> 42'-33<sup>o</sup> N latitudes and 77<sup>o</sup> 37'-78<sup>o</sup> 85' E Longitudes of India (Aswal and Mehrotra, 1999 and Negi, 1995) (Fig. 1). This Himalayan mountain fall into the region with mean altitude of 4000 m above mean sea level. It borders Tibet on its eastern border and the Ladakh region of India on its north. The area is known for its specific topography, severe

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climate and unique vegetation (Aswal and Mahrotra, 1999; Balokhra, 2003; Murti, 2001). The area is covered with snow for more than six months in the year. The principal vegetative growth starts at the commencement of summer, when melting snow provides abundant moisture. The main type of vegetation in Spiti is dry alpine scrubs and alpine meadows; more prominent in July and August, but disappears by the end of September or by early October. Highly peculiar climate and topographical conditions of Spiti provided a wide range of medicinal, aromatic and other important plants (Kala, 2002; 2006). Spiti is a home to a purely homogenous Buddhist society who shares similarities with their neighbors in Tibet and Ladakh. The region inhabited by indigenous tribal community *Bhotia or Bhot* (Negi, 1995; Verma, 1997). Being very close to the nature tribal people possessed good knowledge of surrounding medicinal plants and their curative properties. They have firm belief in traditional medicines system known as the *Amchi System of Medicine* in Spiti and commonly known as *Sowa-Rigpa*. Majority of people rely on them to cure various diseases. All the villages of Spiti have at least one traditional herbal healer (*Amchi*). *Amchis* have enjoyed high respect and social status among the local communities since time immemorial.

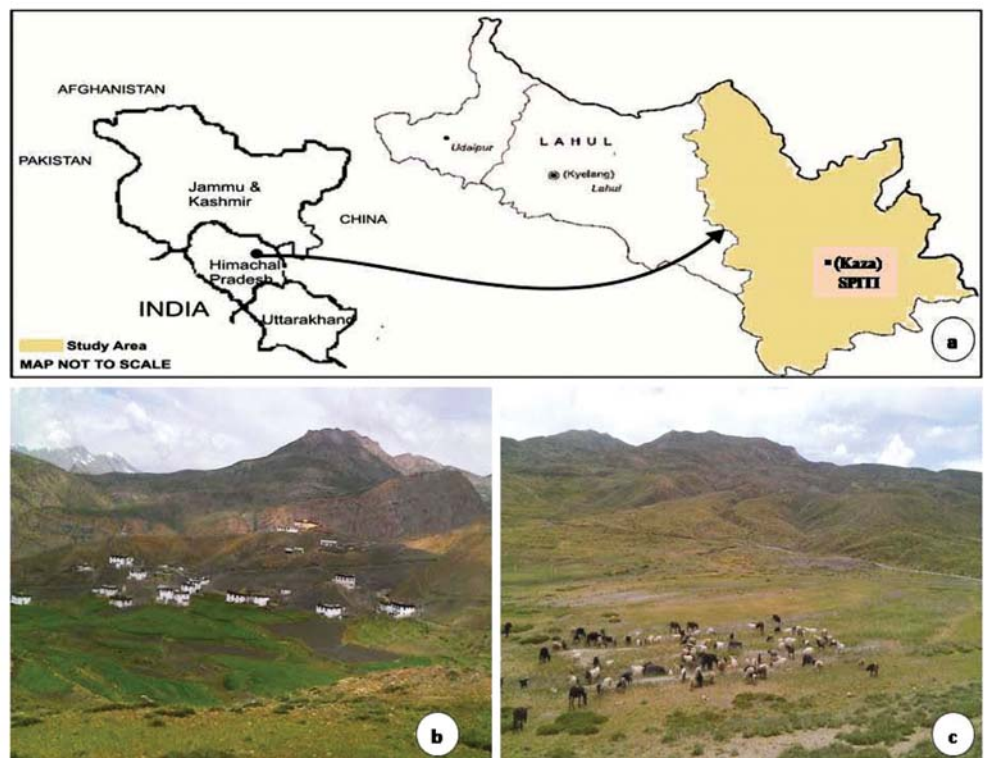
In recent past, efforts were made by various workers to document traditional medicine knowledge of the cold desert (Chandra Sekar and Srivastava, 2003; Devi and Thakur, 2011; Devi *et al.*, 2014; Kala, 2002, 2006, Phani *et al.*, 2009; Seth and Devi, 2014; Sharma *et al.*, 2006; Sharma *et al.*, 2011 and Singh *et al.*, 2009; Singh, 2012; Singh *et al.*, 2012 and Sood *et al.*, 2001) in which few studies have been focused on particular ailments (Ballabh and Chaurasia, 2007, 2009; Ballabh *et al.*, 2008; Chandra Sekar and Srivastava, 2005 and Lal and Singh, 2008; Singh and Lal, 2008). However, no comprehensive information has been brought out so far on the traditional uses of plants to cure respiratory and musculo-skeletal disorders. Keeping in view of rich traditional knowledge among local tribes and their high dependency on local medicinal plants, the main purpose of the present study is to document and assess the present status of traditional medicinal plants used against respiratory and musculo-skeletal problems by the tribal community of Spiti valley.

