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Ethnomedicinal investigation of medicinal plants from tribal communities of Uttarakhand

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Abstract

Medicinal plants come under Non timber forest product (NTFPs), which play a significant role in livelihood making of local traditional healers of Uttarakhand. In addition to the items of basic need, the forest also provides life-giving NTFP medicines to the natives to cure from different disease as well as economic benefits. This study has been done to document medicinal plants from different areas of Uttarakhand. In which Mana village and Niti Valley of Chamoli district, Munsiyari in Pithoragarh and Harsil, Taluka in Uttarkashi were included, where different tribal peoples are directly dependent on the forests for their basic needs. Even today NTFPs are collected from the forests by the tribal people and sold in the local markets for sustenance. The present paper provides information on the use of indigenous knowledge of medicinal plants for the prevention of various diseases by people in tribal pockets.

Keywords: Ethno medicinal plants, traditional knowledge system, ethno botany, NTFP

1. Introduction

Ethno-botany is the study of plants that use by native peoples and how plants are utilized for edible purpose, timber, firewood, ornaments, and medicines. The purposes of ethno botany are to report, document, and preserve the indigenous knowledge of plants (Munir *et al.* 2022) ^[15]. The traditional knowledge of herbal plants is important part of primary health care system in almost every society, especially the remote locations. These areas, one of the key storehouses of indigenous knowledge are under the constant risk of losing this valuable knowledge as it passes from one generation to another through word of mouth (Khajuria *et al.* 2021) ^[9]. According to Agarwal and Ghosh, (1985) ^[1] out of 2000 drugs used in therapeutic of humans in India, 75% medicines are herbal plant based. Plant based medication are easily available, low cost and have wider acceptance within the people along with minor side effects in comparison to advance drugs (Gumisiriza *et al.* 2019) ^[7]. That is why; more than 60% rural people still depends on the indigenous medicinal system in India. The hilly region of the Himalaya is settled by different tribal communities and among these the Bhotiyas and Jad mostly live in the high-altitude areas of Uttarakhand state in India and seasonally migrate for livestock (Phondani *et al.* 2010) ^[19]. In the border areas of Uttarakhand, even today, various incurable diseases are treated by the tribal people on the basis of traditional knowledge. In many area of Uttarakhand, NTFPs are known as a component of traditions, identity, mythologies and religious practices, and tribal peoples still have a wealth of information concerning how to use indigenous flora for edible and other purposes. Folk knowledge held by various indigenous tribes has proven to be exceptionally precious in resource collection, utilization and protection. With the leading technologies and modern way of living, indigenous knowledge on herbal plant resources is degrading. The loss of traditional information in a rapidly shifting culture is as reversible as the disappearance of plant communities. As a result, efforts should be made to document indigenous knowledge and customs before they are entirely vanished.

2. Methodology

2.1 Study area: This study has been done at the remote border areas of Uttarakhand. In which Mana village and Niti Valley of Chamoli district, Munsiyari in Pithoragarh and Harsil, Taluka in Uttarkashi are included. Locations of Study area are given in the table 1.

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Table 1: Study area

S. N.	Study Area	Location	
1.	Taluka	N-31°04'573"	E-078°14'913"
2.	Harsil	N-31°02'36.9"	E-078°44'531"
3.	Mana	N-30° 44' 35. 91"	E-79° 29' 37.56".
4.	Niti	N-30°77'76.0"	E-79°84'12.8"
5.	Munsiyari	N-30°04'17.46"	E-080°14'14.42"

**Fig 1:** Map of study sites

2.2 Selection of Study Sites: A reconnaissance survey of the study sites were conducted through field trips during summers and winter season from August, 2021 to December 2022. The study sites were chosen on the basis of availability of tribal inhabitants (Assefa *et al.* 2021) [3].

2.3 Ethno botanical Data Collection: The informers included old people, local Vaidyas and also the middle age people venders, pavements and local healers of the study site to document and record their traditional and cultural knowledge, about the medicinal plants. Throughout the survey, information was collected on the basis of prepared 7 questionnaire viz., Botanical Name, local name, family, mode of formulation, parts used, medicinal and ethnobotanical uses, etc. Standard guideline was followed for the gathering of plant materials, mounting, preparation and maintenance of plant parts as known herbarium practices. For the course of investigation field trips were carried out to the respected area during summer and winter season from August 2021 to Dec, 2022. During the course of the study, all possible attempts were made to cover all the study area. Appropriate methodology was used to obtain possible information about the ethno-botanical uses of different plants from the local population. The information was obtained from the people by using a legal questionnaire. The local herbal healers were

mostly consulted during the course of study. The aim of this study was to gather and find out the plants used for remedial purposes by local communities and to document information on indigenous herbal medicine.

