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## Diversity of wild edible plants in the Mandal- Chopta forest, Uttarakhand

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### Abstract

Wild edible plants (WEP) provide staple and supplement foods, as well as cash income to local communities, thus favouring food security. However, WEP are largely ignored in land use planning and implementation, economic development, and biodiversity conservation. Moreover, WEP-related traditional knowledge is rapidly eroding.

The information was collected through focus group discussions and key informant interviews. The methods employed in the study were designed with the purpose of providing baseline information on the use of plant species in local system through village surveys and field visits to various areas in the villages of Chamoli district falling under the boundaries of Mandal-Chopta Forest in Garhwal Himalayas, Uttarakhand.

The diversity of wild edible plants being use by the local inhabitants is 64 species belonging to 47 genera and 36 families. Most of the species were used as fruits (30 species) followed by as leafy vegetables (20). Almost half of the species (51%) were also used for purposes other than food. From the species with market value (28% of the total). Further studies revealed that WEP are threatened mostly by habitat destruction, land-use change and over-harvesting. Some of these plants are crop wild relatives and could thus be used for crop improvement.

**Keywords:** Wild edible, traditional knowledge, economic potential, ethno botanical

### 1. Introduction

Wild edible plants (WEP) are an important source of food for mankind before the dawn of civilization and the domestication of the present day fruits. These wild fruits have played a very vital role in supplementing the diet of the people.

Local inhabitants in the rural areas mostly depend upon wild plants during their lean seasons, which are often collected from nearby forest as their collection does not require any skills and capital investment (Alcorn, 1990; FAO, 1995; Arnold and Ruiz Perez, 1995; Ros-Tonen, 2000) [1, 6, 2, 13].

The Garhwal Himalayas region is the land of many beautiful holy places, valleys and hills, as Himalayas are very rich in natural resources. The forest resources play an important role in the livelihood of the local communities. The rich diversity of the area is utilized by the local inhabitants in various forms as medicine, food, fodder, fuel, timber, agricultural implements, etc. Among these, wild edible plants play an important role in food supplement during scarcity for local inhabitants. Because of small land holdings and subsistence agriculture, the local people collect many wild plants for food.

People living in the rural areas of the Himalayas utilize a variety of biological resources for livelihoods. Animal husbandry and marginal agriculture are the major source of their economy (C.P. Kala, 2005, 2007) [8, 9].

Pande *et al.* (2001) [11] and Naithani *et al.* (2009) [10] have conducted systematic studies on the vascular plants of Mandal forest. An extensive floristic survey has been conducted by (Rai, Adhikari and Rawat, 2011) in Kedarnath Wildlife Sanctuary, during the survey a total of 433 plant species belonging to 234 genera under 71 families were recorded along the sub-alpine and alpine region (2800-3680m *amsl*) of which there are 349 herbs, 42 shrubs, 18 grasses, 13 trees, 5 sedges and 6 climbers respectively. Bhat *et al.* (2013) [3] conducted the study on ecological status and traditional knowledge of medicinal plants in Kedarnath Wildlife Sanctuary of Garhwal Himalaya.

About 182 villages are situated around KWS, of which about 50 are located very close to the best wildlife areas.

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The main sources of income in the Mandal valley (1500 to 1800m) are milk, honey and fruits. From lower valley bottom to sub-alpine and alpine zones of Kedarnath WLS, livestock production and tourism are the main land use practices.

**Materials and Methods**

**1. Study Area**

Kedarnath Wildlife Sanctuary (KWLS; 30° 25'-30° 45' N latitude, 78° 55'-79° 22' E longitude) is the one of the floristically rich and largest Protected Areas (PAs) in Uttarakhand covering an area of 975 km<sup>2</sup>. It lies in the Northern catchments of Alaknanda, a major tributary of the river Ganges.

An intensive study area of around 100 km<sup>2</sup> was selected along the Southern fringe of Kedarnath WLS. Nearly 70% of the intensive study area lies in Mandal valley with in Alaknanda catchment. Upper part of the study area is marked by famous Hindu shrine Tungnath (3550m). The local inhabitants are settled in scattered villages along lower fringes (< 2200m) who are basically agro-pastoralists. The study area includes substantial areas of Makku Reserve Forest with the altitude ranging between 1,500-3,680 m. The area was selected as it has a wide altitudinal range, different habitat and vegetation types mainly dominated by the oaks, varied aspect and slope categories. Six villages viz., Siroli, Mandal, Khalla, Koteshwar, Bandwara, Bairagana in Mandal valley and five villages viz., Makku, Hudu, Daira, Kanda and Jagpura were selected for the intensive study.