## Materials and Methods

A series of ethnomedicinal surveys of the study area were carried out from 2009 to 2014 during season months May to September when the area is snow-free. Different localities of valley from altitude 3000 m to 4500 m were visited to document the traditional medicinal plants. During field surveys standard procedures were adopted for collection, preserving and identifying the specimens (Jain and Rao, 1977). Most of the plants were identified on spot and the rests were brought to the laboratory and identified through local floras flora (Aswal

and Mehrotra, 1999; Chandra Sekar and Srivastava, 2009; Chowdhery and Wadhwa, 1984; Dhaliwal and Sharma, 1999; Polunin and Stainton, 1984; Singh and Rawat, 2000). The voucher specimens were matched and compared with the authentic specimens lying with the herbarium of Botanical Survey of India (BSI), Dehradun (BSD) and deposited in the Laboratory herbarium of HPU, Shimla as reference material. Altitude of the area was noted down with the help of GPS (Make; Garmin GPSmap76CSx).

First-hand information on traditional knowledge related to respiratory and muscular–skeletal disorders was gathered by taking interviews of local knowledgeable residents, women, elderly people, village headmen and *Amchi* (traditional doctors). Information about the local names of the plants, part(s) used, ailments treated, mode of administration, and curative properties were recorded. The information is given in a tabular form includes scientific names of plants along with family, local names, locality with altitude, habit, parts used, ethnomedicinal uses reported, names of ailments, and modes of administration/formulations (Table 1).



**Figure 1 (a-c):** (a) Map of Spiti Valley showing its position in India and Himachal Pradesh; (b) Village of study area; (c) Alpine pasture of study area

**Table 1:** Ethnomedicinal plants of Spiti valley used to cure respiratory and musculo–skeletal disorders

S. No.	Taxa with family	Local name	Locality with altitude	Life form	Part Used	Traditional uses
	<b>Alliaceae</b>					
1.	<i>Allium carolinianum</i> DC.	Laot	Kibber (4200 m)	H	Wp, Fl	Whole plant powder is used for body pain and swelling. Powder of flower head is used for cold.
	<b>Amaranthaceae</b>					
2.	<i>Amaranthus spinosus</i> L.	Zansho	Tabo (3000 m)	H	Wp	Decoction of whole plant is used for cough.
	<b>Apiaceae</b>					
3.	<i>Bupleurum falcatum</i> L.	Thonpu	Tackcha (4100)	H	Rt	Decoction of root is used for cold.
4.	<i>Bupleurum hamiltonii</i> Balakr.	–	Kunzum pass (4500 m)	H	Rt	Root decoction is taken for cough and influenza.
5.	<i>Carum carvi</i> L.	Mao	Lossar (4080 m)	H	Sd	Powder of seed is used for joint pain. The seed tied in cloth and soaked in warm oil of Chulli (seed oil of <i>Prunus armeniaca</i> L.) and applied on the nasal area to get relieve of cold.
6.	<i>Ferula jaeschkeana</i> Vatke	Tunak, Ye	Attargo (3300 m)	H	Sd, Rt	Powder of seed and root is used for joint pain.
7.	<i>Heracleum candicans</i> Wall. Ex DC.	Chogot	Kibber (4200 m)	H	Rt	Root paste is used to get relieve from joint pain.
8.	<i>Semenovia thomsonii</i> (C.B.Clarke) Manden	Karpo	Mud (3900 m)	H	Fr	Decoction of fruits is taken for headache.

S. No.	Taxa with family	Local name	Locality with altitude	Life form	Part Used	Traditional uses
	<b>Asteraceae</b>					
9.	<i>Anaphalis royleana</i> DC.	Kirchee mentok	Kunzum pass (4500 m)	H	Lf	Leaves paste is used for body pain.
10.	<i>Artemisia biennis</i> Willd.	Sar-Bung-Karpo	Tabo (3000 m)	H	Wp	Powder of whole plant is used for cough and cold.
11.	<i>Artemisia capillaris</i> Thunb.	Khamtso	Kungri (3700 m)	H	Inf	Decoction of inflorescence used to cure pneumonia. The leaves powder mixed with cow ghee and massaged on painful joint to get relief.
12.	<i>Artemisia maritima</i> L.	Atonge-carpo	Hansa (3800 m)	S	Lf	Decoction of leaves is used to cure joint pain and cough.
13.	<i>Centaurea depressa</i> M.Bieb	Pashakha	Shego (3400 m)	H	Ap	Decoction of aerial part is used for cough.
14.	<i>Chrysanthemum pyrethoides</i> (Kir. & Kir.) B. Fedtsch.	Burse	Kunzum pass (4500 m)	H	Wp	Smoke of whole plant inhaled for asthma. The whole plant as poultice is used externally for joint pain.
15.	<i>Cicerbita macrorrhiza</i> (Royle) Hook. f.	Thumpu	Gulling (3600 m)	H	Ap	Powder of aerial part is used for headache.
16.	<i>Cousinia thomsonii</i> Clarke	Tawa	Dhankar (4270 m)	H	Cotton wool, Rt	Cotton wool of plant is used as acupressure for body pain and muscular pain. Root paste is used for joint pain.
17.	<i>Erigeron alpinus</i> L.	Achak	Komic (4500 m)	H	Wp, Ap	Decoction of whole plant is used for cold and cough. Powdered of aerial plant part is given to cure joint pain.

