



Contribution of wild edible plants to the food security, dietary diversity and livelihood of tribal people of Keonjhar district, Odisha

Deeptimayee Samal^{1*}, N. C. Rout² and A. K. Biswal¹

¹P.G.Department of Botany, North Orissa University, Takatpur, Baripada 757 003, Odisha

²Environmental Sustainability Department, CSIR-IMMT, Bhubaneswar-751013, Odisha

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ABSTRACT

Edible wild plants (EWPs) refer to both indigenous and naturalized exotic plants occurring in the natural environment. These plants form an important source of supplementary food in the times of food stress for native communities. They provide sustainable livelihood, food security and also play an important role in nutritional requirement of the poor tribal people of Odisha. Keonjhar district of Odisha, dominated by tribal population, occupies an important place in the mineral resource map of Eastern India and excessive mining activities have been responsible for considerable depletion of biological resources, which affect the livelihood of the poor local people. The field survey conducted during the year 2016-18 in Keonjhar district of Odisha recorded the use value of 160 species of wild edible plants belonging to 119 genera and 63 families. This includes 80 species yielding edible fruits, 75 species used as leafy vegetables, 22 species bearing edible flowers, 8 species producing edible tubers and 12 species with edible seeds. Some plants are found to have multiple use values. The study will help in generating information on diversity, distribution, utilitarian values, socio-economic potential and conservation implications of wild edible plants.

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1. Introduction

Forest plays an important role in maintaining environmental stability and to meet the essential requirements of almost all the living organisms on earth. The wild plants provide food, fodder, medicine, construction materials and many other items since time immemorial. Majority of the tribal communities of India live close to or within forests and depend on wild products and biomass for their food and energy needs (Mohapatra & Sahoo, 2010; Mahapatra & Mitchell, 1997). Even today, wild plants constitute an important part of the staple food of many tribal communities. Besides, wild edible plants play a significant role to meet the supplement or substitute food in times of scarcity like drought, flood and famine. According to an estimate, 80% of forest dwellers in Bihar, Odisha, Madhya Pradesh, West Bengal and Himachal Pradesh depend on forest for 25 to 50 % of their annual food requirements (Tiwari, 1994). Knowledge about the wild edible plants is being transmitted from the tribal medicine-man/

elderly persons living in the area for longer time to young persons of their community. Indigenous rural and tribal people living in the vicinity of the area collect, process and use a good number of plants for their own consumption and to earn their livelihood through sale of these items in local markets. The diversity in wild plant species offers variety of family diet and contributes to household food security, but the lack of awareness, limited nutritional data and the poor perception that most wild plants are of poor nutritional value have led many wild food plants to be neglected by local people and researchers (Padulosi *et al.*, 2002; Mishra *et al.*, 2008). The nutritional and medicinal values of these species have never been assessed. Considering their importance and non-availability of published account on the subject, an effort has been made to compile all available information on wild edible plants of Keonjhar district, Odisha, India. Keonjhar district occupies a distinct place in the tribal map of Odisha as well as India. According to 'Food Security Atlas of Rural Odisha' (WFP, 2008), the status of Keonjhar

* Corresponding author; Email: deeptimayee1966@gmail.com

district is under 'severely unsecured' category though the district is bestowed with sound forest cover with abundance of wild edible plants. In view of this, the authors conducted a survey to document the little and less known uses of plants consumed or marketed by the tribals. The use values of non-domesticated crops known in local communities require proper study and documentation in order to validate, quantify and disseminate useful information (Edison *et al.*, 2006). A harmonious blend to indigenous knowledge with modern science is essential to promote sustained utilization of these wild and potential source of nutrition (Horo & Topno, 2015).

2. Materials and methods

2.1 Study area

Keonjhar district has an area of 8240 km², and lies between 21° 1' N to 22° 10' N latitude and 85° 11' E to 86°

22' E longitude (Fig 1). It is one of the predominant tribal districts of Odisha. It is surrounded by Singhbhum district of Jharkhand in the North, Jajpur in the South, Dhenkanal and Sundargarh in the West and Mayurbhanj and Bhadrak in the East. It lies at an altitude of 480 meter. To the West is a range of lofty hills which contains some of the highest peaks of Odisha namely Gandhamardan (3477ft), Mankadnacha (3639ft), Gonasika (3219ft) and Thakurani hills (3003ft). About half of the area of this district spreading over 4043 km² is covered with forests of northern tropical moist deciduous type. The river Baitarani comes out of Gonasika hills and flows to the north touching the border of Singhbhum district of Jharkhand. The soil is mostly red throughout the district and in the south there is a small patch of black cotton soil. The important minerals available in huge quantity in the district are iron-ore, manganese and chromites.

