



# Ethnobotanical uses of plants of Mandakini valley in Rudraprayag, Uttarakhand

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## Manuscript details:

Received: 21.05.2022  
Accepted: 24.09.2022  
Published: 30.09.2022

## Cite this article as:

Pradeep Kumar Bhandari, Meenam Bhatia and Uniyal PL (2022) Ethnobotanical uses of plants of Mandakini valley in Rudraprayag, Uttarakhand, *Int. J. of Life Sciences*, 10 (3): 273-281.

Available online on <http://www.ijlsci.in>  
ISSN: 2320-964X (Online)  
ISSN: 2320-7817 (Print)



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## ABSTRACT

The present study describes ethnobotanical uses of plants in Mandakini valley of Rudraprayag district. Total 112 plant species in 100 genera and 63 families (both wild and cultivated) were recorded. These plants were categorised as herbs (59%), tree (28%), shrubs (10%) and climbers (3%). Ethnobotanically significant taxa were classified into eight different service categories like as medicine, edible, construction, oil, fodder, fuel, fibre and miscellaneous. The highest number of taxa (7 spp) were found of Rosaceae followed by that of Asteraceae, Lamiaceae (5 spp), Euphorbiaceae, Poaceae (4 spp), Cucurbitaceae, Solanaceae (3 spp), and Berberidaceae, Pinaceae, Adiantaceae (2 spp each). A total of 10 taxa such as *Acorus calamus*, *Berberis chitra*, *Berginia straychi*, *Kalanchoe integrata*, *Litsea glutinosa*, *Paris polyphylla*, *Potentilla fulgens*, *Satyrium nepalense*, *Taxus wallichiana*, and *Zanthoxylum armatum* were observed to be of rare and endangered category, were found in the area. These plants should be conserved with sustainable management.

**Key words:** Endangered, Mandakini valley, Medicine, Rare, Rosaceae.

## INTRODUCTION

The Himalaya harbours a rich diversity of medicinal plants. Where about 8000 species of angiosperms, gymnosperms (44 species), and pteridophytes (600 species) were reported in the Indian Himalaya (Agrawal, 1997). The highest number of taxa used as medicines were reported from Uttarakhand (Kala, 2004). Of these, sixty two taxa are endemic to the Himalaya. Uttarakhand is well known for its rich diversity of medicinal plants and associated traditional knowledge and most of the plants have high curative properties (Bisht *et al.*, 2013). The Large human population with unique traditions and culture inhabiting Garhwal Himalaya has been using the local plant species in various ways (Dangwal, 2010).

The application of various plants species as food, medicine, fuel, timber and various other purposes has been well documented in ancient Hindu literature (Tulsidas, 1631; Charak and Drdhabala,1996). With the

enhancement in modernization, a great treasure of cultural heritage and traditional knowledge is declined in many parts of the world (Bates, 1985; Frankel, 1970) as also in the Himalaya (Agrawal, 1997). The weaker sections of the community collect the plants from the forest for commercial use as livelihood option. Women of the Himalayan region have a close association with the surroundings forest for fulfilling their needs as fuel, fodder and other forest products. Rural women in the Himalayas are the sole ones who play an important role having knowledge about the significance of plant and how they can be utilized (Uniyal and Shiva, 2005). Thus, their knowledge must be conserved and documented. The rural communities in Rudraprayag district hold a good traditional knowledge on medicinal plants but presently, most of the indigenous people are dependent on English drugs due to which they have lost their traditional practices to heal the ailments.

