



Glimpses on the ethnomedicinal plant diversity in Pindari Valley, Uttarakhand

Ravindra Kumar^{1,2}, Poushali Dey² and Priyanka Agnihotri^{1,2,3}

¹Academy of Scientific and Innovative Research (AcSIR), Kamla Nehru Nagar, Ghaziabad - 201002, India

²Plant diversity, Systematics & Herbarium Division, CSIR-National Botanical Research Institute, Rana Pratap Marg, Lucknow - 226001, India

³Corresponding author; e-mail: priyagni_2006@yahoo.co.in

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Abstract

The present study aims to document the ethno-medicinal plants from the Pindari Valley situated in the Bageshwar district of Uttarakhand. A total of 80 ethno-medicinal plants belonging to 34 families have been enlisted here. Correct nomenclature, local names, families and habit have been assigned to all the species. Herbs (56%) form the major portion of these species followed by trees (15%), shrubs (13%) and climbers (6%). Native people frequently use leaves (23%) of the plants followed by roots (20%), fruits (14%), whole plants (12%), seeds (8%), flowers (5%), bark (5%) and resin/latex/oil (1%). Asteraceae family with 10 members is the dominant family for ethnobotanically important plants, followed by Rosaceae (7) and Lamiaceae (6). All the collected plant species are found to be used by local people to treat about 55 diseases including cough, fever, jaundice, arthritis, asthma, diarrhoea, etc.

Key words: Pindari valley, ethnobotanical plants, Western Himalaya, disease.

INTRODUCTION

India, one of the mega-biodiverse countries, harbours about 7-8% of recorded species in terms of plant biodiversity in the world (Agnihotri *et al.* 2016). A diverse range of geographical, climatic and topographic features have resulted in a number of variety of habitats and ecosystems in the subcontinent which augment its biodiversity (Balachandhran & Arora 2006). Presence of snow-laden Himalayas in the north, peninsula in the south, deserts in the west and wet marshy deltas in the east adds to the diversity of the country both in terms of flora and fauna.

The Himalayas, which are the youngest, highest and largest mountain range in the world foster an enormous diversity of plants and relation between plants and human beings dates back to pre-historic era. Since time immemorial, human beings are dependent on natural resources, especially plants, for fulfilling their basic needs. Especially, in mountainous region, nature furnished with rich biodiversity provides shelter and facilities for individuals who use their conventional ecological expertise to make use of local natural resources. People in these regions depend on available plants for their primary needs and thus have acquired traditional knowledge of application of these plants and their products in their day-to-day life such as food, fodder for livestock and medicinal benefits. Local people transfer this traditional knowledge to their generations using various methods like oral dialogue, folklore, written scripts, taboos etc. and therefore, it keeps on gradual expansion.

Ethnobotany deals with the investigation of plants by native people of a region for exploring their indigenous uses, owing to the intrinsic value of plants and implication towards their conservation (Pandey & Tripathi 2017). Ethnobotanical surveys form the dynamic relationship between plants and ethnic communities or tribal people (Balick & Cox 1996; Ford

et al. 1994). Apart from food, fodder and shelter, utilization of plants as medicines is of considerable significance. The importance of medicinal plants in traditional health maintenance provides hints for new research areas and biodiversity conservation. Since time immemorial, medicinal plants have been the subject of man's interest, almost every society has a medicinal plant usage past. Since, there is still insufficient knowledge of the uses of medicinal plants from many remote areas of the Himalayas, it is important to obtain the variety of plant resources used by local tribal people for herbal remedies that are reliable.

Attributed to its geographical location, optimum climatic and topographic features, Uttarakhand is a reservoir of different life forms and presents rich biodiversity. Uttarakhand Himalaya is bestowed with number of glaciers, rivers, valleys and peaks, which glorify the state and add to its diversity. The Pindari Glacier is situated in Bageshwar district of Uttarakhand at an altitude that ranges from 1700 to 3660 meters above msl (Joshi *et al.* 2011). It is located in the upper reaches of Kumaon Himalayas, between 30°19'N – 30°10'N latitude and 79°57'E – 80°4'E longitude with total area of 339.39 km². It is eminent amongst the most easily available of all the Himalayan ice sheets and has provided considerable attention to naturalists since the last century. Pindar River originates from Pindari glacier and meets the Alakananda River at the junction of Karnaprayag in the Garhwal district. The glacial belt ranging from 4000 to 6000 meters above msl constitutes the famous Pindari Pass which opens communication between Martoli in Milam valley and Danpur.

