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Diversity of food plants used by tribal people of Dhenkanal district, Odisha, India: An ethnobotanical analysis

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ABSTRACT

An ethnobotanical investigation was carried out in Dhenkanal district, Odisha, India to explore the use of edible food plants among its tribal inhabitants. Data were collected through structured questionnaires, complemented by personal interviews. The tribal people used plant species as food supplement particularly during scarcity period of the year. A total of one hundred and thirty seven species from sixty families were recorded in the course of investigation. Different plant parts like fruits (53 types), leaves (40 types), flower and seed (15 types each) and tubers and corms (14 types) were consumed in raw or cooked form by the tribal population. This study can provide a better database both for past and present relationship between plants and traditional societies of Dhenkanal district, Odisha. Attention need to be paid for the collection and preservation of such taxa which are being grown in backyards of these tribals in remote forest areas.

KEYWORDS

Edible plants;
Ethnobotany;
Odisha;
Traditional knowledge;
Tribals.

INTRODUCTION

Man has depended on plants ever since life began. The reason are various- for food, shelter and clothing. At the micro level, tribal people living in and around forests for centuries have recognized different food plants as important forests resources.Tribals are usually philotheranian and phytophilous. In India there are nearly 68 million people belonging to 576 indigenous communities designated as scheduled tribes. These communities belong to 227 ethnic groups and 427 scheduled tribes are still the primary inhabitants of natural forests[1].So it is comprehensively evident that India has an enormous indigenous knowledge[2].Odisha, one of the eastern states of India has oldest and richest cultural traditions. It is the land of nearly 62 different tribal communities and majority of them live in forests. The tribal affinity to forests of Odisha has been very high in terms of source of living, way of life and cultural moorings.

Tribals have their own sociocultural practices, tradition and typical food practices. Although they grow food grains but it is not sufficient throughout year because of marginal land holdings. In this context wild edible food plays a significant role not only in providing nutrient food

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supplement during scarcity but also generating side income for the tribal people. Fruits collected by them from natural forests are often seen on sale in rural markets. Their diet comprises variety of unconventional foods, viz.edible forms of flowers, fruits, tubers, leaves and seeds. World wide, ten thousands of species of higher plants and several hundred lower plants are currently used by human beings for a wide variety of purposes such as food, fuel, fiber, oil, herbs, spices, industrial crops and as forage and fodder for domesticated animals[3]. It is estimated that 80% of forest dwellers in different states of India particularly Bihar, Himachal Pradesh, Madhya Pradesh, Odisha and West Bengal depend on forest for 25-50% for their annual food supplement[4].At present the practice of collection by the tribal's are vanishing as a result of rampant deforestation and the displacement of the tribal's from their traditional habitats. The neglect of traditional foods may seriously deteriorate the health and well- being of traditional peoples[5,6]. Furthermore, nature-based traditional foods are generally viewed as interchangeable, diet being highly regarded as the primary basis for sustaining and/or restoring health and well-being. Though there is no authentic evidence of when and how plants came into usage for food purpose, the tribes of Dhenkanal district use traditional knowledge of several food plants during food scarcity.

Although there have been many publications on different aspects of ethnobotany, some have dealt with the ethnomedicine[7-13], while others have reported the use of plants as household and rituals, folk proverbs in weather and agricultural forecasting, rainfall and crop productivity, livestock characters and selection, cultivation technique of indigenous rice varieties etc[14-16] and a few have attempted to examine the diversity of plants used as food[17]. There have, however, been no reports in Dhenkanal district of Odisha,India. The present study was carried out to investigate the abundance and diversity of food plants, its relationship to tribal population in determining food supplement particularly during scarcity period of the year from Dhenkanal district, Odisha, India, on the basis of field surveys and taxonomic identification of plants

MATERIALS AND METHODS

Study area

The Dhenkanal district (Figure 1) is situated in the central part of the Odisha (20^0 29' to 21^0 11' N and 85^0 58' to 86^0 2' E) and covers an area of 4452 sqKm with a population of 1067001(2001 Census). Most of this district is covered with dense forest and a long range of hills, which are home of wild elephant and tigers. The District is the centre of a religious movement called 'Mahima Dharma' which over the last century has spread throughout the India. Majority of the people lives in villages (91.29%) and agriculture is taken as their main occupation. Twenty six tribal communities viz. Sabara, Saora, Juanga, Saunti, Santal, Pendia, Paraja, Oraon, Munda, Mirdha, Matia, Mankidi, Mahali, Lodha, Koya, Kora, Kolha, Kishan, Kandha, Haria, Ho, Gand, Dharua, Binjhal, Bhumij and Bhuyan are glorifying the district. As per 2001 census, the tribal population of the district was 136501, which constitutes 12.79% of the total population of the district. They depend solely on their surrounding plants for more of their requirements from food to medicines.

