



Study on wild edible plant diversity in the parts of district Tehri Garhwal, Uttarakhand, India

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Abstract

Field investigation of WEPs in the study region documented species which were found well distributed in different life forms in which, trees share the largest proportion with 15 species (41.66%), followed by shrubs with 11 species (30.55%), herbs with 8 species (22.22%), 1 climbers and 1 fern (2.77% each). Of the 36 species documented in the study region, only one species is of Pteridophyta (*Diplazium esculentum*) and all others are of Angiosperms. With respect to families, Rosaceae shared the largest proportion which, consisted of 7 species. 36 species are observed as fruit bearing, accounting about 50%, followed by leaves with 11.11%, flowers with 8.3%, flower buds, tuber, nut, seed, whole plant, fronds with 2.8% each, and others 13.9% (bark, fungi, nut, root, whole plant). 7 species were preferred for use by local people among the surveyed 36 species in the investigated area, such as *Rhododendron arboreum*, *Myrica esculenta*, *Berberis asiatica*, *Rubus ellipticus*, *Ficus auriculata*, *Bauhinia variegata*, and *Rumex hastatus*. Garhwal Himalaya is the home of diversity of WEP species occasionally used for food requirements by local populace. However, it can be enriched through suitable screening of unexplained pockets and survey among the concerned population. Focus should be made on appropriate techniques for increasing the source of income of people. Therefore, such wild edible plant species needs attention for multiplication in their own habitat and also in farm lands.

Keywords: WEP, Garhwal Himalaya, Uttarakhand, wild forest resources, traditional knowledge.

Introduction

Himalaya has peculiar topography, vegetation, people and traditions. The diversity of topographical and climatic conditions has favoured the luxuriant growth of forests. Uttarakhand in general and Garhwal in particular are rich in its ethno-cultural, traditional and biological diversity. The evidence of man's dependency on plants for survival can be demonstrated by palaeo-ethnobotanical findings from prehistoric archaeological sites¹. Himalayan region is considered as the bowl of rich diversity of WEP, many of them are being used by local populace for various purposes viz- food, fodder, medicinal herbs etc, preferably in the time of scarcity².

Although rural people utilized wild plants in scarcity period, and scientists have recently realized importance of such plants in rural economy. Since late 1980s, studies on different aspects of WEP in tropical forests have been taken up vigorously³. The easy access to the resources and proximity to widely dispersed rural markets are key factors enabling people to generate income for NTFP⁴. In India, nearly 1532 plant species are used as wild edibles by different ethnic groups⁵.

WEPs are the species that exclusively reported in natural habitat and sometime used for different needs, preferably food, fruit, raw medicinal herbs etc. Earlier findings reveals that WEPs are the rich source of nutrition sometime than favoured foods,

specially at the time of scarcity⁶. Among all the 36 WEPs documented in the study region, only one species is of Pteridophyta (*Diplazium esculentum*) and all others are of Angiosperms. With respect to families, Rosaceae shared the largest proportion which, consisted of 7 species. Mostly the fruits are found to frequently among 36 investigated species, considered for income generation of rural communities around the globe⁷. WEPs are found to be as the important share of nutrition for large populace in rural localities. The nutritional content was put together by FAO⁸, the Food and Nutrition Division, 1994.

Changing consuming passions of the forest dwellers/tribals, due to acculturation and introduction of exotic vegetables etc. and depletion of forest resources are some of the major reasons⁹. Present investigation was carried out in view of the above mentioned facts aiming documentation of such resources, hence gradual disappearance of this wealth and knowledge among the coming generations.

Material and methods

Study area: Present study was conducted Ranichauri and Salamkhet areas in Chamba block of Tehri Garhwal with temperature varied from -4°C to 24°C, annual relative humidity between 54.7 and 79.5, where January is expected to be coldest and June to be warmest month of the every year.

Table-1: Geographic location of Ranichauri and Salam Khet areas in Chamba Block of Tehri Garhwal district.

Area	Ranichauri	Salam Khet
Latitude	30°18'34.2"	30°18'82.0"
Longitude	78°24'23.1"	78°25'17.2"
Altitude	1900 m	2000 m
Climate	Temperate	Temperate

Field survey: Before conducting the field survey an extensive literature survey was conducted for preparing an inventory on WEPs of Garhwal Himalayas. The inventory was prepared with the help of different journals, and from the different web sites.