S. No.	Taxa with family	Local name	Locality with altitude	Life form	Part Used	Traditional uses
18.	<i>Inula racemosa</i> Hook.f.	Poshakar	Mane (3600 m)	H	Rt	The roots decoction is used for cough cold and chronic bronchitis.
19.	<i>Lactuca orientalis</i> (Boiss) Boiss.	Nechak	Gette (4270 m)	S	Fl	Paste of flower is used for headache.
20.	<i>Leontopodium himalayanum</i> DC.	-	Kunzum pass (4500 m)	H	W/p	Whole plant is used as acupressure for body stress.
21.	<i>Saussurea bracteata</i> Decne.	Pang-chi-towo	Demul (4360 m)	H	Inf	Decoction of inflorescence is used for cold.
22.	<i>Saussurea costus</i> (Falc.) Lipsch.	Kusth, Pachak	Mane (3600 m)	H	Rt	Root is used for joint pain. It is also used in asthma, bronchitis and cough.
23.	<i>Saussurea jacea</i> (Klotz.) Clarke	Pang-chi	Kibber (4200 m)	H	Inf	Smoke of inflorescence is inhaled for respiratory problem (asthma).
24.	<i>Taraxacum officinale</i> Weber	Sarchen-Metok	Kibber (4200 m)	H	Ap	Aerial part in powder form is given for cough and throat infection.
25.	<i>Waldheimia tomentosa</i> (Decne.) Regel.	Lukmik	Kunzum pass (4500 m)	H	Fl & Lf	Powder of flower and leaves is given for backache.
26.	<i>Youngia glauca</i> Edgew	Seertik	Kunzum pass (4500 m)	H	Ap	Powder of aerial part is taken for headache.
	<b>Betulaceae</b>					
27.	<i>Betula utilis</i> D.Don	Takpa	Chhatru (3360 m)	T	Bk	Decoction of bark is used for joint pain

S. No.	Taxa with family	Local name	Locality with altitude	Life form	Part Used	Traditional uses
	<b>Boraginaceae</b>					
28.	<i>Arnebia euchroma</i> (Royle ex Benth.) I.M. Johnston	Khamet	Gette (4270 m)	H	Rt	Powder of root is used to control cough and lung problem.
29.	<i>Arnebia guttata</i> Bunge	Dimok	Tabo (3000 m)	H	Rt	Powder of root is also used for cough.
30.	<i>Lindelofia stylosa</i> (Kar. & Kir.) Brand	Shora	Hikkim (4200 m)	H	Wp	Past of whole plant is used on swelling.
31.	<i>Lepidium latifolium</i> L.	Chulti	Gulling (3600 m)	H	Ap	Aerial part powder is used for joint pain.
32.	<i>Sisymbrium irio</i> L.	Khubkalan	Gulling (3600 m)	H	Sd	Seeds powder is used in asthma, throat and chest infection.
	<b>Campanulaceae</b>					
33.	<i>Codonopsis clematidea</i> (Schrenk) Clarke	Ludud- nakpo	Kibber (4200 m)	H	Ap	Powder of aerial part is used for joint pain.
34.	<i>Codonopsis ovata</i> Benth	Ruchukpa	Gulling (3600 m)	H	Rt, Lf	Powder of root is used for joint pain. Roots and leaves poultice is applied to swollen joint.
	<b>Capparaceae</b>					
35.	<i>Capparis spinosa</i> L.	Chileep	Poh (3300 m)	S	Fr	Fruit is use to cure joint pain.
	<b>Caprifoliaceae</b>					
36.	<i>Lonicera spinosa</i> (Jacq. ex Decne) Walp.	Trapa	Kyoto (3850 m)	S	Fl	Decoction of flower is used for headache.

S. No.	Taxa with family	Local name	Locality with altitude	Life form	Part Used	Traditional uses
	<b>Caryophyllaceae</b>					
37.	<i>Cerastium cerastoides</i> (L.) Britton.	Suppa	Kibber (4200 m)	H	Wp	Powder of whole plant is used for cough.
	<b>Chenopodiaceae</b>					
38.	<i>Chenopodium botrys</i> L.	Zanchi	Hull (3800 m)	H	Wp	Extraction of whole plant is used for headache.
	<b>Crassulaceae</b>					
39.	<i>Rhodiola cretinii</i> (R. Hamet) H. Ohba.	Solo-marpo	Kunzum pass (4500 m)	H	Rz	Decoction of rhizome is used for asthma.
40.	<i>Rhodiola himalensis</i> (D. Don) S. H. Fu	Solo mukpo	Tackcha (4100)	H	Wp	Whole plant is used for asthma.
	<b>Cuperaceae</b>					
41.	<i>Juniperus recurva</i> Buch.-Ham. ex D. Don.	Thellu	Mane (3600 m)	S	Sd	Seed oil is massage on painful joint.
	<b>Elaeagnaceae</b>					
42.	<i>Hippophae rhamnoides</i> L.	Chharma, Tarpo	Shego (3400 m)	S	Fr	Extraction of fruit is used against cough.
43.	<i>Hippophae tibetina</i> Schlecht	Chharma	Losar	S	Fr	Extraction of fruits is used for cough.
	<b>Ephedraceae</b>					
44.	<i>Ephedra Gerardiana</i> Wall. ex Stapf.	Chhedum	Tabo (3000 m)	S	Ap, Fr	The decoction of aerial part is given for joint pain, asthma, pneumonia and chronic bronchitis. Juice of berry is given in affection of respiratory passage.



