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FLORISTIC DIVERSITY AND ITS ECONOMIC POTENTIAL IN PAURI GARHWAL, NORTHWEST HIMALAYA

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ABSTRACT

The Pauri region of Northwest Himalaya, part of the ecologically rich Indian Himalayan zone, boasts remarkable floristic diversity with significant economic potential. This study examines the diverse plant species of the region, focusing on their economic uses across various areas. The region's altitudinal changes, combined with its peculiar climatic conditions, have fostered a rich assemblage of flora with immense ecological and economic value. Field investigations revealed more than 210 plant species that belong to families such as Fabaceae, Rosaceae, Lamiaceae, and Asteraceae. These species are frequently used in numerous fields, including medicine , agriculture,, food, and aromatics. *Rhododendron arboreum*, known for its edible flowers and use in beverages, along with *Cedrus deodara* and *Cupressus torulosa*, valued as sources of high-quality timber, and *Juglans regia* (walnut), prized for its nuts and wood, collectively underscore the significant economic potential of the region. Additionally, many species provide essential resources like fodder, fuelwood, and fibers, contributing to local community livelihoods. These species not only contribute to local livelihoods, but also have vast ecological and commercial value, emphasizing the requirement for their sustainable management and conservation. Despite their importance, these resources face threats from overexploitation, habitat degradation, and climate change. The study emphasizes the need of sustainable management approaches in preserving the region's floristic wealth while also increasing its economic potential.

Key words: diversity, livelihoods, resources, economic potential, conservation

INTRODUCTION

The Northwest Himalaya is a distinct region with specific climate, geology, and flora. Its unique geographical location and diverse climatic conditions have fostered rich biodiversity and an extensive range of plant species. This diversity has progressed over time due to ecological changes that have driven processes like speciation, isolation, and competition. Uttarakhand, a key part of this region, boasts extensive forest cover, constituting approximately 63.87% of its total geographic area, with about 4.04% designated as permanent pastures and grazing lands. These forests are invaluable repositories of biological diversity, providing ecological stability and essential resources such as timber, fodder, and fuelwood for local communities. Livestock and animal husbandry have deepened the dependence of these communities on their immediate environment, particularly for their daily needs of fuelwood and fodder (Nautiyal et. al. 2018).However, the forests in the Lesser Himalayan zone are facing severe biodiversity loss. Factors such as village settlements at altitudes between 1000 to 2000 m.s.l. contribute significantly to forest degradation, as local needs are heavily reliant on forest resources. The Pauri Garhwal district, despite its rich biodiversity, has been largely overlooked by past researchers. This paper aims to address this gap by compiling comprehensive information on the ethnobotanical uses of plants found in the region. A numbers of workers i.e. Arya et al., 1999; Bhatt and Gaur, 1992; Gaur, 2008; Gaur and Nautiyal, 1993; Gaur et al., 1997; Joshi and Pandey, 2000; Mehta and Bhatt, 2007; Negi and Gaur, 1991; Negi and Gaur, 1994; Shah and Joshi, 1990; Ramakrishnan et al. 2000, Samant, et.al. 2007, Tiwari and Pandey, 2010, Pandey et.al. 2016, Bisht, 2017, Kukshal et.al. 2022 and Kukshal et.al. 2024 carried out studies on the plants of economic values in the Himalayas.

MATERIAL AND METHODS

After surveying various summits in Pauri Garhwal district, the NagDev summit was chosen for this investigation based on its proximity to the site, latitudinal gradient, slope, aspect, and other favorable conditions. Pauri town, the district headquarters, is situated between latitudes 29°47'–30°13' N and longitudes 78°18'–79°10' E. The study area spans an elevation range of 1800 to 2250 m.s.l. The rainfall in this region is predominantly affected by the monsoon. The South-East monsoon begins in late June and continues until mid-September, while the North-East monsoon occasionally brings winter showers from December to February. The soils in the region are young and thin, ranging from light yellowish brown to dark brown colour. The texture is predominantly clay, reflecting the distinct environmental characteristics of the area.

This study is the result of extensive and thorough field surveys conducted across different seasons (rainy, winter, and summer). Specimens were collected using conventional methods for collection, preservation, and maintenance in the herbarium (Jain and Rao, 1977). Detailed field notes were taken, including local names, plant habit, habitat, altitude range, flower color, flowering and fruiting periods, general availability, and uses. Information on various uses of plants and their parts wasacquired through personnel interviews with local people and cross checked by various literatures i.e. Gaur (1999) and Naithani (1985). The collected specimens were recognized using recent and relevant floras. Their identification was further validated by comparing them to authentic specimens from HNB Garhwal University Herbarium (GUH), Srinagar. The identification of ferns (pteridophytes) followed the work of Beddome (1866).