Two villages were surveyed for knowledge about local WEPs. These villages were selected because people of the region are well versed with the use of WEP. These people are depends on the natural resources. Field survey was conducted during March 2018 using a pre-structured questionnaire which was used to obtain information about the knowledge of wild edible plant species from informants. In each locality around 5 traditional knowledge holders were chosen¹⁰. Plants specimens were photographed. All plant species were arranged alphabetically with all the necessary details.

Results and discussion

After a detailed survey in the study areas, information collected for all the possible plants are described in following tables categorised under wild fruits, leafs, seeds, nuts, tubers, whole plant parts, flowers etc. The present study was carried out in Ranichauri and Salam Khet villages of Tehri districts. The present check list of WEPs for Garhwal Himalayas was prepared after gathering detailed information from villagers and specified respondents. Survey has been carried in 2 villages represented by 5 households of each study area. Primary data were collected using the questionnaire method. Field investigation of WEPs in the study region documented species which were found well distributed in different life forms in which, trees share the largest proportion with 15 species (41.66%), followed by shrubs with 11 species (30.55%), herbs of 8 species (22.22%), 1 climber and 1 fern (2.77% each) (Table-2, 3 and Figure-1).

Of the 36 species documented in the study region, only one species is of Pteridophyta (*Diplazium esculentum*) and all others are of Angiosperms. With respect to families, Rosaceae shared the largest proportion which, consisted of 7 species. Among all the studied WEP components, fruits are frequently used part accounting for 50%, followed by leaves with 11.11%, flowers with 8.3%, flower buds, tuber, nut seed, whole plant, fronds with 2.8% each, and others 13.9% (bark, fungi, nut, root,

whole plant). Similar investigations on WEP were revealed in Nepal by Upreti et al.¹¹ and Dhanus, C.¹² in Tehri Garhwal. Further, studies on wild plant documentation was also conducted by Deb et al.¹³ with 41 species in Brahmaputra hill range; Kumar and Shiddamallayya¹⁴ with 29 species in Angadihalli, Hassan district, Karnataka; Samant and Dhar⁵ with 675 wild plant species in Indian Himalaya; Misra et al.¹⁵ with 21 wild edible species in Nanda Devi Biosphere buffer zone; Upreti et al.¹⁶ with 184 wild species in Uttarakhand; Chandra et al.¹⁷ found *Dioscorea deltoidea* which having a good nutritional and medicinal value; Chandra et al.¹⁸ recorded 282 species among the 700 listed plants as wild economic wealth in Rudrapryag district; Dangwal et al.¹⁹ with a total of 58 wild edible plant species used by Gujjar and Bakerwal tribes of District Rajouri (J&K); Maikhuri et al.²⁰ conducted the study on, 13 potentially exploitable wild fruit species of Garhwal region (Table-2, 3 and Figure-1).

7 species among the total studied 36 were found preferably used by respondents, viz-*Rhododendron arboreum*, *Myrica esculenta*, *Berberis asiatica*, *Rubus ellipticus*, *Ficus auriculata*, *Bauhinia variegata*, and *Rumex hastatus*, similarly,²¹ documented 150 species in Khasi hills Meghalaya.

Among all the species, *Rhododendron arboreum* and *Myrica esculenta* are most popular species in the study region. In general, demand of food items utilized by local communities in tropical countries are fulfil by WEPs²¹. Further, Sasi and Rajendran²² listed 70 lesser known wild plant species of the Nilgiri region suggesting their appropriate collection and conservation strategies. Negi et al.²³ carried out a study to highlight herbal and nutritional use of *Rhododendron arboreum* in Garhwal Himalaya. Bhatt et al.²⁴ reported distribution, propagation and various important aspects of *Myrica esculenta* in Kumaun region, India²⁵. documented about 82 wild edible species w.r.t. diversity, availability statues and indigenous uses of wild edibles of Lohba range of the Kedamath Forest Division, Garhwal Himalaya. Sharma¹ in Chopta-Mandal Forest also documented 7 species of WEPs having oil bearing seeds.

