



DIVERSITY, INDIGENOUS USES AND UTILIZATION PATTERN OF WILD EDIBLE PLANTS OF CENTRAL HIMACHAL PRADESH, NORTH WESTERN HIMALAYA

Pooja Kumari*¹ and S. S. Samant²

¹G. B. Pant National Institute of Himalayan Environment, Himachal Regional Centre, Mohal-Kullu - 175 126, Himachal Pradesh.

²Himalayan Forest Research Institute, Conifer Campus, Panthaghati- 171 013, Himachal Pradesh.

Corresponding Author: Dr. S. S. Samant

Himalayan Forest Research Institute, Conifer Campus, Panthaghati- 171 013, Himachal Pradesh.

Article Received on 28/12/2021

Article Revised on 18/01/2022

Article Accepted on 08/02/2022

ABSTRACT

Wild plants and their edible parts such as fruits, leaves, flowers, tubers, roots, rhizomes, etc. are nature's gift to mankind while providing various nutrients. It also plays a significant role in the socio-economic upliftment of the rural communities living in the Himalayas. Present study was conducted to document the diversity, indigenous use and utilization pattern of wild edibles in the Central Himachal Pradesh, which is a veritable emporium of economically important plants. Total 92 wild edibles were recorded in which 41 species were native to Himalaya and 53 species were non-native. Dominant species were herbs with 39.13%, followed by tree (31.52%) and shrubs (28.26%). Among the part used fruits (44 spp.), leaves (27 spp.), seeds (11 spp.), root and bark (06 spp. each), whole plants (05 spp.) and bulbs (02 spp.) were the major parts. It was also found that *Angelica glauca* species i.e., endemic and 10 other species found were near endemic to the Indian Himalayan Region. Sustainable harvesting methods, nurseries for quality planting material, ex-situ and in-situ conservation involving locals and forest department has been suggested for conservation of these resources. Further, processing of these wild edibles for fulfilling nutrients demand and livelihood generation of the locals while creating small scale industries is also recommended.

KEYWORDS: Central Himachal Pradesh, Wild Edible, Local communities, Livelihood, Native, Endemic.

INTRODUCTION

Wild edible plants (WEPs) are collected from the diverse habitats such as forests, fields, open landscapes, wastelands, etc. and plays a significant role in the lives of people throughout the world.^[1] It is reported that, about 40,000 to 1,00,000 species of plants have been used regularly in different geographical regions for food, fodder, medicine, fiber, fuel, oil, timber, cultural and industrial purposes, etc.^[2] All over the world, various ethnic communities draw a significant part of their sustenance and livelihood from the wild plants.^[3] WEPs are the plant species accessible from natural habitats used as a food which can neither be cultivated or domesticated.^[4] There are more than 7000 WEPs which has been utilized so far by the humans.^[5] but large number of such plants are still unexplored.^[6] Poor communities throughout the world are dependent on these wild plants for their food, nutrition, subsistence needs and livelihood.^[7,8,9,10] According to FAO, there are over 20,000 edible species as wild plants in the world, until now only 30 (thirty) plants are used to meet the 90% world's food requirement.^[11] In India, a large proportion of WEPs are used for eating and medicinal

purposes but using these plants without knowledge can also be harmful.^[12] Though ethnobotanical studies have been increased rapidly, but the traditional knowledge system of many plants has not been documented yet.^[13] WEPs also has an important position in our cultural, religious and health care system.^[15] In India, about 1532 WEPs are reported,^[14] in which 675 species are from Indian Himalayan Region (IHR)^[16] and 800 species used by only tribal communities.^[17]

Himachal Pradesh is a hilly state having vast diversity of plants and also known as a treasure house of traditional, indigenous and neutralized species that providing fruits, vegetable, medicines etc.^[18] These plants can be a good source of food security,^[19] agriculture diversification,^[20] income generation,^[21] and also nutrition.^[22] Food security is the main concern in recent scenario therefore, use of wild edible resources can be a great alternative footstep towards balancing human demand and utilization of resources.^[23,24] Until now a little attention has been given to document the WEPs of Himachal Pradesh as the information is scattered, sparse and has various gaps.^[25] Study on wild edibles in IHR.^[26] and

some parts of Himachal Pradesh was done by various researchers.^[27,28,29,30,31,32,33] Documentation on the WEPs in the central Himachal Pradesh is still lacking. Therefore, current study has been carried out in the Central Himachal Pradesh which provides a variety of habitats for the luxuriant growth of potential edible plant species. Therefore, present study was conducted to investigate the diversity, indigenous uses and utilization pattern of wild edible plants of the region. Study also suggests the major for various conservation methods and promotion of small-scale industries involving women for its sustainability, conservation and livelihood generation.

Study area

The study area comprises of two districts namely Mandi and Hamirpur of Himachal Pradesh. The area lies

between latitudes. 31°-13'-50"N and Longitudes. 77°-23'-15"E and falls largely under the sub-tropical, temperate, sub-alpine and alpine regions of the Himachal Pradesh (Fig.1). The altitude ranges from 800-4,100m amsl (above mean sea level). Two main rivers namely, Beas and Satluj surrounds most of the area.^[34] The area harbors a rich of economically important floristic diversity including wild edible plants.^[35] The area experiences sub-tropical, temperate, sub-alpine and alpine climate. The vegetation comprises sub-tropical, temperate, sub-alpine and alpine types. The area is inhabited by the diverse groups of inhabitants and they are largely dependent on floristic diversity for food and various other purposes.