RESULT AND DISCUSSION

The research site was visited over two successive years, during which both qualitative and quantitative characteristics of the vegetation in various stands were studied across different seasons.Table 1 and 2 highlights the important diversity features at a glance. A total of 215 species were identified from the research area of which 179 were dicotyledones, 31 monocotyledones, and 5 gymnosperms. These species fall in 147, 28 and 4 genera belonging to 60, 9 and 2 families respectively. Asteraceae is the largest one with 35 species in 27 genera, followed by Lamiaceae with 15 species (13 genera) and Fabaceae having 14 species (10 genera). Among the monocots, Poaceae has the largest number of species being 12 (11 genera) followed by Cyperaceae with 6 species (4 genera) and Orchidaceae with 4 species (4 genera). Out of 210 angiosperms, there were 19 tree species, 46 shrubs, 107 herbs, 9 climbers, 12 grasses and 7 sedges/ lianas species (fig. 1). 27.62% (58 species) phanerophytes, 23.81 % (50 species) chaemaephytes, 20.48 % (43 species) hemi- cryptophytes, 12.38% (26 species) cryptophytes and 15.71% (33 species) therophytes represented the whole community.

Table 3 shows a large number of naturally occurring plant species in the Garhwal region and are traditionally utilized by local communities for fodder, fuel, vegetables, and timber. Each plant species holds specific value, serving purposes such as fodder, vegetables, bee forage, resin, tannin, dye, timber, and ornamentation.

The forests in the study area exhibit significant anthropogenic pressure, as evidenced by the absence of mature trees in higher growth classes and the slow natural succession of key forest species such as *Lyonia ovalifolia*, *Myrica esculenta*, *Quercus leucotrichophora*, and *Rhododendron arboreum*. The presence of a few old oak trees alongside patches of chir pine indicates that the area was once dominated by oak forests, which have gradually diminished due to human activities, making way for chir pine.

Table 1- The Number and percentage of families, genera and species of Gymnosperms, Dicotyledons and Monocotyledones

Groups	Families		Genera		Species	
	Number	Percent	Number	Percent	Number	Percent
Gymnosperms	2	2.8	4	2.3	5	2.2
Dicotyledones	60	84.5	147	83.5	179	80.3
Monocotyledones	9	12.7	28	15.9	31	13.9
Total	71	100.0	179	101.7	215	96.4

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Table 2 - Contribution of family, genera and species in the Study area

S.No.	Family	Genera		Species	
		Number	Percent	Number	Percent
1	Cupressaceae	2	1.1	2	0.9
2	Pinaceae	2	1.1	3	1.4
3	Ranunculaceae	3	1.7	5	2.4
4	Berberidaceae	1	0.6	2	0.9
5	Papaveraceae	1	0.6	1	0.5
6	Fumariaceae	1	0.6	1	0.5
7	Ulmaceae	1	0.6	2	0.9
8	Moraceae	1	0.6	1	0.5
9	Urticaceae	1	0.6	1	0.5
10	Juglandaceae	1	0.6	1	0.5
11	Myricaceae	1	0.6	1	0.5
12	Fagaceae	1	0.6	3	1.4
13	Amaranthaceae	3	1.7	3	1.4
14	Caryophyllaceae	1	0.6	1	0.5
15	Polygonaceae	4	2.2	5	2.4
16	Hypericaceae	1	0.6	3	1.4
17	Tiliaceae	1	0.6	1	0.5
18	Malvaceae	1	0.6	1	0.5
19	Violaceae	1	0.6	2	0.9
20	Cucurbitaceae	1	0.6	1	0.5
21	Begoniaceae	1	0.6	1	0.5
22	Brassicaceae	2	1.1	2	0.9
23	Ericaceae	2	1.1	2	0.9
24	Sapotaceae	1	0.6	1	0.5
25	Myrsinaceae	1	0.6	1	0.5
26	Primulaceae	3	1.7	3	1.4
27	Hydrangeaceae	1	0.6	1	0.5
28	Crassulaceae	2	1.1	2	0.9
29	Saxifragaceae	2	1.1	2	0.9
30	Rosaceae	11	6.1	12	5.6
31	Mimosaceae	1	0.6	1	0.5
32	Ceasalpiniaceae	1	0.6	2	0.9
33	Fabaceae	10	5.6	14	6.5
34	Lythraceae	1	0.6	1	0.5
35	Thymelaeaceae	1	0.6	1	0.5
36	Onagraceae	1	0.6	1	0.5
37	Euphorbiaceae	1	0.6	1	0.5
38	Rhamnaceae	1	0.6	1	0.5
39	Vitaceae	1	0.6	1	0.5
40	Linaceae	1	0.6	1	0.5
41	Hippocastanaceae	1	0.6	1	0.5

