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Wild Edible Plant Resources of the Lohba Range of Kedarnath Forest Division (KFD), Garhwal Himalaya, India

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Abstract

The present study was carried out in the Lohba range of the Kedarnath Forest Division, Garhwal Himalaya to document the diversity, indigenous uses and availability status of wild edible plants. The inhabitants of the region are dependent up to a large extent on wild resources for their food and other daily needs. The region is rich in wild edible plant resources. A total of 82 species belonging to 62 genera and 46 families were documented from the study area. Out of the recorded species 24 were herbs, 23 shrubs, 28 trees and the rest 7 were climbers. Among the documented plants, 15 were abundant, 46 common and 21 uncommon to this area. Plant parts such as leaves, shoots, young twigs, roots, rhizomes, tubers, flowers, fruits, seeds, etc. are used for food by the local people. The study will be helpful in developing a comprehensive data base on wild plant resources, strengthening the food security in area and in conserving the traditional knowledge for the prosperity of the remote areas.

Keywords: Wild edible plants, availability status, indigenous uses, Kedarnath forest division, Garhwal Himalaya.

Introduction

Wild edible plants have played an important role in human life since time immemorial. Throughout the history, wild edible plants have sustained human populations in each of the inhabited continents[1]. In India, most rural inhabitants depend on the wild plants to meet their supplementary food requirements[2]. The diversity in wild plant species offers variety in family diet and contributes to household food security. Today, most human plant food is based on rather limited number of crops, but it is clear that in many parts of the world the use of wild plants is not negligible[3- 8]. Sometimes the nutritional value of wild plants is higher than several known common vegetables and fruits[9-11]. Garhwal Himalaya has peculiar topography, vegetation, people and traditions. The forest resources play an important role in the livelihood of the local communities in the region. Even now they are dependent on the natural resources from the forests for their sustenance[12], because of small land holdings and subsistence agriculture, the local people collect many wild edible plants for food, medicine, fodder, fuel, timber, agricultural implements, etc. Among these, wild edible plants play an important role as food supplements during scarcity for local inhabitants.

Many works have emphasized on the diversity and indigenous uses of wild plant resources from different parts of Garhwal Himalaya[2, 13-21], but little attention has been paid on wild edible plant resources from the Lohba range of the Kedarnath Forest Division (KFD). Documentation of such resources is required in view of gradual disappearance of this knowledge in new generations. Keeping this in view, the present study was conducted as an attempt from the region to explore and identify the wild edible plant resources and indigenous knowledge about their utilization.

Material and Methods

Study area: KFD is situated in the north-west part of the Himalaya and stretches between 29° 57' 33" to 30° 06' 05" N latitudes and 79° 11' 33" to 79° 20' 33" E longitudes with the altitude ranging from 1268m to 3067m asl (figure-1). The total geographical area of region is about 16387.40 ha which represents 26.76 % of the division. Western Ramganga is the main river of this area, which originates from the lesser Himalayan mountain range (*Dhudhatoli*) and enters into Corbett National Park after flowing 100 km with its tributaries. Besides providing perennial water source it provides habitat to many plant and animal communities. The economy of local people is basically based upon the surrounding forests. The inhabitants of the area largely depend on wild plants for food, fodder, fuel-wood, timber, medicine and various religious and cultural needs.

Vegetation composition: The mountainous tract of the whole region is varying in altitude which contributes variations in the climatic conditions to play an important role in the distribution of the vegetation in the area. The vegetation of the study area is characterized by sub-montane and montane zone types. The area is represented by Pine-mixed forest (1200-1500 m), Oak-mixed forest (1500-2500 m), Oak forest (1800-2000 m), Oak-Abies mixed forest (2700-3114 m) while, some patches are occupied by pine and scrub forest along with grassy slopes. *Benthamidia capitata*, *Berberis* spp., *Bergenia ciliata*,