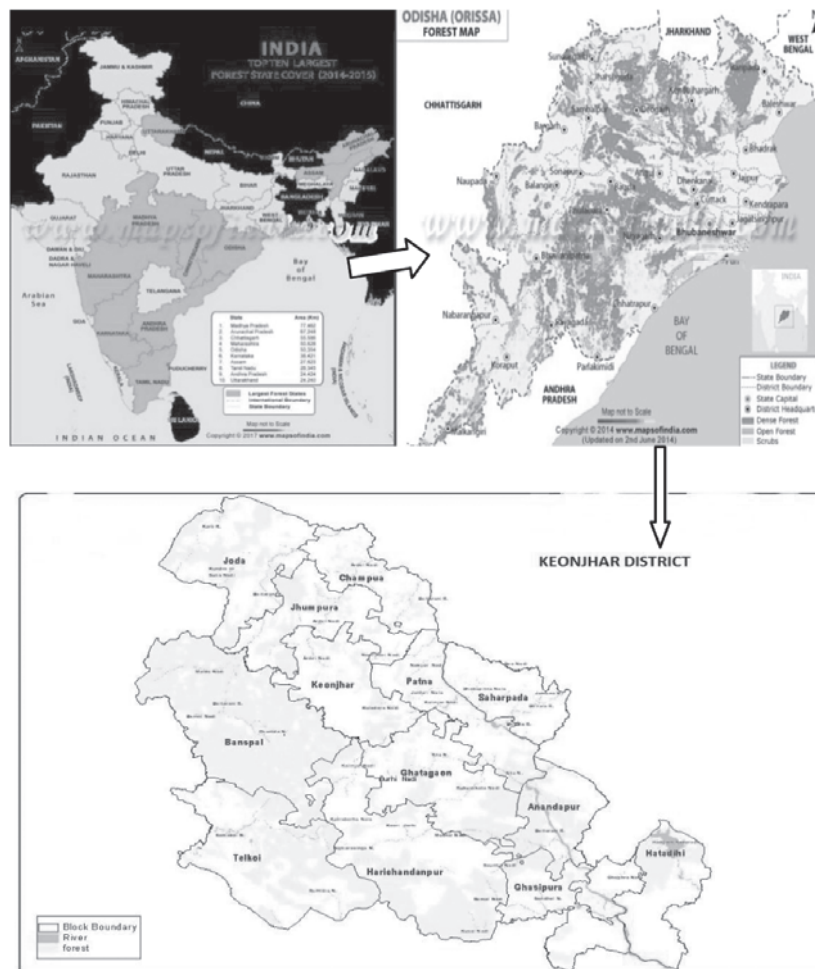


Fig.1. Map showing the location of Keonjhar district, Odisha (Study site)

2.2. Climate, soil and population

The climate of the district is characterized by an oppressively hot summer with high humidity; May being the hottest month. The lowest temperature in December is as low as 11.7°C. The average annual rainfall is 1,534.5 mm. The varied soil, topography and climate are conducive for rich plant diversity.

The scheduled tribe population of Keonjhar district is 8,18,878 as per 2011 census belonging to 46 tribes. Out of these the principal tribes are Bathudi, Bhuyan, Bhumji, Gond, Ho, Juang, Kharwar, Kisan, Kolha, Kora, Munda, Oraon, Santal, Saora, Sabar and Sounti. The concentration of scheduled tribes is the highest in Keonjhar Sub-Division and lowest in the Anandpur Sub-Division.

2.3 Data collection

Several field trips were undertaken in different tribal dominated areas of Keonjhar district, Odisha during 2016-2018 to collect information about wild edible plants in different seasons. Some elderly persons of the tribe were the key informants to share their inherited knowledge. They shared knowledge on the flowering and fruiting time, vernacular names, uses of the edible parts and their mode of consumption. Tribal inhabitants helped in the collection of plant samples. The forest range officials not only supported the survey but also assisted in the forest walk as authors' guide. The rural markets have been surveyed to access the sale and marketing of the species. Data collection was done through interviews and discussions with the tribal and rural sellers in the rural market.

The plant specimens were collected from the field and the voucher specimens were processed and preserved using standard herbarium techniques. Photographs of the plants or plant parts were also taken in the field for record. The species were identified in consultation with 'The Botany of Bihar and Orissa' (Haines, 1921-1925) and 'Flora of Orissa' (Saxena and Brahamam, 1994-1996). The specimens have been deposited in the Herbarium of the P. G. Dept of Botany, North Orissa University, Baripada, Odisha. The plants are enumerated alphabetically with their botanical names, families, local names, plant parts used and mode of consumption.

3. Results and discussion

During the present survey, 160 wild edible plants have been recorded which are consumed by the tribes and local inhabitants of Keonjhar district as food and/or medicine. Out of the documented edible wild taxa, 75 species are reported to be used as leafy vegetables, 80 species as fruits, 22 species as edible flowers, 12 species as seeds and 8 species as tubers (Fig 2). Some of the noted species having multiple edible parts are *Amorphophallus paeoniifolius*, *Artocarpus heterophyllus*, *Azadirachta indica*, *Brassica campestris*, *Buchanania lanzan*, *Cucurbita maxima*, *Madhuca indica*, *Mangifera indica*, *Moringa oleifera*, *Semecarpus anacardium*, *Shorea robusta*, *Tamarindus indica* etc. These species are listed in Table 1 with botanical description and the methods of consumption.

Table 1

List of wild edible leafy vegetables with their vernacular names, parts used and method of consumption

Sl.	Botanical name	Family name	Vernacular/ Common name	Parts used	Habit	Method of consumption
1	<i>Achyranthes aspera</i> L.	Amaranthaceae	Chirchithi	Leaves	Herb	Young leaves & shoots together with other greens are cooked & eaten.
2	<i>Alternanthera sessilis</i> (L.) R.Br.ex DC	Amaranthaceae	Madaranga	Leaves	Herb	Leafy shoots are cooked with spices.
3	<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	Bela	Fruit	Shrub	Eaten raw, toasted. Ripe fruits are eaten as drinks, snacks, sweet taste.
4	<i>Alangium salvifolium</i> (L.f.)Wang.	Alangiaceae	Ankula	Fruits	Tree	Fleshy ripe fruits are cherished by children & tribes though they emit fishy smell. It has a lot of medicinal value.
5	<i>Allmania nodiflora</i> (L.) R.Br. ex Wight	Amaranthaceae	Marakata	Leaves	Herb	Leaves are used as common greens.