S. No.	Taxa with family	Local name	Locality with altitude	Life form	Part Used	Traditional uses
45.	<i>Ephedra intermedia</i> Schrenk et C.A. Meyer	Khaut	Kibber (4200 m)	S	Ap	Decoction of aerial part is used for relieving bronchial spasm.
	<b>Fumariaceae</b>					
46.	<i>Corydalis govaniana</i> Wall.	Togsil	Demul (4360 m)	H	Rt	Decoction of root is used for joint pain.
	<b>Gentianaceae</b>					
47.	<i>Gentianopsis paludosa</i> (Hook.) Ma	Tikta	Kibber (4200 m)	H	Ap	Decoction of aerial part is used in headache.
48.	<i>Lomatogonium carinthiacum</i> (Wulf.) A.Br	—	Kunzum pass (4500 m)	H	Fl	Powder of flower is used for cough, cold and joint pain.
49.	<i>Swertia cuneata</i> D. Don	Tikta	Kungri (3700 m)	H	Wp	Decoction of whole plant is used for cough, cold and headache.
50.	<i>Geranium pratense</i> L.	Pollo-Mendok	Sagnam (3650 m)	H	Wp	Powder of whole plant is used for cough.
	<b>Lamiaceae</b>					
51.	<i>Dracocephalum heterophyllum</i> Benth.	Toksa, Jibkar	Lhalung (3660 m)	H	Wp	Whole plant is used for cough and headache.
52.	<i>Hyssopus officinalis</i> L.	Tyangu	Sagnam (3650 m)	H	Wp	Paste of crushed herb is used for muscular rheumatism.
53.	<i>Mentha longifolia</i> (L.) Huds.	Khoit	Lidang (3470 m)	H	Lf	Leaves powder is used to treat headache. A fine paste of leaves is used on the painful joint.
54.	<i>Nepeta discolor</i> Royle. ex Benth	Khot	Kunzum pass (4500 m)	H	Lf	Leaves powder is used for cold and cough.

S. No.	Taxa with family	Local name	Locality with altitude	Life form	Part Used	Traditional uses
55.	<i>Nepeta longibracteata</i> Benth.	Gipachi	Chichum (4200 m)	H	Lf, Fl	Powder of leaves and flower is used for joint pain.
56.	<i>Nepeta podostachys</i> Benth.	Ribusku	Kunzum pass (4500 m)	H	Ap	Aerial part decoction is used for cough.
57.	<i>Thymus linearis</i> Benth.	Pedumba	Kyoto (3850 m)	H	Wp	Decoction of whole plant is used for whooping coughs, cold and headache.
	<b>Malvaceae</b>					
58.	<i>Malva verticillata</i> L.	Chyamba	Poh (3300 m)	H	Wp	Extraction of whole plant is used for cough, cold, irritation of throat and joint pain.
	<b>Morinaceae</b>					
59.	<i>Morina coulteriana</i> Royle	Achakser	Gue (3200 m)	H	Fl	Decoction of flowers is used for joint pain.
	<b>Orobanchaceae</b>					
60.	<i>Orobancha alba</i> Steph.	Bongtosigcha	Sagnam (3650 m)	H	Ap	Decoction of aerial part is given for joint pain.
	<b>Fabaceae</b>					
61.	<i>Oxytropis cachemiriana</i> Camb.	Sumuk	Lossar (4080 m)	H	Lf	Extraction of leaves is used for cold and cough.
62.	<i>Thermopsis lanceolata</i> R. Br. ex Alton	Chuthup	Komic (4500 m)	H	Fl & Sd	Flower and seed powder is used for joint pain.
63.	<i>Trigonella pubescens</i> Edgew. ex Baker.	Pusukhang	Rangrik (3715 m)	H	Lf & Fl	Powder of leave and flower used to cure chest infection.