Figure 1 : Map of the study site.

The climate of the district is warm and humid. Three distinct seasons are felt during the year. Rainy season (mid June till October), winter (mid October to February) and summer (March to mid June). The annual rainfall is varying from 1420 mm to 1450 mm. The average temperature ranges from 37°C to19°C. Hills, serene environment of dense forest, picturesque river valleys and mountain peaks with ancient shrines are further characteristic features of the district.

Methodology

The study was carried out in 15 villages in Kamahhyanagar sub-division of Dhenkanal district. The field study was carried out from November 2008 to December 2009, and information on the use of food

plants was obtained through a combination of tools and techniques of structured questionnaires, complemented by free interviews and informal conversations[18]. The interviews were individually carried out and, during the first contacts with the local population, "native specialists" were identified, in other words, people who consider themselves, and are considered by the community as having exceptional knowledge about the use of plants. 119 (49 men and 70 women) were interviewed. Among these interviewees, 10% were aged 21-40 years, 40% were 61 years old or more and half of the sample (50%) were in the 41-60 age range. Collections are valuable because they serve as voucher specimens, records of the plants that are known by community and function as specimens for systematic identification[19]. A voucher specimen facilitates the identification of the species encountered during the research and permits colleagues to review the results of the study[20,21]. Knowledgeable persons, experienced and aged persons, local healers of the villages were consulted for recording local name; parts of plants used as food. Personal interviews and group discussions with local inhabitants revealed some very valuable and specific information about the plants, which were further authenticated by crosschecking. In addition to crosschecking and recording folk names of plants through collecting voucher specimens, it is important to crosscheck information with different people and compare the results from different methods[22]. Interviews with people out of the village, pastures or forests were conducted on a systematic basis to know more details about species, their management and distribution. The voucher species were identified following the published literature as previously described[23-25]. The plants collected are listed here with their botanical names followed by family name, their local names in Oriya and the parts used for food purpose.

RESULTS AND DISCUSSION

The tribal segment of India's population presents an interesting profile of the country's ethnic diversity. Living with nature they have gathered enough traditional knowledge about the flora as well as utilisation and management of phytodiversity that surrounds them for sustainable socio-economic development. Folklores are the best means to learn or explain any incidence or event[26].Tribals move here and there in search of food, their life and culture is closely associated with their food habit. In addition to cultivated crops tribal people generally used different forest plants in wild forms as their food which is natural and free from pesticides or chemicals. The outcome of the present study reveals that 137 plant species were used for food purposes in the surveyed area. The inventoried species comprise 60 families. The most important plant families were Caesalpiniaceae, Dioscoreaceae, Euphorbiaceae, Moraceae, Anacardiaceae and Cucurbitaceae.

Foods available inside forest area can be classified under various heads. (a) Fruits (b) flowers (c) leaves (d) seeds and (e) tubers and corms. Among the reported 137 species, 53 were recorded for fruits, 40 for leaves, 15 each for flower and seed and 14 plants are recorded for tubers and corms (TABLE 1-5). Some of these are very useful to the local population for meeting their subsistence consumption need while other is of commercial importance. Most of the food plant species reported in this paper form significant component of the economic life of the locals. There is no doubt that the edible plants influence the living of the people. These resources provide incentives to rural poor for maintaining the sustainability of forest eco-system and help to preserve biological diversity and traditional knowledge. The percentage contribution of herbs, shrubs, trees and climbers are given in figure 2. From the figure it is evident that trees were widely used followed by herbs.

TABLE 1 : Wild plant foods: Fruits.