3. Results and Discussion

Some important medicinal non-timber forest products (NTFPs) available in this region are *Betula utilis* (Bhojpatra), *Angelica glauca* (Choru), *Valeriana jatamansi* (Masi) *Allium stracheyi* (Faran), *Taxus wallichiana* (Thuner), *Saussurea obvallata* (Brahm kamal), *Swertia chirata* (Cherata), *Picrorhiza kurroa* (Kutki), *Rhododendron arboretum* (Burans) *Hippophae rhamnoides* (Seabuckthorn), *Berberis* spp. (Kilmora), *Aconitum heterophyllum* (Atis) *Cordyceps Sinensis* (Kida Jadi), *Rheum australe* (Dolo), *Bergenia ciliata* (Pashanabhed), *Zanthoxylum armatum* (Timur), *Potentilla fulgens* (Bajradanti), *Viola serpense* (Banafsha), *Dactylorhiza hatagirea* (Salam-panja) *Jurinea macrocephala* (Guugal, Dhuup) etc. 4 tree species, 14 Herbs, 2 shrubs, 1 Insect was identified for use as a medicinal properties used by local people of this area. Raw drugs are collected by the tribe from the local forests and alpine pastures of high-altitude area in Mana and Niti valley (Chamoli), Taluka & Harsil (Uttarkashi) and Munsiyari in Pithauragarh district of Uttarakhand.



Fig 2: Interaction with local tribal people of the study area

Several works have thrown some light on the indigenous medicinal knowledge in Uttarakhand. However, still there are various areas and plant species which remain undocumented. In the remote border areas of Uttarakhand, NTFP is the main resource of livelihood of tribes, and are utilized by those who have little alternative way in to other economic activities. The present work has been done keeping in view the paramount importance of NTFP. Some important NTFP species present in five study sites (Niti valley, Mana, Taluka, Harsil, Munsyari) are collected from local bhotiya and Jad tribal people is given below-

Betula utilis (Vernaclar name Bhojpatra) belongs to the family Betulaceae. The bark of Bhojpatra was used long ago in India as manuscript for writing long-lasting scriptures and Sanskrit texts and other scripts. The leaves of the plant show efficiency in therapy of urinary problems in bladder and kidney stones (Singh *et al.* 2012) ^[24]. In Munsyari its peeling outer bark is also used as a havan samagri.

Angelica glauca (Vernaclar name Choru) belongs to family Apiaceae. This species was found to be traditionally used for post-delivery weakness, nausea, dyspepsia, acidosis, stomach pain, irritation, dysentery, cold, loss of appetite and asthma in human being (Butola and Vashistha, 2013) ^[5]. The root of choru used as a cough syrup, 2-3 *Angelica* roots boil in a quart of water, addition of sufficient honey use to make it a syrupy consistency. Two tablespoons up to 3 times per day have been use by local people for relief of cough and congestion.

Nardostachys jatamansi (Vernaclar name Jatamansi, Masi) belongs to family Valerianaceae. Masi is an endemic high-altitude Himalayan medicinal herb that has been usually

known as “Jatamansi”. The roots and the rhizomes of masi, as have been used by local tribes in different herbal formulations include nutritional supplements, also used to treat epilepsy, panic, syncope, convulsions, and psychological problems (Pandey *et al.* 2013) ^[14]. Various studies review the potential of *N. jatamansi* as a memory enhancer. The investigational studies performed on Jatamansone showed different properties like antihypertensive, anti-estrogenic, antiarrhythmic, anti-asthmatic, nematocidal and antiseptic activity. (Thakur *et al.* 2021) ^[25]

Allium stracheyi (Vernaclar name Faran, Jambu) belongs to family Amaryllidaceae. Allium species are antibacterial, antifungal, antihelminthic, antidiabetic, anti-thrombotic in nature and have been used as remedies for human diseases as they contain therapeutic values (Samal *et al.* 2010) ^[22]. Traditionally it is used as a vegetable and for the healing of asthma, jaundice, cold and stomach troubles.