6	<i>Allophylus serratus</i> (Roxb.) Kurz	Sapindaceae	Khandakoli	Fruits	Shrub	Ripe fruits are relished by rural children
7	<i>Alocasia fornicata</i> (Roxb.) Schott	Araceae	Saree ala	Leaves	Herb	Tender leaves & petioles are cooked with spices & tamarind pulp to make curry.
8	<i>Alocasia macrorrhiza</i> (L.) G.Don	Araceae	Manasaree ala	Leaves	Herb	Tender leaves & petioles are cooked with spices & tamarind pulp to make curry.
9	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC	Amaranthaceae	Gurundi saga, Mudurunga	Leaves	Herb	Leaves are fried/roasted and taken. Very commonly used.
10	<i>Amaranthus spinosus</i> L.	Amaranthaceae	Kanta maris, Kanta khara	Leaves	Herb	Leaves & shoots are cooked with salt & chilli
11	<i>Amaranthus tricolor</i> L.	Amaranthaceae	Lal bhaji	Leaves	Herb	Whole plant is cooked with spices & eaten as vegetables.
12	<i>Amaranthus viridis</i> L.	Amaranthaceae	Bhaji saga	Leaves	Herb	Leaves & shoots are chopped & cooked with oil, salt & garlic.
13	<i>Amorphophallus campanulatus</i> Bl.	Araceae	Ola	Leaves Tuber	Herb	Young tender leaves are cooked with tamarind, tomato & spices & eaten with rice.
14	<i>Amorphophallus paeonifolius</i> (Dennst.) Nicolson	Araceae	Olua	Tuber	Herb	Curry made with boiled tuber with tamarind pulp & fried with oil and garlic.
15	<i>Annona reticulata</i> L.	Annonaceae	Repdei Daru/ Chini balar	Fruits	Shrub	Ripe fruits are sweet & tasty with sweet aroma.
16	<i>Annona squamosa</i> L.	Annonaceae	Repdei Daru/ Chini balar	Fruits	Shrub	Ripe fruits are sweet & tasty with sweet aroma.
17	<i>Antidesma acidum</i> Retz.	Euphorbiaceae	Nununia	Leaves	Shrub	Leaves are cooked & eaten.
18	<i>Ardisia solanacea</i> Roxb.	Myrsinaceae	Laidak	Leaves, flowers	Shrub	Leaves are boiled with dal & cooked to eat with rice. Flowers are also edible.
19	<i>Artocarpus heterophyllus</i> L.	Moraceae	Panasa	Fruits	Tree	Ripened fruit is eaten as such, used in ice-cream, candies, desserts, homemade cakes. Unripe fruits are cooked as curry, fried as snacks.
20	<i>Artocarpus lacucha</i> Roxb. ex Buch.- Ham.	Moraceae	Dheucha	Fruits	Tree	Ripe fruits are edible & eaten as snacks. Seeds are toasted & eaten.
21	<i>Averrhoa carambola</i> L.	Averrhoaceae	Karmanga	Fruits	Tree	Fruit is eaten fresh, cooked or pickled.
22	<i>Azadirachta indica</i> A. Juss	Meliaceae	Neem	Leaves Flowers Fruits	Tree	Young leaves are cooked or fried with potato, brinjal & tomato. Sometimes leaves made into curries. Rice cake is made by mixing the leaves, gram & rice. Children eat the fruits while wandering.
23	<i>Bacopa monnieri</i> (L.) Pennell	Scrophulariaceae	Panikundi	Leaves	Herb	Used as greens

24	<i>Bambusa bambos</i> L.	Poaceae	Kantabaunsa	Leaves	Herb	Young shoots called 'Karadi' are cut into small pieces, cooked with spices & used as delicacy. These are dried & preserved for future.
25	<i>Basella alba</i> L.	Basellaceae	Poi saga	Leaves, stem, flowers	Herb	Stems, floral buds & leaves are used in curry making.
26	<i>Bauhinia purpurea</i> L.	Caesalpinaceae	Kuliari	Leaves, flowers	Shrub	Young shoots along with tender leaves are fried as greens & also cooked as curry. Flowers are also edible.
27	<i>Bauhinia retusa</i> Roxb.	Caesalpinaceae	Kanchana	Leaves, flowers	Shrub	Tender leaves & flowers are cooked & fried.
28	<i>Bauhinia vahlii</i> Wight & Arn.	Caesalpinaceae	Sialilata	Leaves, seed	Climber	Seed kernel roasted.
29	<i>Bauhinia variegata</i> L.	Caesalpinaceae	Kanchana	Leaves, flowers	Shrub	Tender leaves are fried. Edible flowers are deep fried to make snacks.
30	<i>Begonia picta</i> Sm.	Begoniaceae	Lundi ara	Leaves	Shrub	Leaves are boiled, then cooked as curry.
31	<i>Boerhavia chinensis</i> (L.) Asch. & Schweinf.	Nyctaginaceae	Puruni, khapra saga	Leaves	Herb	Leaves with tender shoots are fried with oil, salt and mustard.
32	<i>Boerhavia diffusa</i> L.	Nyctaginaceae	Puruni khapra saga	Leaves	Herb	Leaves with tender shoots are fried with oil, salt & mustard.
33	<i>Borassus flabellifer</i> L.	Arecaceae	Tala	Fruits	Tree	Ripe fruits are juicy and tasty. Pulp is used in making cakes, jaggery, sweets etc.
34	<i>Brassica campestris</i> L.	Brassicaceae	Sorisa	Leaves, flowers	Herb	Inflorescence along with tender leaves are cut into small pieces and fried with onion or garlic.
35	<i>Brassica napus</i> L. var <i>glauca</i> (Roxb.) Schulz	Brassicaceae	Sorisa saga	Leaves, flowers	Herb	Leaves and flowers are cooked & consumed by all tribes.
36	<i>Bridelia retusa</i> (L.) Spreng.	Euphorbiaceae	Kasi phala	Fruits	Tree	Fruits are eaten by forest dwellers.
37	<i>Buchanania lanzan</i> Spreng.	Anacardiaceae	Chara	Fruits, seeds	Tree	Ripe fruits are palatable and relished by all. Seed kernels are used in making sweets, ladoos and desserts.
38	<i>Canthium dicoccum</i> (Gaertn.) Teijsm & Binnend.	Rubiaceae	Kukurhada/ Karuna	Fruits	Shrub	Both ripe & raw foods are eaten.
39	<i>Capparis zeylanica</i> L.	Capparaceae	Asadhua	Fruits	Shrub	Raw fruits are cooked and ripe fruits are edible as such.
40	<i>Carissa spinarum</i> L.	Apocyanaceae	Dudkoli	Fruits	Shrub	Ripened fruits are edible
41	<i>Casearia graveolens</i> Dalz.	Flacourtiaceae	Benchi	Fruits	Shrub	Ripened fruits are edible.
42	<i>Cassia occidentalis</i> L.	Caesalpinaceae	Chako ara	Leaves	Herb	Tender leaves are cooked.
43	<i>Cassia tora</i> L.	Caesalpinaceae	Chako ara	Leaves	Herb	Tender leaves are cooked.

