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Diversity and Ethnobotany of tree species in sub-tropical region of Jammu Shivalik's range of North-Western India: A depository of knowledge for People's Biodiversity Register

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ABSTRACT

National Biodiversity Authority formed under Biological Diversity Act, 2002 has asked the states to prepare the People's Biodiversity Register (PBR) through State Biodiversity Board where Biodiversity Management Committee (BMC) like village panchayats were involved to document information on locally available bio-resources (plants, animals and microorganisms) their medicinal or any other traditional knowledge including landscape and demography of a particular area. In view of this the present study was conducted through systematic quadrat method where 209 plots of 20 m×20 m was laid at sites (100m transect) near to villages and a total of 99 tree species (having ≥ 5 cm diameter at breast height (dbh) belonging to 49 families and 80 genera were recorded where Fabaceae is dominant family with the highest number of species (10) followed by Moraceae (09 species). The ethnobotany of these species was also documented by interviewing 78 individuals using questionnaire survey by semi structured, structured interview from the villagers and importance of People's Biodiversity Register (PBR) was also communicated to the respondents in the presence of sarpanches of panchayat. This study created a baseline of information on the tree species diversity of the Jammu district which is expected to be helpful to the future researchers as well as for the native people of the area to document their native flora.

Key words : *Biodiversity, Urbanisation, National Biodiversity Authority, landscape, Biodiversity Management Committee, People's Biodiversity Register*

Introduction

The collision of continents plates between Indo -Eurasian plates that took place during the late cretaceous to early Eocene times resulted in the origin of Himalaya where the Shivalik group has received significant attention in terms of various geological attributes. The data is available from the rocks of Middle and Upper Siwalik subgroups like Purmandal formation, Nagrota formation and Boulder Conglomerate formation (Pandita *et al.*, 2014). Due to the unique geological characterization of lower Shivalik's where environmental conditions, habitat and existing biotic factors influences the vegetation of an area. The fundamental goal of ecological research is to understand the diversity of nature

and it has been explained with reference to climate, biotic interaction and productivity (Givnish, 1999). Species composition of major forest of thenorth western Himalayais described by (Rathan *et al.*, 1982; Saxena and Singh, 1982; Tewari and Singh, 1981). They summarized the information diversity and characteristic vegetation distributed over a wide range of topographic structure and functioning of Himalayan Forest ecosystem. Major studies in the similar topography are conducted worldwide prominent being of (Kacholi and Amir, 2022; Umair *et al.*, 2017; Patnaik and Sharma, 2013; Rahman and Hossain, 2002; Roy *et al.*, 1993). As environmental gradients determine the species composition, regeneration status and distribution pattern of plants in an area. Presently it is the major topic of ecological investigation in the Jammu Shivalik's where various studies revealed the vegetation diversity in predominantly sub-tropical forest of J&K (Ghazal and Raina, 2015; Koul *et al.* 2015; Dar *et al.*, 2014; Raina and Sharma, 2010; Sharma and Kachroo, 1983). The ethnobotanical knowledge of the biodiversity in an area is documented by locals in the form of Peoples' Biodiversity Register (PBR) which is a document with comprehensive information on locally available bio-resources (plants, animals and microorganisms) their medicinal or any other use or any other traditional knowledge including landscape and demography of a particular area or village. The government of India came up with the biodiversity rules, 2004 after ratifying the National Biodiversity Act in 2002. Thus, preparation of "People's Biodiversity Registers (PBR)" having a scientific basis proves to be an activity that is very much appropriate to our biodiversity rich country, and very much timely in the current era of rapid technological developments impacting our precious biodiversity and natural resources.

The present study was essential for documenting the ethnobotany of local trees which are used by the local people for their personal use. Although (Kumar *et al.*, 2022; Rao *et al.*, 2015; Bushanand Kumar, 2013; Pant and Verma, 2008) worked on the ethnobotanical perspective of flora found in Shivalik's range but the aspect of connecting People's Biodiversity Register was the major research gap. Therefore, the rationale behind this study is to add the local flora in the People Biodiversity Register and to sensitize village panchayat about the Convention on Biological Diversity.