Earlier reports reveal that attention has been paid to various aspects of ethnobotany and several studies have been conducted in other regions of Western Himalaya (Shah & Joshi 1971; Singh & Kumar 2000; Aitken & Badola 2003; Pala *et al.* 2010; Rawat & Vashistha 2011; Bisht *et al.* 2012; Siwach *et al.* 2013; Topwal & Uniyal 2018) but till date, no such study has been done from Pindari valley. The region has remained unexplored since Rao (1960) conducted a botanical tour to Pindari glacier in 1957 to assess the phytodiversity. Considering the importance of the phytodiversity of the Pindari valley and lack of previous studies, an attempt has been made to assess the plant resources of the area and to interpret medicinal value of these natural resources used by local communities to treat various ailments on the basis of folklore knowledge among these communities.

MATERIALS AND METHODS

Study Area

Pindari valley inhabiting the Bageshwar district [30°19'N – 30°10'N latitude and 79°57'E – 80°4'E longitude] falls under the Kumaon Himalaya of Uttarakhand state (Kandpal & Sathyakumar 2010). With an area of about 339 sq km, it lies between the Nanda Devi and Nandakot peaks and ends at an elevation of 3627 meters above msl (Kholiya *et al.* 2018). The valley is well known for its Pindari glacier. Pindari Glacier gives rise to Pindar River which drains the valley. There are about 14-15 towns in the valley inhabited by poor people who make their two ends meet by practicing negligible subsistence farming, dairying cattle for milk and horses for voyagers. The vegetation is affected by the climatic conditions and range of altitude prevailing there in the valley. The dominant *vegetation* includes *Pinus*, *Acer*, *Juglans*, *Cupressus*, *Quercus* and *Rhododendron* distributed from temperate to sub-alpine zone while alpine meadows occupy the area between Phurkia and Pindari Glacier which is moistly devoid of trees. The best kenneled trekking course in Kumaun, pursued by the Pindari stream to its source on the ice sheet includes Nandakote (6,860 m). On the east and west of Pindari ice mass, Chhanguch (6,322 m) and Nandaghunti (6,310 m) peaks exist respectively while the Kaphni peak lies at the foot of Nandakote and Sunderdhunga ice sheets. Among them, Pindari ice sheet is about 3 km long and 0.25 km wide associated with the southwestern incline of the external dividers of Nanda Devi Sanctuary.

Field survey and data collection

The present study was done in Pindari valley in the year 2019. A botanical trip was undertaken in order to assess the plant diversity of the area and to collect assessment data from their natural habitat. Efforts were made to find out the extent of economic potential of plant diversity. Interactions with the local people were made to know the mode of uses and their dependency on plant resources for the treatment of various ailments and for other beneficial purposes. Approximately, 200 plant species were collected, out of which, 80 species were found to be of medicinal importance and are frequently used by the local inhabitants of the Pindari valley. Further, published literature, online databases and other available information on the web was consulted for the medicinal value and uses of the plant species recorded from Pindari valley and also used by the other communities in Indian Himalayan region.