Taxus wallichiana (Vernaclar name Thuner, Himalayan yew, Lweta) belongs to family Taxaceae. It is a medium-sized tree found in Himalayan temperate forest having medicinal importance. In India, this evergreen species is distributed at altitudes between 1800 and 3300 m above mean sea level (MSL) (Juyal *et al.* 2014) ^[8]. Thuner has a significant history of its practice in the traditional system of medicine. Dry crush of bark is mixed with salt, spoonful ghee and cup of water use to make a nankeen tea. It is consumed as decoctions, juice and herbal tea for treating cold, cough, respiratory problems, dyspepsia, and epilepsy. Its importance is described in Unani and Ayurvedic remedy. It received attention recently due to leaves and bark was found to be the prime source of taxol, a effective anticancer drug. Due to overexploitation, the species

are now in danger of extinction.

Saussurea obvallata (Vernacular name Brahm kamal) belongs to family Asteraceae. Its flowers bloom in mid of monsoon (July-August) amongst the rocks and meadows of the alpine zone at an altitudinal range of 3700-4600 m. Brahm kamal is traditionally used for the healing of paralysis, wounds, bruises, cerebral ischemia, liver disorders, bone-ache, cuts, cough, intestinal and urinal troubles. *S. obvallata* is used to reduce body temperature and also to boost appetite. The decrease in the liver inflammation can be done by the consumption of Soup made from this plant. The underground roots acts as a remedial agent in wounds, swelling, pain, boils and skin problems. (Sakthivel *et al.* 2019) ^[21]

Swertia chirata (Vernacular name Cheraita Anaryatikta, Bhunimba, Chiratikta, Kairata) belongs to family Gentianaceae. Cheraita is a well-known medicinal plant native to the temperate Himalayas is used as a traditional medicine to treat several ailments such as liver problems, diabetes, and malaria. It is also reported to have a large spectrum of pharmacological properties. Leaves and stems of *S. chirata* are crushed, steeped in 250ml of water over night, then filter and drunk to treat diabetes. The whole plant of *S. chirayita* have been reported to be used for the treatment of antifungal and antibacterial activity (Laxmi *et al.* 2011; Kumar and Staden, 2016) ^[13, 12].

Picrorhiza kurroa (Vernacular name Kutki) belongs to family Scrophulariaceae distributed in Himalayan zone from 3500 m -4500 m altitude. The roots are harvested time from October to December. The active constituent of *P. kurroa*, known as kutkin, is a combination of picroside and kutkoside. Kutkin has shown hepatoprotective properties pharmacologically. (Almeleebia *et al.* 2022) ^[2]. It is also a well-known plant in the Ayurvedic medicine. It is used as a traditional remedy for fever by Bhotiya tribal communities of Niti valley in Central Himalaya and also cure disorders of the liver and upper respiratory tract, decrease fevers, and to treat indigestion, scorpion sting and chronic diarrhea. 5gm of root is crushed, steeped in a copper pot with 250ml of water over night, then clean and drunk to treat diabetes.

Rhododendron arboreum (Vernacular name Burans) belongs to family Ericaceae distributed between 1500-3500m. Burans possess various therapeutic properties in the treatment of diarrhea, dysentery, irritation, detoxification, bronchitis, fever, asthma and constipation. The leaves, flowers and roots of the tree have been possess several medicinal properties and are used in the treatment of conventional and modern system of medicines (Swamidasan *et al.* 2020) ^[24]. The blooming petals of *Rhododendron* used for the preparation of valuable food products like buransh squash, jam and jelly.

Hippophae rhamnoides (Vernacular name sea buckthorn, Amesh) belongs to family Elaeagnaceae. The leaves and flowers are used in gastrointestinal problems, arthritis, gout and rashes. Its fruits are also used to stop infection and increase immune function. It also helps to cure cuts/injuries from burns, acne, skin problems (Zakynthinos And Varzakas, 2015) ^[28]. Berries processed to make juice and used as flavoring agent. Traditionally decoction of ripen fruit juice is mixed with 1 spoonful of sugar and 30-40gm of finger millet (*Eleusine coracana*) are consume to treat cough and cold. (Phondani *et al.* 2010) ^[19].

Berberis species (Vernacular name Kirmor) belongs to family Berberidaceae. It is a highly valuable medicinal shrub used in folklore medicine and generally used to treat different

diseases, such as diabetes mellitus, liver problems, bone fractures, abdominal pain, skin oral ulcers, diseases, conjunctivitis, piles, leprosy, jaundice and rheumatism (Shahid *et al.* 2009) ^[23]. Furthermore, the ripen fruits are edible. The dry root bark water extract is used against scabies, bone fracture, diabetes and pustules. 5 gm of crushed dried root steeped in 250ml of water over night, then filter and consumed as a remedy to treat diabetes (Phondani *et al.* 2010) ^[19].