Callicarpa macrophylla, *Celtis australis*, *Cinnamomum tamala*, *Cotinus coggygria*, *Cotoneaster microphyllus*, *Duchesnea indica*, *Elaeagnus parvifolia*, *Elsholtzia flava*, *Fagopyrum dibotrys*, *Ficus* spp., *Fragaria nubicola*, *Gonatanthus pumilus*, *Grewia oppositifolia*, *Helixanthera ligustrina*, *Mukia maderaspatana*, *Myrica esculenta*, *Oxalis corniculata*, *Phoenix humilis*, *Pinus roxburghii*, *Prinsepia utilis*, *Prunus cerasoides*, *Pyracantha crenulata*, *Pyrus pashia*, *Rhamnus triqueter*, *Rhododendron arboreum*, *Rosa macrophylla*, *Rubia manjith*, *Rubus* spp., *Rumex hastatus*, *R. nepalensis*, *Urtica dioica*, *Viburnum cotinifolium*, *V. grandiflorum*, *etc*., are common plant species in the study area.

Methodology: Extensive field surveys were made in the study area from January 2010 to December 2012 in different seasons *i.e.*, rainy, winter and summer, to collect the wild edible plants and their indigenous uses. The information on wild plants was collected by interviewing local inhabitants based on a structured questionnaire. The informants were men and women working in the fields, priests, medicine-men and birth attendant above the age of 50 years. To determine the authenticity of information collected during field work, repeated verification of data from different informants was done. Thus, only the specific and reliable information cross-checked with informants has been incorporated in the present study. Recorded plant species were identified with the help of Garhwal University Herbarium (GUH) and regional floras[22-25]. The availability status of plants such as abundant, common and uncommon was given based on their occurrence in the study area.

Results and Discussion

The study revealed 82 wild edible plant species belonging to 62 genera and 46 families in the Lohba range of the Kedarnath Forest Division, Garhwal Himalaya. The availability status and indigenous uses of the plant species have been presented in table-1. Trees were the primary source of food in terms of the number of species (28). The recorded species belong to different life forms (figure-2), *i.e*., trees (28 species), shrubs (23), herbs (24) and climbers (7).

The families, Rosaceae (14 species), Moraceae (8), Amaranthaceae (3), Caesalpiniaceae (3), Lamiaceae (3) and Polygonaceae (3) were represented by higher number of species, whereas *Ficus* (6 species), *Rubus* (4), *Amaranthus* (3), *Bauhinia* (3), *Berberis* (2), *Chenopodium* (2), *Mentha* (2), *Morus* (2), *Polygonatum* (2), *Rosa* (2), *Rumex* (2) and *Viburnum* (2) were the genera with more than one species being used (table-1). As per the plant parts, fruits of 46 species were used as food (figure-3), followed by leaves (17 species) and shoots/young twigs (11 species).

The present study indicates that the area harbors a high diversity of wild edible plants. Out of 82 plant species, 15 were abundant, 46 common and 21 uncommon to this area. Species like *Adhatoda zeylanica*, *Amaranthus spinosus*, *Angelica glauca*, *Bauhinia purpurea*, *B. racemosa*, *B. vahlii*, *Bombax ceiba*, *Camellia sinensis*, *Chenopodium foliosum*, *Cleome viscosa*, *Coriaria nepalensis*, *Ficus semicordata*, *Hippophae salicifolia*, *Murraya koenigii*, *Opuntia cochenillifera*, *Phyllanthus emblica*, *Polygonatum multiflorum*, *P. verticillatum*, *Rosa sericea*, *Taxus baccata* and *Ziziphus oxyphylla* were uncommon to this area and being threatened due to unplanned exploitation. The inhabitants revealed rich presence of many of these species in the area in the past, which has restricted now to certain patches. If immediate steps for their sustainable utilization and conservation are not taken, these species may reach to the status of threatened in the area.