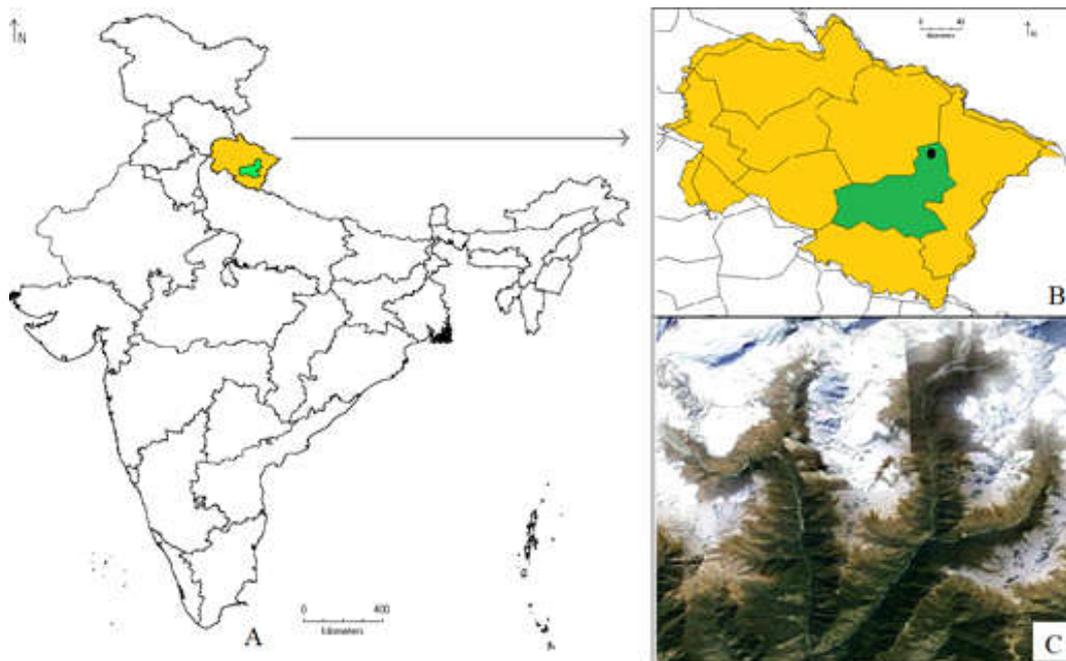


Figure 1: Map showing the position of the Pindari Valley in Uttarakhand

RESULTS AND DISCUSSION

Altogether 80 ethnobotanically important species belonging to 72 genera 34 families have been recorded from the Pindari Valley (Table 1). All the species along with their botanical names, vernacular or local names, families, parts used and uses are enumerated in Table-1. Among the recorded species 53 species were herbs, 13 were trees, 9 were shrubs 9 and 5 were climber (Figure 2). Native people mostly use leaves (30) followed by root/rhizome (26), fruit (18), whole plants (15), seeds (10), flower (7), bark (6), tuber (5), shoot/aerial parts or twigs (5), stem (2), wood (2) and oil and latex each with single species in order to cure different ailments (Figure 3). The distribution within the taxonomic families of those plants/parts is dominated by Asteraceae (10), followed by Rosaceae (7) and Lamiaceae (6), Berberidaceae, Ericaceae, Apiaceae (4 each), Amaranthaceae, Ranunculaceae (3 each), Sapindaceae, Betulaceae, Araceae, Asparagaceae, Dioscoreaceae, Caryophyllaceae, Plantaginaceae, Violaceae (2 each), Cannabaceae, Brassicaceae, Pinaceae, Solanaceae, Moraceae, Cucurbitaceae, Caprifoliaceae, Polygonaceae,