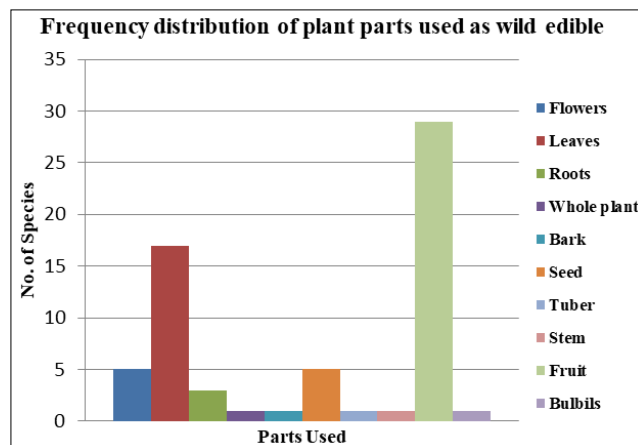
**2. Methodology**

The Present Survey was conducted in 11 villages of the study area covering the Chamoli and Rudraprayag district based on personal interviews among local people. The informers included responsible old persons; attempts were made to include females in interviews and middle aged people who were fully aware about their forest wealth. During the survey, information was gathered on the basis of prepared questionnaire viz., local name, parts used, methods of uses medicinal uses, etc (Fig. 1). Standard methods were followed for the collection of plant materials, mounting, preparation and preservation of plant species.

**Results**

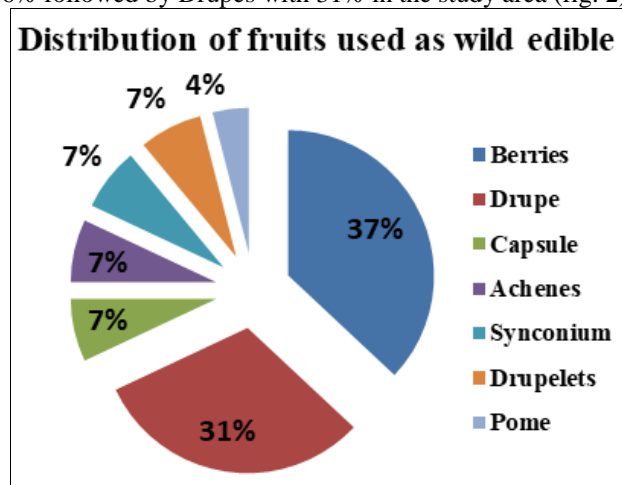
The study came to document nearly 64 species of plants used as wild edibles (Table 1). Analysis of taxonomic group of plants revealed that a total of 64 wild edible species belonging to 47 genera and 36 families are documented. Only one plant belongs to Pteridophyta and all others to Magnoliophyta. Analysis of habits of plants documented shows that shrubs share the largest proportion with 24 species (37%), followed by herbs with 20 species (31%). Most importantly, fruits are found to frequently used part

accounting for 45%, followed by leaves with 27%, flowers and seed with 7% respectively (fig. 1).



**Fig 1:** Plant part used as wild edible

Among fruits distribution Berries contribute the most about 36% followed by Drupes with 31% in the study area (fig. 2)



**Fig 2:** Distribution of fruits used wild edible

**Discussion and Conclusion**

All of the WEPs species listed in table.1 are collected from their natural habitats in the forest areas near villages for their bonafide use. At present there are no conservation or protection measures applied in these areas by government, NGOs, nor local communities.

Informants revealed that there has been tremendous pressure from anthropogenic activities (unsustainable harvesting, expansion of agriculture land and forest fires). Since collection of WEPs is a free access without paying any royalty to the state government it partly encourages over exploitation of some species.

**Table 1:** Wild edible plants of study area

S. No.	Botanical Name	Family	Local Name	Altitudinal range (m)	Life form	Plant parts and methods of use
1	<i>Aesculus indica</i> (Wall. Ex Cam b.) Hook. f.	Hippocastanaceae	Pangar	1500 - 2800	Tree	Seeds are edible
2	<i>Angelica glauca</i> Edgew	Apiaceae	Choru	3300 - 4000	Herb	Root is used as spice and condiment.
3	<i>Asparagus curillus</i> Buch. –Ham. ex Roxb.	Asparagaceae	Sharanoi	1800 - 3000	Shrub	Tender soot are edible
4	<i>Bauhania vahlii</i> Wt. & Arn	Caesalpiniaceae	Malu	up to 1500	Climber	Roasted seeds are edible
5	<i>Berberis aristata</i> DC	Berberidaceae	kingor	1800 - 3200	Shrub	Fruits are edible
6	<i>Berberis asiatica</i> Royle	Berberidaceae	kingor	600 - 2000	Shrub	Fruits are edible
7	<i>Berberis lycium</i> Royle	Berberidaceae	kingor	1500 - 2200	Shrub	Fruits are edible and made into sauce
8	<i>Bergenia ciliata</i> (Haw.) Sternb	Saxifragaceae	Pattarchoor	1200 - 2600	Herb	Roots are edible
9	<i>Cannabis sativa</i> L.	Cannabaceae	Bhang	1000 - 2200	Herb	Seeds and leaves are edible
10	<i>Capsella bursa-pastoris</i> (L) Medik	Brassicaceae	Medik	Up to 3000	Herb	Young plant used as vegetable