During the survey, it was observed that the local people of the area are dependent on wild plant resources for food up to much extent. They frequently visit forests to collect necessary foods and food supplements. Some important wild edible plants used by local inhabitants in the area have been given in figure-4. The plant parts used were leaves, fruits, tubers, flowers and whole plants for food supplements. Trees made the highest proportion of the edible species followed by herbs, shrubs and climbers. The time and frequency of collecting various plants and plant parts varied from plant to plant depending upon their availability. Method of preparation and uses fall into categories like cooked and eaten as raw.

The discussions with inhabitants showed that the wild plant resources are used as common household foods and make a significant contribution to food security of the people of the area. Therefore, steps are needed to undertake extensive education about their importance and assess their nutritional value to serve as a direct or indirect source of food to the local inhabitants. This may bring to light one or other new food plants from wild for ever increasing population of our country[26]. Furthermore, the over-exploitation of plant species for fuel, fodder, timber, medicine and food (wild edibles) may lead to reduction of these species from the area.

Conclusion

Thus, the present study provides comprehensive information on diversity, availability status and indigenous uses of wild edible plant resources. Based on the results, it can be concluded that the area has high potential of wild edible plant species. Therefore, there is a need to develop adequate strategy and action plan for the conservation and management of wild edible plants, so that sustainable utilization of these species could be ensured.

Acknowledgements

The authors are thankful to the inhabitants of the Lohba range of the Kedarnath Forest Division (KFD) for providing the information about the indigenous uses of the plant resources.

Table-1
Diversity, availability status and indigenous uses of wild plant species in the Lohba range of Kedarnath Forest Division (KFD), Garhwal Himalaya

S. No.	Botanical Name	Local Name	Family	Life Form[1]	Elevation (m)	Availability Status[2]	Plant parts and methods of use
1	*Adhatoda zeylanica* Medikus	Basinga	Acanthaceae	S	1200 – 1400	+	Young shoots and leaves are cooked as vegetable
2	*Amaranthus caudatus* L.	Kedar chua	Amaranthaceae	H	1300 – 2200	++	Young twigs and leaves are cooked as vegetable
3	*Amaranthus spinosus* L.	Kau chua	Amaranthaceae	H	1300 – 2200	+	Leaves are used as vegetable
4	*Amaranthus tricolor* L.	Chua	Amaranthaceae	H	1300 - 2200	++	Leaf cooked as vegetable and seed flour is used to make *chapaties*
5	*Angelica glauca* Edgew.	Choru	Apiaceae	H	2900 - 3000	+	Dry seed and root is used as spice
6	*Bauhinia purpurea* L.	Gwiral	Caesalpiniaceae	T	1300 - 1400	+	Young flowering buds are used as vegetable
7	*Bauhinia racemosa* Lam.	Gwiral	Caesalpiniaceae	T	1300 - 1400	+	Young flowering buds are used as vegetable
8	*Bauhinia vahlii* Wight & Arn.	Malu	Caesalpiniaceae	Cl	1300 - 1400	+	Roasted seeds are eaten.
9	*Benthamidia capitata* (Wallich ex Roxb.) Hara	Bhamora	Cornaceae	T	1500 - 2200	++	Ripened fruit is eaten
10	*Berberis aristata* DC.	Kimor	Berberidaceae	S	1700 - 3000	+++	Ripened fruit are edible
11	*Berberis asiatica* Roxb. ex DC.	Kimor	Berberidaceae	S	1200 - 2500	++	Fruits are edible
12	*Bergenia ciliata* (Haworth) Sternberg	Silpari	Saxifragaceae	H	2200 - 2400	+++	Dried leaves is used with tea
13	*Bombax ceiba* L.	Semal	Bombacaceae	T	1200 - 1400	+	Flowering buds are cooked as vegetable
14	*Callicarpa macrophylla* Vahl	Daiya	Verbenaceae	S	1200 - 1500	++	Fruits are edible
15	*Camellia sinensis* (L.) Kuntze	Chaipatti	Theaceae	S	1200 - 2100	+	Young roasted twigs and leaves are used to prepare tea
16	*Cannabis sativa* L.	Bhang	Cannabinaceae	S	1300 - 2100	+++	Roasted seeds are used as condiments
17	*Celtis australis* L.	Kharik	Ulmaceae	T	1300 - 1500	++	Fruit are edible
18	*Chenopodium album* L.	Baithu	Chenopodiaceae	H	1200 - 2300	++	Leaves used as pot vegetable
19	*Chenopodium foliosum* (Moench) Ascherson	Baithu	Chenopodiaceae	H	1200 - 2300	+	Leaves used as pot vegetable
20	*Cinnamomum tamala* (Buch.-Ham.) Nees & Ebermaeir	Dalchini	Lauraceae	T	1300 - 1700	++	Used as flavoring agents in tea, pulse, vegetables, etc.
21	*Cleome viscosa* L.	Jakhiya	Cleomaceae	H	1200 - 1400	+	Seeds are used as condiments
22	*Coccinia grandis* (L.) Voigt	Kandaroi	Cucurbitaceae	Cl	1200 - 2000	++	Young shoots made into vegetable
23	*Coriaria nepalensis* Wallich	Makroli	Coriariaceae	S	1400 - 2000	+	Ripened fruits are edible
24	*Cotinus coggygria* Scopoli	Dashmil	Anacardiaceae	S	1300 - 2000	++	Fruits are edible
25	*Cotoneaster microphyllus* Wallich ex Lindley	Bani	Rosaceae	S	1300 - 2800	++	Mature fruits are edible

