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Traditional knowledge and use of medicinal plants: a case study from Joshimath block of Chamoli Uttarakhand

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Abstract

The rural communities living in remote areas of Uttarakhand, have their own way of living with in social and cultural moorings. Irrespective of their simplicity and complexity, these communities holds rich traditional knowledge on medicinal plants. The interviews were collected in local dialect to avoid translation problem. The interviews were conducted through structured questionnaires to obtain information on medicinal plants, including local name, name of the disease for which the plant is used and mode of preparation, part of the plant used etc.

A total of 53 plant species were recorded in the study area. Among the medicinal plants, the recorded species of trees, shrubs, herbs, lichens and fungi are 21, 5, 22, 2 and 3 respectively, belonging to fifty two genera of forty families. The most frequently used parts of ethno-medicinal plants, compiled with relevant literature were whole plant (26.42%), leaf and twig (16.98%), leaf and fruit (15.09%), fruit (13.21%), root and rhizome (9.43%), aerial parts, bark, root and flower (3.77% each) and followed by leaves and rhizome (1.89% each). The medicinal plants used to cure several ailments such as stomach ache, fever, cough, diarrhoea, dysentery, kidney problems, pain, wounds, cuts, insecticides, eye diseases, stop bleeding, abdomen pain, indigestion, antiseptic, healing foot cracks, mouthwash, blood diseases etc.

Keywords: Ethnomedicinal, Threatened, Traditional knowledge, plant part used

Introduction

The world's most important means of treating diseases and combating infections has been the use of medicinal plant species. From ancient times, medicinal plants have been rich sources of efficient and safe medicines (Russell *et al.*, 2006). Traditional herbal treatments have been a continuous source for the treatment of a variety of diseases (Kunwar *et al.*, 2010) [22] not for the human beings but also for domestic animals. According to Manadhar (2002) [24], traditional herbal medicine has been used since ancient times in many parts of the world and particularly in Indian and in Uttarakhand. According to Farnsworth, 2004 near about 85% of the traditional herbal medicines used for healthcare are resultant of medicinal plants. According to Health Canada (2001), 70% of the population in Canada use traditional herbal medicine from plants. Also, 47% of the population in England use traditional herbal medicine derived from plants (Thomas *et al.*, 2001) [39]. Moreover, in Latin America the WHO regional office for the Americas reports that 71% of the population in Chile and 40% of the population in Colombia use traditional herbal medicine (WHO, 2008) [42]. In India, the native people exploit a variety of herbs from the plants for effective treatment of various ailments (Verma *et al.*, 2007) [41]. The rural communities living in remote areas of Uttarakhand, have their own way of living with in social and cultural moorings. Irrespective of their simplicity and complexity, these communities holds rich traditional knowledge on medicinal plants. However, this knowledge orally passes on from one generation to the next; thus, have vulnerability to wiped out (Kala, 2005) [18]. Such traditional knowledge is often an important part of their cultural identity. However, traditional knowledge on the use of medicinal plants and the techniques of making many herbal formulations have declined over the past few decades due to lack of awareness and spread of allopathic medicines (Kala, 1998). Regions with less accessibility and a

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comparatively slow rate of development, such as mountainous areas like the Himalayas are excellent examples (Rao., 1996, Kala 2004) [31] of knowledge bank adopted by the local people regarding medicinal plants. With the passage of time the traditional knowledge system of primary health care of local communities in Uttarakhand is under great threat because of a number of factors including modernization, limitation of knowledge to older people and deforestation. The present study was conducted to understand the ethno – medicinal importance and conservation status of the plants in Uttarakhand. The study focused on the following: 1) the use and mode of preparation of medicinal plants by local inhabitants for various ailments, and 2) conservation status of medicinal plants in Uttarakhand and possible sustainable conservation measures.

Materials and methods

Details of study area

The present study was conducted in Joshimath block of Chamoli district of Garhwal Himalaya with elevation of 1360 to 2600 masl (Fig.1). The region has very rich biodiversity of plant and animal species with both subtropical and temperate forests.