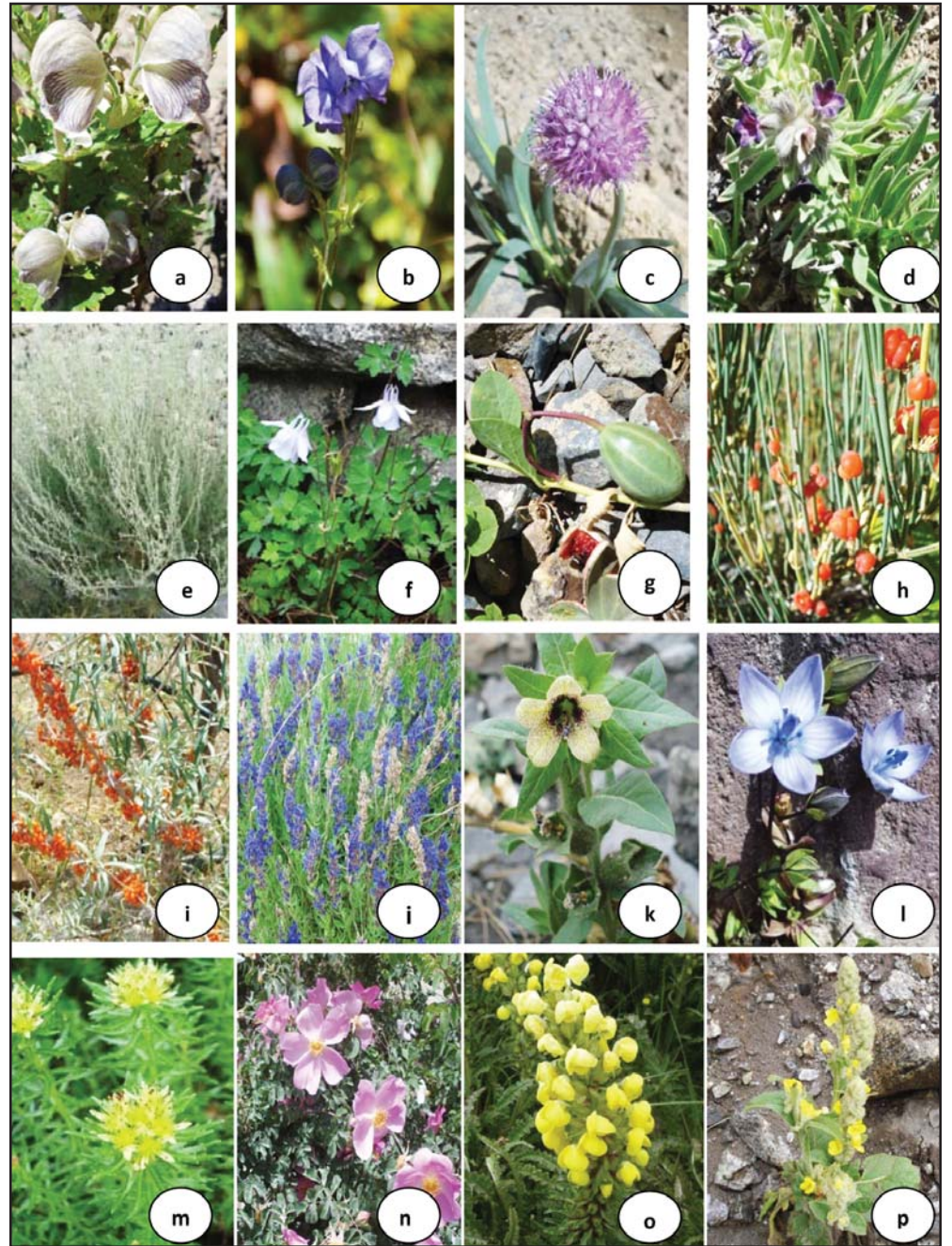
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	<b>Polygonaceae</b>					
64.	<i>Bistorta affinis</i> (D. Don.) Greene	Retheram	Tackcha (4100)	H	Lf, Fl, Rt	Leaves and flower dried and ground in to a fine powder. One table spoon of powder is taken to cure cough and cold. Root chewed for throat irritation.
65.	<i>Rheum australe</i> D. Don. Wall.	Chhucha	Mane (3600 m)	H	Rt	Root powder is used for asthma and bronchitis. The dry root powder mixed with mustard oil and massage on painful joint. Root paste is used for muscular swelling.
66.	<i>Rumex nepalensis</i> Spreng.	Chuomsa	Kibber (4200 m)	H	Rt	Root powder is used for joint pain.
67.	<i>Rumex patiens</i> L.	Shyomang	Sagnam (3650 m)	H	Rt	Roots paste is used for swelling and joint pain.
	<b>Primulaceae</b>					
68.	<i>Androsace mucronifolia</i> Watt	Zingsolo	Mud (3900 m)	H	Lf	Powder of leaves is used for cough.
69.	<i>Primula denticulata</i> Smith	Mendok-Karpo	Mud (3900 m)	H	Wp	Whole plant is used for headache.
70.	<i>Primula reptans</i> Hook.f. ex Watt.	Sangtik	Kunzum pass (4500 m)	H	Fl	Powder of flowers is used for headache and cough.
	<b>Ranunculaceae</b>					
71.	<i>Aconitum heterophyllum</i> Wall. ex Royle	Bhonga	Mane (3600 m)	H	Rt	Root powder taken orally for cough.

S. No.	Taxa with family	Local name	Locality with altitude	Life form	Part Used	Traditional uses
72.	<i>Aconitum rotundifolium</i> Kar. & Kir.	Bonkar	Chichum (4200 m)	H	Rt	Root powder is used for cough and headache.
73.	<i>Aconitum violaceum</i> Jacq. ex Stapf	Ponkhar	Chichum (4200 m)	H	Rt	Decoction of root powder is used for cold, cough and joint pain.
74.	<i>Aquilegia fragrans</i> Benth.	Ludud-dorge	Ki (3800 m)	H	Ap	Powder of aerial part is used for joint pain.
75.	<i>Aquilegia moorcroftiana</i> Wall. ex Royle	Semok	Rangrik (3715 m)	H	Ap	Powder of aerial part is used for joint pain.
76.	<i>Thalictrum minus</i> L.	Chaka-chu	Langza (4400 m)	H	Ap	Decoction of aerial part is used for joint pain.
	<b>Rosaceae</b>					
77.	<i>Potentilla bifurca</i> L. (Rosaceae)	Lande-mentho	Kiber (4200 m)	H	Lf	Extraction of leaves is used for headache.
78.	<i>Potentilla multifida</i> L. (Rosaceae)	Seetaka	Rangrik (3715 m)	H	Lf	Decoction of leaves is used for cold.
79.	<i>Prunus armeniaca</i> L. (Rosaceae)	Chuli, Chult	Tabo (3000 m)	T	Sd	The warm seed oil is massaged for joint pain.
80.	<i>Rosa webbiana</i> Wall. ex Royle	Siamendo	Lidang (3470 m)	S	Fr	Powder of fruit is used for headache.
81.	<i>Sibbaldia parviflora</i> Willd.	Padam	Kunzum pass (4500 m)	H	Lf	Extraction of leaves is used for joint pain.