42	Anacardiaceae	2	1.1	2	0.9
43	Meliaceae	1	0.6	1	0.5
44	Rutaceae	2	1.1	2	0.9
45	Oxalidaceae	1	0.6	2	0.9
46	Geraniaceae	1	0.6	1	0.5
47	Balsaminaceae	1	0.6	1	0.5
48	Araliaceae	1	0.6	1	0.5
49	Apiaceae	3	1.7	3	1.4
50	Gentianaceae	3	1.7	6	2.8
51	Apocynaceae	1	0.6	1	0.5
52	Solanaceae	1	0.6	2	0.9
53	Boraginaceae	1	0.6	1	0.5
54	Verbenaceae	3	1.7	3	1.4
55	Lamiaceae	13	7.3	15	7.0
56	Buddlejaceae	1	0.6	1	0.5
57	Oleaceae	1	0.6	1	0.5
58	Scrophulariaceae	4	2.2	4	1.9
59	Acanthaceae	4	2.2	4	1.9
60	Rubiaceae	4	2.2	5	2.4
61	Valerianaceae	1	0.6	1	0.5
62	Asteraceae	27	15.1	35	16.3
63	Araceae	1	0.6	1	0.5
64	Commelinaceae	2	1.1	2	0.9
65	Cyperaceae	4	2.2	6	2.8
66	Poaceae	11	6.1	12	5.6
67	Zingiberaceae	2	1.1	2	0.9
68	Liliaceae	2	1.1	2	0.9
69	Hypoxidaceae	1	0.6	1	0.5
70	Smilaceae	1	0.6	1	0.5
71	Orchidaceae	4	2.2	4	1.9
	Total	179	100.0	215	100.0

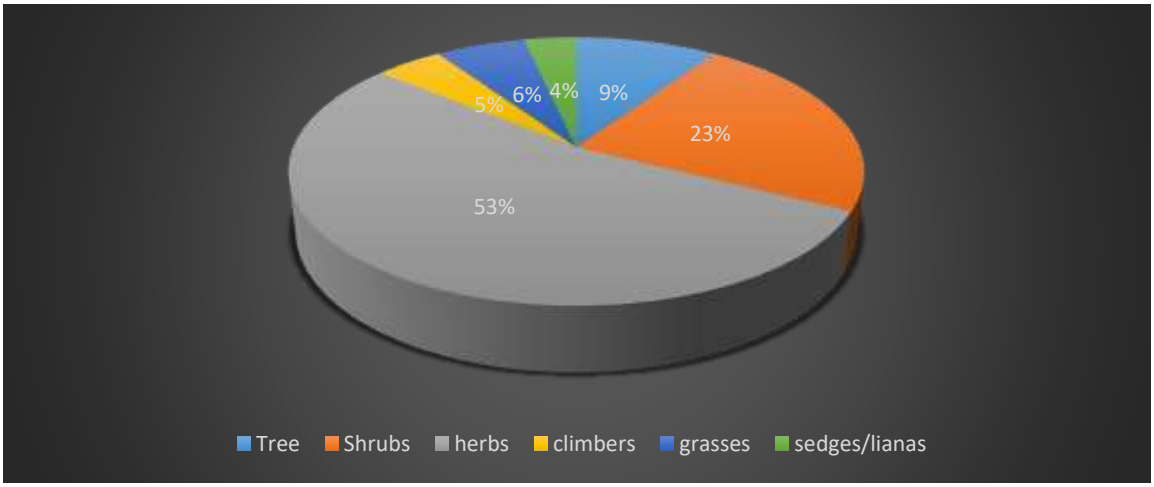

Fig.1 Diversity of angiosperms in the study area

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Broad-leaved oak forests are widely regarded as essential for water and soil conservation. Traditionally, these forests were related with better water quality and greater abundance of perennial springs, and their decline has led to the decrease of spring water availability.