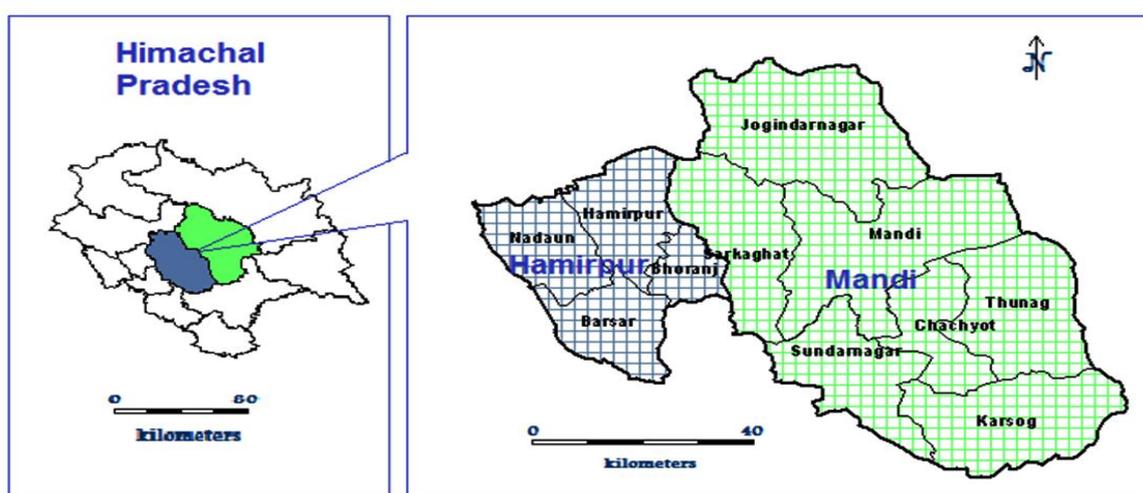


Fig. 1: Map of the Study area.

METHODOLOGY

For the assessment of wild edible plants, numerous surveys were conducted in all seasons during 2015- 2018 by following rapid sampling.^[35] The inhabitants of 17 representative villages namely, *Alsogi, Ambla Galu, Baldwara, Bhambla, Balra, Bachawan, Chowk, Dabhoi, Dhanotu, Kot, Leda, Koon, Ner, Ropadi, Samkhetar* and *Ukhla* located at different elevations were selected to generate information on indigenous uses of wild edibles, present in the study area. For this, knowledgeable persons from each village were interviewed. The interviews were mostly individual and followed informal method and open ended rather than a strict questionnaire.^[26] The language used by the informants was the local dialect of the study area viz., *Mandyali* and *Hindi*. The samples of plants were collected from their natural habitats with the help of a local knowledgeable hired person. The collected fresh samples of species were brought to the Institute for the identification. All identified species were identified with the help of local and regional floras.^[36,37,38,39] Nativity of the species was identified following Anonymous (1883-1970) and Samant (1998, 1999) While the endemism of species was identified based on distribution of species.^[40,41] The

species restricted to Indian Himalayan region were considered as endemic, whereas the species with extended distribution to neighboring countries were considered as near endemism.^[42]

RESULTS

Diversity

Total 92 species of edibles plants belonging to 70 genera and 46 families were recorded. Of these, 29 species were trees, 26 shrubs, 36 herbs and one fern. Rosaceae (09 spp.); Moraceae (07 spp.); Berberidaceae, Caprifoliaceae, Polygonaceae and Rutaceae (04 spp., each); Alliaceae, Combretaceae and Zingiberaceae (03 spp., each) were the dominant families. Among the genera, *Ficus* (06 spp.); *Berberis* and *Rubus* (04 spp. each) and *Terminalia* and *Allium* (03 spp., each) were species rich genera. Maximum richness of wild edible plants (65 spp.) as reported in the altitudinal range, 1801-2800m, amsl followed by <1800m amsl. Some of the important wild edible plants of the altitudinal zone < 1800m amsl, were *Aegle marmelos*, *Amaranthus spinosus*, *Carissa spinarum*, *Diplazium esculentum*, *Elaeagnus conferta*, *Murraya koenigii*, *Punica granatum*, *Phyllanthus emblica*, *Tamarindus indica*

etc., 1801-2800m amsl were *Berberis aristata*, *Chenopodium album*, *Cordia dichotoma*, *Juglans regia*, *Rubus biflorus*, *Rhododendron arboreum*, *Viburnum cotinifolium*, *Terminalia chebula* etc; 2801-3800 m, amsl

were, *Ribes glaciale*, *Polygonatum verticillatum*, *Thymus linearis*, *Taxus wallichiana*, *Angelica glauca* etc; and >3800m, amsl were *Allium humile*, *Allium wallichii*, *Allium stracheyi*, etc. (Table.1).

Table 1: Diversity, distribution, nativity, endemism and indigenous uses of wild Edible plants in Central Himachal Pradesh.

