



# Ethnobotanical Study of Medicinal Plants among Local Tribes of Rajaji Tiger Reserve Haridwar

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**Abstract:** Ethnobotanical study had been conducted during 2019-2021 in Chilla range (S1) and Chandi Devi Hills (S2) in Rajaji tiger reserve during the survey through personal interview, group discussion and questionnaire with informants. A total of 68 plant species belonging to 32 families collected, identified and documented with associated traditional knowledge.

**Keywords:** Ethnobotany, Medicinal plants, Traditional knowledge, Tribals, Haridwar

Medicines prepared with ethnobotanical knowledge plays a vital role to cure the variety of diseases in human. According to WHO, 80% of world population mainly depend on traditional medicine system. In India, almost 70% of the people in rural areas depends upon Ayurvedic system and medicinal plants to meet their primary health care needs (Sharma et al 2020). This indigenous knowledge of plants having medicinal values is learnt by them from their ancestors and mostly transfers from one generation to next orally and verbally (Sharma et al 2021). The oral and verbal method of moving this treasured ethnic knowledge is highly vulnerable to diminished with the ongoing passage of time and generations. Ethnobotanical studies disclosed that traditional knowledge is still in extensive use in different regions of Himalayas particularly among the old aged people, tribes and traditional medicine healers. Utilization of plants as a source of medicine has been inherited from generation to generation and is an important component of health care system in India. Due to remoteness and inaccessible areas, the local community largely depends on these medicinal plants (Sharma et al 2020). Due to extensive exploitation the plants are on the verge of extinction and so conservation is must for these plant species. Some plant species of high medicinal values require further phytochemical and pharmacological studies (Sharma et al 2020). Therefore, the aim of the present study was to documentation of traditional knowledge and study of medicinal plants used by the local inhabiting community of Chilla range and Chandi Devi hills of Shyampur range of Rajaji Tiger reserve in Haridwar, Uttarakhand.

## MATERIAL AND METHODS

**Study area:** The study was investigated in Chilla range and

Chandi Devi hills of Shyampur range in Haridwar. It is situated at foot hills of Shivalik or sub-Himalayan ranges (Fig. 1). Chandi Devi hills are located between latitude 29.9338° N and longitude 78.1805°E; Chilla Forest range are located between latitude 29.9450°N and longitude 78.2260° E. Winter season start from November to February when the days are pleasant (20-25°C), nights cold and humidity is low. Temperature rises rapidly to 40-45°C in the summer season (March to June) and rainfall increases with the occasional thunderstorm. Humidity is high in the rainy season (July to October). Annual rainfall ranges from 1200-1500mm. Soils are generally poor and infertile, with accumulation of humus at few places. Chandi Devi Hills is situated between Bilvaand Neel Parvat. It comprises a total of 510-hectare forest reserve in Shyampur range and situated on the eastern bank of river Ganga on national highway. The Chandi Devi hill is one of the sacred grooves of Uttarakhand due to the temple of Goddess Chandi. The vegetation of the areas is classified under the northern tropical dry deciduous forest type. This region is a mixed forest and is very rich in medicinal plants.

**Ethnobotanical field survey:** The survey of the selected sampling zones was conducted on monthly basis in each zone from January 2020 to May 2021. The actual information was gathered by conducting interviews, group discussions and questionnaires, we had covered all the Deras of Gujjars and collected information also from local inhabitants such as Garhwali and Kumauni people. The information collected included common diseases, local name of plant species, habit, wild/cultivated, plant part used, ethnomedicinal use, method of preparation and mode of administration of drugs.

**Collection and identification of medicinal plants:** Field surveys of the selected sampling zones were scientifically

planned and carried out monthly. The proper field number was assigned to each collected sample specimen for identification purposes. Plant voucher samples along with more than 250 digital photographs were taken during the field investigation and samples were processed following herbarium techniques proposed by Jain and Rao (1977). Twenty deras in localities were visited to complete the questionnaires prepared for the survey and data analysis. Hakim, Vaid, medicine men and herdsman were consulted for investigation. People of age group between 15 and above years (including male & female) were consulted during the survey. The ethnobotanical information was collected from the experts and well experienced herbal practitioner, local faith healers and traditional medicine men. The plants were also identified with the help of standard flora of Himalayas. The identified medicinal plants were confirmed by consulting the herbaria of different standards keys like “Flowers of the Himalaya”, Flora Britannica and Flora of Haridwar. The herbarium was deposited to the Department of Botany and Microbiology, Gurukula Kangri (Deemed to be University) Haridwar.