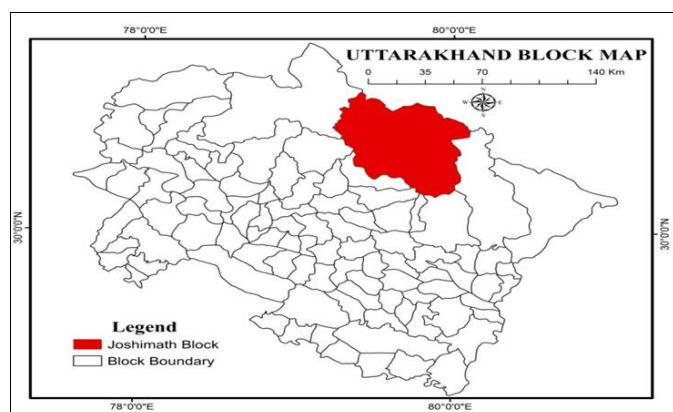


Fig 1: Map of the study area

Data collection

Ethnomedicinal inventory

Information on plants with ethnomedicinal uses was collected from the informants living in villages adjacent to the forest, after establishing oral prior informed consent in village meetings, about 10% of the inhabitants were interviewed about their dependence on the forest for various products especially medicinal uses. The informants were randomly selected and included men, women and children who regularly visited the forests. The interviews were collected in local dialect to avoid translation problem. The interviews were conducted through structured questionnaires to obtain information on medicinal plants, including local name, name of the disease for which the plant is used and mode of preparation, part of the plant used etc.

Result and discussion

A total of 53 plant species were recorded in the study area (Table). Among the medicinal plants, the recorded species of trees, shrubs, herbs, lichens and fungi are 21, 5, 22, 2 and 3 respectively (figure 2), belonging to fifty two genera of forty families (Figure 2). In terms of number of medicinal plants Rosaceae was dominant family (7 species, 6 genera) of medicinal plants followed by Poaceae, Ericaceae, Lamiaceae

and Ranunculaceae (Table 1). The most frequently used parts of ethno-medicinal plants, compiled with relevant literature were whole plant (26.42%), leaf and twig (16.98%), leaf and fruit (15.09%), fruit (13.21%), root and rhizome (9.43%), aerial parts, bark, root and flower (3.77% each) and followed by leaves and rhizome (1.89% each) (figure 3, table 1). According to different reports (a, b, c, d and e) ten plant species encountered have been classified as rare, endangered, critically endangered, near threatened or vulnerable (Table 1). *Aconitum heterophyllum*, *Arnebiabentharii*, *Angelica glauca*, *Betula utilis*, *Dactylorhiza hatagirea*, *Nardostachys jatamansi*, *Taxus wallichiana*, *Swertia chirayita*, *Picrorhiza kurroa* and *Zanthoxylum armatum* were recognized in threat category. The reported 53 medicinal plants used to cure several ailments such as stomach ache, fever, cough, diarrhoea, dysentery, kidney problems, pain, wounds, cuts, insecticides, eye diseases, stop bleeding, abdomen pain, indigestion, antiseptic, healing foot cracks, mouthwash, blood diseases etc. Root powder and extract of *Aconitum heterophyllum*, *Picrorhiza kurroa* and leaf of *Swertia chirayita* are useful against fever, *Rheum tibeticum* are used for pain and hidden wounds, leaves of *Thymus serpyllum*, *Origanum vulgare* are used for cold and cough, *Zanthoxylum armatum* for dental decay and pyorrhea and gum bleeding, *Berberis* species were used for jaundice and *Urtica dioica* is beneficial for sprain and low blood level, *Dactylorhiza* and *Ophiocordiceps* are used as rivitality (Table 1). The relationship between plants and people is connected through Ethnobotany (Khumbongmayum, 2005) [20], with rapid growth and developmental threat to the biodiversity is increasing at rapid speed, approximately 5000 species of animals and 25,00 plant species are currently listed as endangered, threatened, or at risk due to overexploitation (CITES, 2003) [5]. Uncontrolled developmental activities are causing a great loss to the biodiversity in the Indian Himalayan region, where medicinal plants in particular are declining at a very fast rate due to their over exploitation for trade (Samant *et al.*, 2007) [35], moreover, the excessive anthropogenic activities are the main cause of decline and availability of medicinal plants in the region (Dhar *et al.*, 2002, Dhyan and Kala, 2005) [9, 10]. There are many protected areas (PAs) across the Himalayan region with no single PA that has specifically established to ensure the conservation of medicinal plants. However, uses of plant species can change over a short period without initially affecting knowledge but generating long-run changes in knowledge. Researchers could use the gap between knowledge of plant uses and actual uses to study erosion of indigenous knowledge of plant uses. The knowledge of traditional medicines is intact in the region and they use this knowledge mostly for the daily use. However, the concern among the natives is that their ancestors were much skilled than them and used to keep all herbal medicines (*jadi-buti*) to cure contemporary health problems whereas, the present generation is being dependent on modern medicinal system. Albeit some dry herbal medicines are still available in their home and some are maintained in the home garden or kitchen where these herbs grow naturally. The traditional plant knowledge however is disappearing in many communities because of rapid socio-economic and cultural change. Therefore, the sustained use of this knowledge and its documentation is necessary.