Sl. No	Botanical name, author, local name and family	Habit/habitat/domestication	Form of use
1	*Aegle marmelos* Corr. Bel Rutaceae	Cultivated tree species. A plant of great folklore, considered sacred and a common temple yard plant. Fl.March-Apr. Fr. after one year.	Fruits become yellow when ripe. Sweaty pulp is eaten.
2	*Alangium salvifolium* L. Ankula, Alangiaceae	Small bushy tree, common in wasteland. Fl.March-Apr. Fr. June-July.	Fruits ellipsoid and eaten raw.

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Sl. No	Botanical name, author, localname and family	Habit/habitat/domestication	Form of use
3	*Antidesma acuminatum* Wall. Kathajamural,Euphorbiaceae	Small tree. Fl. May-June. Fr. Aug.-Nov.	Ripen fruit is edible.
4	*Antidesma lanceolarium* Wall. Nununia,Euphorbiaceae	A large shrub common in forests. May-June. Fr. Sept.-Dec.	Fruit are largely eaten in raw as well as ripen
5	*Artocarpus heterophyllus* Lamk. Panasa, Moraceae	Cultivated tree species.Fl.Dec.-Feb. Fr. June-July	Raw fruits are eaten after cooking. Ripen fruits are eaten before they are quite ripe.
6	*Artocarpus lacucha* Roxb. Jeuta, Moraceae	Cultivated tree species. Fl. Dec.and Apr. Fr. May and Oct.-Nov.	Ripen fruits are edible.
7	*Bridelia retusa* L. Kasiphal, Euphorbiaceae	A medium sized forest species. Fl.Aug.-Oct. Fr. Sept.-Jan.	Ripen fruits are edible.
8	*Buchanania lanzan* Spreng. Charkoli,Anacardiaceae	A Small tree common in forests. Fl. Jan.-Mar. Fr. Apr.-May	Ripen fruits are edible.
9	*Casearia graveolens* Dalz. Benchi,Flacourtiaceae	A Small tree common in forests.Fl. Feb.-March Fr.Apr.-Jul.	Ripen fruits are edible.
10	*Capparis zeylanica* L.Asadhua,Capparaceae	A Climbing shrub. Fl.Feb.-Apr. Fr. Sept.-Oct.	Ripen fruits are edible.
11	*Coccinia grandis* L. Kunduri,Cucurbitaceae Cucurbitaceae	A cultivated climbing herb. Fl and Fr. Most part of the year.	Raw fruits are used as vegetable.
12	*Calamus rotang* L. Beta, Arecaceae	Tall climber	Ripen fruits are edible.
13	*Diospyros malabarica* Desr. Dhusara kendu,Ebenaceae	A handsome tree in forest. Fl and Fr. Mar.-Apr.	Ripen fruit is edible
14	*Diospyros melanoxylon* Roxb. Kendu, Ebenaceae	A small tree commonly found in wasteland. Fl Apr.-May ripens following May.	Ripen fruit is edible.
15	*Dillenia aurea* Sm. Karmata, Dilleniaceae	Moderate size deciduous forest species. Fl. Apr.-May Fr. May-Jun.	Raw and ripe fruits are edible.
16	*Dillenia indica* L. Oou,Dilleniaceae	A cultivated tree. Fl. May-June, Fr. Sept.-Feb.	Fruits are eaten usually after cooking.
17	*Dregia volubilis* L.f. Dugdhica,Strychnaceae	Common tree in coastal plains and forests. Fl. Apr.-June, Fr. Dec.-Feb.	Ripen fruits are edible.
18	*Emblica officinalis* Gaertn. Aonla,Euphorbiaceae	Moderate sized tree common in plains and hills. Fl. Feb.-May, Fr. Oct.-Apr.	Raw and ripen fruits are eaten.
19	*Erycibe paniculata* Roxb. Joraikoli,Convolvulaceae	A climbing shrub. Fl. May-June, Fr. Following Mar.-May.	Ripen fruit is sweet in taste.
20	Ficus palmate Forssk. Anjeer, Moraceae.	A forest shrub species. Figs Nov.-July.	Ripe fruit is eaten
21	*Ficus hispida* L.f. Dimiri,Moraceae	A common wasteland species. Figs Nov.-July.	Ripen and raw fruits are eaten after cooking.
22	*Gardenia gummifera* L.f. Gurudu, Rubiaceae.	A forest shrub species. Fl. Mar.-May, Fr. Jun.-Aug.	Ripe fruit is eaten.
23	*Garcinia tinctoria* D.C. Chiuri, Clusiaceae.	Moderate sized forest species.Fl. Apr.-May, Fr. May of following year.	Sour fruits used in curries.
24	*Gmelina arborea* Roxb. Gambari, Verbenaceae	Moderate sized forest species. Fl. Mar.-Apr. - Fr. May-June.	Ripen fruits are edible.
25	*Garcinia cowa* Roxb. Rajkusuma,Clusiaceae.	A forest species. Fl. Mar.- Apr, Fr. May-June.	Ripen fruits are edible.
26	*Garuga pinnata* Roxb. Kathakusum,Burseraceae.	A tree in forests.Feb. - Apr, Fr. Jun.-Aug.	Ripen fruits are edible.
27	*Gelonium multiflorum* Juss. Khakru, Euphorbiaceae	A small tree commonly found in forests. Fl. and Fr .Mar.-Aug.	Raw and ripen fruits are edible.
28	*Grewia elastica* Royle. Mirig chara,Tiliaceae.	A small tree commonly found in forests. Fl. Apr.-May, Fr. Oct.-Jan.	Ripen fruits are edible.