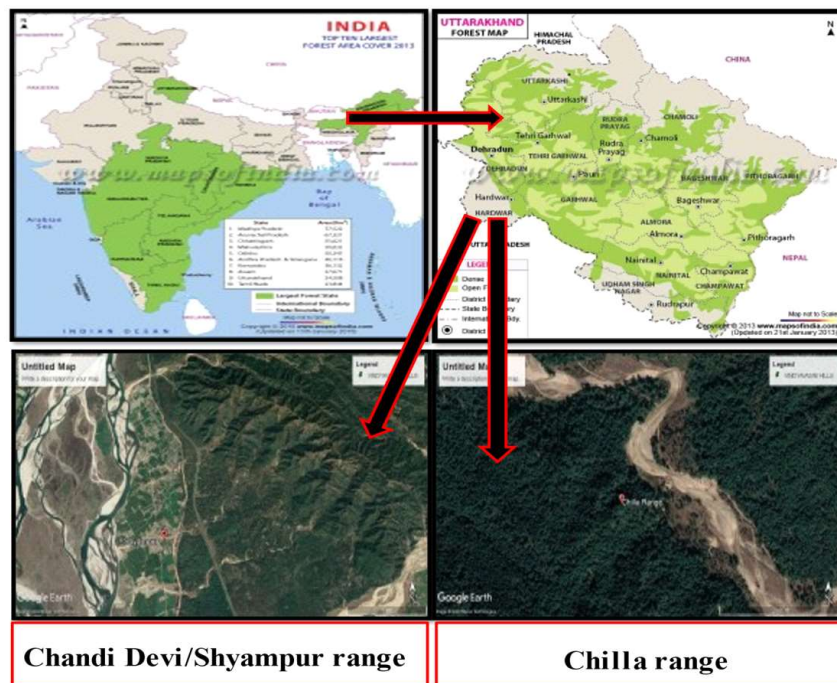
**RESULTS AND DISCUSSION**

During the field survey a total of **68** plants from **32** families had been collected, identified and their traditional uses have been recorded. A total of 23 plant species from Chilla range like *Acacia catechu*, *Albizia lebbeck*, *Bombax malabarica*,

*Centella asiatica*, *Catharanthus roseus* and 14 plant species from Chandi Devi Hills are *Acacia Arabica*, *Bombax ceiba*, *Buchanania lanzan*, *Butea monosperma*, *Crataeva nurvala*, *Erythrina suberosa*, *Euphorbia hirta* are only present in these particular sampling areas. 31 plants species collected were present in both the selected sampling zone i.e., *Anogeissus latifolia*, *Azadirachta indica*, *Boerhavia diffusa*, *Calotropis procera*, *Cassia fistula*, *Datura metel*, *Emblica officinalis*, *Ricinus communis*, *Solanum nigrum* (Table 1). The dominant families in the study areas are Caesalpiniaceae (6 plant species), Fabaceae (5 species), Mimosaceae, Asteraceae, Combretaceae, Euphorbiaceae (4species), Rutaceae, Acanthaceae, Myrtaceae, Moraceae, Lamiaceae (3 species).

**Major life forms:** The maximum numbers of plant species recorded in Chilla range were herbs with 13 species followed by trees with 6 species and shrubs with 3 species while in Chandi Devi Hills the maximum number of plant species were trees followed by herbs and shrubs (3 species). The maximum number of plant species present in both the ranges are trees (16 species) followed by herbs (8 species) and shrubs (5 species) respectively (Fig. 2).