Family/ Taxa	Local Name	AR (m)	LF	Nativity	Part used	Indigenous uses
Angiosperms						
Amaranthaceae						
<i>Amaranthus spinosus</i> L.	Sariyara	1500-2500	H	Am Bor	Lf	Used as vegetable.
Alliaceae						
<i>Allium humile</i> Kunth	Jangli lahsan	3200-4000	H	Ind Or	Lf	Used as flavoring material; Soup making.
<i>A.stracheyi</i> Baker	Kochay, Gyamen	3600-3800	H	Reg Himal	Bb,Lf	Used as condiment.
<i>A.wallichii</i> Kunth	-	2500-4100	H	Reg Himal Prace	Lf, Bb	Chatney preparation, used as flavoring agent.
Apiaceae						
<i>Angelica glauca</i> Edgew.*	Chaura	2000-2800	H	Reg Himal	Rh, Rt	Roots used as flavouring agent.
<i>Selinum vaginatum</i> (Edgew.) Cl.	-	2900-3400	H	Reg Himal	Rt	Used as condiment.
Apocynaceae						
<i>Carissa spinarum</i> L.	Garne	800-1600	Sh	Reg Himal	Fr	Ripe fruits are eaten.
Araceae						
<i>Arisaema flavum</i> (Forsk.) Schott	Kida alu	2400-3300	H	Arabia	Tu	Tubers eaten.
<i>Colocasia affinis</i> Schott	-	1200-1700	H	Reg Himal	Corm	Corm is used as vegetable.
Araliaceae						
<i>Aralia cachemirica</i> Dcne.**	-	2500-3050	H	Reg Himal	Rt	Used as condiment.
Arecaceae						
<i>Chamaerops humilis</i> L.	Khajara	1000-1500	T	Reg. Mediterr. Occ	Lf	Ripe fruits eaten.
Asparagaceae						
<i>Asparagus racemosus</i> Willd.	Sansarpali	800-1700	Sh	Ind Or Afr Trop Austr	Tu	Tubers are boiled and taken as soup.
Asteraceae						
<i>Bidens biternata</i> Merr. & Sherf.	-	800-1600	H	Reg Trop	Lf	Young leaves used as vegetable.
<i>Lactuca dolichophylla</i> Kitam.	-	1600-2500	H	Reg Himal	Lf	Young leaves used as vegetable.
<i>Myriactis nepalensis</i> Less.	-	1800-3050	H	Reg Himal As Centr	Lf	Leaves are cooked as vegetable.
Berberidaceae						
<i>Berberis aristata</i> DC.**	Kasmal	1800-2800	Sh	Ind Or	WP	Ripe fruits eaten.
<i>B. asiatica</i> Roxb. ex DC.	Kasmal	800-1700	Sh	Reg Himal	WP	Ripe fruits eaten.
<i>B. jaeschkeana</i> Sehneid.	Kasmal	2700-3050	Sh	Reg Himal	Rt, Fr	Ripe fruits eaten.
<i>B. lycium</i> Royle**	Kasmal	800-2200	Sh	Reg Himal	Rt, Fr	Ripe fruits eaten.
Bombaceae						
<i>Bombax ceiba</i> L.	Semal	800-1600	T	Am Austr	Fl	Flowers are used t for making chatney.
Boraginaceae						
<i>Cordia dichotoma</i> G.Forst.	Lasooda	800-1400	T	Austr.	Fr	Fruits are used for making pickle; also used as vegetable.
Caesalpiniaceae						

<i>Tamarindus indica</i> L.	Imli	900-1800	T	As. et Afr Trop	Fr	Fruits are used for making chatney.
Cannabaceae						
<i>Cannabis sativa</i> L.	Bhang	800-2000	H	As Centr Reg Himal Bor Occ	Sd	Seeds eaten.
Caprifoliaceae						
<i>Viburnum cotinifolium</i> Don*	Dab	1600-2500	Sh	Reg Himal	Fr	Ripe fruits eaten.
<i>V. erubescens</i> Wall. ex DC.	-	2000-3050	Sh	Reg Himal Ind Or	Fr	Ripe fruits eaten.
<i>V. grandiflorum</i> Wall. ex DC.**	Padara	2700-3050	Sh	Reg Himal	Fr, Lf	Ripe fruits eaten.
<i>V. mullaha</i> Buch.-Ham. ex Don	-	1600-2500	Sh	Reg Himal	Fr,Lf, Wd	Ripe fruits eaten.
Chenopodiaceae						
<i>Chenopodium album</i> L.	-	800-2500	H	Reg Temp et Trop	Lf, Sd	Young leaves are used for making vegetable;seeds eaten.
Combretaceae						
<i>Terminalia arjuna</i> (Roxb. ex DC.) Wt. & Arn.	-	1200-1700	T	Ind Or	Bk	Powder of Bark is taken with milk.
<i>T.bellirica</i> (Gaertn.) Roxb.	-	1200-1700	T	Ind Or Malaya	Fr	Ripe fruits eaten.
<i>T.chebula</i> Retz.	-	1200-1600	T	As Trop	Fr	Ripe fruits eaten.
Cornaceae						
<i>Cornus capitata</i> Wall.	Kreeva	1500-2000	T	Reg Himal	Fr, lf,fl	leaves and fruits as vegetable; flower buds as flavoring agents and ripe fruits eaten raw.
<i>C. macrophylla</i> Wall.	Khrembal	1500-2800	T	Reg Himal	Fr, Wd, Lf	Ripe fruits eaten.
Cucurbitaceae						
<i>Solena amplexicaulis</i> (Lam.) Gandhi	-	800-2000	H	As Trop et Sub Trop	Fr	Used as vegetable.
<i>Trichosanthes tricuspidata</i> Lour.	-	800-2300	H	Cochinch	Sd	Seeds eaten.
Dioscoreaceae						
<i>Dioscorea belophylla</i> Voigt. ex Haines.	Tardi	800-1800	H	Guiana	Tu	Tubers are used as vegetable.
<i>D. deltoidea</i> Wall. ex Kunth	-	1600-2800	H	Ind Or	Tu	Tubers are boiled and eaten.
Dipsacaceae						
<i>Dipsacus inermis</i> Wall.	-	2200-3250	H	Reg Himal	Lf	Leaves used in cooked form.
Elaeagnaceae						
<i>Elaeagnus conferta</i> Roxb.	Geai	800-1800	Sh	Ind Or	Fr	Ripe fruits eaten.
<i>E. parvifolia</i> Wall. ex Royle	Geai	1600-2400	T	Japan	Fr	Ripe fruits eaten.
Ericaceae						
<i>Gaultheria trichophylla</i> Royle	-	2000-3500	H	Reg Himal	Fr	Ripe fruits eaten.
<i>Rhododendron arboreum</i> Sm.	Brash	1400-2200	T	Reg Himal	Fl	Flowers are used as to making chatney and juice.
Euphorbiaceae						
<i>Phyllanthus emblica</i> L.	Aambla	970-1400	T	As. Trop	Fr	Fruits are used to making Aachar, Marabba, Juice.
<i>Ricinus communis</i> L.	Arand	800-1600	Sh	Reg Trop	Sd	Seed are used as vegetable oil.