Table 1. List of medicinal plants recognized from the Pindari Valley

Botanical name [Family]	Local name	Habit	Parts used	Uses
<i>Acanthophyllum cerastioides</i> (D. Don) Madhani & Zarre [Caryophyllaceae]		Herb	Whole plant	Boils and wounds
<i>Achyranthes bidentata</i> Blume [Amaranthaceae]	<i>Putkanda</i>	Herb	Whole plant, leaf, root	Mouth ulcers, scorpion sting, swelling, whooping cough.
<i>Aconitum heterophyllum</i> Wall. ex Royle [Ranunculaceae]	<i>Atish</i>	Herb	Root	Diarrhoea
<i>Aesculus indica</i> (Wall. ex Cambess.) Hook. [Sapindaceae]	<i>Khanor</i>	Tree	Seed, fruit, bark	Anthelmintic, dislocated joint, diuretic, leucorrhoea and veterinary galactagogue
<i>Ajuga integrifolia</i> Buch.-Ham. ex D. Don [Lamiaceae]	<i>Neelkahi</i>	Herb	Leaf	Acidity and indigestion
<i>Alnus nepalensis</i> D. Don [Betulaceae]	<i>Utish</i>	Tree	Latex, bark	Diuretic
<i>Anaphalis triplinervis</i> Sims ex C.B. Clarke [Asteraceae]	<i>Woolly Pearly Everlasting</i>	Herb	Leaf, whole plant	Diuretic
<i>Angelica glauca</i> Edgew. [Apiaceae]	<i>Chaura</i>	Herb	Root	Dysentery, gastric complaints, menorrhoea, stomach complaints, vomiting
<i>Arisaema intermedium</i> Blume [Araceae]	<i>Nagdaman</i>	Herb	Roots, Stem	Dehydration, fever, intestinal pain, body ache and skin infection
<i>Arisaema tortuosum</i> (Wall.) Schott [Araceae]	<i>Nagdaman</i>	Herb	Tuber	Rheumatism and breathing disorder
<i>Artemisia parviflora</i> Roxb. ex D. Don [Asteraceae]	<i>Jhau</i>	Herb	Leaf, Root, Seed	Throat problems, vermifuge and carminative
<i>Asparagus filicinus</i> Buch.-Ham. ex D. Don [Asparagaceae]	<i>Shatavari</i>	Herb	Root	Antitussive, Diuretic expectorant, nervine, stomach ache, tonic
<i>Berberis aristata</i> DC. [Berberidaceae]	<i>Kambal</i>	Shrub	Stem, Bark, Wood, Root	Eye complaints, diarrhoea, jaundice, skin diseases, syphilis, chronic rheumatism, urinary disorders, diabetes, jaundice and gastro intestinal problem.
<i>Berberis asiatica</i> Roxb. ex DC. [Berberidaceae]	<i>Kilmore</i>	Shrub	Root, Fruits	Diaphoretic, astringent, ulcers urethral, ulcers and piles
<i>Berberis lycium</i> Royle [Berberidaceae]	<i>Darubaridra</i>	Shrub	Roots, fruits	Indigestion and fever
<i>Betula utilis</i> D. Don [Betulaceae]	<i>Bhuj</i>	Tree	Papery bark and young leaves	Skin disinfectant, convulsions, wound healing, bronchitis and leprosy