In Chilla range, the maximum plant part used were leaves 39%, fruits and bark/stem 18%, flower 13%, roots, whole plants and seeds with 4 % each respectively. On comparison with Chandi Devi Hills, leaves 38%, fruits, bark/stem and roots 14% each, flower 10%, whole plants and



**Fig. 1.** Google earth images of selected sampling zones Chilla range (S1) and Chandi Devi Hills/Shyampur range(S2) of Rajaji Tiger Reserve

**Table 1.** Ethnobotanical plants documented in Chilla zone and Chandī Devi Hills

Botanical name	Family	Chilla range (S1)	Chandī Devi Hills (S2)	Ethnobotanical uses	Mode of administration o/e
<i>Acacia catechu</i> (L.f.) Wild.	Mimosaceae	+	-	The bark of the plant is boiled in water and used for gargling	o
<i>Acacia Arabica</i> Wild.	Mimosaceae	-	+	The bark of this plant is specifically used for tooth cleaning. Regular use of babul makes your tooth stronger, gums healthier, and additionally reduces plaque accumulation.	o
<i>Acacia nilotica</i> (L.) Del.	Mimosaceae	+	-	Dried fruit along with seed is taken, grind it to make fine powder. One tea spoon powder taken with water daily in the morning.	o
<i>Achyranthes aspera</i> Linn.	Amaranthaceae	+	+	Take 10-2-ml of Juice with honey or water	o
<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	+	+	Take leaves and grind it with water. Mix jaggery give it twice in a day	e
<i>Adhatoda vasica</i> Nees.	Acanthaceae	+	+	Roots are crushed and taken with water once in a day	o,e
<i>Ageratum conyzoides</i> Linn.	Asteraceae	+	+	Leaf's juice is applied on cut, it stops bleeding immediately and heal the wound.	o
<i>Albizia lebbeck</i> (L.) Benth.	Fabaceae	+	-	Bark decoction is used with water for better results	o, e
<i>Anogeissus latifolia</i> Roxb.exDC	Combretaceae	+	+	The decoction of leaves is mixed with honey and taken twice in a day	o
<i>Argemone Mexicana</i> Linn.	Papaveraceae	+	+	The powder of the seed used with water once in a day	o
<i>Azadirachta indica</i> A.juss.	Meliaceae	+	+	Leaves are boiled in water and put one or two drops in ear. Juice of leaves is used to treat skin problems	o
<i>Boerhavia diffusa</i> Linn.	Nyctaginaceae	+	+	Root paste of this plant is used to cure bloody dysentery	o
<i>Bombax malabarica</i> DC.	Bombacaceae	+	-	Flowers and Gum are used in digestive disorder and piles	o, e
<i>Bombax ceiba</i> L	Bombacaceae	-	+	Gum is applied on piles	o
<i>Buchanania lanzan</i> Spreng.	Anacardiaceae	-	+	However, seeds can also be roasted or fried to enhance the flavour and cure diseases.	o
<i>Butea monosperma</i> O. kuntze.	Fabaceae	+	+	Seed, gum and flowers are used to treat diseases.	o
<i>Calotropis procera</i> R. Bl.	Asclepiadaceae	+	+	One fresh flower is taken daily with water for ten days continuously to control fast breathing during Asthma.	o
<i>Cassia fistula</i> Linn.	Caesalpinaceae	+	+	Grind bark with raw turmeric and mix little amount of alum in it, then boil in water to make a paste. This paste is applied on painful area twice a day.	o
<i>Cassia tora</i> Linn.	Caesalpinaceae	+	+	Burn the seeds into ash. Mix coconut oil in it and apply on itching area.	o, e
<i>Cassia occidentalis</i> L.	Caesalpinaceae	+	+	Give its flower with jaggery regularly.	o
<i>Carica papaya</i> L.	Caesalpinaceae	+	-	Give its ripened fruit with black salt thrice a day.	o
<i>Cissampelos pareira</i> Linn.	Menispermaceae	-	+	The root decoction is used twice a day with luke warm water.	o
<i>Crataeva nurvala</i> Ham.	Capparidaceae	-	+	Leaves and root paste along with desi ghee twice a day	o
<i>Cuscuta reflexa</i> Roxb.	Convolvulaceae	+	+	Boil its creeper with salt then tie it on stomach and wrapped with cotton cloth.	o,e
<i>Caesalpinia bonduc</i> (L.)	Caesalpinaceae	+	-	Prepare decoction of its leaves.	o