44	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Rubiaceae	Salag	Fruits	Shrub	Raw fruits are boiled & sieved to remove tannin content, then cooked to make curry & eaten with rice. Ripe fruits are edible as such.
45	<i>Celastrus paniculata</i> Willd.	Celastraceae	Kujuri saga	Flowers	Climber	Flowers cooked as vegetable.
46	<i>Celosia argentea</i> L.	Amaranthaceae	Laenga, Khukari Sirgiti ara	Leaves	Herb	Leaves & young shoots are collected fried/roasted with chilly & onion
47	<i>Centella asiatica</i> (L.) Urb.	Apiaceae (Umbelliferae)	Chauka ara Thalkudi (Odia)	Leaves	Herb	Leaves are fried as greens. Sometimes leaves are made into chutney.
48	<i>Chenopodium album</i> L.	Chenopodiaceae	Bathua ara/ Betua ara	Leaves	Herb	Tender leafy shoots are cooked to make a delicious bhaji eaten by all.
49	<i>Cicer arietinum</i> L.	Fabaceae	Buta saga	Leaves, seeds	Herb	Young leaves & shoots are collected, roasted & eaten. Seeds are eaten commonly.
50	<i>Citrus medica</i> L.	Rutaceae	Jambira/ bada nimbu	Fruits	Shrub	Fruits are squeezed & eaten with garlic & chilly and also used in making sarbat, pickles, jellies, etc.
51	<i>Clausena excavata</i> Burm. f.	Rutaceae	Agnijala/ Agnijalini	Fruits	Shrub	Ripe fruits are sweet & eaten by tribes.
52	<i>Cleome viscosa</i> L.	Cleomaceae (Capparaceae)	Hurhuria saga	Leaves	Herb	Young plants are consumed.
53	<i>Cleome monophylla</i> L.	Cleomaceae	Hurhuria saga	Leaves	Herb	Young plants are consumed.
54	<i>Coccinia grandis</i> (L.) Voigt.	Cucurbitaceae	Banakunduri/ Kainchikakudi	Leaves Fruits	Herb	Young leaves are cooked as vegetables. Fruits are used as vegetables & eaten raw.
55	<i>Colocasia esculenta</i> (L.) Schott	Araceae	Saru ara, Pechki	Leaves	Herb	Young shoots and tender leaves are chopped and cooked with spices and tamarind pulp.
56	<i>Commelina benghalensis</i> L.	Commelinaceae	Kansiri, Kena saga	Leaves	Herb	Leafy young shoots are fried with other greens.
57	<i>Corchorus capsularis</i> L.	Tiliaceae	Nalita	Leaves	Herb	Tender leaves are boiled sieved then fried with mustard seeds & mustard oil.
58	<i>Cordia obliqua</i> Willd.	Ehretiaceae	Bahala saga	Leaves Floral buds	Shrub	Leaves along with floral buds are cooked with tomatoes & spices.
59	<i>Cucurbita maxima</i> Duchesne	Cucurbitaceae	Kakharu saga	Leaves, stem, fruits, flowers, seeds	Climber	Leaves & young stems are fried or cooked as curry along with potato, tomato, pumpkin & mustard paste.
60	<i>Dendrocalamus strictus</i> Roxb.	Poaceae	Baunsa	Leaves	Herb	Young shoots are cooked into delicious dish. These are dried & stored for future.
61	<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	Kari Gandhari	Leaves	Herb	Young leafy shoots are boiled & consumed.
62	<i>Dillenia aurea</i> Sm.	Dilleniaceae	Rai/ Karmata	Fruits, flower	Tree	Fruits are cooked when raw or ripe. Flowers are made into chutney.