## MATERIALS AND METHOD

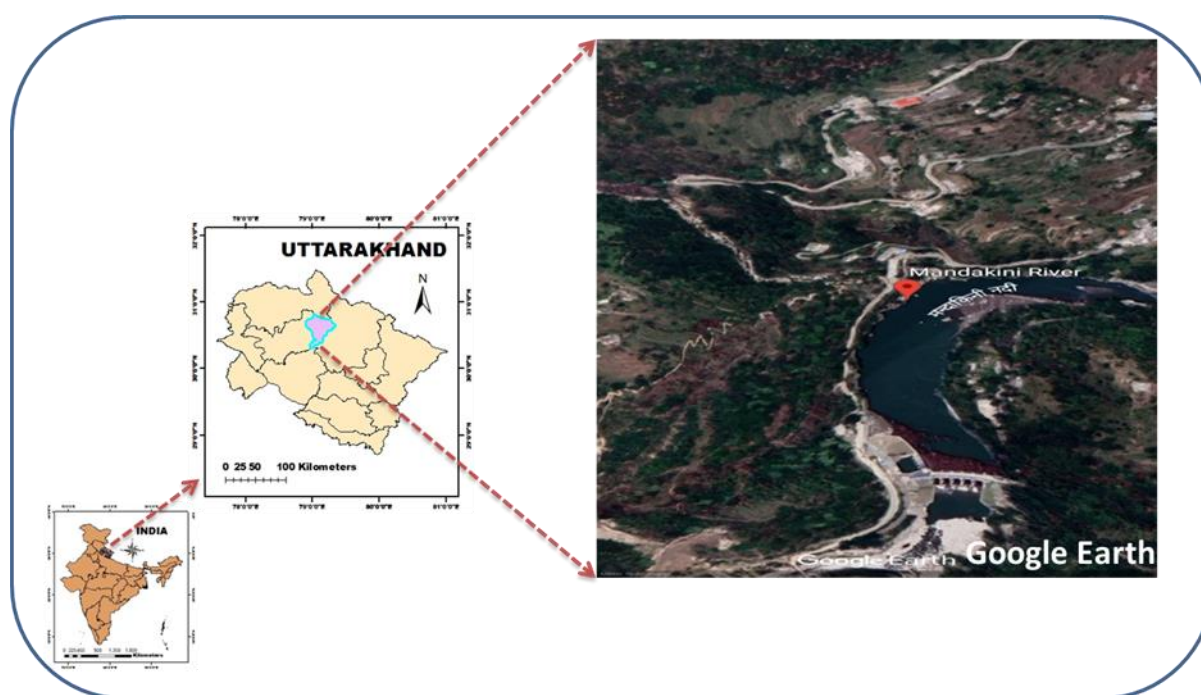
### Study area

The area of study is located between the coordinates (30° 30' 37"N-79° 05' 09"E) and (30° 26' 41"N-79° 00' 12"E). It is extended from lower tropical (824 m) to upper temperate (2160 m) region in Rudraprayag district. There is a warm summer from May to June and severe winter from November to February.

Mandakini is a major river with having many tributaries. This catchment land cover consists of agricultural land, deciduous-evergreen forest, grassland and barren land etc. The study area harbours a rich diversity of plant species. The region of a temperate zone is marked by the presence of *Quercus leucotrichophora* (Banj), *Quercus semicarpifolia* (Kharsu), *Quercus dialata* (Moru), *Quercus glauca* (Harinj), *Rhododendron arboretum* (Burans), *Myrica esculenta* (Kaphal), *Lyonia ovalifolia* (Anyar), *Ibex dipyrena* (Kandara), *Daphniphyllum himalayense* (Ratnyalu) etc. In the exposed sites have pure stands of *Pinus roxburghii* (Kulain). The lower zone has a kind of subtropical vegetation.

### Data collection

The ethnobotanical field survey was conducted to collect authentic information of plants and their applications by indigenous people during 2016-2017. Peoples of all age group (younger, elder and older) have been interrogated. Most of the participants were the local people, rural person and farmers. The information is based on species and plant's part used by native people of the study area. The applications of plants were classified into 8 service categories namely as; medicine, edible, construction, fodder, fuel, oil, fibre and miscellaneous. The data were tabulated and analyzed through MS excel 2007.



**Figure 1** The map showing the surveyed area in Mandakini valley.

## RESULT AND DISCUSSION

Total 112 plant species in 100 genera and 63 families were recorded with their uses. Major plant species were wild (92, 82%) and cultivated (20, 18%).