Grossulariaceae						
<i>Ribes glaciale</i> Wall.	-	2800-3300	Sh	Reg Himal	Fr	Ripe fruits eaten.
Hippocastanaceae						
<i>Aesculus indica</i> Coleb. ex Camb.	Khanor	1800-2600	T	Reg Himal	Sd	Seeds are mixed with flour used for making Halwa.
Juglandaceae						
<i>Juglans regia</i> L.	Akhrot	1600-2000	T	As Occ Reg Himal	Fr	Ripe fruits eaten.
Lamiaceae						
<i>Elsholtzia fruticosa</i> (Don) Rehd.	Pothi, Jaunkra	1600-2200	Sh	Reg Himal	Sd	Ripe fruits eaten.
<i>Thymus linearis</i> Benth.	Ban jira	2000-3050	H	Europe As et Afr Bor	WP	Used as condiment.
Lauraceae						
<i>Cinnamomum tamala</i> Nees & Ebern	-	800-1600	T	Reg Himal	Bk, Lf	Bark and leaves used as flavoring agent.
Liliaceae						
<i>Polygonatum verticillatum</i> (L.) Al.	Salam-Mishri	2000-3300	H	Europe As Bor	Tu	Tubers eaten.
Mimosaceae						
<i>Acacia catechu</i> (L.f.) Willd.	Khair	1100-1700	T	Ind Or	Bark	Used as flavoring agent.
Moraceae						
<i>Ficus auriculata</i> Lour.	Tremal/ Thraimbal	800-1600	T	Reg Himal Burma	Fr	Ripe fruits eaten.
<i>Ficus nemoralis</i> Wall. ex Mir**	Dudla	1600-2000	T	Reg Himal	Fr	Ripe fruits eaten.
<i>F. racemosa</i> L.	Umreya	1000-1500	T		Fr	Ripe fruits eaten.
<i>F. rumphii</i> Bl.	-	800-1600	T	Reg Himal Malaya	Fr	Ripe fruits eaten.
<i>F. sarmentosa</i> Ham. ex Sm.	Debra, Denbere	800-2000	Sh	Reg Himal	Fr	Ripe fruits eaten.
<i>F. semicordata</i> Buch.-Ham. ex Sm.		800-1600	T	Reg Himal	Fr	Ripe fruits eaten.
<i>Morus serrata</i> Roxb.	Cheemu, Paharitut	800-1800	T	Reg Himal	Fr	Ripe fruits eaten.
Myricaceae						
<i>Myrica esculenta</i> Buch.-Ham. ex Don	Kaphal	1400-2400	T	As Trop et Sub Trop	Fr	Ripe fruits eaten.
Myrtaceae						
<i>Syzygium cumini</i> (L.) Skeels	Jamun	1200-1600		Temp Trop Asia	Fr	Ripe fruits eaten; used to make juice.
Oleaceae						
<i>Olea ferruginea</i> Royle	Kahu	1300-1600	T		LF, Fr	Used as vegetable oil.
Oxalidaceae						
<i>Oxalis corniculata</i> L.	Malori	800-2200	H	Amphig Temp et Trop	WP	Whole plant is eaten.
<i>O. latifolia</i> Hk.f.	-	1500-2500	H	Mexico	WP	Whole plant is eaten.
Phytolaccaceae						
<i>Phytolacca acinosa</i> Roxb.	Zharka	2000-2500	H	Reg Himal China	Lf	Young leaves are eaten, also used as salad.
Polygonaceae						
<i>Fagopyrum dibotrys</i> (Lehm.) Mansf. ex K.Hammer	Fafru	1600-2800	H	Reg Himal China	Lf	Leaves eaten raw or cooked; seeds can be sprouted to be used as cereal, can be ground into powder to be used