Botanical name [Family]	Local name	Habit	Parts used	Uses
<i>Brucea javanica</i> (L.) Merr. [Simaroubaceae]	<i>Titri</i>	Shrub	Leaf, fruit	Cholera, gastric complaints, constipation and skin disease
<i>Caltha palustris</i> L. [Ranunculaceae]	<i>Shomalap</i>	Herb	Root, leaf	Gonorrhoea
<i>Cannabis sativa</i> L. [Cannabaceae]	<i>Bhang</i>	Herb	Leaves flower, seeds	Chronic pain, muscle spasms and honey bee sting
<i>Capsella bursa-pastoris</i> (L.) Medik. [Brassicaceae]	<i>Torigbash</i>	Herb	Whole plant	Blood pressure, diarrhoea and dropsy
<i>Cedrus deodara</i> (Roxb. ex D. Don) G. Don [Pinaceae]	<i>Dyar</i>	Tree	Oil, Wood	Anthelmintic, rheumatism and ulcers
<i>Centella asiatica</i> (L.) Urb. [Apiaceae]	<i>Brahmi</i>	Herb	Leaves	Leprosy
<i>Chenopodium album</i> L. [Amaranthaceae]	<i>Bathua</i>	Herb	Leaf, Seed, Whole plant	Revive taste, skin disease and urinary complaints
<i>Cyathula capitata</i> Moq. [Amaranthaceae]	<i>Letkura/ Ketari</i>	Herb	Leaf, Seed	Emetic and abortifacient
<i>Datura stramonium</i> L. [Solanaceae]	<i>Dhatura</i>	Herb	Leaf, Fruit	Veterinary lactation, Parkinson's, asthma and diarrhoea
<i>Dioscorea bulbifera</i> L. [Dioscoreaceae]	<i>Genthi</i>	Climber	Tuber, Leaves	Urinary discharge, sore throat, breast cancers, Leucoderma and bronchitis
<i>Dioscorea deltoidea</i> Wall. ex Griseb. [Dioscoreaceae]	<i>Singli-Mingli</i>	Climber	Root	Contraceptive, constipation and asthma
<i>Drymaria cordata</i> (L.) Willd. ex Schult. [Caryophyllaceae]	<i>Pithpapra</i>	Herb	Aerial parts	Cold and bronchitis
<i>Erigeron multiradiatus</i> (Lindl. ex DC.) Benth. & Hook.f. [Asteraceae]	<i>Himalayan fleabane</i>	Herb	Aerial part	Blood purification
<i>Eschenbachia stricta</i> (Willd.) Raizada [Asteraceae]	<i>Horse weed</i>	Herb	Whole plant	Bone fracture and swelling
<i>Ficus palmata</i> Forssk. [Moraceae]	<i>Bedu</i>	Tree	Fruit, Twigs	Lung and bladder diseases and skin diseases
<i>Fragaria vesca</i> L. [Rosaceae]	<i>Gandkaphal</i>	Herb	Fruit, Leaves	Astringent, problems of urinary organs diuretic and diarrhoea
<i>Galinsoga parviflora</i> Cav. [Asteraceae]	<i>Banmara</i>	Herb	Leaf	Snakebite and stop bleeding
<i>Gaultheria nummularioides</i> D. Don [Ericaceae]	<i>Jalan-thrait</i>	Tree	Leaf, Fruit	Antiseptic, carminative and neural stimulant
<i>Globba racemosa</i> Sm. [Zingiberaceae]	<i>Gundenoppimandu</i>	Herb	Fruit	Heart pain and stomach pain
<i>Hedera nepalensis</i> K. Koch [Araliaceae]	<i>Katari</i>	Climber	Whole plant	Stimulant, diaphoretic, cathartic, rheumatism and emmenagogue.
<i>Jacobaea analoga</i> (DC.) Veldkamp [Asteraceae]		Herb	Whole plant	Inflammation of mouth and sore throat

Botanical name [Family]	Local name	Habit	Parts used	Uses
<i>Lamium album</i> L. [Lamiaceae]	Banbuti	Herb	Roots/ rhizomes	Burns and cuts
<i>Leucas lanata</i> Benth. [Lamiaceae]	Bis-kapra	Herb	Whole plant	Whooping cough
<i>Lyonia ovalifolia</i> (Wall.) Drude (Ericaceae)	Ayaar	Shrub	Leaf	Skin diseases
<i>Meconopsis aculeate</i> Royle [Papaver- aceae]	Veerbuti	Herb	Flowers and roots	Curing the eye diseases
<i>Melanoseris violifolia</i> (Decne.) N. Kilian [Asteraceae]		Herb	Seed, leaf	Menorrhoea
<i>Nardostachys jatamansi</i> (D. Don) DC. [Caprifoliaceae]	Jatamansi	Herb	Root	Rhizome as tonic, stimulant, anti-spasmodic and diuretic
<i>Ocimum tenuiflorum</i> L. [Lamiaceae]	Tulsi	Herb	Whole plant	Bronchitis, diaphoretic, anti-periodic, gastric disorders and malaria
<i>Origanum vulgare</i> L. [Lamiaceae]	Maruva	Herb	Fresh and dried leaves (both)	Chickenpox
<i>Oxyria digyna</i> (L.) Hill [Polygonaceae]	Chyakulli	Herb	Leaves and young shoots	Dysentery
<i>Paris polyphylla</i> Sm. [Melanthiaceae]	Bada Satnwa	Herb	Tuber and roots	Fever, headache, burns, wounds and poisoning
<i>Parnassia nubicola</i> Wall. ex Royle [Celastraceae]	Phutkya	Herb	Tuber	Food poisoning
<i>Parochetus communis</i> Buch. - Ham. ex D. Don [Fabaceae]	Jangalee Badaame Jbaar	Shrub	Leaf	Stomach disease of babies and earache
<i>Picrohiza kurroa</i> Royle ex Benth. [Plantaginaceae]	Kutaki	Herb	Rhizomes	Fever, stomach ache, jaundice, dysentery
<i>Pimpinella acuminata</i> (Edgew.) C.B. Clarke [Apiaceae]		Herb	Whole plant	Diarrhoea and dysentery
<i>Pimpinella diversifolia</i> DC. [Apiaceae]	Bazzeer	Herb	Root	Digestive disorder, cold, cough and leucorrhoea
<i>Plantago erosa</i> Wall. [Plantaginaceae]	Isabagol	Herb	Root & leaf	Bone fracture, inflammation and cooling agent
<i>Podophyllum hexandrum</i> Royle [Berberidaceae]	Bankakri	Herb	Roots, fruits and flowers	Headache, high fever and abdominal pains
<i>Polygonatum verticillatum</i> (L.) All. [Asparagaceae]	Salam Misbri	Herb	Tuber and leaf	General weakness
<i>Potentilla eriocarpa</i> Wall. ex Lehm. [Rosaceae]	Flanchei	Herb	Leaves	Diarrhoea, arthritis and kidney stones
<i>Potentilla fulgens</i> Wall. ex Sims [Rosaceae]	Bajradanti	Herb	Root	Diarrhoea and teeth cleaning
<i>Prinsepia utilis</i> Royle [Rosaceae]	Bhekal	Shrub	Fruit and seed	Joint pain
<i>Prunus cornuta</i> (Wall. ex Royle) Steud. [Rosaceae]	Jammu	Tree	Fruits and ker- nels	Joint pain