Different growth habits as tree, shrubs, herbs and climbers were used by local, in which herbs were preferred as the highest number of plants used. Out of the total species, most of the available plants were used as medicine. Major categories are described as:

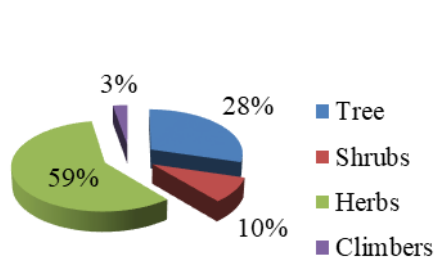
**Table 1:** Ethnobotanical uses of plants of Mandakini valley

Species	Family	Medicine	Edible	Construction	Fibre	Oil	Fuel	Fodder	Miscellaneous
<i>Adiantum caudatum</i> L.	Adiantaceae	+	-	-	-	-	-	+	+
<i>Achyranthes aspera</i> Linn.	Amaranthaceae	+	-	-	-	-	-	+	-
<i>Acorus calamus</i> L.	Acoraceae	+	-	-	-	-	-	-	-
<i>Ajuga bracteosa</i> Wall. ex Benth	Lamiaceae	+	-	-	-	-	-	+	-
<i>Allium cepa</i> L.	Amaryllidaceae	+	+	-	-	-	-	-	-
<i>Allium sativum</i> L.	Amaryllidaceae	+	+	-	-	-	-	-	-
<i>Amaranthus spinosus</i> L.	Amaranthaceae	+	-	-	-	-	-	+	+
<i>Arachne cordifolia</i> (Decne.) Hurusawa	Phyllanthaceae	+	-	-	-	-	-	-	-
<i>Artemisia roxburghiana</i> Wall ex Besser	Asteraceae	+	-	-	-	-	-	-	+
<i>Asparagus Curilius</i> Buch. - Ham ex Roxb	Asparagaceae	+	-	-	-	-	-	-	+
<i>Asplenium dalhousiae</i> Hook.	Aspleniaceae	+	-	-	-	-	-	+	-
<i>Begonia picta</i> Sm.	Begoniaceae	+	-	-	-	-	-	-	-
<i>Berberis asiatica</i> Roxb	Berberidaceae	+	+	-	-	-	+	+	+
<i>Berberis chitra</i> Edwards	Berberidaceae	+	+	-	-	-	+	+	-
<i>Bergenia ciliata</i> (Haw.) Sternb.	Saxifragaceae	+	-	-	-	-	-	+	+
<i>Bergenia stracheyi</i> Stein.	Saxifragaceae	+	-	-	-	-	-	-	-
<i>Bidens bipinnata</i> L.	Asteraceae	+	-	-	-	-	-	+	-
<i>Bombax ceiba</i> L.	Bombaceae	+	+	+	-	-	+	+	+
<i>Brassica campestris</i> L.	Brassicaceae	-	-	-	-	+	-	-	-
<i>Brassica rapa</i> L.	Brassicaceae	+	-	-	-	+	-	+	+
<i>Carrisa opaca</i> Stapf ex Haines	Apocynaceae	+	+	-	-	-	+	+	+
<i>Casearia graveolens</i> Dalzell	Salicaceae	+	-	-	-	-	+	+	+
<i>Cedrus deodara</i> (Roxb. ex D.Don) G.Don	Pinaceae	+	-	+	-	+	+	-	+
<i>Celtis australis</i> L.	Ulmaceae	+	-	+	+	-	+	+	-
<i>Centella asiatica</i> (L.)Urban	Apiaceae	+	-	-	-	-	-	+	-
<i>Cheilanthes argentea</i> (S.G.Gmelin)Kunze	Adiantaceae	+	-	-	-	-	-	+	+
<i>Cinnamomum tamala</i> (Buch.-Ham.) T. Nees & Eberm.	Lauraceae	+	+	-	-	-	+	+	+
<i>Cissampelos pareiera</i> L.	Menispermaceae	+	-	-	-	-	-	+	-
<i>Citrus aurantium</i> L.	Rutaceae	+	+	-	-	-	+	+	+
<i>Citrus pseudolimon</i> Tanaka	Rutaceae	+	+	-	-	-	+	-	+