Oak forests, particularly those dominated by *Q. leucotrichophora*, are heavily impacted by lopping for fuel and fodder. The growing biotic pressure has resulted widespread deforestation, causing severe soil erosion in the mountains and contributing to flooding and siltation in downstream plains. Green and dry oak leaves are frequently collected and used as manure, directly enriching soil fertility in forests and agricultural fields, and indirectly enhancing it through cattle dung derived from fodder leaves and forest grass. Broad-leaved trees also play essential role in providing fuel, small timber for house construction, and materials for agricultural tools, making them vital to the livelihoods of hill communities. Fodder collection, fuel wood harvesting, dry leaf gathering for manure and cattle bedding, natural calamities, and the introduction of invasive weeds are common contributors to resource depletion in natural ecosystems. In any ecological community, increasing stress leads to a decline in biodiversity, with the most sensitive species disappearing first, followed by large woody plants, and eventually higher plants, particularly woody species. Such changes often occur in natural systems, such as timberline zones (Arno and Hammerly, 1984), areas with reduced nutrient availability (Westman, 1975), and regions where human-induced stress, such as pollution from metal smelters emitting SO_2, is prevalent (Amiro and Courtin, 1981).It has been noticed that plant species valuable for fodder and fuel purposes are frequently eliminated in heavily disturbed areas near settlements. In contrast, less useful species, such as invasive weeds (*Eupatorium adenophorum* and *Parthenium hysterophorum*) and shrubs (e.g., species of *Berberis* and *Rubus*), tend to dominate these areas. But varying environmental conditions along with a lack of awareness about the ecological and medicinal value of certain weed plants have led villagers to overlook or discard their potential benefits.

The extinction of economically and ecologically important plants from their native habitats is a crucial issue that requires immediate attention. Despite its significance, this concern has largely been overlooked by naturalists and environmentalists. Addressing this gap requires a concerted effort to raise awareness and implement conservation measures to preserve these valuable plant species.

Table 3: Inventory of plant species, local names, and economic uses in the research area.

Family	Botanical name	Vernacular name	Altitudes (msl)	Flowering	Economic use
CUPRESSACEAE	*Cupressus torulosa* D.Don in Lambert	Surai	1800m-3200m	Jun-Nov	Wood for furniture and construction,, dried leaves used as incense 'Dhup' and leaf oil used in perfumary.
PINACEAE	*Cedrus deodara* (Rox. ex D.Don) G.Don in Loudon	Deodar	2000-3000m	Sept-Dec	Wood is utilized in construction and cooperages
	Pinus roxburghii Sargent,	Chir	900-2500m	Mar-Jun	Wood is used for construction, resin in varnishes, paints and turpentine,
	Pinus wallichiana A.B. jackson in Kew Bull	Kail	2000-3200m		Wood used for construction, resin for varnishes and paints,

RANUNCULACEAE	*Anemone vitifolia* Buch.-Ham	Mudeela	1500-3000m	Jun-oct	Leaves as fodder
	Clematis gouriana Roxb. ex DC.,	Kanguli,	500-2000m	Aug-Oct	Leaves are harmful to livestock, and the fiber is used to make coarse rope.
	Clematis montana Buch.-Ham. ex DC.,	Kujju	1500-2000m	Mar-Aug	Leaves are consumed by sheep and goats.
BERBERIDACEAE	*Berberis aristata* DC.	Kingor	1800-2700m	Mar- May	Fruits edible, bark produces yellow dye.
	Berberis asiatica Roxb. ex DC.,	Kilmora, Kingore	2000m	Apr- Jun	fruits edible. Wood and bark yield yellow dye.
ULMACEAE	*Celtis australis* Linn.	Kharik	500-1500m	Mar-Apr	Fruits edible, Leaves make good fodder. Bark produces yellow dye, and wood is utilized to make small articles.
	Celtis eriocarpa Decne. in Jacquem.	Kharik.	700-1500m	Mar-Apr	Fruits edible, Leaves are used as fodder, wood is used for fuel and to make small articles, etc.
MORACEAE	*Ficus palmata* Forsk. Vern. Eng.,	Bedu, Common Fig.	1800m	May-Jun	Leaves and twigs provide fodder, and the fruits are tasty, often eaten with salt or placed within bread.
URTICACEAE	*Urtica dioica* Linn.,	Kandali,	500 - 3000m	Aug-Apr	Stem yield strong fiber, used for sacs, ropes and mats, Young branches and leaves are utilized as tasty pot herbs, seed oil edible
JUGLANDACEAE	*Juglans regia* Linn.	Akhrot,	700-2500m	Mar-Apr	Fruits are tasty and contain oil; wood is durable and suitable for furniture, carved work, gunstocks, and vaneers. Bark was used as a dye and medicinal, while fruit rind was utilized to intoxicate fish as well as for dyeing and tanning. Leaves mixed with stored grains act as fungicides and insecticides, thus the tree is an important social forestry resource.
MYRICACEAE	*Myrica esculenta* Buch. - Ham. ex D. Don, Vern.	Kaphal	900-2100m	Aug-Oct	Fruits edible, raw or processed into pleasant drinks; bark used to intoxicate fish and provide yellow dye; and wood used as fuel.and implements