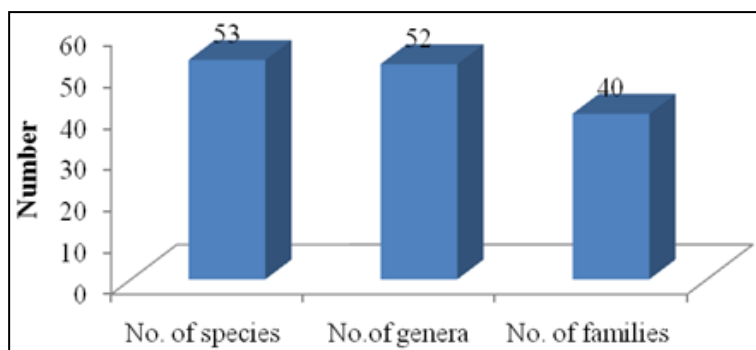


Fig 1: Total number of species, genera families of plants having medical values

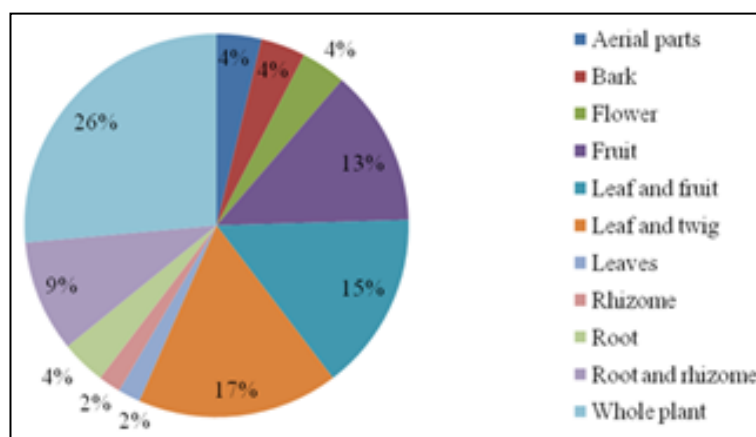


Fig 2: Percentage of plant parts use in preparing medicines for various ailments

Table 1: Plant species with their status and part used in different ailments

Species name	Family	Vernacular name	Habitat	Part Used	Status	Uses
<i>Aconitum heterophyllum</i> Wall. ex Royle	Ranunculaceae	Atis, Indian Atees	H	Roots	R ^b , Ce ^d , Vu ⁶ , E ^a	Roots powder and extract for curing fever and stomach ache ^[11]
<i>Acorus calamus</i> L.	Acoraceae	Bach, Sweet Flag	H	Rhizome		Extract of rhizome often used in gastric troubles of infants ^[2]
<i>Alnus nepalensis</i> D. Don	Betulaceae	Utees, Alder	T	Leaves		Bark used in local medicine ^[2]
<i>Angelica glauca</i> Edgew.	Apiaceae	Choru,	H	Root and rhizome	E ^{a,e}	Seeds and roots used by locals to add flavor of edible, root powder with milk given in bronchitis as well as in constipation ^[2]
<i>Arnebiabenthamii</i> (Wall. ex G. Don) Johns	Boraginaceae		H	Root	Ce ^{a,e}	Root extract mixed with mustard oil is taken orally as syrup and also applied externally as hair tonic, antiseptic, throat problem and fever ^[3]
<i>Berberis schitria</i> Buch.-Ham. ex Lindl.	Berberidaceae	Kingora	S	Whole plant		Bark yields dye, fruit edible, root extract in ophthalmia ^[2]
<i>Betula utilis</i> D. Don.	Betulaceae	<i>Bhojpatra</i>	T	Bark	E ^a , NT ^e	Extract/gum from stem/bark is applied externally during fever and body pain ^[3]
<i>Celtis australis</i> L.	Ulmaceae	Kharik	T	Leaf and twig		Bark paste applied on bones, pimples, joint pains ^[2]
<i>Cladonia cartilaginea</i> Müll. Arg.	Lecanoraceae	Jhula	L	Whole plant		Used as local medicine (present study)
<i>Cynodon dactylon</i> (L.) Persoon	Poaceae	Dubaghas	H	Whole plant		Whole plant paste is taken orally in dysentery, nose bleeding and anemia ³ Leaf extract is useful for control diabetes ^[10]
<i>Dactylorhiza hatagirea</i> (D. Don) Soó	Orchidaceae	Hattajari	H	Root and rhizome	Ce ^{a,e}	Tuber paste is taken orally to cure diarrhea, as an aphrodisiac and tonic ^[3]
<i>Debregeasia salicifolia</i> (D. Don) Rendle	Urticaceae	Syanru	T	Leaf and fruit		Plaster for Bone Fracture ^[2]
<i>Dioscorea pentaphylla</i> L.	Dioscoriaceae	Gajaria	H	Whole plant		Tubers are boiled and eaten ⁵ ; Leaf paste mixed with mustard oil is rubbed on the effected part to treat rheumatism ^[6]
<i>Dryopteris juxtaposita</i> Christ.	Dryopteridaceae		F	Leaf and twig		Plant used as an anthelmintic ^[8]
<i>Echinochloa colona</i> (L.) Link	Poaceae	Jharwa	H	Aerial parts		It cures ingestion ^[9]
<i>Ficus palmata</i> Forsk.	Moraceae	Bedu	T	Leaf and fruit		Fruits medicinal for digestive disorders, useful plant of agroforestry ^[2]
<i>Flacourtia indica</i> (Burm. f.) Merrill	Flacourtiaceae	Bilangra	T	Leaf and fruit		Decoction of fruits given in given hepatitis fever and diarrhoea ^[2]
<i>Geranium wallichianum</i> D. Don	Geraniaceae	Laljari/Ratanjot	H	Whole plant		Otorrhoea & ophthalmia ^[2] , Dysentery & cold ^[5]
<i>Gerbera gossypina</i> (Royle) G. Beauv.	Asteraceae	Kapasee	H	Whole plant		Cuts, wounds, plaster on bone fracture ^[2]
<i>Grewia optiva</i> J.R. Drummond ex	Tiliaceae	Bhimal	T	Leaf and twig		Fruits edible and medicinal use ^[2]