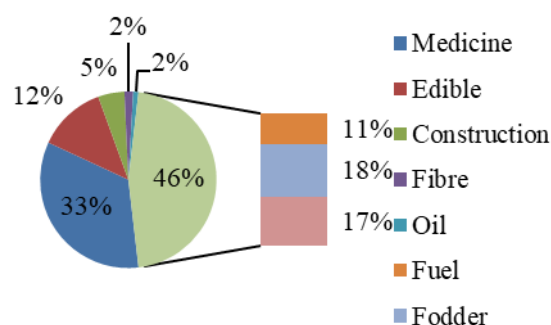
<i>Coelogyne cristata</i> Lindl	Orchidaceae	+	-	-	-	-	-	-	+
<i>Colebrookea oppositifolia</i> Sm	Lamiaceae	+	-	-	-	-	-	-	+
<i>Cucumis hardwickii</i> Royle	Cucurbitaceae	+	-	-	-	-	-	-	-
<i>Cucumis sativus</i> L.	Cucurbitaceae	+	+	-	-	-	-	-	+
<i>Cucurbita maxima</i> Duchesne Lam	Cucurbitaceae	+	+	-	-	-	-	-	+
<i>Curcuma longa</i> L.	Zingiberaceae	+	+	-	-	-	-	-	+
<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	+	-	-	-	-	-	-	-
<i>Cynodon dactylon</i> (L.) Persoon	Poaceae	+	-	-	-	-	-	+	+
<i>Cynoglossum lanceolatum</i> Forssk.	Boraginaceae	+	-	-	-	-	-	+	-
<i>Cyperus rotundus</i> L.	Poaceae	+	-	-	-	-	-	+	-
<i>Datura metel</i> L.	Solanaceae	+	+	-	-	-	-	-	+
<i>Dicliptera bupleuroides</i> Nees	Acanthaceae	+	-	-	-	-	-	+	-
<i>Diplazium esculentum</i> (Retz.) Sw.	Dryopteridaceae	-	+	-	-	-	-	-	-
<i>Dolichos biflorus</i> L.	Fabaceae	+	+	-	-	-	-	+	-
<i>Drymaria cordata</i> (L.) Roem. & Schult.	Caryophyllaceae	+	-	-	-	-	-	+	-
<i>Phyllanthus emblica</i> L.	Phyllanthaceae	+	+	-	-	-	+	-	+
<i>Euphorbia hirta</i> L.	Euphorbiaceae	+	-	-	-	-	-	+	-
<i>Euphorbia royleana</i> Boiss	Euphorbiaceae	+	+	-	-	-	-	-	+
<i>Falconeria insignis</i> Royle	Euphorbiaceae	+	-	-	-	-	-	-	+
<i>Ficus auriculata</i> Lour.	Moraceae	+	+	-	-	-	+	+	+
<i>Ficus racemosa</i> L.	Moraceae	+	-	-	-	-	+	+	-
<i>Ficus religiosa</i> L.	Moraceae	+	-	-	-	-	+	-	+
<i>Fragaria nubicola</i> Lindley ex Lacaite	Rosaceae	+	+	-	-	-	-	+	-
<i>Girardinia diversifolia</i> (Link) Friis	Urticaceae	+	-	-	+	-	-	-	-
<i>Grewia optiva</i> J.R Drumm. ex Burret	Malvaceae	-	+	-	+	-	+	+	-
<i>Juglans regia</i> L.	Juglandiaceae	+	+	+	-	-	+	-	-
<i>Justicia adhatoda</i> L.	Acanthaceae	+	-	-	-	-	-	-	+
<i>Kalanchoe integra</i> (MEDIK.) KUNTZE.	Crassulaceae	+	-	-	-	-	-	-	+
<i>Lecanthus peduncularis</i> (Wall. ex Royle) Wedd.	Urticaceae	+	-	-	-	-	-	+	-
<i>Leucas lanata</i> Benth.	Lamiaceae	+	-	-	-	-	-	+	-
<i>Litsea glutinosa</i> (Lour.) C.B.Rob	Lauraceae	+	-	+	-	-	-	-	+
<i>Lyonia ovalifolia</i> (Wall.) Drude	Ericaceae	+	-	+	-	-	+	-	-
<i>Mangifera indica</i> L.	Anacardiaceae	-	+	+	-	-	+	-	+
<i>Melia azedarach</i> L.	Meliaceae	+	-	+	-	-	+	+	-
<i>Mentha arvensis</i> L.	Lamiaceae	+	+	-	-	-	-	-	+
<i>Micromeria biflora</i> (Don) Benth	Lamiaceae	+	+	-	-	-	-	+	-
<i>Musa balbisiana</i> Colla	Musaceae	+	+	-	-	-	-	+	+
<i>Myrica esculenta</i> Buch.-Ham. ex D.Don	Ericaceae	+	+	+	-	-	+	-	-
<i>Origanum vulgare</i> L.	Lamiaceae	+	-	-	-	-	-	-	-
<i>Oxalis corniculata</i> L.	Oxalidaceae	+	+	-	-	-	-	+	-
<i>Paeonia emodi</i> Wall. ex Royle	Paeoniaceae	+	+	-	-	-	-	-	-