S. No.	Botanical Name	Local Name	Family	Life Form[1]	Elevation (m)	Availability Status[2]	Plant parts and methods of use
26	*Dendrocalamus strictus* (Roxb.) Nees	Bans	Poaceae	S	1200 - 1500	++	Young bud and rhizome is used as vegetable
27	*Dioscorea melanophyma* Prain & Burkill	Ban-geithi	Dioscoreaceae	Cl	1400 - 2000	++	Tuber is cooked as vegetable
28	*Dodecadenia grandiflora* Nees	Tailiya	Lauraceae	T	1600 - 2400	++	Ripened fruits are eaten
29	*Duchesnea indica* (Andrews) Focke	Kaphliya	Rosaceae	H	1400 - 2200	++	Ripened fruits are edible
30	*Echinops cornigerus* DC.	Kandara	Asteraceae	H	1200 - 2000	++	Root is used as *salad*
31	*Elaeagnus parvifolia* Wallich ex Royle	Giwain	Elaeagnaceae	S	1200 - 3000	++	Fruits are edible
32	*Elsholtzia flava* (Benth.) Benth.	—	Lamiaceae	s	1300 - 2600	+++	Mature seeds are used as condiments and spices
33	*Fagopyrum dibotrys* (D.Don) Hara	Kandya	Polygonaceae	H	1300 - 2300	+++	Young twigs and leaves cooked as vegetable
34	*Ficus auriculata* Lour.	Timla	Moraceae	T	1300 - 2000	++	Fruits are eaten raw and used as vegetables
35	*Ficus hederacea* Roxb.	Beduli	Moraceae	Cl	1300 - 2000	++	Fruits are edible
36	*Ficus neriifolia* Smith	Khilk	Moraceae	T	1300 - 2000	++	Fruits are edible
37	*Ficus palmata* Forsk.	Bedu	Moraceae	T	1300 - 2000	++	Fruits are edible
38	*Ficus semicordata* Buch.-Ham. & J.E. Smith	Khaina	Moraceae	T	1300 - 1500	+	Fruits are eaten raw and as vegetables
39	*Ficus subincisa* Buch.-Ham. ex J.E. Smith	Chhachari	Moraceae	T	1200 - 1600	++	Fruits are edible
40	*Fragaria nubicola* Lindley ex Lacaita	Gan-Kaphal	Rosaceae	H	1200 - 2500	++	Ripened fruits are edible
41	*Gonatanthus pumilus* (D.Don) Engler & Krause	Sin-papar	Araceae	H	1600 - 2200	++	Tuber and young leaves cooked as vegetable
42	*Grewia oppositifolia* Buch.-Ham. ex D.Don	Bhimal	Tiliaceae	T	1200 - 2000	++	Mature fruits are edible
43	*Helixanthera ligustrina* (Wallich) Danser	Banderi	Loranthaceae	S	1200 - 2800	++	Ripened fruits are edible
44	*Hippophae salicifolia* D.Don	—	Elaeagnaceae	T	2000 - 2400	+	Fruits are edible
45	*Juglans regia* L.	Akhor	Juglandaceae	T	1300 - 2300	++	Fruits are edible
46	*Mentha arvensis* L.	Paudina	Lamiaceae	H	1200 - 2300	++	Young twigs and leaves are made into sauce and used as flavoring agents
47	*Mentha piperita* L.	Paudina	Lamiaceae	H	1200 - 2300	++	Young twigs are taken as flavoring agent
48	*Morus alba* L.	Keemu	Moraceae	T	1200 - 2300	++	Fruits are edible
49	*Morus serrata* Roxb.	Keemu	Moraceae	T	1300 - 2200	++	Fruits are edible
50	*Mukia maderaspatana* (L.) M. Roemer	Guliya-Kakri	Cucurbitaceae	Cl	1300 - 2100	++	Fruits are edible