Materials and Methods

Study area

The study area lies in the north-west part of Indian subcontinent between elevational range of 510 m to 834 m. It covers approximately a part of 236 km^{2}of Jammu district (Figure 1). It is comprised of two diverse geological formations, the mid Shivalik's and the alluvial plains, which serve as the north western extension of the Indo-Gangetic Plains. The Shivalik

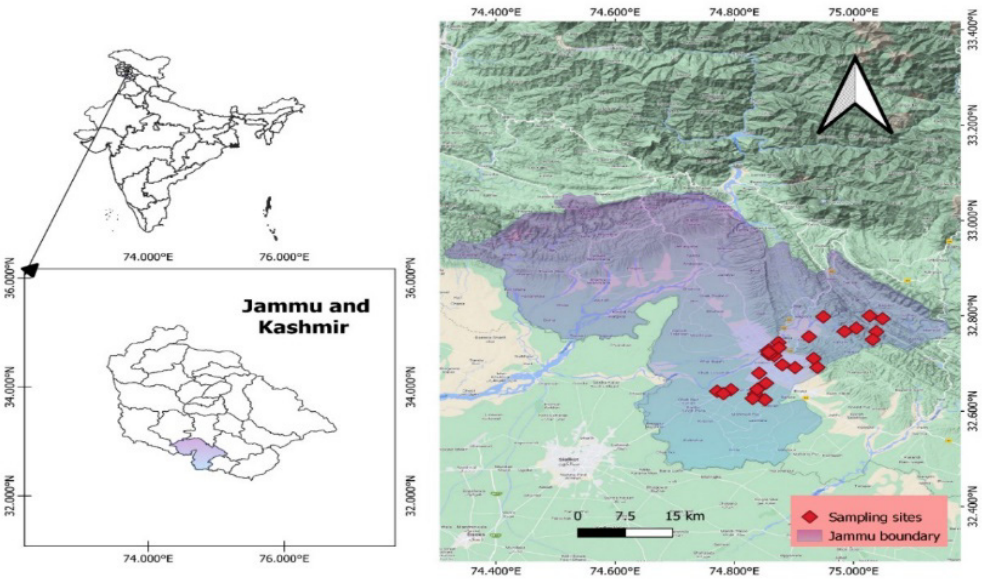

Fig. 1. Map of the study area

system, consisting of moderately elevated hills, is sedimentary innature dividing it into upper, middle, and lower zones, undifferentiated lower murre group. The region is drained by Chenab and Tawi river which are added by seasonal river known as khads. In physiography the study region is divided into alluvial plains (263-320 m), rolling and piedmont plains (320-520 m), Shivalik Hills (520-1020 m) (Rashid and Arora, 2007). The area is characterized by basically four seasons, e.g., winter (December–February), summer (March–May), monsoon (June–September) and autumn (October–November). In Jammu, the climate is warm and temperate when compared with winter, the summers have much more rainfall. The average annual temperature in Jammu is 21.3 °C with about 1313 mm of annual precipitation (Khan *et al.,* 2021; Ashutosh *et al.*, 2010). The forests of Jammu district are classified into three sub types but the study area represent typical subtropical vegetation with distinct vertical zonation of two forest types i.e., Northern dry mixed deciduous forests (5B/C2), Himalayan subtropical scrub (9/C1/DSI) (Champion and Seth, 1968).

Methodology

The composition and diversity of the tree species in Jammu district were assessed through systematic quadrat survey with 20 m×20 m sized sample plots were conducted during October 2018 to September 2019. The quadrat size was determined by applying species area curve method (Moore and Chapman, 1986). A total of 209 quadrats were placed randomly with approximately 100 m distance from each other. The sampling intensity of the survey was 0.54%. Besides the quadrats trees were recorded from the walk ways (line transacts of 100 m) whenever a new species occurred during the travel from one quadrat to another. All trees having ≥ 5 cm dbh were identified, counted by individuals and measured in the quadrats. The research team also did a reconnaissance survey to the study area tohave an idea of species composition of the whole mid Shivalik's prior to selection of sampling protocol for floristic composition and diversity. The study envisions the estimation of tree diversity of the region, for this forest patches near to villages were taken as sampling units. Information about the traditional knowledge among locals was gathered by conducting extensive ethnobotanical survey in different sites of the region, where total of 78 informants between the age group of 18-72 years were interviewed (Table 1). Semi-structured questionnaires were framed and interviews were conducted in local language to extract information from the living population. The present study's objectives were elaborated to the participants, along with help of literate people group and Prior Informed Consent (PIC) was taken from all the participants as per guidelines of Convention on Biological Diversity (CBD). The information about plant's local name, edible plant part, uses was documented and ethnobotany was confirmed by previous work done in similar area like Kathua and Samba (Sharma *et al.*, 2012; Bushan and Kumar, 2013; Sarin and Kapoor, 1984; Lone *et al.,* 2014; Rao *et al.,* 2015). A brief tree inventory was prepared and identification was confirmed by consulting local flora (Sharma and Kachroo, 1983) and Herbaria in Botany Department, University of Jammu.