<i>Paris polyphylla</i> Sm.	Trilliaceae	+	-	-	-	-	-	-	-
<i>Pilea scripta</i> (Buch.-Ham. ex D. Don) Wedd.	Urticaceae	+	-	-	-	-	-	+	-
<i>Pinus roxburghii</i> Sarg.	Pinaceae	+	+	+	+	-	+	-	+
<i>Pisidium gujava</i> L.	Myrtaceae	+	+	-	-	-	+	-	-
<i>Plantago depressa</i> Willd.	Plantaginaceae	+	-	-	-	-	-	-	+
<i>Potentilla lineata</i> Trevir.	Rosaceae	+	-	-	-	-	-	+	+
<i>Prinsepia utilis</i> Royle	Rosaceae	+	-	-	-	+	-	-	-
<i>Prunus ceresoides</i> D. Don	Rosaceae	+	+	+	-	-	+	+	+
<i>Prunus persica</i> (L.) Batsch	Rosaceae	+	+	-	-	-	+	-	+
<i>Pyreantha crenulata</i> (D. Don) M Roem	Rosaceae	+	+	-	-	-	+	+	+
<i>Pyrus pashia</i> Buch. Ham. ex D. Don	Rosaceae	+	+	+	-	-	+	+	+
<i>Quercus leucotrichophora</i> A. Camus	Fagaceae	+	-	+	-	-	+	+	+
<i>Reinwardtia indica</i> Dumortier	Linaceae	+	-	-	-	-	-	+	+
<i>Rhamnus variegatus</i> Roxb.	Rhamnaceae	+	-	-	-	-	+	+	-
<i>Rhododendron arboreum</i> Sm.	Ericaceae	+	-	-	-	-	+	-	+
<i>Rubus ellipticus</i> Smith.	Rosaceae	+	+	-	-	-	-	+	-
<i>Rumex hastatus</i> D. Don.	Polygonaceae	+	+	-	-	-	-	+	-
<i>Rumex nepalense</i> Spreng.	Polygonaceae	+	-	-	-	-	-	+	-
<i>Satyrium nepalense</i> D. Don	Orchidaceae	+	-	-	-	-	-	-	-
<i>Scutellaria scandens</i> D. Don	Scrophulariaceae	+	-	-	-	-	-	+	-
<i>Seasmum orientale</i> L.	Pedaliaceae	+	+	-	-	+	-	-	+
<i>Senecio nudicaulis</i> Wall. ex DC.	Asteraceae	+	-	-	-	-	-	+	-
<i>Solanum nigrum</i> L.	Solanaceae	+	-	-	-	-	-	-	-
<i>Solanum tuberosum</i> L.	Solanaceae	+	+	-	-	-	-	-	-
<i>Sonchus arvensis</i> L.	Asteraceae	+	-	-	-	-	-	+	-
<i>Stellaria media</i> L.	Caryophyllaceae	+	-	-	-	-	-	+	-
<i>Stephania tuberosa</i> Forman	Menispermaceae	+	-	-	-	-	-	+	+
<i>Symplocos paniculata</i> Miq.	Symplocaceae	+	-	+	-	-	+	+	-
<i>Taxus Wallichiana</i> Zucc.	Taxaceae	+	-	+	-	-	+	-	+
<i>Thalictrum foliolosum</i> DC	Ranunculaceae	+	-	-	-	-	-	+	+
<i>Thamnocalamus falconeri</i> Hook. f. ex Munro	Poaceae	-	-	-	+	-	-	-	-
<i>Tridax procumbens</i> (L.) L.	Asteraceae	+	-	-	-	-	-	+	-
<i>Triticum aestivum</i> L.	Poaceae	-	-	-	+	-	-	-	-
<i>Urtica dioica</i> L.	Urticaceae	+	+	-	+	-	-	-	-
<i>Valeriana wallichii</i> DC	Valerianaceae	+	-	-	-	-	-	-	+
<i>Verbascum thapsus</i> L.	Scrophulariaceae	+	-	-	-	-	-	-	+
<i>Viola canescens</i> Wall.	Violaceae	+	-	-	-	-	-	+	+
<i>Viola pilosa</i> Blume	Violaceae	+	-	-	-	-	-	+	+
<i>Vitex negundo</i> L.	Verbenaceae	+	-	-	-	-	+	-	+
<i>Woodfordia fruticosa</i> (L.) Kurz	Lythraceae	+	-	-	-	-	+	+	-
<i>Zanthoxylum armatum</i> DC	Rutaceae	+	-	-	-	-	-	-	+