S. No.	Taxa with family	Local name	Locality with altitude	Life form	Part Used	Traditional uses
	<b>Saxifragaceae</b>					
82.	<i>Bergenia stracheyi</i> (Hook. f. & Thoms.) Engle.	Khilche	Kunzum pass (4500 m)	H	Rt	Paste of root is used for joint and body pain.
	<b>Scrophulariaceae</b>					
83.	<i>Pedicularis bicornuta</i> Klotzsch ex Klotzsch and Garcke	Lukru-karpo	Sagnam (3650 m)	H	Ap	Aerial part Powder is used for joint pain.
84.	<i>Pedicularis pectinata</i> Wall. ex Benth.	Lugru Marpho	Lossar (4080 m)	H	W/p	The whole plant in powder form is used for body ache, cold and cough.
85.	<i>Picrorhiza kurrooa</i> Royle ex Benth.	Honglen	Demul (4360 m)	H	Rz	The paste of fresh rhizome is applied to cure joint pain. Powder of dried rhizomes used for joint pain, cold, cough and asthma.
86.	<i>Vevascum Thapsus</i> L.	Nho Sarje	Kurith (3200 m)	H	Lf	The paste of leaves is used for joint pain.
	<b>Solanaceae</b>					
87.	<i>Hyoscyamus niger</i> L.	Thuklang	Dhankar (4270 m)	H	Sd, Fl	Smoke of seed inhaled for asthma and whooping cough. Leaves paste externally employed for joint pain.
	<b>Tamaricaceae</b>					
88.	<i>Myricaria germanica</i> (L.) Desv. ssp. <i>alopeuroides</i> (Schrenk) Kitamura	Umbo	Schlichillig (3365 m)	S	Lf	Leaves powder is used for chronic bronchitis. Paste of aerial part is used for joint pain.

Abbreviation: Ap: Aerial part, Fl: Flower, Fr: Fruit, Hi: Herb, Inf: Inflorescence, Rt: Root, Rz: Rhizome, S: Shrub, Sd: Seed, T: Tree, Wp: Whole plant

**Figures 2(a-p):** Some ethnomedicinal plants of Spiti valley



**Figure (a-p):** (a) *Aconitum heterophyllum* Wall. ex Royle; (b) *Aconitum violaceum* Jacq. ex Stapf; (c) *Allium carolinianum* DC.; (d) *Arnebia euchroma* (Royle ex Benth.) I.M. Johnston; (e) *Artemisia maritima* L.; (f) *Aquilegia fragrans* Benth.; (g) *Capparis spinosa* L.; (h) *Ephedra gerardiana* Wall. ex Stapf.; (i) *Hippophae rhamnoides* L.; (j) *Hyssopus officinalis* L.; (k) *Hyoscyamus niger* L.; (l) *Lomatogonium carinthiacum* (Wulf.)A.Br.; (m) *Rhodiola cretinii* (R. Hamet) H. Ohba.; (n) *Rosa webbiana* Wall. ex Royle; (o) *Pedicularis bicornuta* Klotzsch ex Klotzsch and Garcke; (p) *Verbascum thapsus* L.

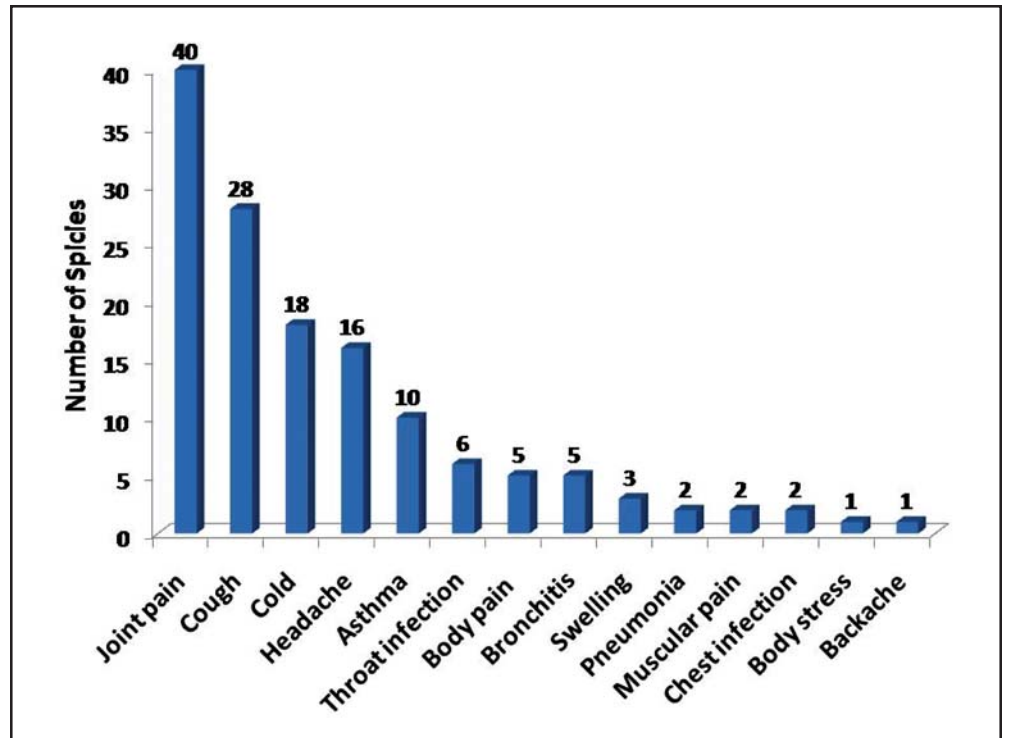


Figure 3: Number of plant species used to cure different ailments.