Table 1. Demographic status of the informants

Demographic details	No. of Informants	Percentage
Gender		
Male	46	58.97
Female	32	41.03
Age groups		
18-26 years	9	11.53
27-35 years	16	20.51
36-45 years	21	26.93
Above 45 years	32	41.03
Occupation		
Farmer	29	37.17
Govt. Service	14	17.94
Private Employee	17	21.82
Retired	18	23.07

Results

The results of the study shows that great variety of trees species (having dbh ≥ 5 cm) exists in the study area. In the 58 sites studied, a total of 99 species belonging to 80 genera and 49 families were observed. All the total 99 tree species were found to have economic value and they areprimarily used for medicinal, timber, food, fodder purpose (Table 2). About 77 tree species were found to have medicinal value whereas 12 species were identified to have religious value like *Aegle marmelos* (L.) Corr., *Azadirachta indica*A. Juss., *Ficus benghalensis* L., *Ficus religiosa*L., *Mangifera indica* L., *Musa paradisiaca* L. etc (Anthwal *et al.,* 2006; Jasrai *et al.,* 2003). Around 42 tree species

Table 2. Trees species composition and their ethnobotanical status in Jammu Shivalik's.

Family	Plant species Scientific name	Local name	Parts used	Purpose/Uses
Rutaceae	*Aegle marmelos* (L.) Corr.	Bilan	Fruit pulp	Diarrhoea and Dysentery
Apocynaceae	*Alstoniascholaris* (L.) R.Br.	Satpatra	Bark	Malaria, ornamental
Rubiaceae	*Haldina cordifolia* (Roxb.) Brandis	Desi Kadamb	Bark	Antiseptic
Mimosaceae	*Albizia lebbeck* (L.) Benth.	Kala siris	Leaves	Surma
Mimosaceae	*Albizia procera* (Roxb.) Benth.	Safed siris	Wood	Timber
Mimosaceae	*Albizia odoratissima* (L.f.) Benth.	Kramblu	Wood	Timber
Meliaceae	*Azadirachta indica* A. Juss.	Neem	Leaves, stem	Skin boils, ring worms
Araucariaceae	*Araucaria Columnaris* J.R. Forst. Hook.	Arucaria	Seeds	Ornamental
Moraceae	*Artocarpus lacucha* Buch. -Ham.	Tao	Wood, fruit	Medicine
Amaranthaceae	*Amaranthus caudatus* Linn.	Chaleri	Leaves, flowers	Vegetable and dyes
Fabaceae	*Acacia nilotica*(L.)	Kikar	Whole plant	Fodder, medicine
Fabaceae	*Acacia modesta* Wall	Fulai	-	Fuel, Medicine
Fabaceae	*Acacia catechu* (L.) Willd., Oliv.	Khair	Trunk, log and leaves	Food, fodder, medicine, dying