Botanical name [Family]	Local name	Habit	Parts used	Uses
<i>Pseudognaphalium hypoleucum</i> (DC.) Hilliard & B.L. Burt [Asteraceae]	<i>Dhoop</i>	Herb	Paste	Cough and backache
<i>Pyrus pashia</i> Buch.-Ham. ex D.Don [Rosaceae]	<i>Mehal</i>	Tree	Fruit, bark	Blood purification and eye infection
<i>Rhododendron arboreum</i> Sm. [Ericaceae]	<i>Burans</i>	Tree	Flower	Diarrhoea and dysentery
<i>Rhododendron campanulatum</i> D.Don [Ericaceae]	<i>Simru</i>	Tree	Leaf, flower, root	Diarrhoea and dysentery.
<i>Sapindus mukorossi</i> Gaertn. [Sapindaceae]	<i>Ritha</i>	Tree	Fruit, seed	Epilepsy, causing vomiting, dental cavity, cough and cold
<i>Sarcococca saligna</i> (D.Don) Müll.Arg. [Buxaceae]	<i>Chirbeeri</i>	Shrub	Fruit	Joint pain
<i>Saussurea obvallata</i> (DC.) Sch.Bip. [Asteraceae]	<i>Brahmkamal</i>	Herb	Flower	Mental disorder
<i>Smilax aspera</i> L. [Smilacaceae]	<i>Kukurdar</i>	Climber	Root, Shoot	Skin eruption, sores and wounds
<i>Solena heterophylla</i> Lour. [Cucurbitaceae]	<i>Blakari</i>	Climber	Leaf, fruit, root	Antifertility, tooth ache cold, diabetes, ear ache, fever, Snakebite, and stomach pain.
<i>Sorbus lanata</i> (D.Don) S.Schauer [Rosaceae]	<i>Chuai</i>	Tree	Fruits	Antidiabetic
<i>Stellaria media</i> (L.) Vill. [Caryophyllaceae]	<i>Badyalu</i>	Herb	Whole plant	Bone fracture
<i>Swertia chirayita</i> (Roxb.) H. Karst. [Gentianaceae]	<i>Chirayita</i>	Herb	Whole plant	Antipyretic
<i>Taraxacum officinale</i> F.H. Wigg. [Asteraceae]	<i>Kanphul</i>	Herb	Root, leaf	Blisters, blood purification, diuretic, dysentery, gastric ulcers, headache, liver complaints, wounds
<i>Taxus baccata</i> L. [Taxaceae]	<i>Thuner</i>	Tree	Leaf, bark	Antifungal, antibacterial and antitumor
<i>Thalictrum foliolosum</i> DC. [Ranunculaceae]	<i>Mamiri</i>	Herb	Root	Abdominal pain, blood purification, earache, eye problems, fever, leukoderma, piles, boils and toothache
<i>Thymus serpyllum</i> L. [Lamiaceae]	<i>Banajvain</i>	Herb	Aerial parts	Asthma, epilepsy, whooping cough, bronchitis and eye problems.
<i>Urtica dioica</i> L. [Urticaceae]	<i>Kandali</i>	Herb	Leaf	Allergy and muscular pain
<i>Verbascum thapsus</i> L. [Scrophulariaceae]	<i>Tamaku</i>	Herb.	Whole Plant	Vomiting
<i>Viola biflora</i> L. [Violaceae]	<i>Banafsha</i>	Herb	Leaf, flower, root, seed.	Constipation, cold, cough, diaphoretic, causing vomiting, fever, leukoderma
<i>Viola canescens</i> Wall. [Violaceae]	<i>Banafsha</i>	Herb	Whole plant	Diaphoresis, epilepsy, blood purification, treatment of skin diseases, ear-ache.
<i>Zanthoxylum armatum</i> DC. [Rutaceae]	<i>Timur</i>	Shrub	Bark, fruit	Toothache treat colds, coughs, stomachache