11	<i>Celtis australis</i> L.	Ulmaceae	Kharik, Khadik	Up to 2400	Tree	Ripe fruits are edible
12	<i>Centella asiatica</i> (L.) Urban	Apiaceae	Brahmi	Up to 2000	Herb	Whole plant
13	<i>Cerastium glomeratum</i> Schutt	Caryophyllaceae	Chandai	1500 - 2400	Herb	Young shoot and leaves are used as vegetable
14	<i>Chenopodium album</i> L.	Chenopodiaceae	Bathu-sag	Up to 3800	Herb	Leaves are used as vegetable
15	<i>Cinnamomum tamala</i> (Buch.-Ham.) Nees & Eberm.	Lauraceae	Tejpatta	1500 - 2000	Tree	Leaves are used as spices
16	<i>Cotoneaster microphylla</i> Wall. ex Lindl.	Rosaceae	-	1500 - 3500	Shrub	Ripe fruits are edible
17	<i>Crataegus Crenulata</i> (D.Don) Roxb.	Rosaceae	Ghingaru	600 - 2800	Shrub	Ripe fruits are edible
18	<i>Datura stramonium</i> L.	Solanaceae	Dhatura	Up to 2000	Herb	Fruit are used to make drinks
19	<i>Debregeasia salicifolia</i> (D. Don) Rendle		Syanru, Tusari	600 - 2000	Shrub	Ripe fruits are edible
20	<i>Dioscorea belophylla</i> Voigt	Dioscoreaceae	Turad, Taid, Tor	600 - 1500	Herb	Tubers are cooked as vegetable
21	<i>Dioscorea bulbifera</i> L.	Dioscoriaceae	Gethi	Upto 1500	Herb	Bulbils are cooked as vegetable
22	<i>Diplazium esculentum</i> (Retz.) Sw.	Athyriaceae	Lingura	1200 - 2000	Fern	Curled leaves or fronds are cooked as vegetable
23	<i>Duchesnea indica</i> (Anders.) Fock.	Rosaceae	Bhiun-Kaphal	1000 - 2000	Herb	Ripe fruit are edible
24	<i>Fagopyrum dibotrys</i> (D.Don) Hara	Polygonaceae	kanalya	1500 - 3000	Herb	Leaves are cooked as vegetable
25	<i>Ficus auriculata</i> Roxb.	Moraceae	Timla	600 - 1800	Tree	Fruit are eaten raw and cooked as vegetable
26	<i>Ficus palmata</i> Forsk.	Moraceae	Pheru	Up to 1800	Tree	Ripe fruits are edible
27	<i>Grewia oppositifolia</i> Roxb.	Tiliaceae	Bhimal	300 - 1500	Tree	Ripe fruits are edible
28	<i>Indigofera heterantha</i> Wall. ex Brandis	Papilionaceae	Kathi	1000 - 2200	Shrub	Young flowers are edible
29	<i>Juglans regia</i> L.	Juglandaceae	Akhor	1600 - 2700	Tree	Seeds are edible
30	<i>Myrica esculenta</i> Buch.-Ham. ex D. Don	Myricaceae	Kaphal	1200 - 2400	Tree	Fruits are edible
31	<i>Oxalis corniculata</i> L.	Oxalidaceae	Salmudi, Khatti-mithi	800 - 2000	Herb	Leaves are taken as salad and cooked as vegetable
32	<i>Perilla frutescens</i> (L.) Britton	Urticaceae	Bhangjeera	300 - 1600	Herb	Leaves are cooked as vegetable and seeds are used as spices and condiments.
33	<i>Pilea scripta</i> Buch. -Ham. ex D. Don	Pinaceae	Chaulu	1500 - 2500	Herb	Aerial parts are cooked as vegetable
34	<i>Pinus roxburghii</i> Sargent	Rosaceae	Chir	1000 - 2400	Tree	Seeds are edible
35	<i>Prinsepia utilis</i> Royle	Rosaceae	Bhekkoi	800 - 2300	Shrub	Root and seed oil are used
36	<i>Prunus ceresoides</i> D. Don	Rosaceae	Phaja	600 - 2300	Tree	Ripe fruits are edible
37	<i>Prunus cornuta</i> (Wall. ex Royle) Steud.	Rosaceae	Mehal	2000 - 3300	Tree	Ripe fruits are edible
38	<i>Pyrus pashia</i> Ham.	Rosaceae	Mole	1000 - 2400	Tree	Ripe fruits are edible
39	<i>Rhododendron anthopogon</i> D.Don	Ericaceae	Burans	3000 - 4500	Shrub	Leaves are used to make drinks
40	<i>Rhododendron arboreum</i> Smith	Ericaceae	Burans	1200 - 3300	Tree	Flowers are used to prepare juice