						as thickening agent in soups.
<i>Polygonum molle</i> D. Don	-	1600-2600		Reg Himal	Lf,Sd	Young leaves are cooked as vegetable
<i>Rumex hastatus</i> Don	Malori	800-1800	H	Reg Himal	Lf	Eaten raw or cooked as vegetable.
Punicaceae						
<i>Punica granatum</i> L.	Daru	800-1800	T	Europe Austr Maurit	Fr	Fruits used for making chatney.
Rosaceae						
<i>Fragaria nubicola</i> L.		1400-1800	H	Reg Temp	Fr	Ripe fruits eaten.
<i>Prinsepia utilis</i> Royle	Bekhal	1600-2600	Sh	Reg Himal	Fr	Ripe fruits eaten.
<i>Prunus armeniaca</i> L	Shada, Khumani	1000-2200	T	Reg Caucas	Sd, Fr	Fruits eaten and oil is extracted from seeds.
<i>Pyrus pashia</i> Buch.-Ham. ex Don	Kainth, Shegal	800-1800	T	Reg Himal	Fr	Ripe fruits eaten.
<i>Rosa moschata</i> L.	Kuja/ Shami	800-1800	Sh	Reg Himal China	Fr	Used for making tea.
<i>Rubus biflorus</i> Buch.-Ham. ex Sm.	Akhaey/ Heer	1500-2500	Sh	Reg Himal	Fr	Ripe fruits eaten.
<i>R. ellipticus</i> Don	Akha	1500-1800	Sh	Ind Or	Fr	Ripe fruits eaten.
<i>R. niveus</i> Thunb.	Akha	1800-2600	Sh	Reg Himal	Fr	Ripe fruits eaten.
<i>R. paniculatus</i> Sm.**	Kalanche, Kala akha	1500-2600	Sh	Reg Himal	Fr	Ripe fruits eaten.
Rutaceae						
<i>Aegle marmelos</i> (L.) Correa	Bil, Bil patri	1200-1600	T	Ind Or	Fr	Fruits are used to making "Marrabba."
<i>Glycosmis pentaphylla</i> (Retz.) DC.	Gingging	1100-1500	Sh		St,Rt,Bk,Lf	Used as vegetable.
<i>Murraya koenigii</i> (L.) Spreng.	Kurry patta/Gandhela	900-1400	Sh	Ind Or	Lf, Fl& Bk	Used as flavouring agent.
<i>Zanthoxylum armatum</i> DC.	Tirmara, Trimbar	800-1800	Sh	Reg Himal China	Fr, Sd	Ripe fruit and seeds eaten.
Saururaceae						
<i>Houttuynia cordata</i> Thunb.	-	1500-2000	H	As Temp	Lf	Young leaves cooked as vegetable.
Urticaceae						
<i>Urtica dioica</i> Jacq. ex Wedd.	Kugsh/ Bicchu buti	800-2300	H	Reg Bor Temp	Lf	Used for making chatney.
<i>U. hyperborea</i> Jacq. ex Wedd.	-	800-2100	H	Reg Himal	Lf	Leaves used for making vegetable.
Vitaceae						
<i>Cissus repanda</i> Vahl		1400-1600	Sh	Ind Or	Fr,Lf	Ripe fruits eaten.
<i>Parthenocissus semicordata</i> (Royle) Planch.**	Kramru	1500-2600	Sh	Ind Or	Fr,Lf	Ripe fruits eaten.
Zingiberaceae						
<i>Alpinia calcarata</i> (Haw.) Roscoe	Jungli, Elaayachi	800-1300	H	Ind Or China	Rh	Used as condiment and flavouring agent.
<i>A. zerumbet</i> (Pers.) B.L.Burt & R.M.Sm.	Jungli Adra	800-1300	H	Ind Or	Rh	Used as condiment and flavouring agent.
<i>Hedychium spicatum</i> Buch.-Ham. ex Sm.**	Ban halder, Shau	800-2200	H	Reg Himal	Rh	Used as condiment.
Gymnosperms						
Taxaceae						
<i>Taxus wallichiana</i> (Zucc.) Pilger	Rakhala/ Talispatra	2400-3050	T	Reg Himal	Bk	Bark is used for making tea.
Pteridophytes						
Athyriaceae						

<i>Diplazium esculentum</i> (Retz.) Sw.	Linger	800-1800	H		Frd	Tender fronds used as vegetable and also used for making pickle.
---	--------	----------	---	--	-----	--

Abbreviations used: AR=Altitudinal range; LF=Life forms; End= Endemism; H = Herb; Sh= Shrub; T= Tree; Reg Himal = Himalayan Region; Ind Or = Indian Oriental; Bor = Borealis; Temp= Temperate; Arct = Arctic; et= And; As = Asia; Centr = Central; Afr= Africa; Geront = Gerontia; Trop= Tropical; Amphig = Amphigaea; Austr = Australia; Amer = America; N.Zel = New Zealand; Orient =Oriental; Cosmop = Cosmopolitan; Occ= Occidentalis; Afghan= Afganistan; Turkist= Turkistan; Arab = Arabia; Subtrop= Subtropical; Hisp = Hispan; Min = Minor; Polynes = Polynesia; Madag= Madagascar; Alger= Algeria; E = Endemic; NE= Near Endemic; AP= Aerial part, Bb= Bulb, Bk= Bark, Fl= Flower, Fr= Fruit, Infl= Inflorescence, Lf=Leaf, Rh= Rhizome, Rt= Root, Sd= Seed, St= Stem, Tu= Tuber, WP= Whole plant, Wd= Wood, Res= Resin; Frd= Frond and La=Latex,

Nativity and endemism

Total 92 edible plants species recorded, in which 41 species were found to be natives to the Himalayan region and remaining species were non-natives (51 spp.). One

species (*Angelica glauca*) as endemic and 10 species were near endemic to the Indian Himalayan Region (Table.1).