Araliaceae, Papaveraceae, Melanthiaceae, Celastraceae, Fabaceae, Simaroubaceae, Buxaceae, Smilacaceae, Gentianaceae, Taxaceae, Urticaceae, Scrophulariaceae, Rutaceae, Zingiberaceae (1 each) (Figure 4). A total of ca. 55 diseases are cured by these 80 plant species and the largest

number of medicinal plants (i.e., 10) were reported to cure stomach ache, diarrhoea; followed by skin diseases (9); cough ; fever, cuts and wounds, urinary disorders (8 each); dysentery (7); bronchitis, joint pain (6 each); asthma jaundice, bone fracture, gastric (4 each); head ache, ear-ache, leukoderma, indigestion (3 each), insect sting, ulcer, leprosy, piles, bleeding, boils, burns (2 each); itching, menstrual disorders diabetes, leucorrhoea, stone, body ache, digestive, constipation (1 each) (Dutt *et al.* 2014; Kumari *et al.* 2018; Naithani & Nand 2018; Pandey *et al.* 2017; Rana & Samant 2011; Topwal & Uniyal 2018).

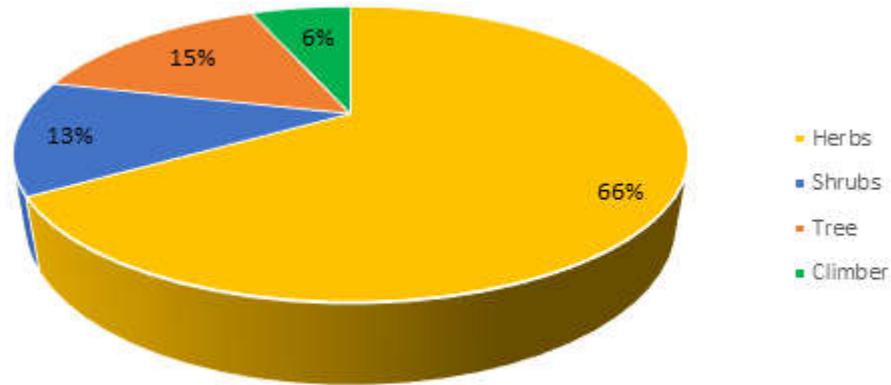


Figure 2. Habit classes of recorded ethno-medicinally important plants used in Pindari valley