Burret						
<i>Hedychium spicatum</i> Buch-Ham. Ex Smith	Zingiberaceae	Banhaldu	H	Whole plant		Rhizome extract is taken orally in asthma and bronchitis ^[3]
<i>Imperatocylindrica</i> (L.) P. Beauv.	Poaceae	Sirau	H	Aerial parts		Root is used as tonic ^[14]
<i>Juglans regia</i> L.	Juglandaceae	Akhort	T	Bark		Paste of oil and bark powder is useful during pregnancy, twig is used for cleaning teeth, curing pyorrhoea ^[3]
<i>Lyonia ovalifolia</i> (Wallich) Drude	Ericaceae	Anyar	T	Leaf and twig		Seed paste is applied on wounds and Boils ^[14]
<i>Morchella esculenta</i> Fr.	Morchellaceae	Guchchhi	F	Whole plant		Used in anti-inflammatory and antitumor ^[22]
<i>Myrica esculenta</i> Buch.-Ham. ex D. Don	Myricaceae	Kaphal	T	Leaf and fruit		Fruit juice mixed with salt is taken to relieve headache, body ache and also used as tonic ^[3]
<i>Nardostachys jatamansi</i> (D. Don) DC.	Caprifoliaceae	Masi	H	Root and rhizome	E ^a	Root powder paste mixed with refined fat or oil is taken orally during heart disease, high blood pressure and insomnia ^[3]
<i>Neolitsea pallens</i> (D. Don)	Lauraceae	Bilaru	T	Leaf and twig		Oil extracted from fruits used in scabies and eczema ^[2]
<i>Ophiocordyceps sinensis</i> (Berk.) Sung, Sung, Jones & Spata.	Ophiocordycipitaceae	Kidajadi	F	Whole plant		Used as a tonic and used for the sexual stimulant ^[18] , Used for vitality and to cure stomach ailments ^[19]
<i>Origanum vulgare</i> L.	Lamiaceae	Bantulsi	H	Leaf and twig		Bronchitis, colic & diarrhoea ^[2] , Toothache, swelling ^[12]
<i>Paeonia emodi</i> Wall. ex Royle	Paeoniaceae	Chandra	H	Leaf and twig		Whooping cough, diarrhoea, intestinal spasms ^[2] , Uterine diseases ^[12]
<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Amla	T	Fruit		Fruits eaten raw or pickled, rich source of vitamin C, one of the ingredient of Trifala ^[2]
<i>Picrorhiza kurroa</i> Royle ex. Benth	Plantaginaceae	Kutki	H	Root and rhizome	E ^a	Dried root decoction along with black paper and honey is useful in fever, stomachache, jaundice and dysentery ^[3]
<i>Pinus roxburghii</i> Sarg.	Pinaceae	Chir	T	Fruit		Asthma & Bronchitis ² , Resin for cracked toes ^[13]
<i>Prinsepia utilis</i> Royle	Rosaceae	Bhainkal	S	Fruit		Seed is used in rheumatic pains, root bark in diarrhoea ^[14]
<i>Prunus armeniaca</i> L.	Rosaceae	Chuli	T	Fruit		seed oil edible and also used medicinally in fever and massage in body pain ^[2]
<i>Prunus persica</i> (L.) Batsch.	Rosaceae	Aaru	T	Fruit		Infusion of leaves and bark used to relieve cough and bark ^[2]