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FAGACEAE	*Quercus acutissima* Carruthers	Manipuri banj.			Wood is used for construction.
	Quercus floribunda Lindley ex Rehder,	Tilonj, Eng. Green Oak.	800-2000m	Apr- May	Wood is used for home items and fuel, while leaves offer fodder and fruits are devoured by wild animals
	Quercus leucotrochophora A. Camus in Riviera Sci.	Banj, Eng. White Oak.	800-2000m	Mar-Apr	Wood is used for construction, plough, and Bed-sticks, as well as fuel. Leaves are used as fodder. Fruit eaten by monkeys and bears, decomposing leaves used as organic fertilizer, and a significant tree of social forestry.
AMARANTHACEAE	*Achyranthes bidentata*	Chicheree, Latjira	2400m	Aug-Dec	Root powder is used to make indigenous beverages.
	Alternanthera sessilis (Linn.) DC. in Cat.	Gudre-Saag.	1200m	Feb-Oct	Occasionally, leaves are utilized as vegetables when supplies are scarce.
	Cyathula tomentosa (Roth) Moq. in DC.	Lichkura.	600-2000m	Jul-Oct	Plant utilized as fodder.
POLYGONACEAE	*Fagopyrum dibotrys* (D.Don) Hara	Banogal, Kanjolya.	1400m	Jul-Sept	Leaves used as vegetable
	Polygonum plebeium R. Br.,	Dondya.	1300m	Jan-Dec	Plant used as manure
	Rumex hastatus D.Don,Vern.	Almoru	2000m	Feb-Jun	Sauce made from sour leaves.
HYPERICACEAE	*Hypericum oblongifolium* Choisy,	Chitroi, Chaya.	1500-2000m	Mar-Apr	Leaves are lopped for fodder and the roots yield yellow dye.
	Hypericum perforatum Linn.,	Choli-phulya,	1000-3000m	Jan-Dec	The stem is utilized as firewood, and the leaves as fodder
MALVACEAE	*Urena lobata* Linn.	Chatkura.	1500m	Aug-Nov	Stem produces a coarse fiber,flower expectorant
BEGONIACEAE	*Begonia picta* Smith,	Patharchatta.	3000m	Jul-Aug	young leaves are occasionally served as vegetables

ERICACEAE	*Lyonia ovalifolia* (Wallich) Drude	Anyar	1000-3000m	Mar-Jul	Wood used as firewood; immature leaves are harmful to livestock.
	Rhododendron arboreum Smith	Burans	1500-3300m	Mae-May	Wood used for fuel and charcoal, flowers eaten raw or processed into sauce, jellies, jams, or refreshing drinks, flowers useful in bee foraging
SAPOTACEAE	*Madhuca longifolia* (Koenig) Mac Bride	Mahuwa		Mar-Apr	Wood used for various constructions, flowers and fruits edible, , useful in apiculture as bee forage, seeds yield an oil, used for candle and soap manufacturing and flowers frequently used in local beverages.
MYRSINACEAE	*Myrsine africana* Linn.	Chupra, Pahari-cha.	800-2000m	Mar-May	Flowers used in apiculture for bee foraging
HYDRANGEACEAE	*Deutzia compacta* Craib in Kew Bull.	Mhujvar	1200-3000m	Mar-Jun	Flowers utilized for bee forage in apiculture
ROSACEAE	*Cotoneaster microphyllus* Wallich ex Lindley in Edgew	Bugarchilla.	2000-3000m	Apr-Jul	Branches used for constructing baskets, ripe fruit edible, wood fuel, flower blooms important in apiculture
	Fragaria nubicola Lindley ex Lacaita in J. Linn. Soc. Bot	Gand-kaphal,	1500-3000m	Mar-Apr	Fruits edible, Fruits are employed in native beverages.
	Potentilla fulgens Wallich ex Hook	Bajradanti.	1500-3000m	Apr-Jun	Fruits edible
	Prinsepia utilis Royle	Bhainkal	1500-2500m	Feb-Mar	Seeds produce oil, which is edible, while blooms are valuable in apiculture as bee food, and the plant is sometimes used as biofence.
	Prunus cerasoides D. Don.,	Panyyan,	2400m	Oct-Dec	The leaves are used as fodder, the ripe fruits are delicious, and the flowers are a great source of bee food. The plant is considered sacred and is used in various local rites.
	Pyracantha crenulata (D. Don.) M. Roemer	Ghingaru	2600m	Mar-May	Fruits are rarely edible; blossoms are beneficial in apiculture as bee feed; and the plant's roots work as a strong soil binder.
	Pyrus pashia Buch. - Ham. ex D. Don	Melu	2400m	Feb-Mar	Leaves and twigs are used as fodder, wood is turned into sticks, flowers are utilized in