Fabaceae	*Acacia torta (*Roxb.) Craib	Raal	-	Medicine, ornamental
Sapindaceae	*Acer caesium* Wall. ex Brandis	Madirae	Bark	Muscular swellings, boils
Annonaceae	*Annona squamosa* L.	Sitaphal	-	Fruit Eatable delicacy
Rubiaceae	*Anthocephalus cadamba*Roxb.	Kadamb	-	Fodder, Analgesic, Antipyretic
Annonaceae	*Artabotryshexapetalus* (L.f.) Bhandari	Kandar	Flowers, essential oils	Vomiting, biliousness, heart diseases
Berberidaceae	*Berberis aristata* DC.	Kimbal	Whole plant	Urinary problems, dying clothes, tanning leather
Caesalpiniaceae	*Bauhinia variegata* (L.) Benth	Kartaid	Bark	Tonic and anthelminthic, leprosy
Caesalpiniaceae	*Bauhinia vahlii* Wight and Arn.	Balungad	-	Ornamental
Fabaceae	*Butea monosperma* (lam.) Taub.	Palash	Leaves and seed	Rheumatic pain
Caesalpiniaceae	*Bauhinia purpurea* Linn.	Kreal	Bark, Flower, Plant	Astringent and Antidiarrheal
Bombacaceae	*Bombax ceiba* Linn.	Simbal	Young roots, Fruits and Flowers	Kidney problems, Anti-inflammatory, Skin
Phyllanthaceae	*Bridelia retusa* (L.) A. Juss.	-	Bark	Useful for urinary contraction and Rheumatoidism
Rutaceae	*Citrus limon* (L.) Osbeck	Nimbu	Fruit, Leaves and Stem	Influenza, Biliousness, Antibacterial
Rutaceae	*Citrus medica* L.	Gargal	Fruit, Root, Flowers	Anthelmintic, Astringent
Boraginaceae	*Cordia obliqua* Linn.	Lasoora	Fruit, Bark and Leaves	Ringworm, Cough and Cold
Capparaceae	*Crataevaadansonii* DC.	Barna	Root and Bark	Urinary disorders
Fabaceae	*Cassia fistula* Linn.	Krangal	Flowers, pods and Seed powder	Amoebiasis
Fabaceae	*Cassia gluaca* (DC.)	Gula	Flowers	Medicinal
Caricaceae	*Carica papaya* L.	Papita	Ripe Fruit and Juice of Seeds	Bleeding piles, Enlarged liver and spleen
Salicaceae	*Casearia tomentosa* Roxb.	-	Leaves, Bark and Root	Malaria, Fissure and Wounds
Casuarinaceae	*Casuarina equestifolia* L.	Saru	Whole plant	Wind barrier, Antispas modic
Myrtaceae	*Callistemon citrinus* (Curtis.) Skeels	Bottle brush	-	Natural herbicide
Caesalpiniaceae	*Caesalpinia decapetal* (Roth) Alston.	-	Roots	Antimalarial and Bronchitis
Cannabaceae	*Celtis australis* Linn.	-	Bark and Roots	Diarrhoea, Heavy Menses and Amenorrhoea
Fabaceae	*Dalbergia sisoo* Roxb.	Tali	Leaves and Wood	Skin diseases, dysentery and fuelwood