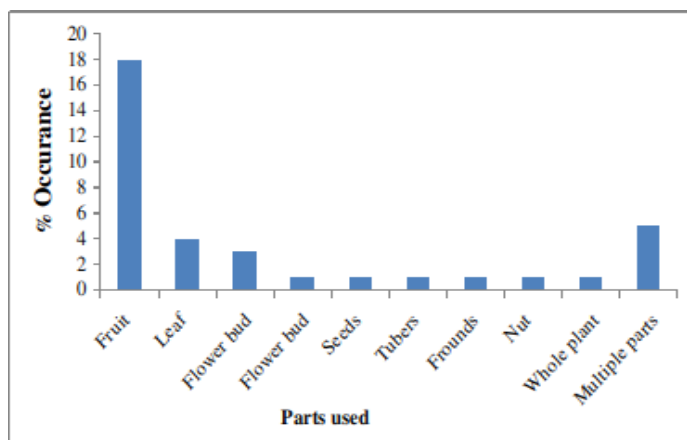


Figure-1: Plant occurrence percentage and different parts of the study area.

Table-2: Diversity of wild edible fruit plant species in the study area²⁶.

Species, Family and Local Name	Altitudinal Range (m)	Life Form	Availability	Occurrence	Native	Part Used and Important Uses
<i>Berberis aristata</i> (Berberidaceae) Darul haldi	1800 - 2700	Shrub	June - July (good number)	Forest and Village	Regional Himalaya	Fruits are edible. Bark and roots are taken orally to relieve jaundice
<i>Berberis asiatica</i> (Berberidaceae) Kilmora	1200 - 2500	Shrub	June - Aug (good number)	Forest	Regional Himalaya	Edible Fruit used raw or dried. The fruit is cooling and laxative. Roots used in jaundice, fevers etc. Tender leaf buds are chewed for dental caries. Wood and bark yield yellow dye.
<i>Berberis lycium</i> (Berberidaceae) Kingor	1500 - 3000	Shrub	Aug - Sept (good number)	Forest	Regional Himalaya	Fruit edible, roots are used as remedy for swollen and sore eyes. Leaves are given in jaundice.
<i>Carissa opaca</i> (Apocynaceae) Karaunda	Up to 1200	Shrub	Jan - March (good number)	Forest and Village	Himalaya	Fruits edible, leaves browsed by sheep and goats, flowers in bee forage in apiculture, roots soil binder.
<i>Cornus capitata</i> (Cornaceae) Bhamora	1500 – 2500	Tree	Aug – Nov (Less number)	Forest	Regional Himalaya	Fruits edible, preferred by wildlife, Wood used in agricultural implements.
<i>Ficus auriculata</i> (Moraceae) Timla	600 – 1800	Tree	June – July (Good number)	Village	Regional Himalaya; Burma	Fruits (figs) are edible and sweet, ripen fruits edible, unripe fruits made into vegetables, leaves made into cup and plates, Provide good fodder for cattle, Wood used as fuel.
<i>Ficus palmata</i> (Moraceae) Bedu	600 – 1800	Tree	June – Aug (Good number)	Forest and Village	North – Western India	Fig is taken raw with salt or filled inside the bread, fruit is medicinal for digestive disorders, leaves and twigs good fodder, Useful plant of Agroforestry.
<i>Mangifera indica</i> (Anacardiaceae) Aam	Up to 1000	Tree	June - July (Good number)	Village	India	Fruits are edible, wood for construction and furniture, flowers useful source of bee forages
<i>Morus alba</i> (Moraceae) Sehtoot	200 – 1800	Tree	March– May (Good number)	Village	North Eastern China	Fruits edible, leaves lopped for fodder for sheep and goats, leaves feed silkworms.
<i>Myrica esculenta</i> (Myricaceae) Kaphal	1200 – 2400	Tree	April – June (Less number)	Forest	Regional Himalaya	Fruits raw or made into refreshing drinks, bark used to intoxicate fishes and yields yellow dye, wood used as fuel and implements, used in treating wounds and disease of oral cavity.
<i>Phyllanthus emblica</i> (Euphorbiaceae) Aonla	150 – 1400	Tree	Sep - Nov (Less number)	Forest and Village	South Eastern Asia	Fruit eaten with salt and water, rich source of vitamin C. “Triphala”, most widely used for several disorders, bark and leaves are rich source of tannin. Leaves used as fodder. Flowers as bee forage. Regarded as sacred tree. Important tree of social forestry.
<i>Prunus armeniaca</i> (Rosaceae) Chulu	Up to 2000	Tree	April - June (Good number)	Forest and Village	Western Asia	Fruits edible, seed oil edible and also used medicinally in fever and massaged in body pain. The dried fruit pulp in local brews. Flower used in