Aconitum heterophyllum (Vernacular name Atis, Ativish) belongs to family Aconitaceae. *Atis* is an essential component in many traditional systems of medicine. Mostly, it is collected for its roots, and its therapeutic properties are due to the presence of various bioactive secondary metabolites, usually known as aconites. In traditional system of medicine, its tuberous roots are used for treating indigestion, abdominal pain diarrhea and diabetes. The plant is normally harvested for its tubers, and during its harvesting, the whole plant is uprooted. Further, the species is in danger by illegal collection and selling. *A. heterophyllum* has significant market demand on account of its marketable use as “Ativisha” in the Ayurvedic remedial system. (Wani *et al.* 2022) ^[27].

Cordyceps Sinensis (Vernacular name Kida Jadi) belongs to family Ophiocordycipitaceae. It is an association of a caterpillar and fungus which found mainly in alpine meadows above 3,800 m. Kida jadi for “all illnesses” as a stimulant, because it improves power, appetite, endurance and sleeping patterns (Panda *et al.* 2011) ^[16].

Rheum australe (Vernacular name Dolo) belongs to family Polygonaceae. Dolo use as a remedial herb since ancient times in diverse traditional systems of medicine to cure a wide variety of ailments associated to the digestive, circulatory, respiratory, endocrine and skeletal systems as well as to treat different infectious diseases. Its root is usually regarded as an expectorant and appetizer. Also traditionally used for wounds, cuts, muscular swellings, mumps and tonsillitis etc. Dried roots and rhizomes are the major parts used as drug and are collected in October to November. Pills of *Rheum australe* made from powder roasted with oil are given to cure Asthma/bronchitis. Its rhizome paste mixed with turmeric powder and fat is used to treat body/muscle pain. (Pandith *et al.* 2018) ^[17].

Berginia ciliate (Vernacular name Patharchatta, Pashanabhed) belongs to family Saxifragaceae. Rhizomes and roots of *Berginia ciliate* have been used for treating kidney and gall bladder stone. Minor burns or wounds heal within a week treating with rhizome paste of *Berginia*. The paste can be useful on setting of dislocated bones, or consumed to treat diarrhea or along with honey in shivering condition. (Koul *et al.* 2020) ^[10].

Zanthoxylum armatum (Vernacular name Timur, Temru) belongs to family Rutaceae. Dried fruit Powder of timur with *Mentha longifolia* dried leaves and black salt is used with water during cholera and dyspepsia. Younger branch or twigs are used as tooth brush. The mature fruits are also used as flavoring agent and condiments in traditional dishes preparation. The bark is utilized as traditional dye producing source. (Bhattacharjee *et al.* 2019) ^[4].

Potentilla fulgens L (Vernacular name Bajradanti) belongs to family Rosaceae. It grows in rocky habitat elevation of about 1800-4000m above sea level. The green root strip extract of bajradanti is consumed by local inhabitants to get rid of intestinal parasitic infections; also, the tap root of the herb is

usually chewed along with betel nut (*Areca catechu*) and betel leaves (Piper betel) for various other ailments. The plant extract is also having antioxidant and anti-diabetic properties. (Roy *et al.* 2010) [20].

Viola serpens (Vernicular name Banafsha) belongs to family Violaceae. It is distributed throughout temperate Himalayan zone. The whole plant having diaphoretic, antipyretic, aperients, diuretic, antipyretic, and febrifuge properties. It is used as a single medicine or as a constituent in various formulations viz. decoction, infusion, syrup, confection, semisolid preparations, pill and oil. Its flower is generally used as a therapy for coughs and sore throat, tonsillitis and hoarseness. (Chandra *et al.* 2015) [6]. It is also very helpful in blood loss piles, constipation and fever, nuisance and skin diseases.

Jurinea macrocephala (Vernicular name Guugal, Dhuup) belongs to family Asteraceae distributed in western Himalaya. Dry roots are used during religious practices for essence. Root decoction is consumed once per day to treat cough and cold. Roots are used as a stimulant and use to treat colic or fever after child birth. It is also used in Niti and mana villages with *Jatamansi* root during religious rituals called havan similar to its use in this study as ceremonial incense.

Dactylorhiza hatagirea (Vernicular name salam-panja) belongs to family Orchidaceae. it is generally spread at an altitudinal ranges between 2500 to 5000 m amsl in grassy slopes and alpine meadows. It is normally used to cure dysentery, diarrhea, chronic fever, cough, indigestion, wounds, cuts, burns, fracture and weakness, particularly in debilitated women after delivery and to increase regenerative fluids. In Uttarakhand salam panja paste is used in bone fracture. The tubers of *D. hatagirea* produce a high quality 'Salep' which is mainly used in local medicine as neuro-tonic for its astringent and aphrodisiac property. (Pant and Rinchen, 2012) [18].