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					apiculture, and they are thought to slow soil erosion in landslide zones.
	Rosa brunonii Lindley	Kunja	600-2000m	Mar-Apr	Fruits edible, Wood utilized as an occasional fuel, flowers used in apiculture as bee feed.
	Rubus ellipticus Smith in Rees,	Hinssar	500-2000m	Mar-Apr	Fruits edible, Root extract is utilized as an intoxicating element in local beverages, flowers are used as bee feed in apiculture, and the plant serves as a soil binder.
	Rubus foliolosus D.Don,	Kala Hissar.	1500-2500m	Apr-May	The young twigs and fruits are edible
	Spiraea bella Sims in Curtis,	Kuji.	2100-3000m	Apr-Jul	Branches served as brooms.
FABACEAE (PAPILIONACEAE)	*Astragalus leucocephalus* Graham ex Benth. in Royle	Rudravanti.		Mar-Jun	Leaves are used as fodder
	Campylotropis macrostyla Bunge		1500m	Apr-Oct	Flowers provide sustenance for bees, while branchlets and leaves serve as fodder.
	Desmodium triflorum (Linn.) DC.		1800m	Jul-Sep	Plants browsed by cattle.
	Flemingia strobilifera (Linn.) R.Br. in Aiton f.,	Bari-Kapasi.	asc. to 1500m	Sept-Dec	Plants serve as brooms, while leaves are used as fodder.
	Indigofera heterantha Wallich ex Brandis	Sakina, Himalayan Indigo	2000m	May-Aug	Flowers are used as vegetables, leaves are lopped for fodder, and twigs are woven into baskets or containers.
	Lathyrus aphaca Linn. Vern. Kurphali. Eng. Yellow Vetehling.	Kurphali, Yellow Vetehling		Feb-May	Crop field weed and fodder source.
	Robinia pseudoacacia Roxb.,	Black locust.			It is a major nitrogen-fixing agroforestry tree.

LYTHRACEAE	*Woodfordia fruticosa* (Linn.) Kurz in J. Asiat. Soc. Bengal	Dhaula.	1500m	Jan-Apr	Flowers give dye for silk, flowers helpful in apiculture as bee feed and also converted into a refreshing drink during the summer, and flowers are also a strong soil binder.
THYMELAEACEAE	*Daphne papyracea* wallich ex Studel	Satpura	-3000m	Mar-Apr	Ropes and sacs composed of the stem fiber, in the past paper was manufactured from the stem and leaves, known as Satpura, notably utilized for religious purposes.
EUPHORBIACEAE	*Sapium insigne* (Royle) Benth. ex Trimen	Khinna.	300-1800m	Feb-Apr	Leaves and bark used to intoxicate fish, wood used to make floats, cases, drums, toys, and matchboxes
RHAMNACEAE	*Rhamnus purpureus* Edgew. in Trans. Linn. Soc.	Gaunta, Luish.	1000-2400m	Mar-Apr	Wood is utilized in agricultural instruments, leaves are lopped for fodder and manure, and flowers are an important source of bee food
VITACEAE	*Parthenocissus semicordata* (Wallich) Planchon in A. DC.	Bhunera, Laguli		May-Jun	Fruits edible and leaves as fodder.
LINACEAE	*Reinwardtia indica* Dumortier,	Phiunli.	2400m	Feb-May	Petals are chewed as tongue wash, regarded sacred, and serve as a sign of the spring season. The flower is also important in apiculture as a source of bee food.
HIPPOCASTANACEAE	*Aesculus indica* (Colebr. ex Cambess.) Hook. in Curtis	Pangar,	1500-2500m	Mar-Nov	Cream-colored wood is used to make pots and containers, fruits are fed to cattle and goats, blooms are used in apiculture as a source of bee food, leaves are used as fodder and manure, and the tree is an important part of social forestry.
ANACARDIACEAE	*Cotinus coggygria* Scopoli	Jal-Tungla or Gad-Tungla	800-2400m		Bark and leaves are used for tanning, leaves for cattle cushioning, and blooms are a good source of nourishment for bees.
	Rhus parviflora Roxb.,	Tungla, Saunla	asc. to 1800m	May-Jun	Fruits edible, Leaves and tobacco were mashed together, while fruits were ground and mixed with flour during hunger. Flowers are a useful source of bee feed in apiaries and are occasionally utilized as biofence.