Utilization pattern

The various plant parts such as roots, leaves, rhizomes, stems, flowers, fruits, etc. of wild edible plants were either consumed raw or in cooked form i.e., roasted, boiled, fried or as flavoring agent, oil, spice/condiment, pickles, jams, or in the form of tea, juice, etc. Among the part used, fruits (44 spp.), leaves (27 spp.), seeds (11 spp.), roots and bark (06 spp. each), whole plants (05 spp.) and bulbs (02 spp.), were the major parts (Fig.2). Out of 92 species recorded, maximum ripe fruits (31 spp.) were eaten followed by 19 species as vegetables, 7 species as flavoring agent/ material, 8 species as condiment/spice, 3 species for pickle preparation, 6 species as salad, 5 species each for juice extraction and making chatney and 2 species, each for soup, tea and oil extraction (Table 1).

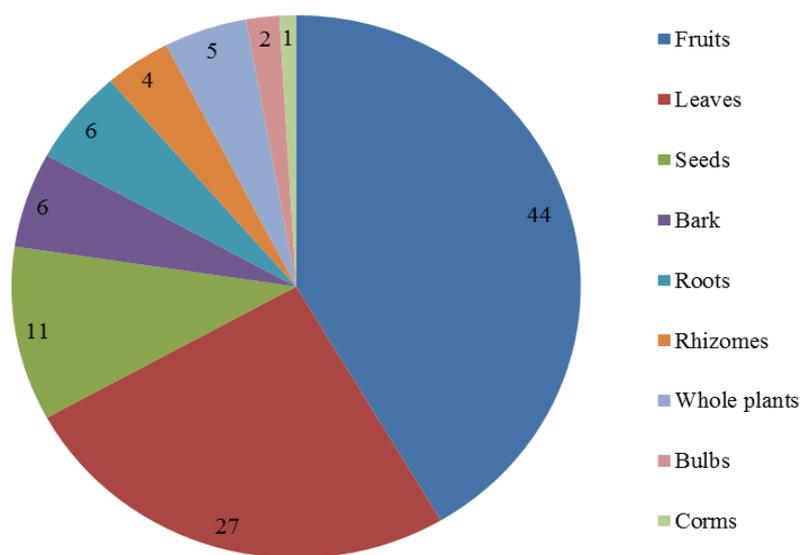


Fig .2. Utilization pattern of various plant parts



Fig. 3: Pictorial view of wild edibles plants (a) *Rhododendron arboreum*; (b) *Juglans regia*; (c) *Berberis aristata*; (d) *Morus serrata*; (e) *Viburnum mullaha*; (f) *Murraya koenigii*; (g) *Angelica glauca*; (h) *Myrica esculenta*; (i) *Phyllanthus emblica*; (j) *Phytolacca acinosa*.

DISCUSSION

WEPs continue playing a vital role in human diet especially in rural areas of the Himalaya.^[43] The Indian Himalayan Region inhabits a rich floral diversity, which is being utilized by the natives in form of fuel, fodder, timber, medicine, agricultural tools, religious, fiber, edible/food, etc.^[44] The WEPs play an important role for the food security of native communities.^[19] and number of medicinal plants (1748), wild edibles (675), fodder (279), essential oil yielding medicinal and aromatic plants (118) and sacred (155) plants were reported⁴⁵ throughout IHR, while in India about 2,500 species of ethnobotanical importance are known.^[45] Total 323 plant species reported to be edible in the entire state of Himachal Pradesh.^[46] There are plenty of scopes to strengthen the database, if biodiversity rich areas are thoroughly explored. In lower parts of Himachal Pradesh, some of the important plant species used as supplementary food among the native communities of these areas and utilization of different plant parts was also observed.^[47] In the present study, 92 species of wild edible plants were recorded from the Central Himachal Pradesh indicating its high socio-economic value. The number of wild edibles decreased with the increasing altitude, similar to previous study.^[29] These plants act as a supplement to the food requirement of local communities.^[18] and may also serve as an alternate during the food scarcity.^[25] and income generation. Some

of the plants like, *Chenopodium album*, *Elaeagnus parviflora*, *Rhododendron arboreum*, *Aesculus indica*, *Juglans regia*, *Myrica esculenta*, *Phytolacca acinosa*, *Fragaria nubicola*, *Prinsepia utilis*, *Prunus cerasoides*, *Urtica dioica*, etc. are highly preferred because of their high nutrient value. Marketing of such species can be helpful in raising the economy of the local communities especially women living in the Himalayan region, which agrees with findings reported by earlier studies.^[48,49] The reported 92 wild edibles species from the current study area also have medicinal properties as documented by other researchers also.^[50,51] This enhances potential of these wild edibles not only as food source or supplement but also as source of income generation for rural people.

CONCLUSION

The study showed that different WEPs were used by the natives of Central Himachal Pradesh for their food diversity. WEPs are very important for the well-being of the inhabitants in the region as sources of supplemental food, nutritionally balanced diets, medicines, and also for their income-generating potential. But change in its consumption pattern is also very evident in the time of modernization and the knowledge for the same is with the older generation only. Still a large number of WEPs are being used by the native which need to be documented so that it can be available for the future generation also.

RECOMMENDATION

In view of above, considering the incredible importance of these wild edible plants as food or supplement, there is a need for conservation and management of this wealth by the local inhabitants, NGOs, Central and State Government Organizations. Documentation of these indigenous knowledge and traditional practices need to be done so that it can be available for the future generation. Study on the population ecology of the important wild edibles, formulation and dissemination of proper information compendium based on appropriate evaluation of nutrient and economic potential of these edible plants; education and awareness programs regarding sustainable utilization of these species for the inhabitants; and development of conventional and in vitro propagation protocols of wild edibles for mass scale propagation and their establishment and maintenance in the *in situ* and *ex situ* conditions are also recommended. It is also recommended to involve various women groups on the entrepreneurial activities for their socio-economic development as well as conservation of the WEPs species.