63	<i>Dillenia indica</i> L.	Dilleniaceae	Ou	Fruits	Tree	Made into jams, jellies, pickles, chutneys & cooked into curry.
64	<i>Dillenia pentagyna</i> Roxb.	Dilleniaceae	Rai	Fruits	Tree	Buds & fruits are eaten cooked or raw.
65	<i>Dioscorea alata</i> L.	Dioscoreaceae	Khamba alu	Tubers	Climber	Boiled tubers are fried, cooked with vegetables or made into chips for snacks.
66	<i>Dioscorea belophylla</i> Voigt ex Haines	Dioscoreaceae	Bhatkanda/ Mandai alu	Tubers	Climber	Consumed as vegetables.
67	<i>Dioscorea bulbifera</i> L.	Dioscoreaceae	Pita alu	Tubers	Climber	Sliced & washed repeatedly to remove bitterness, then they are boiled/fried & eaten.
68	<i>Dioscorea glabra</i> Roxb.	Dioscoreaceae	Kanta alu/ Pindalu	Tubers	Climber	Cooked as vegetables.
69	<i>Dioscorea hispida</i> Dennst.	Dioscoreaceae	Kanda	Tubers	Climber	Cooked as an ingredient of curry.
70	<i>Dioscorea wallichii</i> Hook. f.	Dioscoreaceae	Pitalu	Tubers	Climber	Boiled & cooked with vegetables, also used in dry form for use in food shortage.
71	<i>Diospyros malabarica</i> (Desr.) Kostel.	Ebenaceae	Mankada kendu	Fruits	Climbing herb	Ripe fruits are sweet, smelly & edible.
72	<i>Diospyros melanoxylon</i> Roxb.	Ebenaceae	Kendu/ Tiril	Fruits	Climbing herb	Ripe fruits are sweet & pulpy.
73	<i>Diospyros sylvatica</i> Roxb.	Ebenaceae	Kalicha/ Sara tiril	Fruits	Tree	Ripe fruits are edible.
74	<i>Emilia sonchifolia</i> (L.) DC.	Asteraceae	Uli aa (Kl)	Leaves	Herb	Leaves can be used raw or cooked.
75	<i>Enhydra fluctuans</i> Lour.	Asteraceae	Muchri ara (Mu)	Leaves	Herb	Whole leafy plants are boiled & cooked with oil & spices.
76	<i>Erycibe paniculata</i> Roxb.	Convulvulaceae	Joraikuli	Fruits	Shrub	Ripe berries are pulpy, sweet & edible.
77	<i>Eryngium foetidum</i> L.	Apiaceae	Chutni/Jangli dhaniamu	Leaves	Herb	Leaf paste is made into chutney with chilly and garlic/onion. Plant is used as condiment.
78	<i>Euphorbia granulata</i> Forssk.	Euphorbiaceae	Kantha arak (San)	Leaves	Herb	Young leafy shoots are boiled & consumed.
79	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Dudhia, Marang dudhai	Leaves	Herb	Tender leaves are cooked & eaten.
80	<i>Ficus auriculata</i> Lour.	Moraceae	Dumri	Fruits	Tree	Ripe figs are eaten raw and immature figs are cooked as vegetables.
81	<i>Ficus hispida</i> L. f.	Moraceae	Dimiri	Fruits	Tree	Raw as vegetable and ripe are eaten as such.
82	<i>Ficus racemosa</i> Linn.	Moraceae	Dumri	Fruits	Tree	Raw fruits are cooked with spices and eaten as curry, tasty like mushroom. Fully ripe fruits have pleasant odour and are eaten as such.

83	<i>Ficus religiosa</i> L.	Moraceae	Aswastha	Leaves	Tree	Tender reddish leaves are boiled, sieved and then fried with oil.
84	<i>Ficus semicordata</i> Buch.-Ham. ex J. E. Sm.	Moraceae	Pudhei	Fruits	Tree	Raw fruits are cooked into curry. Ripe figs are eaten raw and made into jams.
85	<i>Flacourtia indica</i> (Burm. f.) Merr.	Flacourtiaceae	Bhaincha	Fruits	Shrub	Fruits are edible, have pleasant flavor and sweet taste. Sufficiently acidic, palatable, used for jam and jelly.
86	<i>Garcinia xanthochymus</i> Hook.f.ex.	Clusiaceae	Amba	Fruits	Tree	Raw and ripe fruits are eaten as mangoes. They are cooked and pickled.
87	<i>Gardenia gummifera</i> Linn. f.	Rubiaceae	Bhurudu	Fruits	Tree	Ripe fruits with pinkish pulp, tasty and eaten as snacks.
88	<i>Glinus oppositifolius</i> A. DC.	Aizoaceae	Pita saga	Leaves	Herb	Whole plant is eaten cooked with potato & brinjal.
89	<i>Glycosmis pentaphylla</i> (Retz.) DC.	Rutaceae	Dubduba	Fruit	Shrub	Ripe berries are sweet and tasty, eaten by children.
90	<i>Gmelina arborea</i> Roxb.	Verbenaceae	Gambhari	Fruit	Tree	Sweet ripe fruits are sometimes eaten by children.
91	<i>Grewia asiatica</i> L.	Tiliaceae	Pharsa koli	Fruit	Tree	Ripe fruits are eaten.
92	<i>Grewia hirsute</i> Vahl.	Tiliaceae	Sunaragada or kukurpelia	Fruit	Shrub	Ripe fruits are sweet, acidic and fragrant.
93	<i>Grewia tilifolia</i> Vahl.	Tiliaceae	Dhamana	Fruit	Tree	Fruit is edible which is seedy with scanty pulp having a good acidic flavor.
94	<i>Indigofera cassioides</i> Rottl. ex DC.	Fabaceae	Gileri	Leaves, Flowers	Shrub	Leaves are cooked (rare). Pink flowers are boiled and sieved out. Dry bhaji is made with onion, tomato, garlic etc. to make a delicious recipe.
95	<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae	Kalama saga	Leaves	Herb	Leaves & tender shoots are fried into a delicious recipe.
96	<i>Justicia adhatoda</i> L.	Acanthaceae	Juani	Leaves	Herb	Leaves are cooked & eaten.
97	<i>Lagenaria siceraria</i> Standley	Cucurbitaceae	Lau	Leaves Fruits	Climber	Tender leafy shoots are cooked with other vegetables.
98	<i>Lantana camara</i> L.	Verbenaceae	Putus	Fruits	Shrub	Ripe fruits are relished by the children.
99	<i>Lepidium sativum</i> L.	Brassicaceae	Himba saga	Leaves	Herb	Leaves and young shoots are roasted and eaten.
100	<i>Leucas aspera</i> (Willd.) Link	Lamiaceae	Gayasa Tupu saga, Pitta saga	Leaves	Herb	Young shoots & leaves (alone) are cooked & eaten with rice.
101	<i>Leucas cephalotes</i> (Roth) Spreng.	Lamiaceae	Tupu saga Kointha	Leaves	Herb	Leaves are boiled/fried & cooked by all tribes.
102	<i>Limonia acidissima</i> L.	Rutaceae	Kaitha	Fruits	Tree	Pulp of ripe and raw fruits is made into chutney with sugar, salt and chilly. Pulp may be eaten as such.