Table 2. *Continued ...*

Family	Plant species Scientific name	Local name	Parts used	Purpose/Uses
Dilleniaceae	*Dillenia indica* L.	Kanel	Seeds and leaves	To treat ulcers, antiseptic
Ebenaceae	*Diospyros cordifolia* Roxb.	Razain	-	Medicinal
Myrtaceae	*Eucalyptus globules* Labille	Safeda	Wood and leaves	Timber, oil
Rosaceae	*Eriobotrya japonica* Lindl.	Lokat	Leaves, Fruit and Flower	Diabetes, Skin diseases
Ehretiaceae	*Ehretialaevis* Roxb.	-	Leaves, Bark and flower	Medicine, Wood, Dye and Cosmetics
Elaeocarpaceae	*Elaeocarpus ganitrus* Roxb.	Rudraksh	Fruit and Stem	Headache, Asthma
Moraceae	*Ficus racemosa* Linn.	Rumbel	Bark, Fruits and Roots	Antiseptic, Skin Disorder, Urinary Disorders
Moraceae	*Ficus elastica* Roxb.ex Hornem.	Rubber	-	Industrial use
Moraceae	*Ficus benghalensis* L.	Barh	Bark, Seeds, Buds and Leaves	Diabetes, Dysentry, Ulcers
Moraceae	*Ficus religiosa* Linn.	Borh	Fruits, leaves and barks	Antiseptic, Ulcers
Moraceae	*Ficus palmata*Forssk.	Fakoda	-	Medicinal, Ornamental
Moraceae	*Ficus virens* L.	Pakh	-	Ornamental
Flacourtiaceae	*Flacourtia indica* (Burm.f.) Merr.	Kakoh	Fruits, leaves, roots and wood	For jam and jellies, against snakebite and as firewood
Proteaceae	*Grevillea robusta* A. Cunn. ER.Br.	Silver oak	Acorns	Astringent, Indigestion
Tiliaceae	*Grewia optiva* Drumn.	Taman	Fruits	Commercial value, stomach and skin
Tiliaceae	*Grewia tillifolia* Vahl.	Taman	-	Medicinal
Rubiaceae	*Hymenodictyonexcelsum* (Roxb.) Wall.	-	Leaves and roots	Gastro intestinal and Urinary infection
Bignoniaceae	*Kigelia pinnata* (Lam.) Benth.	Kakri	Bark and Fruit	Ornamental, Antirheumatic
Sapindaceae	*Litchi chinensis* Sonn.	Lychee	Fruit and Leaf	cough, fever, pain, promote urination
Anacardiaceae	*Lanneacoromandelica* (Houtt.) Merill.	Kambel	Bark Used in gout	Used in gout
Sapotaceae	*Mimosopselengi* L.	Mulsari	Fruit, Flower, Bark and Seed	Astringent, Chronic Dysentry
Moraceae	*Morus alba* Linn.	Toot	Fruit, Leaves and Bark	Cooling, Sore throat, Anti-inflammatory
Moraceae	*Morus serrata* Roxb.		Fruit, Leaves and Bark	Cooling, Sore throat, Anti-inflammatory
Anacardiaceae	*Mangifera indica* Linn.	Aam	Whole plant	Antiscorbutic, Antibacterial, Burns, Antifungal
Meliaceae	*Melia azedarach* Linn.	Drenk	Fruits and leaves	Malaria, leprosy and skin disease
Musaceae	*Musa paradisiaca* L.	Kela	Fruits, Leaves and Roots	Diarrhoea, Intestinal Anthelminthic
Rutaceae	*Murrayakoenigi* (L.) Spreng.	Kurrypatta	Leaves	Antiprotozoal, Digestion
Euphorbiaceae	*Mallotusphilippensis* (Lam.) Muell. Arg	Kambal	Fruit	Anthelminthic, Antibacterial, Red dye
Magnoliaceae	*Micheliachampaca* L.	Chamba	Flowers, Oil, Fruits, Roots, Seeds and Bark	Stimulant, Gout, Healing Cracks
Moringaceae	*Moringa oleifera* Lamk.	Soanjna	-	Food
Magnoliaceae	*Magnolia grandiflora* L.	-	-	Weight loss and Ornamental
Oleaceae	*Olea cuspidata* Wall. ex G. Don	-	Oil from leaves	Heart patients, Cholesterol level