Arnebia benthamii (Vernicular name Balchadi) belonging to family Boraginaceae, a distinctive hairy perennial plant. It is found in the Himalayan region at an altitude range from 3000-4300 m. Within India, it is distributed in, Himachal Pradesh, Jammu & Kashmir and Uttarakhand. (Kumar A and Srivastava, 2014) [11]. They are used in coloring matter in hair oil. Used in fever and also in dyeing. Pest of roots made in water is applied to wounds and burns.

The herbs given by the people of Bhotia community of Niti valley & Munsyari and Jad tribal people of Harsil in Uttarkashi are effective for the diagnosis and treatment of various diseases. Medicines are given according to age and health condition of the patient. Most of the drugs are given in raw form or with some auxiliary drug. List of some species of this area and their part used are given below:



Fig 3: *Allium humile* plant & dry leaf



Fig 4: *Saussurea obvallata* flower



Fig 5: *Picrorhiza kurroa* plant and rhizome



Fig 6: *Hippophae rhamnoides* plant



Fig 7: *Rhododendron arboretum* plant and flower



Fig 8: *Berberis species*



Fig 9: *Aconitum heterophyllum*



Fig 10: *Cordyceps sinensis*



Fig 11: *Rheum austral* plant and root powder



Fig 12: *Nardostachys jatamansi* plant & Rhizome



Fig 13: *Zanthoxylum armatum* plant and seeds



Fig 14: *Angelica glauca*



Fig 15: *Arnebia benthamii*



Fig 16: *Betula utilis* plant & Bark

Table 2: List of ethnomedicinal plants used by local inhabitants

Common Name	Botanical Name	Habit	Family	Part Used
Bhojpatra	<i>Betula utilis</i>	Tree	Betulaceae	Bark
Thuner, or Lweta	<i>Taxus wallichiana</i>	Tree	Taxaceae	Leaves/ Bark
Burans	<i>Rhododendron arboretum</i>	Tree	Ericaceae	Flower
Seabuckthorn, Amesh	<i>Hippophae rhamnoides</i>	Tree	Elaeagnaceae	Fruits, Seeds
Timur, Temru	<i>Zanthoxylum armatum</i>	Shrub	Rutaceae	Whole plant
Kilmora	<i>Berberis Species</i>	Shrub	Berberidaceae	Root
Choru	<i>Angelica glauca</i>	Herb	Apiaceae	Root
Jatamansi or Masi	<i>Valeriana jatamansi</i>	Herb	Valerianaceae	Root
Faran, or Jambu	<i>Allium stracheyi</i>	Herb	Amaryllidaceae	Leaves
Brahm kamal	<i>Saussurea obvallata</i>	Herb	Asteraceae	Flower
Cheraita or Bhunimba	<i>Swertia chirata</i>	Herb	Gentianaceae	Whole plant
Kutki	<i>Picrorhiza kurroa</i>	Herb	Scrophulariaceae	Whole plant
Atis, Ativish	<i>Aconitum heterophyllum</i>	Herb	Aconitaceae	Root/ Flower
Dolo	<i>Rheum australe</i>	Herb	Polygonaceae	Root
Patharchatta	<i>Berginia ciliate</i>	Herb	Saxifragaceae	Root
Bajradanti	<i>Potentilla fulgens</i>	Herb	Rosaceae	Root
Banafsha	<i>Viola serpyllifolia</i>	Herb	Violaceae	Whole plant
Balchadi	<i>Arnebia benthamii</i>	Herb	Boraginaceae	Roots
Guugal, Dhuup	<i>Jurinea macrocephala</i>	Herb	Asteraceae	Root
Salam-panja	<i>Dactylorhiza hatagirea</i>	Herb	Orchidaceae	Tuber
Kida Jadi	<i>Cordyceps sinensis</i>	Insect with fungus	Ophiocordycipitaceae	Whole

Conclusions

Traditional information on herbal medicinal plants in many communities is vanishing because of rapid cultural and socioeconomic changes that are taking place. 21 medicinal plant species are identified from the study sites. Documentation of the knowledge from herbs used by Bhotia tribe, Jad tribe is very important for future generation and promotion of Ayurveda for the treatment of different chronic diseases. Appropriate techniques for effective benefits sharing of potential value of this knowledge need to be developed.

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