103	<i>Limnophila heterophylla</i> (Roxb.) Benth.	Scrophulariaceae	Hidimichi	Leaves	Herb	All tribes consume tender leafy shoots cooked with other greens.
104	<i>Litsea glutinosa</i> (Lour.) Robins.	Lauraceae	Bagha airee	Fruits	Tree	Ripe fruits are eaten sometimes.
105	<i>Luffa cylindrica</i> (L.) M. Roem.	Cucurbitaceae	Tadri	Fruits	Climber	Young fruits are cooked as vegetables.
106	<i>Madhuca indica</i> Gmel.	Sapotaceae	Mahua	Flowers, seeds, fruits	Tree	Fleshy corolla is sun dried made into paste with rice & baked to cakes. Country liquor is distilled from the flower. Fruits are cooked as vegetable. Edible oil is extracted from seeds.
107	<i>Mangifera indica</i> L.	Anacardiaceae	Amba/oli	Fruits, seeds	Tree	Raw fruits are cooked. Used in making pickles, chutney, amchur & serbet. Delicious ripe fruits are eaten as such. The ripe fruits can be used in the preparation of juice, squash, jam, jelly and aam sadha. Seed kernel is boiled & ground to paste along with rice to make cakes in the time of food scarcity.
108	<i>Manilkara hexandra</i> (Roxb.) Dubard	Sapotaceae	Khirokoli	Fruits, seed	Tree	Ripe fruits are sweet & eaten fresh or dries. Edible oil is extracted from seed.
109	<i>Marsilea minuta</i> L.	Marsileaceae	Sunsuni ara	Leaves	Herb	Leaves and shoots are cooked & eaten.
110	<i>Medicago sativa</i> L.	Fabaceae	Ghipari	Leaves	Herb	Cooked & eaten with rice.
111	<i>Mentha spicata</i> L.	Lamiaceae	Pudina	Leaves	Herb	Leaves are used in making chutney. Used in salads .
112	<i>Merremia quinquefolia</i> (L.) Hall. f.	Convolvulaceae	Chadhei saga	Leaves	Climber	Leaves & tender shoots are cooked & eaten with rice.
113	<i>Meyna spinosa</i> Roxb.ex. Link. var. <i>pubescens</i> Robyns.	Rubiaceae	Salara	Fruits	Shrub	Ripe fruits are edible.
114	<i>Momordica dioica</i> Roxb. ex Willd.	Cucurbitaceae	Kankada	Leaves Fruits	Climber	Young leaves are cooked like fruits.
115	<i>Moringa oleifera</i> Lam.	Moringaceae	Sajana saga	Leaves, Flowers, fruits, seeds	Tree	Leaves are fried with moong dal & coconut. Leaves are cooked mixed with other vegetables & spices (curry). Flowers are made into pakoda with besan.
116	<i>Molluga pentaphylla</i> L.	Molluginaceae	Pitagima	Leaves, Floral buds	Herb	Leaves are eaten cooked with brinjal & potatoes.
117	<i>Morus alba</i> L.	Moraceae	Tutkoli	Fruit	Shrub	Ripe fruits are edible.
118	<i>Mukia maderaspatana</i> (L.) Roem.	Cucurbitaceae	—	Fruits	Climber	Fleshy ripe fruits are edible.
119	<i>Murraya koenigii</i> (L.) Spreng.	Rutaceae	Bhrusunga	Leaves	Shrub	Used in tadka to increase flavor of the food item and as snacks and chutneys.