Table 2. *Continued ...*

Family	Plant species Scientific name	Local name	Parts used	Purpose/Uses
Myrtaceae	*Psidium guajava* L.	Amrud	Unripe fruits, Leaves and Flowers	Antidiarrheal, Diabetes, Cough, cold, Anthelmintic
Malvaceae	*Pterospermumacerifolium* (L.) Willd	Kanak champa	Flowers and Bark	Anti-inflammatory
Pinaceae	*Pinus roxburghii* Sarg.	Chir	Needle oil, Oil and Resin	Antiseptic, Cough, Cold remedies
Arecaceae	*Phoenix sylvestris* (Linn.) Roxb.	-	Sap	Fever, Abdominal complaints
Poaceae	*Phyllostachys aurea* Riviere	Baans	Stem	Making of Baskets, Mats
Euphorbiaceae	*Phyllanthus emblica* Linn.	Amla	Fruits, Seeds, Bark and Leaf Trouble	Antianemia, Antidiabetic, Jaundice, Dysentry, Eye
Annonaceae	*Polyalthia longifolia* Sonn.	Ashoka	Stem bark and Leaves	Fungitoxic activity
Putranjivaceae	*Putranjivaroxburghii* Wall.	Patanjan	Fruits	Cough, Cold and Astrin-
gent				
Rosaceae	*Prunus persica* (L.)	Adoo	Fruit, Bark and Leaves	Tranquillizer, Whooping cough
Fabaceae	*Millettia pinnata* (L.) Panigrahi	Sukhchan	-	Oil and Medicinal uses
Rosaceae	*Pyrus communis* L.	Nashpati	-	Food, Ornamental
Rosaceae	*Prunus persica* (L.) Stokes	Ardo	-	Food
Lythraceae	*Punica granatum* L.	Dadoni	Seeds	Fruit, Medicinal
Arecaceae	*Roystonea regia* (Kunth)	Palm	-	Ornamental plant
Euphorbiaceae	*Ricinus cummunis* Linn.	Arand	Roots, Bark and Seeds	Dermatosis and Eczema
Myrtaceae	*Syzygiumcumini* (L.) Skeels	Skeels	Jamun Fruit, Bark, Seeds and Leaves	Antibacterial Antidiarrhoeal,
Meliaceae	*Toona ciliata* M. Roemer.	Tuno	-	Timber
Apocynaceae	*Thevetia peruviana* (Pers.) K. Schum.	-	Bark and Leaves Root	Root Plaster is applied to tumours
Fabaceae	*Tamarindus indica* L.	Imli	Bark, Fruits and Seeds	As blood purifier and snakebite
Combretaceae	*Terminalia arjuna* (Roxb.) Wight & Arn.	Arjuna	Bark and Fruit	Cardiotonic, Cirrhosis of liver, Skin Diseases
Lamiaceae	*Tectona grandis* L.f.	Sagwan	Flower, Seed, Wood, Bark and Root	Urinary problems, Anti-inflammatory, Timber
Combretaceae	T*erminalia bellirica* (Gaertn.) Roxb.	Bhera	Fruit	Diarrhoea, Respiratory Tract infections, Allergy
Combretaceae	*Terminalia chebula* Retz.	Reed, Harad	Fruit and Bark	Ant bilious, Constipation,
Dysentery				
Cannabaceae	*Trema orientalis* (L) Blume	-	Bark	Cough, Sore throat, asthma, Tooth ache, Gonorrhoea
Lamiaceae	*Vitex negundo* L.	Bnaa	-	Analgesic
Apocynaceae	*Wrightia tomentosa* Roem & Schult.	Dudha	Bark and Seeds Skin Disorders	Antidysentery, Piles and
Rubiaceae	*Wendlandiaheynei* (Schult.) Santapauand Merchant.	Kadam	-	Wood and Perfume
Rhamnaceae	*Ziziphus mauritiana* Lam.	Bheri	Fruits, Seeds, Bark and Leaves	Gout, boils, Rheumatic inflammations
Rhamnaceae	*Ziziphus oxyphylla* Edgew.	-	Leaves and Bark	Analgesic, Anti-inflammatory and Liver ailments

were identified to have aesthetic and economic value such as fruit trees like *Zizyphus mauritiana, Annona squamosa* and *Carica papaya* etc. Trees like *Dalbergia sisoo, Acacia catechu* etc. served as timber source for the locals whereas dye and ornamental trees like *Malotus phillipinesis, Amaranthus caudatus*, *Ficus virens* and *Bauhinia vahlii* etc. also fulfils the demand of people. Fabaceae family possess the highest number of tree species (10) followed by Moraceae (09 species) and Rubiaceae (4 species) as represented in Figure 2.