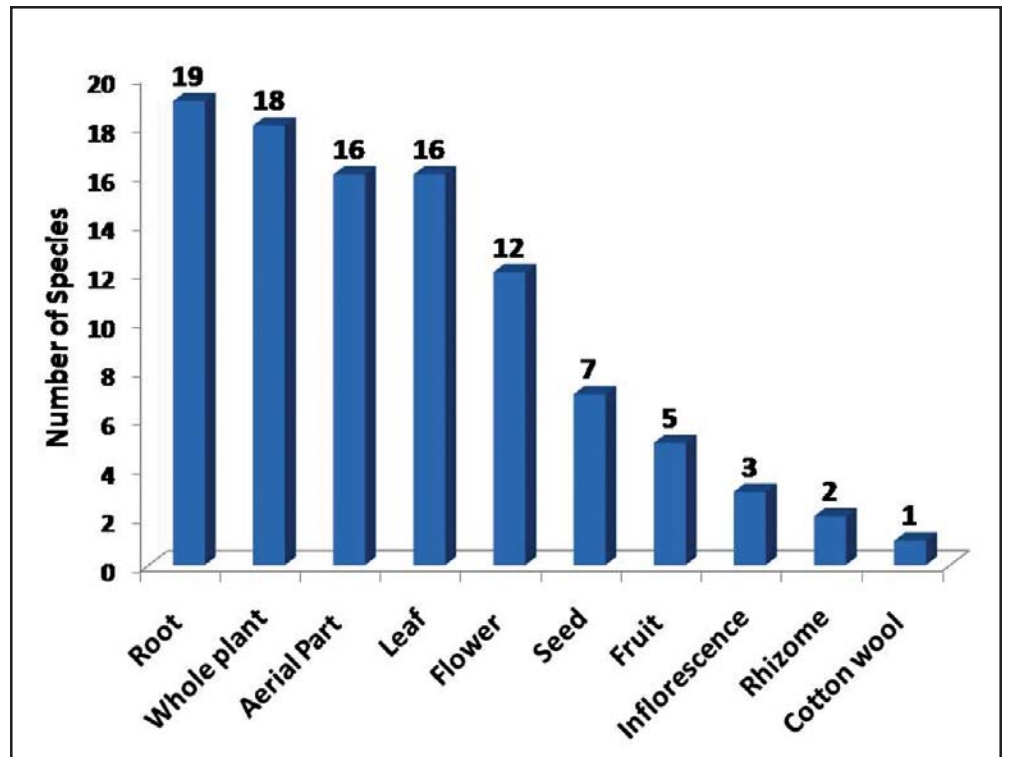
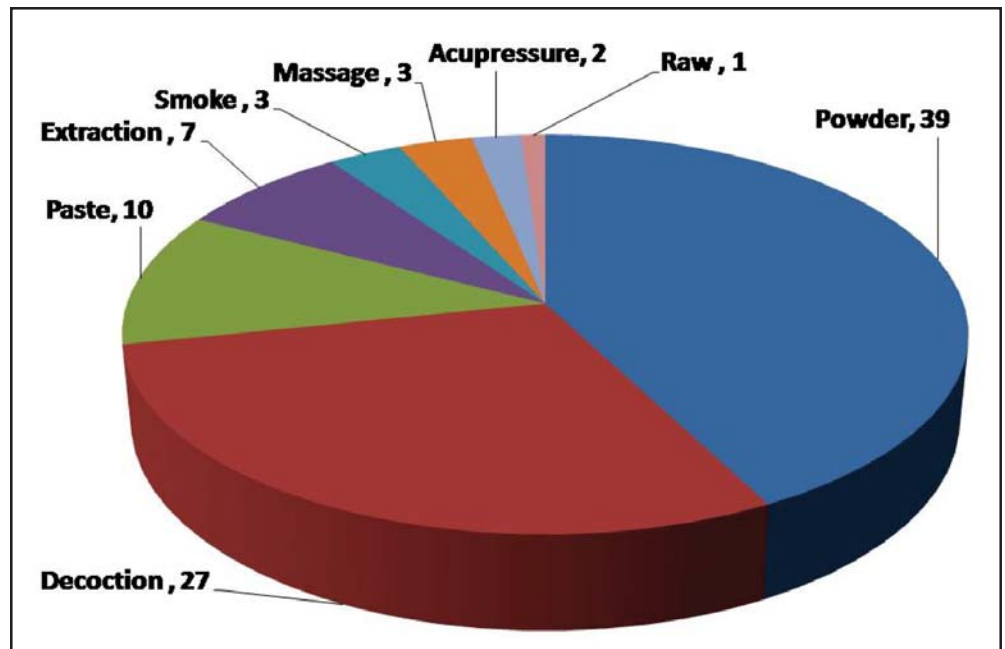


Figure 4: Different plants part used for herbal medicine preparation.