41	<i>Rhododendron barbatum</i> Wall. ex D.Don	Ericaceae	Burans	2000 - 3300	Tree	Flowers are used to prepare juice
42	<i>Rhododendron lepidotum</i> Wallich ex D. Don	Ericaceae	Burans	2600 - 4200	Shrub	Flowers are edible
43	<i>Rhus parviflora</i> Roxb.	Anacardiaceae	Ninawa	1000 - 2000	Tree	Ripe fruits are edible
44	<i>Ribes glaciale</i> Wall	Grossulariaceae	-	2400 - 3600	Shrub	Ripe fruits are edible
45	<i>Rosa brunonii</i> Lindl	Rosaceae	Kunja	2400 - 3000	Shrub	Ripe fruits are edible
46	<i>Rosa macrophylla</i> Lindl.	Rosaceae	Dan-Kunja	2000 - 3600	Shrub	Ripe fruits are edible
47	<i>Rosa sericea</i> Lindl.	Rosaceae	Dhar-Kunja	2000 - 3500	Shrub	Ripe fruit are edible
48	<i>Rubus ellipticus</i> Sm.	Rosaceae	Hinsalu, Anchhoi	500 - 2600	Shrub	Ripe fruit are edible
49	<i>Rubus niveus</i> Thunb.	Rosaceae	kali heesar	1800 - 3600	Shrub	Ripe fruits are edible
50	<i>Rubus paniculatus</i> Sm.	Rosaceae	Kathalu	1200 - 2200	Shrub	Ripe fruits are edible
51	<i>Rumex hastatus</i> D.Don	Polygonaceae	Almoda/halmoda	800 - 2600	Herb	Leaves are eaten raw as salad and also used as condiments
52	<i>Rumex nepalensis</i> Spreng	Polygonaceae	Kilmoru	1500 - 4200	Herb	Leaves are cooked as vegetable
53	<i>Solanum nigrum</i> L.	Solanaceae	Khalarkoi, Bhomolan	Up to 2000	Herb	Young shoots and leaves are cooked as vegetable and ripened fruits are edible
54	<i>Stellaria media</i> L.	Caryophyllaceae	Charchara, Siadi	Upto 3500	Herb	Leaves or young shoot are cooked as vegetable
55	<i>Taraxacum officinale</i> Weber	Asteraceae	Dudhla	1800 - 4000	Herb	Leaves are cooked as vegetable
56	<i>Taxus wallichiana</i> Zucc.	Taxaceae	Thuner	2000 - 3600	Tree	Bark and seeds are edible
57	<i>Thymus linearis</i> Benth.	Lamiaceae	Janglijwan	2000 - 3600	Shrub	Seed are used as spices
58	<i>Urtica ardens</i> Link.	Urticaceae	Kushka	500 - 2500	Shrub	Young branches and leaves cooked as vegetable
59	<i>Urtica dioca</i> L.	Urticaceae	Kandali	2500 - 3500	Shrub	Young branches and leaves cooked as vegetable
60	<i>Viburnum cotinifolium</i> D.Don	Caprifoliaceae	Bansura,	2000 - 3600	Shrub	Ripe fruits are edible
61	<i>Viola betonicifolia</i> var. <i>nepalensis</i> (Ging) Back.	Violaceae	Banafsa	1000 - 2800	Herb	Flower leaves are used as vegetable
62	<i>Vitis parviflora</i> Roxb	Vitaceae	-	Up to 2000	Climber	Ripe fruits are edible
63	<i>Woodfordia fruticosa</i> (L.) Kurz	Lythraceae	Dhaura	1000 - 2000	Shrub	Ripe fruits are edible
64	<i>Zanthoxylum armatum</i> DC.	Rutaceae	Timur	900 - 2200	Shrub	Tender shoots are cooked as vegetable and ripe fruits are edible

Wild edible species may prove a good root stock for the commercial cultivars of the fruit crops due to their wider adaptability to abrupt climatic variations, vigour, growth and resistance to insects and pests. Hence, these may be utilised as good breeding material for the improvement of horticultural

crops as well as restoration and reclamation of degraded land and revised cropping systems.

To maintain the ecosystem equilibrium, awareness of the sustainable utilization of these species needs to be created among the hill communities.

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