120	<i>Nelumbo nucifera</i> . Gaertn.	Nymphaeaceae	Padma	Pedicels and floral buds	Herb	Tribal people cut the petioles into small pieces and use them as vegetables. Children eat the floral buds.
121	<i>Nymphaea nouchali</i> Burm. f.	Nymphaeaceae	Kain	Pedicels	Herb	Pedicels are cooked as vegetables.
122	<i>Oxalis corniculata</i> L.	Oxalidaceae	Ambiliti, Netho sag	Leaves	Herb	Fresh leaves are fried with boiled dal. As the leaves are sour, they are chewed as mouth freshner.
123	<i>Paederia foetida</i> L.	Rubiaceae	Psaruni	Leaves	Climber	Leaves are made into paste & used to make curry with potato & tomato. After cooking there is no bad smell. Leaves are fried with besan/ gram flour also.
124	<i>Passiflora foetida</i> L.	Passifloraceae	Bisiripi	Fruits	Herb	Ripe fruits are edible.
125	<i>Phoenix acaulis</i> Buch.-Ham. ex Roxb.	Arecaceae	Bhuin khajuri	Fruits	Shrub	Ripe fruits are edible though have scanty pulps.
126	<i>Phoenix sylvestris</i> (L.) Roxb.	Arecaceae	Khajuri	Fruits	Shrub	Ripe fruits are sweet. Fruits are used to make juice, jelly and jam.
127	<i>Phyllanthus acidus</i> (L.) Skeels	Euphorbiaceae	Naara koli	Fruits	Shrub	Mature fruits are too tart and used in making pickles.
128	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Aanla	Fruits	Shrub	Fruits are eaten raw and also made into pickled. Salted dried fruits are mouth freshener. Fruits are dried, powdered and preservers.
129	<i>Physalis minima</i> L.	Solanaceae	Tomatilo	Fruits	Herb	Raw fruits are sometimes used as vegetable during fruit scarcity.
130	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Mimosaceae	Sima kaian	Fruits	Tree	Pulpy aril of ripe fruit is sweet and edible.
131	<i>Polyalthia cerasoides</i> (Roxb.) Bedd.	Annonaceae	Budhi chamadi	Fruits	Shrub	Ripe fruits have sweet pulp which is edible.
132	<i>Polygonum barbatum</i> L.	Polygonaceae	Madara	Leaves	Herb	Tender leafy shoots are cooked with tomato & spices.
133	<i>Polygonum glabrum</i> Willd.	Polygonaceae	Sauri ara	Leaves	Herb	Tender leafy shoots are cooked with tomato & spices.
134	<i>Polygonum plebeium</i> R. Br.	Polygonaceae	Muthi sag, Pimpdi sag	Leaves	Herb	Whole leafy plant is ground along with chilly, turmeric & spices. The paste is wrapped in 'Sal' leaves & baked in fire (earthen oven). It is called 'patrapoda' & is taken with rice.
135	<i>Portulaca oleracea</i> L.	Portulacaceae	Balbalia, Nunia sag	Leaves	Herb	Leaves are roasted & eaten.
136	<i>Protium serratum</i> (Wall. ex Colebr.) Engl.	Burseraceae	Rimuli	Fruits	Tree	Ripe fruits are eaten raw. Sometimes these are made into chutneys/ pickles.
137	<i>Rungia parviflora</i> Nees	Acanthaceae	Kawoa sag Hasa arak	Leaves	Herb	Green leaves are consumed as vegetables.

138	<i>Rungia pectinata</i> (L.) Nees.	Acanthaceae	Pimpidi saga	Leaves	Herb	Green leaves are consumed.
139	<i>Schleichera oleosa</i> (Lour) Oken	Sapindaceae	Kusum/ kasam daru	Fruits, seeds	Tree	Ripe fruits are edible with sweet taste. Seeds are eaten roasted. Oil extracted from the seed in cooking and massaging.
140	<i>Semecarpus anacardium</i> Linn.	Anacardiaceae	Bhalia	Fruits, seed	Tree	Fleshy orange receptacle is eaten when ripe. Kernel of seed is roasted and eaten.
141	<i>Sesbania grandiflora</i> (L.) Poir.	Fabaceae	Agasthi	Leaves Flowers	Shrub	Flowers are cooked as curry with spices and also fried into delicious pakoda.
142	<i>Shorea robusta</i> Gaertn.f.	Dipterocarpaceae	Sal/sargi	Fruits, seeds	Tree	Raw fruits are cooked as vegetables and eaten with rice. Seeds are roasted and taken as snacks. Oil is used in cooking and massaging.
143	<i>Solanum nigrum</i> Sw.	Solanaceae	Katha koli	Fruits	Herb	Raw fruits are cooked as vegetable (rare).
144	<i>Solanum torvum</i> Sw.	Solanaceae	Dengabheji	Fruits	Herb	Raw fruits are used as vegetables.
145	<i>Solanum viarum</i> Dunal	Solanaceae	Bheji	Fruits	Herb	Raw fruits are used as vegetables.
146	<i>Solanum virginianum</i> Orleg.	Solanaceae	Kantaregi	Fruits	Herb	Raw fruits are used as vegetables.
147	<i>Spondias pinnata</i> (L. f.) Kurz	Anacardiaceae	Ambada	Fruits	Tree	Raw fruits are eaten raw, pickle or cooked. Ripe fruits are used as such.
148	<i>Streblus asper</i> Lour.	Sterculiaceae	Sahada	Fruits, flowers	Shrub	Ripe fruits are edible and flowers are cooked.
149	<i>Streblus taxoides</i> (Heyne ex Roth) Kurz	Sterculiaceae	Jhumpura	Fruits	Shrub	Raw fruits are cooked as vegetables.
150	<i>Syzygium cerasoides</i> (Roxb.) Chatt. & Kanjilal f.	Myrtaceae	Kudedaru	Fruits	Tree	Edible ripe fruits mildly acidic with scanty pulp.
151	<i>Syzygium cumini</i> (Linn.) Skeels	Myrtaceae	Jamu	Fruits	Tree	Ripe fleshy fruits are commonly eaten.
152	<i>Tamarindus indica</i> L.	Caesalpinaceae	Tentuli	Fruits, flowers, leaves, seeds	Tree	Ripe and unripe fruits are eaten. Pulp is used for flavoring curry and used in making sauces, chutneys, pickles, beverages etc. Tender leaves and flowers are edible as well as mouth freshener. Seed kernels are eaten burnt.
153	<i>Tamilnadia uliginosa</i> (Retz) Tirveng. & Sastre	Rubiaceae	Tolaka	Fruits	Tree	Ripe fruits are eaten as such or after being boiled or made into curries.
154	<i>Toxicarpus kleinii</i> Wt. & Arn.	Asclepiadaceae	-	Flowers	Herb	Flowers are cooked to make delicious dish like mushroom.
155	<i>Trianthema portulacastrum</i> L.	Aizoaceae	Purni	Leaves	Herb	Young plants are eaten by all tribes.