S. No.	Botanical Name	Local Name	Family	Life Form[1]	Elevation (m)	Availability Status[2]	Plant parts and methods of use
51	*Murraya koenigii* (L.) Sprengel	Karipatta	Rutaceae	S	1200 - 1400	+	Leaves are used as flavoring agents and fruit are edible
52	*Myrica esculenta* Buch.- Ham. ex D.Don	Kaphal	Myricaceae	T	1300 - 2500	+++	Fruits are edible
53	*Nasturtium officinale* R. Br.	—	Brassicaceae	H	1200 - 2500	++	Young plants cooked as vegetable
54	*Opuntia cochenillifera* (L.) Miller	Nagphani	Cactaceae	S	1200 - 1400	+	Ripened fruits are edible
55	*Oxalis corniculata* L.	Bhilmori	Oxalidaceae	H	1300 - 2200	+++	Young twigs and leaves are used as vegetable and salad
56	*Phoenix humilis* Royle	Khajur	Arecaceae	T	1200 - 1400	++	Ripened fruits are edible
57	*Phyllanthus emblica* L.	Aola	Euphorbiaceae	T	1200 - 1400	+	Ripened fruits are edible and made into sauce, pickle, juice, etc.
58	*Pinus roxburghii* Sarjent	Kulain	Pinaceae	T	1300 - 2500	+++	Mature seed are edible
59	*Polygonatum multiflorum* (L.) Allioni	—	Liliaceae	H	1200 - 1400	+	Roots are eaten raw
60	*Polygonatum verticillatum* (L.) Allioni	—	Liliaceae	H	1400 - 2300	+	Roots are eaten raw
61	*Potentilla fulgens* Wallich ex Hook.	Bajrdanti	Rosaceae	H	2300 - 3000	++	Ripened fruits are edible
62	*Prinsepia utilis* Royle	Bhainkal	Rosaceae	S	1300 - 3000	+++	Seed oil is edible
63	*Prunus cerasoides* D.Don	Payain	Rosaceae	T	1200 - 2200	++	Fruits are edible
64	*Pyracantha crenulata* (D.Don) M. Roemer	Ghingaru	Rosaceae	S	1400 - 2200	+++	Fruits are edible
65	*Pyrus pashia* Buch.-Ham. ex D.Don	Melu	Rosaceae	T	1200 - 2900	+++	Fruits are edible
66	*Rhamnus triqueter* (Wallich) Lawson	—	Rhamnaceae	T	1500 - 2200	++	Ripened fruits are edible
67	*Rhododendron arboreum* Smith	Burans	Ericaceae	T	1200 - 3000	+++	Flowers are used to prepare juice, sauce, jam, jellies and refreshing drinks
68	*Rosa macrophylla* Lindley	Dand-kunj	Rosaceae	S	1400 - 2200	++	Fruits are edible
69	*Rosa sericea* Lindley	Dhurkunja	Rosaceae	S	2700 - 3000	+	Fruits are edible
70	*Rubia manjith* Roxb. ex Fleming	Majeithi	Rubiaceae	Cl	1300 - 3000	+++	Fruits are edible
71	*Rubus ellipticus* Smith	Hinsar	Rosaceae	S	1200 - 2000	++	Fruits are edible
72	*Rubus foliolosus* D.Don	Hisoi	Rosaceae	S	1200 - 2000	++	Fruits are edible
73	*Rubus niveus* Thunb.	Kali Hinsar	Rosaceae	S	1200 - 2200	++	Fruits are edible
74	*Rubus paniculatus* Smith	Hisar	Rosaceae	Cl	1400 - 2300	++	Fruits are edible
75	*Rumex hastatus* D.Don	Almor	Polygonaceae	H	1300 - 2300	+++	Leaves are used as *salad* and condiments