						apiculture as bee – forage.
<i>Prunus cerasoides</i> (Rosaceae) Payain	1200 - 2400	Tree	Feb - March	Forest and Village	Regional Himalaya	Ripe fruits edible. Branches for walking sticks. Bark in Psychomedicines. Leaves as fodder. Juice from the bark applied on body swellings confusions.
<i>Pyracantha crenulata</i> (Rosaceae) Ghingaru	1000 - 2600	Shrub	June - Oct (Less number)	Forest and Village	China; Regional Himalaya	Fruits edible. Branches used for walking sticks and tool handles. Flowers useful in apiculture as bee-forage, Plant acts as soil binder.
<i>Pyrus pashia</i> (Rosaceae) Melu	1000 – 2400	Tree	May – Dec (Less number)	Forest and Village	Regional Himalaya	Ripe fruits edible and also used in digestive disorders Leaves and twig as fodder. Wood made into sticks. Flowers useful in apiculture. Believed to check soil erosion in landslide zones.
<i>Rhus parviflora</i> (Anacardiaceae) Tungla	1400 to 1800	Shrub	July - Nov (Less number)	Forest and Village	Regional Himalaya	Fruits can be grinded and mixed with flour. Leaves mixed with tobacco
<i>Rubus ellipticus</i> (Rosaceae) Hinsalu	600 – 2200	Shrub	May – June (Good number)	Forest	Indian Origin	The fruits are edible and birds spread the seeds. Root extract used in local beverages as intoxicating ingredient; flower useful in apiculture as bee-forage; plants acts as soil binder. Himalayan raspberry can invade disturbed habitats and displace other plant species.
<i>Rubus paniculatus</i> (Rosaceae) Kala Hinsal	1500 – 2500	Climber	May – July (Good number)	Forest	Himalayan Region	Leaf paste externally applied on skin ailments. Fruit with many glossy black carpels is edible.

Table-3: Diversity of wild edible species other than fruit yielding plant in the study area²⁶.

Species, Family and Local Name	Altitudinal Range (m)	Life Form	Availability	Occurrence	Native	Part Used and Important Uses
Edible Leaf Part						
<i>Aloe vera</i> (Liliaceae) Gwar -Patta	-	Herb	Throughout the year (Good number)	Village	Mediterranean	Leaves gel eaten raw for the treatment of various diseases. Fleshy leaves used on wounds and sores, after thorough boiling. The plant can be snapped off and placed on cuts and burns for immediate relief.
<i>Rumex dentatus</i> (Polygonaceae) Jungli - Palak	1000 - 2400	Herb	Throughout the year (Good number)	Forest and Village	Indian Origin	Leaves used as vegetables.
<i>Rumex hastatus</i> (Polygonaceae) Almoru	800 - 2600	Herb	Throughout the year (Good number)	Forest and Village	Regional Himalaya	Sour leaves, made into sauce. The leaf extract of plant are applied on wounds and cuts to check bleeding. Plant is also believed to relieve from suffering of nettle sting. Root is laxative alternative, tonic, and anti rheumatic and can be used in skin disease. Leaf extract applied on cuts and wounds to check bleeding and