ACKNOWLEDGEMENT

Authors are thankful to Dr RS Rawal, Director, GB Pant National Institute of Himalayan Environment, Almora, Uttarakhand for facilities and encouragement. Help received from Amit Kumar, Research Assistant, UCOST, Uttarakhand for preparing the map of the study area is highly acknowledged. Local communities are also acknowledged for providing information on uses of wild edible plants.

REFERENCES

- Burger J, The state of the world's indigenous peoples. Cultural Survival Inc. Report from the frontier, 1987.
- Tebkew, Mekuanent, Zebene Asfaw and Solomon Zewudie, Underutilized wild edible plants in the Chilga District, northwestern Ethiopia: focus on wild woody plants, *Agri & Fd Secu.*, 2014; 3(1).
- Schippmann U, Cunningham AB, Leaman DJ. Impact of cultivation and gathering of medicinal plants on biodiversity: global trends and issues. In: Biodiversity and the ecosystem approach in agriculture, forestry and fisheries, Rome: FAO, 2002.
- Beluhan S and Ranogajec A, Chemical composition and non-volatile components of Croatian wild edible mushrooms, *Food Chem.*, 2010; 124: 1435-1452.
- Grivetti LE, Ogle BM. Value of traditional foods in meeting macro- and micro nutrient needs: the wild plant connection. *Nutri Res Rev.*, 2000; 13(1): 31-46.
- Mohan Ram HY. Plant Resources of Indian Himalaya 9th G P Pant Memorial Lecture, G B Pant Institute of Himalayan Development, Gangtok, Sikkim, 2000.
- Sundriyal M, Sundriyal RC, Sharma, E and Purohit AN, Wild edibles and other useful plants of Sikkim Himalayas, India, *Oecologia Montana*, 1998; 7: 43-54.
- Mishra SB, Dwivedi S, Shashi A, rajapati K, Ethnomedicinal uses of some plant species by ethnic and rural peoples of the Salem district of Tamilnadu with special reference to the conservation of vanishing species, *Ethnobot. Leaflets*, 2008; 12: 873-887.
- Tiwari JK, Ballabha R and Tiwari P, Some promising wild edible plants of Srinagar and its adjacent area in Alaknanda valley of Garhwal Himalaya, India, *Am. J. Sci.*, 2010; 6: 167-174.
- Badhani A, Sakalani S and Mishra, AP, Variation in biochemical's and antioxidant activity of some wild edible fruits of Uttarakhand. Report and Opinion, 2011; 3: 1- 10.
- FAO, Agricultural Biodiversity, Multifunctional Character of Agriculture and Land Conference, Background Paper Maastricht, Netherlands, 1999.
- Kaval, İdris, Lütfi Behçet, and Uğur Çakilcioğlu, Survey of wild food plants for human consumption in Geçitli (Hakkari, Turkey), 2015.
- Luczaj L, Pieroni A, Tardío J, PardodsSantayana M, Sōukand R, Svanberg I and Kalle R, 2012. Wild food plant use in 21 st century Europe, the disappearance of old traditions and the search for new cuisines involving wild edibles. *Acta societatis botanicorum poloniae*, 2012; 81(4).
- Bhatia H, Sharma, YP, Manhas RK, Traditionally used wild edible plants of district Udhampur, J&K, India, *J Ethnobot Ethnomed.*, 2018; 14: 73.
- Reddy KN, Traditional knowledge on wild food plants in Andhra Pradesh, 2007.
- Samant SS and Dhar U, Diversity, endemism and economic potential of wild edible plants of Indian Himalaya, *Int. J. Sustain. Dev. World Ecol.*, 1997; 4: 179-191.
- Bandyopadhyay S and Sobhan K Mukherjee, Wild edible plants of Koch Bihar district, West Bengal, 2009.
- Chand R, Singh, AN and Nirmala C, Ethnoecological survey of underutilized plant diversity of Hamirpur district, Himachal Pradesh, India: an edibility assessment, *Env. and Eco. Res.*, 2017; 5(1): 13-29.
- TB G-D, Maass L, Isselstein J, Plant biodiversity and ethnobotany of Borana pastoralists in southern Oromla, Ethiopia, *Eco Bot.*, 2005; 59: 43-65.
- Shrestha PM, Dhillion SS, Diversity and traditional knowledge concerning wild food species in a locally managed forest in Nepal, *Agrofor Syst.*, 2006; 66: 55-63.
- Thakur D, Sharma A, Uniyal SK, Why they eat, what they eat: patterns of wild edible plants consumption in a tribal area of Western Himalaya, *J Ethnobiol Ethnomed.*, 2017; 13: 70.
- Burlingame B, Wild nutrition, *J Food Composition Analysis.*, 2000; 13: 99-100.