<i>Pyracantha crenulata</i> (D. Don) M. Roemer	Rosaceae	Ghingaru	S	Leaf and fruit		Prophylactic and therapeutic treatment with juice and alcohol extract of fruit may reduce precipitation of calcium oxalate, with improvement of kidney function as well as cytoprotective effect ^[16]
<i>Pyrus pashia</i> Buch.-ha. ex D. Don	Rosaceae	Mehal/Melu	T	Fruit		Paste applies in skin disease ^[11] , Digestive disorder ^[2] , ³ , Astringent, Laxative, Anthelmintic, Febrifuge ^[4]
<i>Quercus leucotrichopora</i> A. Camus	Fagaceae	Banj	T	Leaf and twig		Gum is used for gonorrhoeal and digestive disorders ^[14]
<i>Rheum tibeticum</i> Maxim. ex Hook. f.	Polygonaceae	Dolu	H	Root and rhizome		Fresh young stems are used as vegetable during the summer days acting as mild laxative relieving constipation ^[23]
<i>Rhododendron arboreum</i> Smith	Ericaceae	Buransh	T	Flower		Flower and bark used for digestive and respiratory disorders ^[14]
<i>Rosa damascena</i>	Rosaceae	Himrose	S	Flower		Used in the pharmaceutical, flavours, and fragrance industries ^[24]
<i>Rubus ellipticus</i> Smith	Rosaceae	Hisalu	S	Leaf and fruit		Whole plant used in Diarrhoea ^[11]
<i>Sapindus mukorossi</i> Gaertn.	Sapindaceae	Ritha	T	Leaf and fruit		Expectorant, antiepileptic, Emetic, febrifuge & Dental cares ^[13]
<i>Swertia chirayita</i> (Wall.) Cl.	Gentianaceae	Chirata	H	Whole plant	E ^{ce} , Vu ⁶ , Ce	Malaria ^[2] , Blood purifier ^[12]
<i>Taxus wallichiana</i> L.	Taxaceae	Tuhuner	T	Bark	Ce ^{a,e}	Plaster on fractured bones Headache ^[2] & Breast Pile ^[12]
<i>Thalictrum foliolosum</i> DC.	Ranunculaceae	Mameri	H	Whole plant		The decoction of the said rhizome is been used by the Naga tribe in curing fever since ancient times ^[21]
<i>Thymus serpyllum</i> auct. non L.	Lamiaceae	Ban ajwain	H	Whole plant		Flavouring agent is also eaten for stomach ailments ^[17]
<i>Urtica dioica</i> L.	Urticaceae	Sisuna / Bichchhu	H	Leaf and twig		Applied in body cramp and external pains ^[11]
<i>Usnealongissima</i> Ach.	Parmeliaceae	Jhula	L	Whole plant		Used in Unani System of Medicine to treat wounds and inflammatory diseases and presently reported as antibacterial, expectorant and immune strengthener ^[20]
<i>Valeriana jatamansi</i> Jones	Valerianaceae	Samewa/Sumaya	H	Whole plant		Roots and stems are used for havan (incense) ^[17]
<i>Zanthoxylum armatum</i> DC.	Rutaceae	Tumuru	T	Leaf and fruit	Vu ^{c,e}	Mouth wash ^[2] , seed paste and twigs /bark is used for teeth cleaning, toothache and pyorrhoea ^[3]