						also believed to relieve from suffering of nettle sting.
<i>Rumex nepalensis</i> (Polygonaceae) Khatura	1500 - 3200	Herb	Throughout the year (Good number)	Forest and Village	Regional Himalaya	Leaves cooked as vegetable; infusion of leaves given in dysmenorrhoea, as well as in stomachache. Leaf extract is applied to skin sores. Leaves are rubbed on the affected part for relief from irritation caused by Bichchhoo plant.
Edible Flower Part						
<i>Indigofera cassioides</i> (Fabaceae) Sakena	1000 - 2000	Shrub	Mar - May (Good number)	Forest	Regional Himalaya	Leaf powder taken in malarial fever. Foliage used as fodder. A decoction of the roots is used in the treatment of coughs. The root is dried, ground into a powder and applied externally in the treatment of pains in the chest.
<i>Rhododendron arboreum</i> (Ericaceae) Burans	1200 - 3300	Tree	Mar - May (Good number)	Forest	Indian Origin, Regional Himalaya; Zeylan	Flowers used by locals in Uttarakhand for extraction of juice. Flowers useful as bee forage. Flowers and bark medicinal for digestive and respiratory disorders.
<i>Rosa macrophylla</i> (Rosaceae) Dand kunja	2200 - 3600	Shrub	Sep - Nov (Less number)	Forest and Village	Regional Himalaya; China	Wood as an occasional fuel; flowers useful in apiculture as bee-forage. Flower paste applied on skin ailments.
Edible Flower Buds						
<i>Bauhinia variegata</i> (Caesalpinaceae) Guiral	500 - 1700	Tree	Feb - April (Good number)	Village	Indian Origin; Burma, China	Flowers are roasted for consumption. Leaves as fodder. Agricultural implements and construction. Dried leaves ash using as cough treatment. An important tree of social forestry.
Edible Seeds						
<i>Pinus roxburghii</i> (Pinaceae) Chir	1000 - 2400	Tree	March - June (Good number)	Forest	Regional Himalaya	Seeds are edible. The turpentine obtained from the resin of is antiseptic, diuretic, rubefacient and vermifuge. Wood used for construction. Resin in varnishes, paints and turpentine. Saw – dust with honey used in asthma and bronchitis.
Edible Whole Plant Part						
<i>Cannabis sativa</i> (Cannabaceae) Bhang	Up to 2300	Herb	Fl: May-Aug Fr: Aug-Oct (Average number)	Forest and Village	Regional Himalaya	Seeds as condiments. Leaves are smoked in dry form. Bark fibre used for making ropes, sacs and rough clothes. Stem as a fuel. Seed oil edible, leaves and flowers as intoxicating agent.
Edible Tubers						
<i>Dioscorea belophylla</i> (Dioscoreaceae) Turad	600 - 1500	Herb	Jan - Mar (Average number)	Forest	Indian Origin	Tubers are eaten in the form of vegetable. Leaves as a fodder Tubers are medicinal, much liked by wild life.
Edible Fronds						
<i>Diplazium</i>	1200 -	Fern	Jul - Oct	Frond	Regional	The young fronds are stir-fried as a

<i>esculentum</i> (Dryopteridaceae) Lingura	2000		(Good number)		Himalaya	"vegetable" or used in salads. Lower part is used for breeding of animals.
Edible Nut						
<i>Juglans regia</i> (Juglandaceae) Akhrot	1600 - 2700	Tree	Aug - Oct (Average number)	Village	Regional Himalaya	Fruits edible and yields oil, wood used for furniture, carved work, gun stocks and veneers. Bark used as dye and medicine. Used to intoxicate fishes and for dyeing and tanning. Leaves using as fungicide and insecticide. Important tree of social forestry.
Edible Multiple Parts						
<i>Agave Americana</i> (Agavaceae) Rambans	-	Shrub	Throughout the year (good number)	Forest and Village	Tropical America	Leaves stalks juice is made as intoxicating drink , flowers are cooked as vegetable. Biological fence. Leaf fibre used for several wicker works. Leaf paste as poultice. Leaf extract as fish poison. Using in checking land slide and soil erosion.
<i>Chenopodium album</i> (Chenopodiaceae) Bathua	Up to 1400	Herb	Jan - Dec (Good number)	Forest and Village	Sub - Temperate region	Bathua can be eaten as a vegetable, seeds are very nutritious, a very good feed for chickens etc Breads prepared from grinded grains.
<i>Cinnamomum tamala</i> (Lauraceae) Dalchini	500 – 2200	Tree	Throughout the year (poor number)	Village	Regional Himalaya	Bark and dried leaves used for flavouring tea and various food preparations, bark chewed in dyspepsia and throat irritation.
<i>Urtica dioica</i> (Urticaceae) Kandali	1800 - 3500	Herb	Throughout the year (Good no.)	Village and Forest	Boreal Region	Stem yield fibres, seed yields edible oils.
<i>Zanthoxylum armatum</i> (Rutaceae) Timur	900 - 2200	Shrub	Mar-Oct	Forest	Tropical and Subtropical areas	Tender shoots as vegetable, ripe fruits are edible. Fruits, twigs and seeds are used against toothache. Seeds and Leaves are used as condiments. Wood for walking sticks. It is also used for low blood pressure, fever, and inflammation.

Conclusion

Availability of WEPs in Garhwal Himalyan region supports many of village communities, by connecting these wild edible plant species with proper market may improve the socioeconomic conditions of dependent village communities in such areas. Different edible plant parts may have a significant role to set up some small scale industry at village community level. As many of wild edible plants reported and proven their higher medicinal values. Therefore, it may be possible to encourage the cultivation of such plant species through extension and awareness among village communities in Garhwal Himalayan region. Beside this different government programs also have to integrate the cultivation and extension of wild edible plants in some areas. Moreover, there is a need to

protect the fast disappearing wild plants based on traditional knowledge, which is still abundant in the different ecosystems.

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