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**Table 1.** Ethnobotanical plants documented in Chilla zone and Chandi Devi Hills

Botanical name	Family	Chilla range (S1)	Chandi Devi Hills (S2)	Ethnobotanical uses	Mode of administration o/e
<i>Catharanthus roseus</i> (L.) G. Don	Apocynaceae	+	-	Dry its leaves in shade, grind it to make powder. Dry its leaves in shade, grind it to make powder in the morning.	o
<i>Centella asiatica</i> (L.) Urbans	Apiaceae	+	-	Leaf's paste is applied on forehead, and used as memory enhancer	o
<i>Citrus maxima</i> (Burm.) Merr	Rutaceae	+	-	Fresh fruit is taken with black salt daily.	o
<i>Clitoria ternatea</i> L.	Fabaceae	+	-	Jaundice Seed is grinding to make powder. One spoon full powder is taken with honey.	o
<i>Cuscuta reflexa</i> Roxb.	Convolvulaceae	+	-	Boil its creeper with salt then tie it on stomach and wrapped with cotton cloth.	o,e
<i>Cynodon dactylon</i> (L.) Pers	Poaceae	+	-	Grind leaves with black salt and give it twice a day	e
<i>Cyperus rotundus</i> L.	Cyperaceae	+	-	Decoction of roots	e
<i>Datura metel</i> L.	Solanaceae	+	+	Grind leaves and apply the paste on wound area. Tie it with cotton cloth.	o
<i>Desmodium gangeticum</i> DC.	Fabaceae	-	+	Leaves of the plant can be used to prevent diseases.	o
<i>Eclipta alba</i> (L.) Hassk	Asteraceae	+	+	Put two to three drops of leaves juice in ear opposite to aching tooth	o
<i>Emblica officinalis</i> Gaertn.	Euphorbiaceae	+	+	Fruit's powder is taken with water two to three times a day.	o
<i>Erythrina suberosa</i> Roxb.	Fabaceae	-	+	The bark ash mixed with coconut oil applied on wound	o
<i>Euphorbia hirta</i> L.	Euphorbiaceae	+	-	Whole plant is crushed and paste is made. This paste is applied on affected area.	o
<i>Eugenia jambolana</i>	myrtaceae	-	+	Raw fruits are consumed.	o, e
<i>Ficus bengalensis</i> Linn.	Moraceae	+	+	Dried root powder mix with honey in equal proportion is taken twice a day to cure Asthma.	o
<i>Ficus racemosa</i> Linn.	Moraceae	+	+	Take raw fruits and make it like vegetable, eat it daily till cure.	e
<i>Ficus religiosa</i> L.	Moraceae	+	-	Grind the bark with water and apply paste on affected area	e
<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	+	-	Flower juice is put in ear, one or two drops to get relief.	o
<i>Holarrhena ant- idysenterica</i> (Roth.) DC.	Apocynaceae	+	+	Grind bark, then boil in water till water evaporate and paste is left. Paste is dried in shade then mix with jaggery and prepare small pills.	e
<i>Holoptelia integrifolia</i> Planch.	Ulmaceae	-	+	Paste is dried in shade then mix with jaggery and prepare small pills. One pill is taken early in morning with milk.	o
<i>Justicia adhatoda</i> L.	Acanthaceae	+	-	Leaves are boiled in water to prepare decoction. Two spoons full is given twice a day	o
<i>Justicia gend-arussa</i> Burm. f	Acanthaceae	+	-	Take its leaves in an earthen pot. Heat the pot over cow dung cakes. Take the ash and mix with honey, give this mixture twice a day	o
<i>Lantana camara</i> Linn.	Verbenaceae	+	+	Leaf's juice of plant is mix with onion juice and water. One tea spoon of juice is given.	o
<i>Leucas aspera</i> Spreng.	Asteraceae	-	+	Paste made from leaves	o
<i>Litsea chinensis</i> Lam.	Lauraceae	+	+	Bark is grinding to make paste. This paste applied on fracture area and tie it with cotton cloth.	o