**Figure 5:** Pie diagram showing different form of herbal medicine preparation.

## Results and Discussion

The present studies have revealed that the tribes of the Spiti valley possess good amount of indigenous knowledge on medicinal plants. Tribal lifestyles of the study area have blended harmoniously with the surrounding nature, and they are considered as “eco-friendly people”. They have made use of maximum surrounding plants resources to cure various diseases. Almost every third plant growing in the area is used by the people in one form or the other. Traditional herbal medicine remains the first choice for primary healthcare for many diseases, especially for the inhabitants who cannot afford expensive pharmaceuticals. Respiratory problems such as cough, cold, asthma, pneumonia, chest infection, chronic bronchitis and musculo–skeletal disorders such as joint pains, body pain, swelling, headache, muscular pains, body stress and backache are very prominent in the study area. Due to cold and harsh environment ailments like cough, cold, asthma, pneumonia, joint pain are very common among all of above, if not treated properly in the initial stages, the problem may become chronic. The traditional healer (*Amchi*) possess good knowledge about the diagnosis of diseases and their treatment. They use various types of herbs, shrubs and trees available in their surroundings for treatment of diseases. The medicines are prescribed only after proper check-up the sign-symptoms and stage of the disease. In the present study, some 88 plant species belonging to 69 genera and 30 families were collected which are used to cure various respiratory and musculo–skeletal disorders (Table 1 & Fig. 2). Plant species of Asteraceae family are maximum used for herbal preparations (18 spp.), followed



by Lamiaceae (7 spp.), Apiaceae (6 spp.), Ranunculaceae (6 spp.), Boraginaceae (5 spp.), Rosaceae (5 spp.). Rest of the families are represented by less than five species. As area falls under alpine zone, herbs (75 spp.) are dominated and easily available for medicinal use followed by shrubs (11 spp.) and tree (2 spp.).

Of these, 63 species are used for musculo-skeletal disorders and 45 species for respiratory disorders, out of which 41 species are only used for musculo-skeletal disorders, 23 species only for respiratory disorders and 22 species for both problems. Highest number of plant species (40 spp.) are used for joint pain followed by cough (28 spp.), cold (18 spp.), headache (16 spp.), asthma (10 spp.), throat infection (6), body pain and bronchitis (5), swelling (3 spp.). Rest of ailments are cured by either one or two species (Fig. 3). The highly interesting findings for joint pain, cough, cold and asthma in present study need detailed analyses and validation. Many of the plant species used by local healers are of great importance and found in Ayurveda and Unani, the traditional health care systems of India (Chauhan, 2003; 2009; Dey, 1980; Kapoor, 1990 and; Kritikar and Basu, 1981).

The different plant parts used for medicinal purposes are root (19 spp.), whole plant (18 spp.), leaf and aerial part (16 spp. each), flower (12 spp.), seed (7 spp.), fruit (5 spp.), inflorescence (3 spp.), rhizome (12 spp.), cotton wool of plant (1 spp.) (Fig. 4). Both fresh and dried parts of the plant are used for the preparation of medicine. Generally, for winter season, when the areas covered by snow and fresh plant parts are not available, the herbal products are dried, and preserved for future use. In the present study maximum 39 species are used in powder form followed by decoction (27 spp.), paste (10 spp.), extraction (7 spp.), smoke form (3 spp.), massage (3 spp.), aqua pressure (2 spp.), consumed raw (1 spp.) (Fig. 5). The administration of the herbal medicinals is mostly internal in the form of powder, decoction and extraction. Paste is applied topically specially for joints pain, body pain and headache. Most of the formulations of herbal plants are taken once or twice a day as a full dose, depending on age, health and types of ailment. Sometime, to cure some respiratory problem, such as asthma and whooping cough, smoke of the plant part is inhaled viz., *Chrysanthemum pyrethoides* (Kir. & Kir.) B. Fedtsch, *Hyoscyamus niger* L., *Saussurea jacea* (Klotz.) Clarke. In case of body stress, body ache and muscular pain, the rounded ball of cotton wool obtained from surface of stem and branches of *Cousinia thomsonii* Clarke and sometime whole cottony plant (*Leontopodium himalayanum* DC) is used in the form of aqua pressure to get relief from the ailment. The root of *Bistorta affinis* (D.Don.) Greene is consumed raw for throat irritation.

During the study it is observed that the tribal peoples of Spiti valley inherit a rich traditional knowledge and documentation of this knowledge provides novel

information from the area. However, this medicinal plant diversity is being constantly severely affected due to modernization, destruction of forests, urbanization, and overgrazing. Moreover, high percentage use of underground parts (root and rhizome) and whole plant use is, in fact, a negative note, as over extraction of underground parts and whole plant may badly affect the population status of the species. Furthermore, existing knowledge on traditional uses of medicinal plants is fast declining due to lack of interest of local youth. Therefore, in order to conserve medicinal plants and their use from becoming disappear, some management measures are to be taken jointly with the participation of local communities, via village administrative council etc. Most of the high altitude medicinal plant species have great importance in pharmaceutical industry of the country (Chauhan, 2011). Therefore, information regarding commercial use of medicinal plants may be disseminated among the local farmers. This would be a viable option of income generation as well as species conservation which can help to reduce the pressure on wild stocks. Thus, the present documentation of traditional knowledge will not only help in its conservation but could also be of great use from pharmaceuticals point of view.

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