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Sl. No	Botanical name, author, localname and family	Habit/habitat/domestication	Form of use
29	*Hibiscus sabdariffa* L. Khata palanga,Malvaceae	A cultivated herb. Fl. Jul.-Oct, Fr.Oct.-Feb.	Ripen and raw fruits are edible.
30	*Ixora undulate* DC. Karuna,Rubiaceae.	A large shrub in coastal plains and hills. Fl. Apr.-May, Fr.Aug.-Sept.	Ripen fruits are edible
31	*Lantana camara* Linn. Naga airi, Verbenaceae.	A wasteland weed.Fr and Fl. all the year around.	Ripen fruits are edible.
32	*Melothria heterophylla* (Lour).Cogn. Banakunduri,Cucurbitaceae	A climber planted on village hedges. Fr and Fl.Sept.-Dec.	Fruit is eaten after cooking.
33	*Momordica dioeca* Roxb. Kankad,Cucurbitaceae	A cultivated climber in hills and plains. Fl. Aug.-Sept., Fr.Sept.-Nov.	Fruit is eaten after cooking.
34	*Mangifera indica* Linn. Amba, Anacardiaceae.	A common forest as well as cultivated tree. Fl. Jan-Mar., Fr.Apr.-May.	Unripe fruit is eaten as chutney and pickles and also eaten after ripening.
35	*Mangifera pinnata* L.f Ambada,Anacardiaceae.	A cultivated tree. Fl. Feb.-Mar., Fr. in the following Jan.	Fruit is eaten as condiment and made into chutney and also eaten after ripening.
36	*Mimusops elegani* L. Baula, Sapotaceae.	Ornamental tree Fl. Apr.-May, Fr.Aug.-Sept.	Ripen fruit is eaten.
37	*Mesua ferrea* L. Nageswar, Cluslaceae	A forest tree. Fl. Mar.- July,Fr.Oct.-Nov.	Ripen fruits are edible.
38	*Olax scandens* Roxb. Bhadabhadalia,Olacaceae.	A forest shrub. Fl.Mar.- Aug., Fr.Oct.-Dec.	Ripen fruits are edible.
39	*Passiflora foetida* L. Bisiripi, Passifloraceae.	A climber in wasteland and also planted in hedges. Fl. and Fr. Nov.-June.	Ripen fruits are edible.
40	*Piper nigrum* L. Golmaricha, Piperaceae.	A climber species in coastal plains and hills.Fr. Apr.-May.	Dry fruit as spice.
41	*Phoenix sylvestris* Roxb. Khajuri, Arecaceae.	An unbranched wasteland tree. Fl. and Fr. May-Oct.	Ripen fruit is edible.
42	*Randia brandisi* Gamble. Kalaikanta, Rubiaceae.	A small forest tree. Fl. Mar.-June, Fr. Nov.-Jan.	Ripen fruit is eaten
43	Shorea robusta Gaertn. Sal, Dipterocarpaceae.	A timber yielding forest species. Fl. Mar.-Apr, Fr. May-June.	Raw fruit a vegetable.
44	*Sarostema acidum*.Roxb. Somalata, Asclepiadaceae	A shrub common in hilly region.	Ripen fruits are edible.
45	*Schleicher oleosa* Lour. Kusum,Sapindaceae	A deciduous tree in coastal plains and hills. Fl. Feb.-Mar., Fr. Jun.-Aug.	Yellow pulp is eaten when ripe. Pleasant and acidic in taste.
46	*Smilax zozeylanica* L. Rajdantari,Smilaceae.	A medium sized climber. Fl. Apr.-Jul., Fr. Oct.- Jan.	Ripen fruit is edible.
47	*Solanum nigrum* L. Lunikoli, Solanaceae.	An erect branched herb common in waste ground.Fl. and Fr. Most of the year.	Ripe and raw fruits are edible.
48	*Solanum viarum* Dunal in DC. Bhejibaigana,Solanaceae.	An erect branched shrub common in waste land. Fl. and Fr. Most of the year.	Raw as vegetable.
49	*Syzygium cuminii* L. Jamu, Myrtaceae.	A forest species. Fl.Apr.-May,Fr. Jul.-Aug.	Ripen fruits are largely eaten.
50	*Tamarindus indica* L. Tentuli, Caesalpiniaceae	A forest species. Fl. Apr.-Jun.,Fr. Dec.-Mar.	Ripe and raw fruits are eaten and also used in curries.
51	*Ziziphus rotundifolia* Lamk. Tinkoli, Rhamnaceae	A small branched shrub.Fl. Oct.-Dec.,Fr.Nov.-Feb.	Ripen fruits are edible.
52	*Ziziphus oenoplia* L. Mill. Kanteikoli, Rhamnaceae.	A thorny climbing shrub in wasteland. Fl. Jun.-Sept.,Fr.Oct.-Jan.	Ripen fruits are eaten.
53	*Ziziphus jujuba* L. Barokoli, Rhamnaceae	Branched thorny cultivated and forest species.Fl. Mar.-Oct., Fr.Jan.-Mar.	Unripe fruit is eaten as pickles and also eaten after ripening.