156	<i>Woodfordia fruticosa</i> (L.) Kurz	Lythraceae	Icha/ dhatki	Flowers	Shrub	Children suck the petals to remove nectar while wandering in the jungle. Flowers are highly medicinal.
157	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Barakoli	Fruits	Tree	Mature raw fruits and ripe fruits are eaten raw, pickled, candied and also preserved for future.
158	<i>Ziziphus nummularia</i> (Burm.f.) Wt & Arn.	Rhamnaceae	Jangli barakoli	Fruits	Tree	Ripe fruits are edible.
159	<i>Ziziphus oenoplia</i> (L.) Mill.	Rhamnaceae	Kanteikoli	Fruits	Shrub	Sweet acidic ripe fruits are edible.
160	<i>Ziziphus rugosa</i> Lam.	Rhamnaceae	Chunkoli	Fruits	Shrub	Ripe fruits being sweet in taste are eaten as such.



Fig. 2 (a) A tribal girl collecting edible fruits; (b) Collection of flowers of *Indigofera cassioides*; (c) *Annona reticulata* (d) *Merremia quinquefolia*; (e) *Eryngium foetidum*; (f) *Dioscorea wallichii*; (g) *Phoenix acaulis*; (h) *Ficus racemosa* and (i) *Schleichera oleosa*

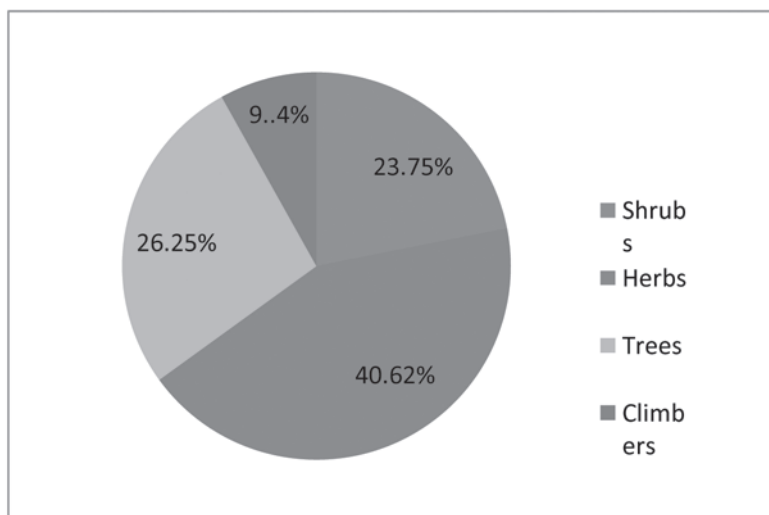


Fig.3. Wild edible food plants in terms of habit

The edible taxa listed in the above table belong to 160 species under 119 genera and 63 families (Fig. 3). A good number of leafy vegetables like *Alternanthera sessilis*, *Bauhinia purpurea*, *Brassica campestris*, *Chenopodium album*, *Cicer arietinum*, *Cordia obliqua*, *Eryngium foetidum*, *Ipomoea aquatica*, *Leucas aspera*, *Marsilea minuta* and *Moringa oleifera* are generally cooked by all communities. These species are marketable and provide opportunity to supplement household income. Edible flowers of *Indigofera cassioides*, *Brassica campestris*, *Moringa oleifera*, *Bauhinia variegata*, *Cordia obliqua*, *Madhuca indica*, *Sesbania grandiflora* and *Toxocarpus* species are sold in the market depending on their season of availability. Varieties of edible wild foods also include fruits, seeds and tubers which are safe for consumption. Tubers of *Dioscorea* species and fruits of *Mangifera indica*, *Diospyros melanoxylon*, *Buchanania lanzan*, *Tamarindus indica*, *Schleichera oleosa*, *Artocarpus heterophylla*, *Embllica officinalis*, *Ficus racemosa* and many others are consumed in large scale and also traded outside. Though commercial use of Sal (*Shorea robusta*) seeds has picked up during last two to three decades, the extraction of oil from it for domestic consumption is in practice since long. Now it is being used for making vegetable ghee (Vanaspati), sweets and chocolates. Kusum and Mahua seeds also yield edible oils. Seeds of *Buchanania lanzan* are highly nutritive, tasty and costly. The tubers are the most important food crops for the tribes in lean seasons.

4. Conclusion

Wild edible plants are of high social and economic value to the tribal people and those living in forest fringe villages, which ensures food security and household income.

However, habitat loss and over-exploitation of NTFPs has been the cause of depletion of forest resources. Many edible plants are rapidly shrinking due to increasing population and anthropogenic pressure along with the traditional knowledge base. Present research on wild edibles may help the forest planners on linking livelihood and socio-economic development with biodiversity conservation. Sustainable harvesting, value addition and cultivation are essential for judicious utilization of the wild edible plants.

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