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**Table 1.** Ethnobotanical plants documented in Chilla zone and Chandī Devi Hills

Botanical name	Family	Chilla range (S1)	Chandī Devi Hills (S2)	Ethnobotanical uses	Mode of administration o/e
<i>Mallotus philippinensis</i> Muell.	Euphobiaceae	-	+	Leaves and fruit powder along with milk or curd is consumed.	o
<i>Melia azedarach</i> Linn.	Meliaceae	-	+	Flower paste mixed in water given twice a day for one week.	o
<i>Moringa oleifera</i> . Lam	Moringaceae	+	+	Grind its leaves with equal amount of mustered oil, heat it and apply the paste on painful area.	o
<i>Mimosa pudica</i> L.	Mimosaceae	+	-	Give leaves juice with jaggery regularly within a week it cures Jaundice.	e
<i>Murraya koenigii</i> (L.) Spreng.	Rutaceae	+	-	Use its stem to brush the teeth and chew stem.	o
<i>Nyctanthes arbor tristis</i> L.	Oleaceae	+	+	Leaves are boiled in water to prepare decoction. Half cup is taken twice a day.	o
<i>Ocimum sanctum</i> L.	Lamiaceae	+	+	Fresh leaves are boiled in water to prepare decoction. One cup is taken twice a day.	o
<i>Organum vulgare</i> L.	Lamiaceae	+	-	Take eight to ten leaves and grind them with small amount of cumin seeds. Give this mixture orally	o
<i>Ricinus communis</i> Linn.	Euphorbiaceae	+	+	Warm its leaves with mustard oil and tie them on affected area	o
<i>Solanum nigrum</i> Linn.	Solanaceae	+	+	Fresh leaves are boiled in water. One tea spoon is given with mother milk.	o
<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	+	+	Chew some leaves, it relieves toothache.	o
<i>Tagetes erecta</i> L.	Asteraceae	+	-	Leave paste is apply on wound area.	o
<i>Tamarindus indica</i> L.	Caesalpiniaceae	+	-	Crush its fruits in water and strain the solution. Add sugar, salt and cumin in it. One cup is given.	o
<i>Terminalia arjuna</i> (Roxb. ex DC.) Wt. & Arn	Combretaceae	+	+	Grind bark, then boil in water till water evaporate and paste is left. This paste is applied on injured area and tie with cotton cloth	o, e
<i>Terminalia belarica</i> Roxb.	Combretaceae	+	+	Grind dried Bahera and Amla fruit to make powder. Take one tea spoon of this powder with water daily	o
<i>Terminalia chebula</i> Retz.	Combretaceae	-	+	Take one tea spoon of this powder with water daily	o
<i>Tinospora cordifolia</i> (Willd.)	Menispermaceae	+	+	Prepare decoction of its stem. Take one cup twice a day.	e
<i>Vitex negundo</i> Linn.	Lamiaceae	-	+	Powder is given to cure diarrhoea	e

†Present; – Absent; S1 Chilla Range; S2 Chandī Devi Hills, o/e- Mode of administration, Oral/external

seeds with 5 % each respectively. While on both Zones (S1+S2), leaves 39%, bark/stem 23%, roots 16%, seeds 10%, flower 6%, whole plants and fruit with 5 % each respectively (Fig. 3).

**Diseases cured:** The major diseases and ailments cured in the study area in Chilla range were dysentery, diarrhoea, malaria. On contrary to Chandī Devi hills were diarrhoea, wound healing, asthma, joint pain, constipation, diabetes. A very decent percentage of medicinal plant species are available in both zones for the treatment of dysentery, diarrhoea, malaria, toothache, jaundice, other diseases like fever, snake bite, digestive problem, spider bite, piles urinary disorders (Fig. 4).