Discussion

The present study revealed Jammu Shivalik's as a diverse area with great ethnobotanical importance which is represented by 99 tree species. The tree composition of Jammu city forest (99 tree species under 80 genera and 49 families) is quite greater than 85 tree species reported from Bamu reserve forest of Cox's Bazar (Hossain *et al.*, 1997); 92 tree species from Chunati Wildlife Sanctuary (Rahman and Hossain, 2003); 62 tree species from Tankawati natural forest (Motaleb and Hossain, 2011); 77 tree species from Dudhpukuria Natural Forest (Hossain and Hossain, 2012); 18 tree species from Satchari National Park (Hossain *et al.*, 2018). But it is quite lower in comparison to the 197 plants from 87 families and 174 genera from Kathua district (Rao *et al.*, 2015); 162 tree species from primary forests of Garo Hills, India (Kumar *et al.*, 2006). Similar studies were done in J & K, where 35 plants species were recorded from shiwalik mountains of Azad J&K (Khanum *et al.*, 2022); 39 trees species from kalidhar forest range of western shiwaliks (Sharma and Kumar, 2021); (Jan *et al.*, 2021) reported 60 plant species belonging to 35 families in the temperate forest; 213 vascular plant species from mixed subtropical and temperate forests of Devi Pindiyan valley in trikuta hills of Northwest Himalaya (Thakur *et al.*, 2019); 323 plant species from lower shiwalik hills (Sharma *et al.*, 2015); 190 species from hills of north western Himalayas (Dutt *et al.*, 2015). Although Protected Areas (PAs) play a key role for the harbouring elusive flora and fauna similarly our study area encompasses 3 wildlife sanctuaries (Nandni WLS, Surinsar-Mansar WLS- some part in samba and Ramnagar WLS) but we excluded the sanctuaries because our motive was to document trees species near to the villages and settlements in peri urban areas. To access the information of locals regarding medicinal uses of some trees a total of 219 informants (131 males and 88 females) from the age group of 18- 67 years were interviewed. They were using a total of 88 tree species from 43 families for the ethnomedicinal purposes. The most dominant families were Fabaceae and Asteraceae and the most important plants of the study site on the basis of use-value were *Mentha longifolia*, *Curcuma domestica* and *Zingiber ofcinale*. Due to cutting of trees for the construction of roads some centuries old trees also being cut off. Therefore, the local community isinvolved in protecting the natural resources of their area. As a result, the nomadic people who generally used to cut and collect the timber, fuelwood and bamboos from the forests like Jindrah and Bahu range are not allowed to do the same extensively. Local people are conscious and trying to protect their forests from deforestation. The Jammu and Kashmir Forest Department also extended their responsibilities to strengthen the conservation measures of the forest resources and documentation of these indigenous tradition of using

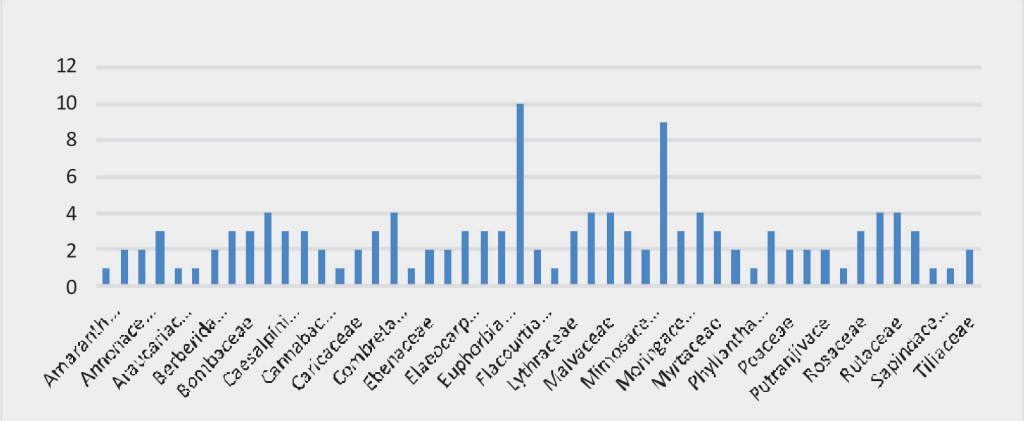

Figure 2. Family dominance based on species richness

these resources into People's Biodiversity Register (PBR).

Conclusion

The present study reveals that despite rapid urbanisation Jammu region is still rich in wealth of traditionally available ethnomedicinal plants. But the knowledge is depleting among the younger generation due to their high qualification. The study suggests that, the need for the incorporation of indigenous knowledge into PBR for sustainable development and conservation of natural resources should receive more recognition and proper scientific investigation into ethno-botanical aspect is required. Therefore, if paid attention, it may go a longway towards fostering the sustainable use of natural resources and knowledge available within the local communities.

Declaration

Ethics approval and consent to participate: Prior consent was taken from the participants for interview.

Conflict of interest: The authors declare that they have no conflict of interest.

Author Contributions: AT conceptualized the work and did field survey along with SD. S prepared the draft of the manuscript. AT and SD reviewed and edited the manuscript. ATreviewed, edited and finalised the manuscript.

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