(+) = AVAILABLE, (-) = NOT AVAILABLE



**Figure 2:** Percentage of different growth habits of local plants



**Figure 3:** Different used categories in study area

### Medicine

The native people of the study area were found using the locally available plants to cure various ailments of both human and live stocks. Among the plants part used, leaves contribute the highest (43%) followed by root (20%), bark (9%), rhizome, seed (6%), flower (4%), bulb, latex, fruit (2%) and clove, epicarp, resin, fruit stalk, root knot, prop root, apical shoot, stem twig, tuber (1%). Major plants species were found to be used for multiple cases because of their wide range of curative properties. The indigenous people were found using the plant species for curing burns (7 spp), toothache (6 spp), vomiting (9 spp), indigestion (4 spp), headache (4 spp), paralysis (1 sp), body pain (7 spp), diabetes (7 spp), boils (14 spp), fever (14 spp), acidity (6 spp), joint pain (4 spp), diarrhoea (5 spp), eye pain (2 spp), ringworm (4 spp), cuts (12 spp), hepatitis A (4 spp), leucorrhoea (12 spp), otorrhea (4 spp), itching (4 spp), osteoarthritis (3 spp), conjunctivitis (9 spp), kidney stone (2 spp), blood clotting (1 spp), earache (1 spp), amoebiasis (2 spp), epistaxis (4 spp), respiratory problems (5 spp), abdominal pain (5 spp), goitre disease (1 sp), urinary trouble (3 spp), dyspepsia (2 spp), sprain (1 spp), cough (2 spp), makda (5 spp), eczema (5 spp), bone fracture (4 spp), bone fracture (2 spp), irregular menses cycle (1 sp), hairfall (1 sp), fistula problems (1 sp), warts (1 sp), piles (1 sp), dysentery (6 spp), tuberculosis (1 spp), bone cancer (1 sp), cracked heels (1 sp), sore throat (1 sp), anaemia (1 sp), pyrohaemia (1 sp), inflammation (1 sp), dysuria (1 sp). Out of the total 15 plants that used to treat the ailments of house hold cattle, two taxa as *Allium cepa* and *Musa paradisiaca* were used to make easy delivery (a birth of baby) in

the live stocks. Some of the plants like as *Asparagus curillus* (Jhirnu), *Cuscuta reflexa* (Aakash laguli), *Quercus leuchotrichophora* (banj), *Rumex nepalense* (jangli palak), *Stephania tuberosa* (Ginzladu) were used as coolant (regulate body temperature) and tonic (enhance body strength). Other plant as *Prunus cerasoides* (Panya) used to reset bone fractured site, the bark paste of the taxon was applied on the affected area for the instant recovery.