The ethnobotanical study shows a high degree of novelty and the use of plants among the tribes and Gujjars reflects the revival of interest in traditional folk culture. The local peoples, tribal, nomads and Gujjars have a magnificent knowledge about the use of plants for curing various diseases and ailments as a part of their healing methods (Akash et al 2021, Tewari et al 2015, Singh et al 2020). By evaluating thoroughly, the cause for endangerment status of the plants used in the traditional medicine, we put our approval that folk utilization is not the main reason for the deterioration of wild resources but may be vast collection for industrial purpose cause rapidly depletion of the wild plant resources. Regardless of the species richness of medicinal

plants in the sampling zones the tradition of this valuable culture is facing a severe threat, mainly due to the rapid development of modern medicine. The ageing of herbalists without inheritors results in the rapid loss of valuable knowledge. In addition, the knowledge of traditional medicinal plants inherited via the oral mode and the accuracy

of inheritance are difficult to determine. Unfortunately, the traditional use of plants is declining and accordingly knowledge is mainly restricted to the elderly. Therefore, it is must to document this valuable traditional knowledge concentrated in these peoples inhabiting in the remote and wild regions.

**CONCLUSION**

A total of 68 plants from 32 families had been collected, identified and their traditional uses have been recorded. It was concluded that the study areas have present rich diversity of medicinal plants species with extensive ethno medicinal properties used in curing various diseases.

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Received 10 March, 2022; Accepted 20 May, 2022

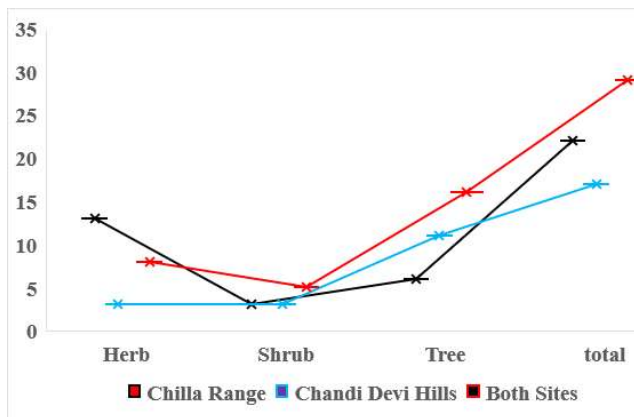


Fig. 2. Graphical representation of life forms of ethnobotanical plants

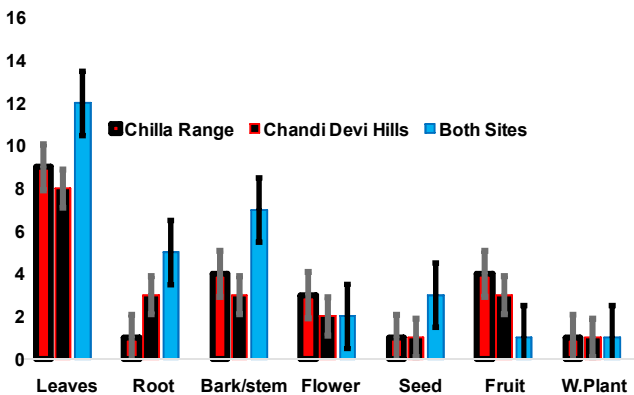


Fig. 3. Preference wise plant parts used by local peoples in selected sampling zone

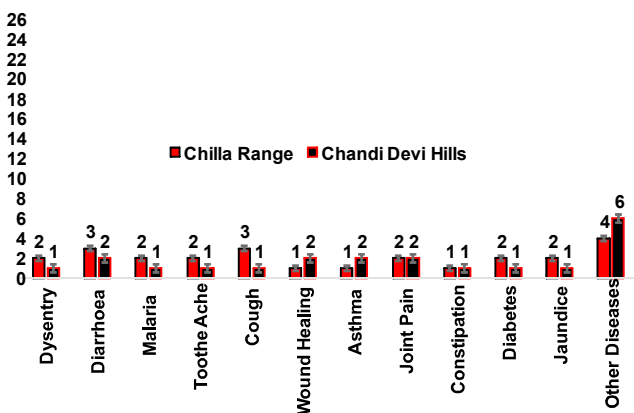


Fig. 4. Various diseases cured by ethnobotanical plants in selected sampling zones