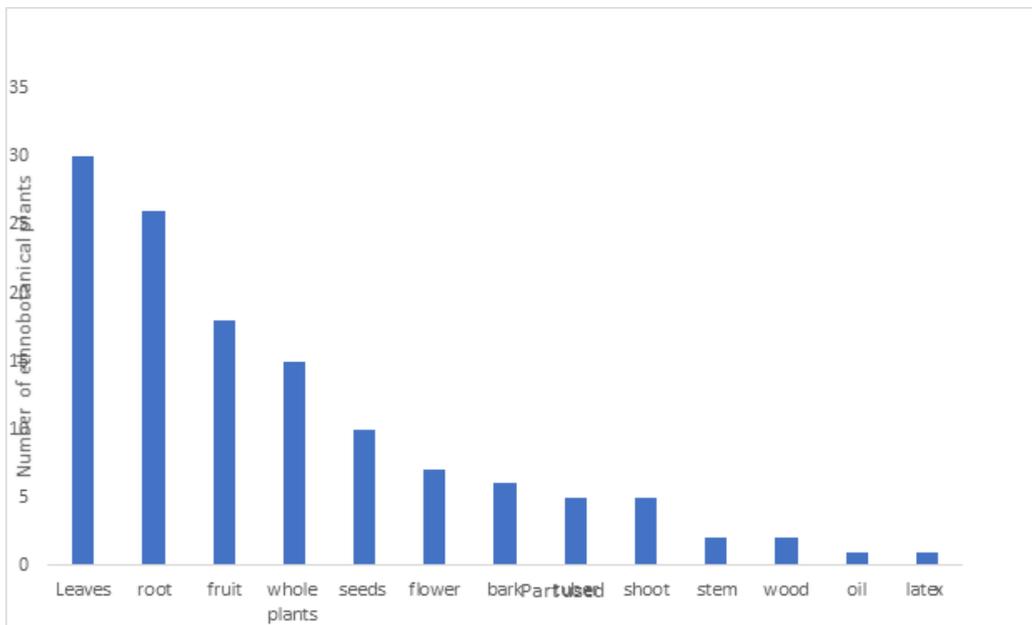


Figure 3. Contribution of different plant parts used for ethnomedicinal purpose

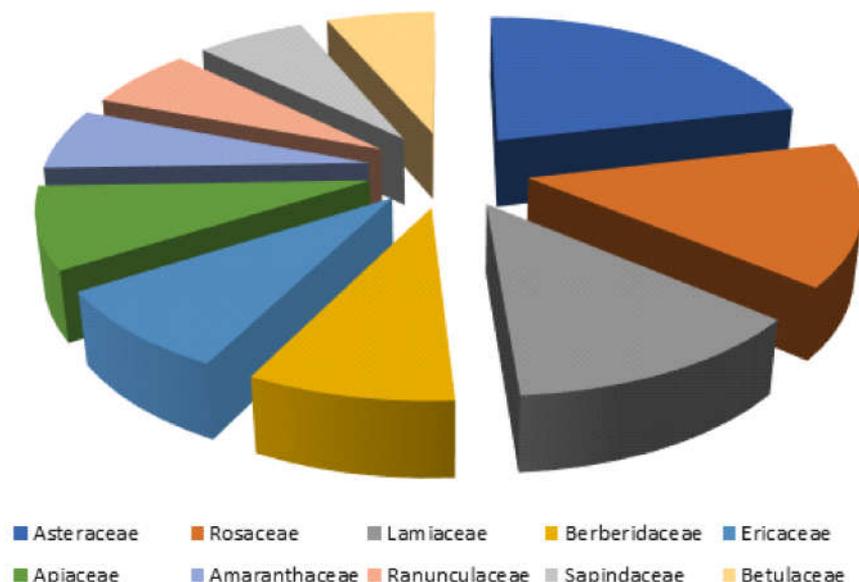


Figure 4. Contribution of ten dominant families having ethnomedicinal plants in Pindari valley

Most of the plant species are known by their own local name by the local people of the region as listed out in Table 1. Local people deliberately utilize these plants because of their high beliefs of nutrients and medicinal qualities.

CONCLUSION

From this study, it can be established that Pindari valley has a treasure of ethnomedicinal plants. The traditional knowledge about the habitat, parts used and way of using ethnomedicinal species is preserved. The exploration of the valley for discovering more valuable plants requires cumulative efforts towards attaining more knowledge about the medicinally important plants. But there should be sustainable utilization of these plants so as to conserve them from the threat of extinction.

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