### Fuel wood

Majority of the population of this region relies on forest for fuel wood because of their socioeconomic conditions and adverse climatic conditions. Thirty three taxa were found used as fuel wood by the native people. The cool climate of temperate zone requires fuel woods very frequently that are required for cooking and keeping the houses warm. The highly preferred taxon was *Quercus leuchotrichophora* due to its use in burning, heating and coal forming properties (Singh, 1982). At upper elevation (1400-1700 m), the most preferred taxa used as fuel wood were *Myrica esculenta*, *Lyonia ovalifolia* (Anyar), *Symplocos paniculata* (lodh) and *Rhododendron arboreum* (burans) while at lower elevation (900-1400 m) the highly used taxa were *Celtis australis* (Kharik), *Melia azedarache* (Dainkru), *Mangifera indica*, *Rhus parviflora* (tungla), *Pinus roxburghii* (kulain), and *Casearia graveolens* (Naru). The most preferred shrubs taxa at lower elevation were of *Berberis asiatica*, *Carrisa opaca* while *Berberis chitra* (tautooru) and *Rhamnus varigatus* (Chadylu) were used as the fire wood at the higher elevation.



**Figure 4:** Local healer is using the root paste of *P. depressa* to resolve the problem of little age child.



**Figure 5:** *D. esculentum*, an edible plant used by local lady as vegetable.



**Figure 6 (A-C):** Method used for fibre extraction from *Grewia optiva*

**Figure 7 (D-F):** Wheat straws used for making a basket

**Figure 8 (G-I):** Forest resources used by local people in making house hold apparatus.

### Fodder

The native people rear cows, buffalos, goats and other household animals that largely support in their agriculture. They were found using fifty eight plant species for the domestic herds and oak (*Quercus leucotrichophora*) was preferred as the most palatable with high nutrient content in the study area (Singh, 1982). According to the local people, the newly emerged leaves of this oak species are highly toxic for cattle. Other used fodder species were *Celtis australis*, *Grewia optiva*, *Ficus auriculata*, *Woodfordia fruticosa*, *oxalis corniculata* that enhance milk production (lactation) in domestic herds. Three fern species as *Adiantum caudatum*, *Asplenium dalhousiae* and *Cheilanthes argentea* were used in fodder material. In tropical as well as montane region, sheep and goats principally use *Berberis spp*, *Carissa opaca*, *Rumex hastatus*, *Rubus ellipticus* and *Pyrecantha crenulata* for foraging.

### Fibre

Four plants species as *Grewia optiva*, *Urtica dioica*, *Girardinia diversifolia*, and *Celtis australis* were found used to extract fibre. Once, these plants were used for making ropes and other house hold items. At present time, *Grewia optiva* (bhynul) is the sole taxon used in fibre extraction in the area. For the extraction of fibre firstly, plants twigs were cut, made bundle or separately sun dried and then that dipped in water bodies for considerable time (3-4 months). The rotten bast fibres easily peeled off from the main twigs which are cleansed by water for several times that makes easy a fibre extraction. At last, the well cleansed fibres were sun dried up to 3 or 4 days and ultimately it gets ready to use.

### Edible

Total thirty nine edible plants were recorded from the surveyed areas. These plants were consumed in various forms by the communities. Most of the plants were eaten as raw fruits whereas some of the plants were used as vegetables. Leaves of the some plants *Allium sativum*, *Cinnamomum tamala* and *Mentha arvensis* were utilized as condiments or in other forms. The immature flower buds of *Bombax ceiba* being consumed as vegetables. Some of the commonly used plants are *Diplazium esculentum* (lingura), *Ficus racemosa* (umra) and *Paeonia emodi* (dhandooru). The consumption of *Urtica dioica* was very common at early 1960 to 1980s but now occasionally used by younger generation. *Diplazium esculentum* is sold in local markets by the natives. Indigenous people of this

area consume ripe fruits of *Rubus ellipticus* (hisul), *Pyrus pashia* (mole), *Pyrecantha crenulata* (Ghingaru), *Myrica esculenta* (Kaphal), *Carrisa opaca* (Karunja), and *Citrus aurantium* (Malta), *C. pseudolimon* (Pahari nimbu). A young or immature fruits of *Ficus auriculata* (Timulu) are used as vegetables.