S. No.	Botanical Name	Local Name	Family	Life Form[1]	Elevation (m)	Availability Status[2]	Plant parts and methods of use
76	*Rumex nepalensis* Sprengel	Khoya	Polygonaceae	H	1300 - 3000	++	Young twigs and leaves cooked as vegetable
77	*Solanum nigrum* L.	Makoi	Solanacae	H	1200 - 2300	++	Ripened fruits are edible
78	*Taxus baccata* L.	Thuner	Taxaceae	T	2500 - 3000	+	Bark is used as substitute of tea
79	*Urtica dioica* L.	Kandali	Urticaceae	H	1200 - 3000	+++	Young twigs and leaves are cooked as vegetable
80	*Viburnum cotinifolium* D. Don	Ghenu, Guya	Caprifoliaceae	T	1500 - 3000	++	Fruit are edible
81	*Viburnum grandiflorum* Wallich ex DC.	Ghenu	Caprifoliaceae	T	2800 - 3000	++	Fruit are edible
82	*Ziziphus oxyphylla* Edgew.	Ber	Rhamnaceae	S	1200 - 1300	+	Fruit are edible

Abbreviations used: H = herb, S = shrub, T = tree, Cl = climber, +++ = abundant, ++ = common, + = uncommon

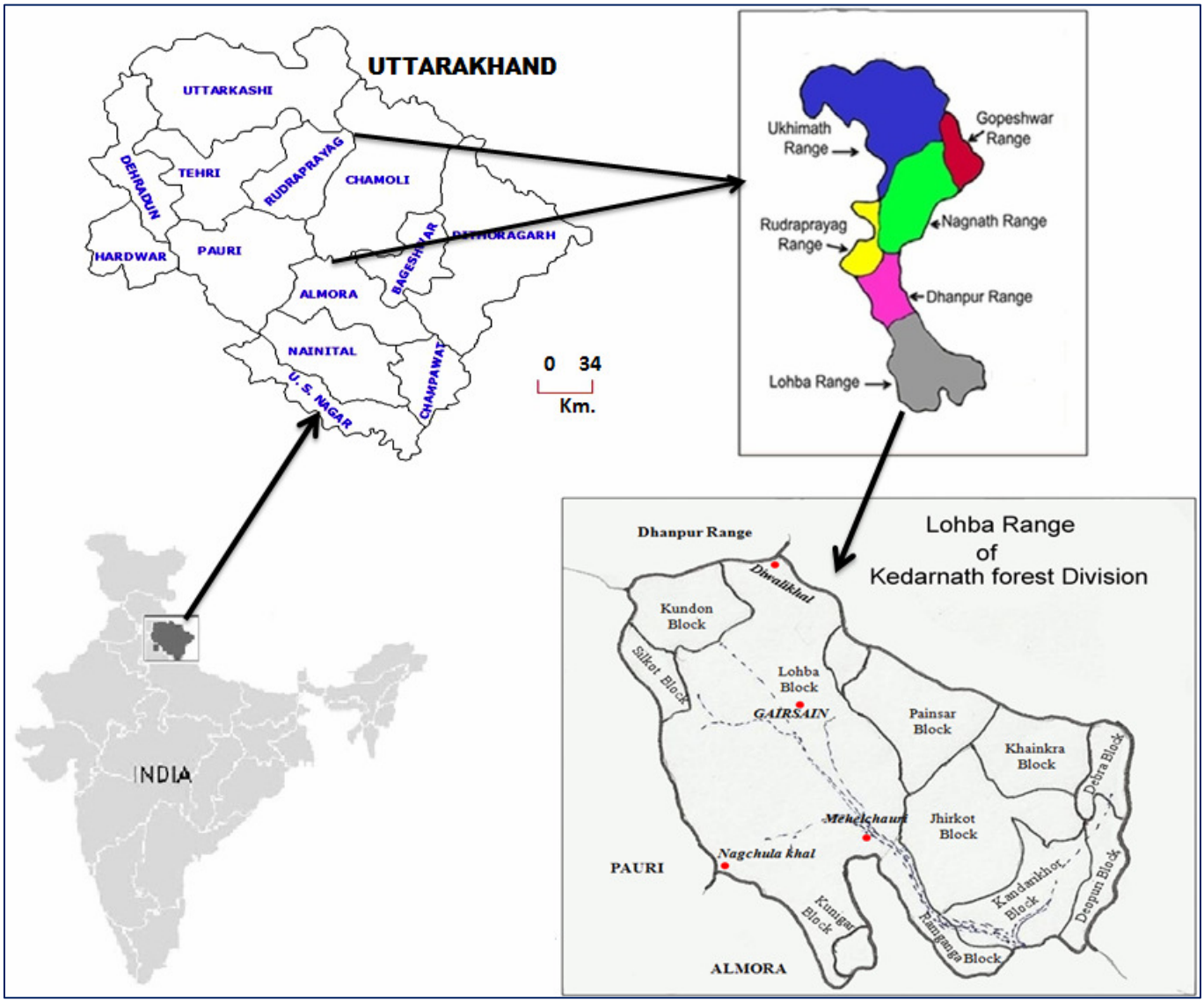

Figure-1
Map showing the study area

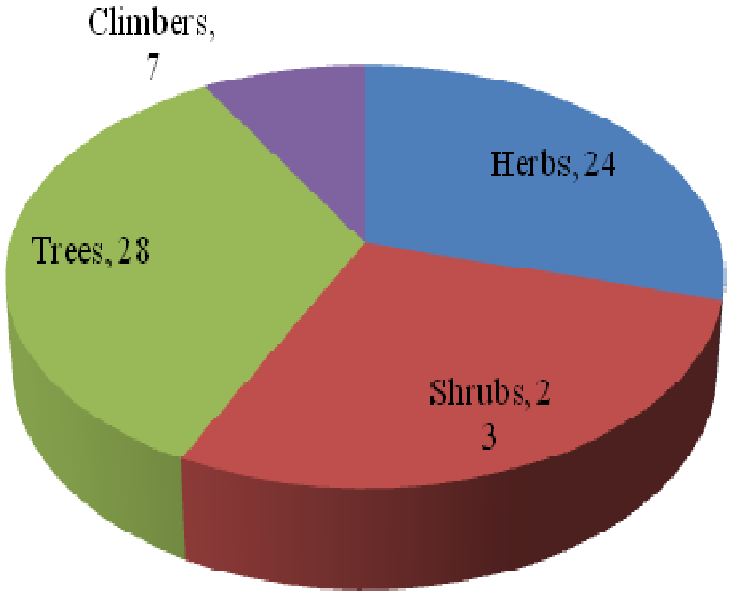

Figure-2
Number of species in different life forms