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MELIACEAE	*Toona hexandra* (Wallich ex Roxb.) M. Roemer	Tun	1000m	Mar-Apr	It is an essential tree for construction, furniture, and other uses. Sulphur dye is derived from the blooms, which are a valuable source of bee food for apiculture, as well as an important tree in social forestry.
RUTACEAE	*Zanthoxylum armatum*	Timroo.	2000m	Mar-May	Leaves and fruits are chewed for mouthwash and dental care. Walking sticks produced from the stem are occasionally kept at the house doorways and are thought to ward off evil spirits, bark is used to intoxicate fish, and blossoms are a valuable source of bee feed in an apiary.
OXALIDACEAE	*Oxalis corniculata* Linn.	Bhilmori, Khati-Buti.	1800m	Jan-Dec	Leaves used in salads or cooked as vegetables.
GERANIACEAE	*Geranium wallichianum* D.Don ex Sweet,	Ratanjot, Kaphlya,	2500m and above	Jul-Sept	Red dye derived from the roots is supposed to be used in woollen clothing.
APIACEAE (UMBELLIFERAE)	*Bupleurum hamiltonii* Balakrishnan,	Hare's Ear		Jul-Sept	Cattle browsed plant.
APOCYNACEAE	*Quirivella frutescens* (Linn.) M.R. and S.M. Almeida	Bel-kami or bari-danti,	Asc. to 1200m	Aug-Nov	Branches are turned into baskets, leaf extract is said to be febrifuge, and flowers are employed as a source of bee feed in the apiary.
SOLANACEAE	*Solanum erianthum* D.Don.	Akra	1400m	Jan-Dec	Fruits are occasionally eaten.
	Solanum pseudo-capsicum Linn.,	Jangli-Mirch	1500m	Jul- Oct	Occasionally grown as an ornamental.
VERBENACEAE	*Callicarpa macrophylla* Vahl	Daiya	1400m	Jul-Sept	Fruits edible, flowers serve as a source of forage for bees.
	Caryoptris foetida (D.Don) Thellung,	Karwi		Mar-Apr	Used as fodder, Flowers serve as a source of forage for bees.
	Lantana camara Linn.	Kuri-ghas	2000m	Jan- Dec	Dried stem is used as fuel, sometimes made into cheaper quality furniture, leaves insecticide or germicidal,utilized in skin diseases and sometimes acts as soil binder.

LAMIACEAE (LABIATAE)	*Clinopodium umbrosum* (M. Bieb.) C. Koch in Linnaea	Birchee.	2000m	Dec-Feb	Flowers as a source of food for bees.
	Leucas lanata Benth. in Wallich,	Bis-kapra.	2000m	Jan-Dec	Shoots were prepared as vegetables.
	Nepeta ciliaris Wallich ex Benth. in Wallich	Nueet	2000m	Jul-Nov	Leaves produce essential oil.
	Origanum vulgare Linn.,	Bantulsi,		May-Aug	Flowering branches were hung on dwellings to ward off evil spirits, while leaves were used as a vegetable and seasoning agent.
	Plectranthus mollis (Aiton) Sprengel,		2800m	Aug-Sept	Flowers serve as a source of forage for bees.
	Pogostemon benghalense (Burm. f.) Kuntze, Vern.	Kala-Basingu		Jan-Dec	Flowers are a vital source of bee forage, and the plant is a strong soil binder.
	Rabdosia rugosa (Wallich ex Benth.) Hara,	Chhenchneri.	1000-2800m	May-Sept	Flowers are a significant source of bee feed.
	Salvia lanata Roxb., Vern.	Ghanyajhar.	800m and above	Mar-Jun	Flowers are a major source of bee feed.
	Scutellaria scandens Buch. - Ham ex D. Don	Kutlaphul,	2500m	Mar-Apr	Bees graze on flowers.
BUDDLEJACEAE	*Buddleja asiatica* Lour.,	Bhati,	1500m	Nov-Apr	The stem is used to make walking sticks, the flowers provide bee food, and the plant acts as a soil binder.
SCROPHULARIACEAE	*Scrophularia himalensis* Royle ex. Benth.	Sikula, Himalyan Figwort.		Jul-Sept	Insecticide made from leaves and preserved grains
ACANTHACEAE	*Barleria cristata* Linn.	Saundi, Kala-bansa	1500m	Sept-Nov	Flowers serve as a source of bee feed, while plants act as soil binders.
	Dicliptera bupleuroides Ness in Wallich,	Kulartore.	2000m	Jan-Dec	The plant is utilized as fodder, and its flowers are used as bee food.