23. Shackleton SE, Dzeferos CM, Shackleton CM, Mathabela FR, Use and trading of edible herbs in the central Lowveld savanna region, South Africa, *Econ Bot.*, 1998; 152(3): 251–259.
24. Balemie K, Kebebew F, Ethnobotanical study of wild edible plants in Derashe and Kucha districts, *South Ethiopia J Ethnobiol Ethnomed.*, 2006; 2: 53.
25. Arora RK, Pandey A, Wild edible plants of India, diversity, conservation and uses, ICAR and NBPGR, New Delhi, 1996; 294.
26. Samant SS, Dhar U, Rawal RS, Diversity and distribution of wild edibles of Indian Himalaya, In: Plant diversity of Himalaya, edited by Pc pandey and ss samant, (Gyanodaya Prakashan, Nainital), 2001; 421-482.
27. Sen T, Samant SS and Tewari LM, Diversity, Endemism and economic potential of Wild Edible Plants in Rissa Khad watershed of District Mandi, Himachal Pradesh, *J. NTFP*, 2013; 20(2): 155-164.
28. Chauhan PP, A Nigam and VK Santvan, Ethnobotanical study of wild fruits in Pabbar Valley, District Shimla, Himachal Pradesh, *JMPS*, 2016; 4(2): 216-220.
29. Sharma L, Samant SS, Kumar A, Lal M, Devi K and Tewari LM, Diversity, distribution pattern, endemism and indigenous uses of wild edible plants in cold desert biosphere reserve of Indian Trans Himalaya. *Indian J. Trad.Know*, 2018; 17(1): 122 - 131.
30. Negi, PS, and Surulibommu PS, Wild edible plant genetic resources for sustainable food security and livelihood of Kinnaur district, Himachal pradesh, India. *Int J of Cons Sci.*, 2015; 6: 4.
31. Jhamta R, Puri R, Sharma ML, Khan S and Kaur H, Traditional knowledge and ways of consumption of wild edible plants by rural communities of Shimla District, Himachal Pradesh (India), *Plant Sci Today*, 2019; 6(2): 201-207.
32. Kumar S, Wild Edible Plants Consumed by Rural Communities in District Bilaspur, Himachal Pradesh, India, 2019.
33. Thakur A, Singh S and Puri S, Exploration of Wild Edible Plants Used as Food by Gaddis-A Tribal Community of the Western Himalaya, *The Sci World J*, 2020.
34. Kumari P, Samant SS, Puri S, Singh A and Rathore S, Diversity, indigenous uses and traditional practices of dye yielding plants in Central Himachal Pradesh, North western Himalaya, *IJTK*, 2019; 18(3): 560-564.
35. Kumari P, Samant SS, Puri S and Kumar D, Assessment of economically important floristic diversity of Kamrunag Sacred Groove and surroundings in Himachal Pradesh, North Western Himalaya, India, *NTFP*, 2018; 25(30): 145-160.
36. Chowdhery HJ and Wadhwa BM, Flora of Himachal Pradesh. Vol. 1-3, 1984, Botanical Survey of India, Calcutta, 1984.
37. Aswal BS and Mehrotra BN, Flora of Lahaul-Spiti (A Cold Desert in North-West Himalaya), Bishen Singh Mahendra Pal Singh, Dehradun, 1994.
38. Dhaliwal DS and Sharma M, Flora of Kullu District (Himachal Pradesh). Bishen Singh Mahendra Pal Singh, Dehradun, 1999.
39. Singh SK and Rawat GS, Flora of Great Himalayan National Park, Himachal Pradesh. Bishen Singh Mahendra Pal Singh, Dehradun, 2000.
40. Dhar U, and Samant SS, Endemic diversity of Indian Himalaya, I. *Ranunculaceae* and II. *Paeoniaceae*. *J. Biogeography*, 1993; 20: 659-668.
41. Samant SS, Diversity, nativity and endemism of vascular plants in a part of Nanda Devi Biosphere Reserve in west Himalaya, I. *Himal. Bios. Reserv. Biannual Bulletin*, 1999; 1(1&2): 1-28.
42. Samant SS, Dhar U, Palni LMS, Medicinal plants of Indian Himalaya: Diversity distribution potential values, Gyanodaya Prakashan, Nainital, 1998.
43. Sundriyal M, Sundriyal RC, Sharma E, Porohit AN, Wild edibles and other useful plants from the Sikkim Himalaya, India, *Oecol Montana*, 1998; 7(1): 43–54.
44. Sood SK, Rawat D, Kumar S, Rawat S, Handbook of wild edible plants. Jaipur: Pointer Publishers, 2012.
45. Samant SS, Pant S, Diversity, distribution pattern and traditional Knowledge of sacred plants of Indian Himalayan Region, *Ind. J. Fores*, 2003; 26(3): 201-213.
46. Samant SS, Pant S, Singh M, Lal M, Singh A, Sharma A, Bhandari S, Medicinal plants in Himachal Pradesh, North Western Himalaya, India, *Int. J. Biod. Sci. Mangnt*, 2007; 3: 234-251.
47. Jain SK, Dictionary of Indian Folk Medicine and Ethnobotany, Deep Publications, New Delhi, 1991.
48. Bhardwaj J, Seth MK, Edible wild plant resources of Bilaspur, Hamirpur and Una districts of Himachal Pradesh, India, *Int J Bot Std*, 2017; 6(2): 09-17.
49. Sharma P, Agnihotry A, Sharma PP, Sharma L, Wild edibles of Murari Devi and surrounding areas in Mandi district of Himachal Pradesh, India, *Biodivers Conserv*, 2013; 5(9): 592-604.
50. Monika B, Samant SS, Tewari LM, Vijay K, Diversity, endemism and indigenous uses of wild edible plants of Shikari Devi Wildlife Sanctuary in Himachal Pradesh, North Western Himalaya, India, *Indian Fores.*, 2019; 145(1): 62-9.
51. Thakur SD, Diversity, distribution and utilization pattern of some forestry foods (Wild Edibles) from Tirthan wildlife sanctuary of district Kullu, HP, *Int J Adv Sci Engg & Tech*, 2017; 5(2): 4-11.