Abbreviation Habitat: T= Tree, S = Shrub, H = Herb, F = Fungi, L = Lichen,

Status: R = Rare, Vu = Vulnerable, Ce = Critically Endangered, E = Endangered, NT = Near Threatened.

Superscript: ^(a) = Kumar, 2017, ^(b) = Red Data Book (IUCN, 1993), ^(c) = Gaur 1999, ^(d) = National Medicinal Plant, ^(e) = Uniyal. 2014

Board (NMPB, 2003), ¹ = Uniyal, *et al.*, (2006), ² = Gaur (1999), ³ = Semwal, *et al.*, 2007, 4 = Borthakur, 5 = Kulkarni *et al.* (1993), 6 = Rahman *et al.* (2007), 7 = Liu *et al.* (2012), 8 = Joshi *et al.* (2011), 9 = Zereen *et al.* (2013), 10 = Dangwal (2015), 11 = Bhawana 2014, 12 = Singh & Rawat 2011, 13 = Joshi *et al.* (1=2010), 14 = Munesh Kumar *et al.* (2011a), 15 = Munesh Kumar *et al.* (2011b), 16 = Bahuguna *et al.* (2009), 17 = Thakur *et al.* (2014), 18 = Devkota (2006), 19 = Garbyal *et al.* (2004), 20 = Rauf *et al.* (2011), 21 = CL. Ringmichon* and Bindu Gopalkrishnan (2014), 22 = Nitha *et al.* (2007), 23 = KHAN *et al.* (2011), 24 = Pal and Singh (2013).

Conclusion

The results of the study indicate that medicinal plants are used frequently by local people in the region. Some of the plants

are already under threat because of over exploitation; including conversion of forest into agricultural land etc. the majority of the population seems to be unaware of the threat

to the medicinal plants growing in the wild. Therefore efforts should be made to conserve and preserve the threatened species and also effort should be made to document the traditional knowledge.

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