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RUBIACEAE	*Himalrandia tetrasperma* (Roxb.) Yamazaki,	Kamoli, Ghara	600-2200m	Mr-Apr	Wood can be used as walking sticks, fuel, and a source of bee food.
	Rubia manjith Roxb. ex Fleming in Asiat. Res.Vern	Majethi,	2500m	Jul-Sept	Manjit, a commercially available dye made from the root and stem.
	Spermadictyon sauveolens Roxb.,	Padera, Padaru.	2000m	Oct-Feb	Both leaves and stored grains are utilized as fodder and pesticide, respectively. Flowers are a significant source of food for bees.
VALERIANACEAE	*Valeriana jatamansii* Jones in Asiat. Res.	Balchari		Feb-May	Insecticide and incense are two further uses for dried roots. In indigenous beverages, roots are utilized to enhance aroma.
ASTERACEAE (COMPOSITAE)	*Anaphalis contorta* (D.Don) Hook. F. in Fl. Brit. India	Bugla		Jul-Mar	Plant smoke is utilized as an insect repellant, and the fiber of leaves and stems is used to light the fire by rubbing against stones (Agela).
	Anaphalis triplinervis (Sims) C.B. Clarke in Comp. Indicae	Buglya		Aug-Oct	Stone friction is utilized to light the fire using the fiber of the leaves and stem.
	Artemisia capillaris Thunb	Jhirun	300-2000m	Jul-Nov	Twigs used as brooms and a leaf decoction used as a bitter remedy for colic and worms.
	Bidens pilosa Linn.,	Kumra	1500m	Mar-Aug	plants that were grazed for food.
	Emilia sonchifolia (Linn.) DC. in Wight	Hirankuri, Dudhi	2000m	Feb-Jun	Upper leaves can occasionally be prepared as a vegetable.
	Gerbera gossypina (Royle) G. Beauv.	Kapasee	2500m	Mar-Aug	Fiber used to burn fire and to make coarse cloth for mats and sacs.
	Myriactis nepalensis Lessing in Linn.	Bakura		Jul-Nov	Young branches and leaves are occasionally utilized as vegetables.
	Taraxacum officinale Weber in Wiggers	Kanphuliya		Feb-Oct	Young shoots and leaves are cooked as vegetables by boiling them thoroughly.

CYPERACEAE	*Cyperus rotundus* Linn.	Motha	1500m	Jul-Dec	Perfumes made from dried subterranean parts.
POACEAE (GRAMINEAE)	*Apluda aristata* Linn		Asc. to 2000m in Himalaya	Aug-Sept	Utilized as fodder when young
	Brachiaria villosa (Lam.) A. Camus in Lecomte	Malchu		Jul-Aug	Utilized as animal feed for milching
	Chrysopogon aciculatus (Retz.) Trinius.	Surwala	Asc. to 800m	Nov-Dec	As fodder
	Cynodon dactylon (Linn.) Persoon.	Dubla	1800m	Jan-Dec	The plant is used in various religious rites and is said to be sacred.
	Dichanthium annulatum (Forsk.) Stapf in Prain.		Asc. to 1800m	Jan-Dec	Used excessively as fodder.
	Heteropogon contortus (Linn.) P. Beauv. ex Roemer and Schultes	Kumrya-ghas,	Asc. To 1500m	Aug-Nov	Grass kept for use as fodder at a time of famine
	Setaria viridis (Linn.) P. Beauv.	Birali-ghas,		Aug-Dec	The grains edible, Using green grass and hay as fodder.
	Sporobolus diander (Retz.) P. Beauv.	Sitya.	Asc. to 1500m	Mar-Sept	An excellent soil binder that also supplies fodder
SMILACACEAE	*Smilax aspera* Linn.	Kukurdara	Asc. to 2000m	Jun-Nov	Sometimes young leaves are fried, and blooms are used as bee food.

Conclusion

As a whole, the region hosts a wide range of plant species that fulfill essential daily needs of local communities—ranging from supplementary foods and vegetables to medicinal, aromatic plants, and wild fruits. This biodiversity is deeply tied to traditional knowledge systems, reflecting a strong ethnobotanical heritage and a sustainable relationship with nature. The area's rich plant genetic resources offer immense scope for bioprospecting, with potential discoveries of novel nutritional and medicinal substances that may be useful medicine, food security, and natural product industries. By adopting sustainable harvesting, promoting value addition, and ensuring local community participation, this biological wealth can be conserved and utilized effectively.

Thus, Pauri Garhwal's floristic diversity serves not only as a natural treasure but also as a means of achieving sustainable rural growth in the Himalayan region.

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