### Oil seeds

Earlier, the seeds of *Prinsepia utilis* were highly preferred for extraction of oil, but presently the use of this species is diminished. At higher elevation, the seeds of this plant are still in use to procure oil. The plants seed dipped and washed with water to separate its pulpy part with seed coat, then sun dried and seeds are ground to extract oil. Seasmum (Til) seeds oil was given to domestic cattle, which is very helpful in increasing their physical strength. The oil cake of Brassica (*Brassica campestris* and *B. rapa*) seeds after the process of extraction is used to enhance lactation (milk yield) in domestic animals.

### Miscellaneous

This category includes the plants utilized for agricultural implements, ritual ceremonies, dye yielding, household apparatus, superstitious beliefs and narcotics. Total five species were found used in making agriculture tools and *Quercus leucotrichophora* was found very common in use (plough, handle of axe, sickle and picks etc.) by the native people in the surveyed area. *Pyrus pashia* was also used to make a handle of axes, sickle and picks tools used in agriculture. In the preparation of buttermilk (whey), the vessel or pot used is made by *Taxus wallichiana*. It also used in formation of Danka (used by local priest during ritual ceremony), cattle's tag and its bark is used in tea preparation. The daily used articles such as baskets for keeping chapatti and cow manure, kandi (storage container), swalta (a kind of basket with hexagonal eye), mat (taitoolu), soop (rice cleaner) were made by *Thamnocalamus falconeri*. There were fourteen plants species used during ritual ceremonies, auspicious occasions and in superstitious beliefs. These plants are considered sacred by locals like *Prunus cerasoides* is regarded a tree of pandavas and worshipped at the time of Pandav nirtya (a ritual dance) by villagers. In the month of august, local Children of villages collect the flowers of *Reinwarditia indica*, *P. pashia*, and *Rhododendron arboreum* to celebrate 'phyunli' (local festival). The plants of *Verbascum thapsus*, *Cucurbita maxima*, and *Stephania*



*tuberosa* are used to worship a local deity for driving away an evil spirits.

### Timber yielding plants

The woody plants play an important role as a construction material used for houses, cattle's sheds and for temporary settlements in the area of study. In early time, the permanent houses were made by *Cedrus deodara*, *Pinus roxburghii* and *Quercus leuochotrichophora*. At higher elevation (temperate zone), temporary settlements are constructed principally by *Q. leuochotrichophora*, *Myrica esculenta*, *Lyonia ovalifolia* and the roof is made with the *Pinus roxburghii* (Chir) needle and the leaves of *Thamnocalamus falconeri* (bamboo sp). *Quercus sp* were found very common and most abundantly used by indigenous communities in surveyed areas.

### DISCUSSION

From the present study, some plants were found highly valuable in context with their therapeutic uses (leucorrohea, kidney stone, fever etc.), economic importance (edible, fibre yielding plants) and other uses being utilized by local people in this area. This study indicates that the plants are still in practises and used in different ways by the native peoples as the weaker section of the society are dependent on these resources to full fill their needs.

### CONCLUSION

The finding of the study indicates that traditionally used ethno-botanically significant plants are frequently being utilized by the native inhabitants of this region. Some of the plants are found under threatened categories due to their high rate of exploitation and unexpected changes in environmental conditions. There is a need to conserve these plants through the implementation of in-situ and ex-situ conservation methods. By the documentation of an ethnobotanical data based on traditionally used plants will help the mankind in various ways.

### Acknowledgement

The authors thank all the native people of the study area, who provided valuable assist and information about the use of local plants. PKB is thankful to the Council of Scientific Industrial Research (CSIR), New Delhi for providing financial assistance during the research program. We are grateful to the University of Delhi for providing R & D grant.

**Conflicts of Interest:** The authors declare no conflict of interest.

### Author contribution

Pradeep Bhandari recorded the first-hand information whereas P.L.Uniyal and Meenam Bhatia gave the inputs and modified the manuscript.

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