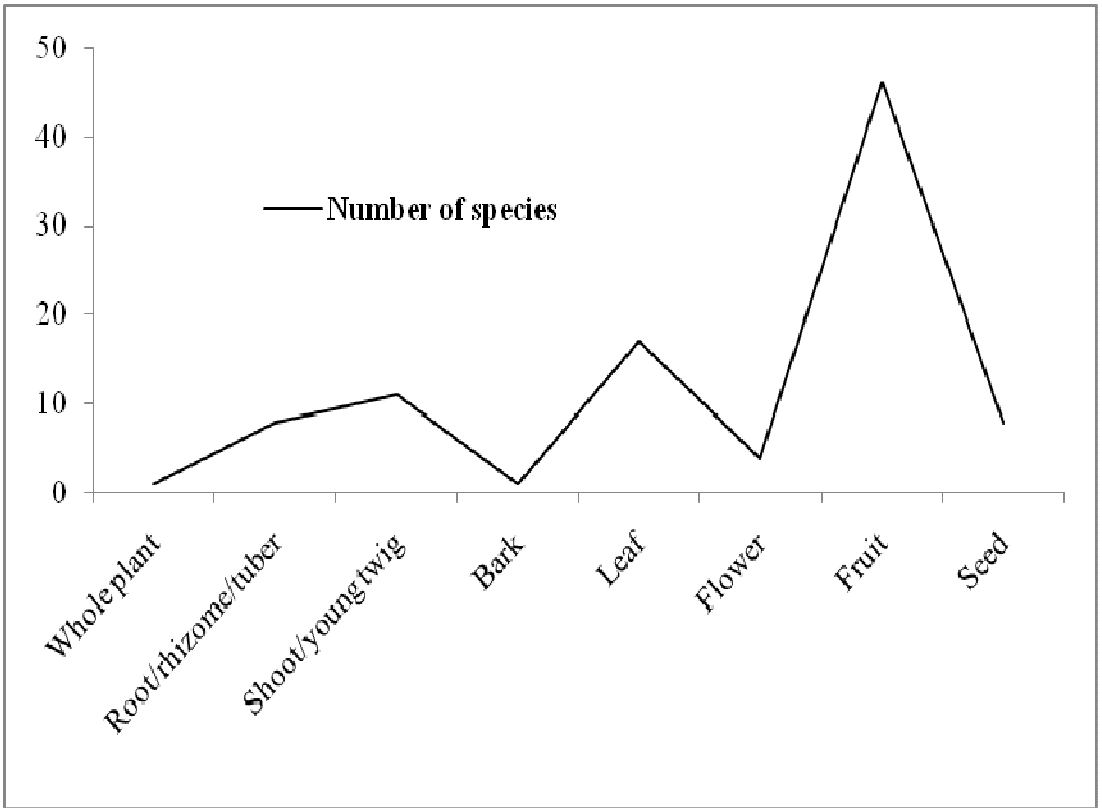

Figure-3
Plant parts used as wild edibles

Figure-4
Some important wild edible plants used by local inhabitants in the study area.
(a). ***Benthamidia capitata*** **(b).** ***Bergenia ciliata*** **(c).** ***Dodecadenia grandiflora*** **(d).** ***Elaeagnus parvifolia*** **(e).** ***Myrica esculenta*** **(f).** ***Pyracantha crenulata*** **(g).** ***Rhododendron arboreum*** **(h).** ***Rumex nepalensis*** **(i).** ***Taxus baccata***

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