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TABLE 2 : Wild plant foods: Leaves & leafy shoots.

Sl. No	Botanical name, authors, local name and family	Habit/habitat/domestication	Form of use
1	*Alternanthera sessilis* (L.)R.Br. Madaranga, Amaranthaceae	Prostrate herb and a common weed.	
2	*Amaranthus spinosus* L. Kanta leutia, Amaranthaceae.	Erect glabrous branched herb in cultivated and waste ground.	
3	*Amaranthus viridis* L.Marsi, Amaranthaceae.	Herb and a common weed.	
4	*Aerva lanata*(L.) Juss. Paunsia Amaranthaceae	Perennial, herb and a common weed.	
5	*Antidesma diandrum* Roxb.Mamuri,Euphorbiaceae.	A forest tree.	
6	*Asteracantha longifolia* L.Koilikhai, Acanthaceae.	Under shrub	
7	*Basella alba* L.Banapoi, Polygonaceae.	A cultivated herb.	
8	*Boerhavia chinensis* L. Puruni,Nyctaginaceae.	A herb in village hedges.	
9	*Boerhavia diffusa* L.Ghodapuruni, Nyctaginaceae.	A weed herb.	
10	*Bauhinia purpurea* L. Debakanchan, Caesalpiniaceae	A moderate sized forest and cultivated species.	
11	*Bambusa ba*mboo L. Baunsa,Poaceae	Shrub	
12	*Centella asiatica* L. Thalkudi,Apiaceae.	A herb in wet places.	
13	*Cleome monophylla* L. Rangasorisa,Capparaceae	Under shrub in fallow fields.	
14	*Cleome viscosa* L. Anasorisia,Capparaceae.	An erect herb and a common weed.	
15	*Coccinia grandis* L. Kunduri, Cucurbitaceae	A cultivated climbing herb.	
16	*Celosia argentea* L. Lahenga, Amaranthaceae.	A common cultivated and roadside weed.	Leaf and leafy shoots are cooked by frying with mustard oil and also cooked with mustard seed paste.
17	*Cochlospermum religiosum* L. Kapasia, Cochlospermaceae	A deciduous forest tree.	
18	*Commelina benghalensis* L. Kansiri, Commelinaceae.	A common weed in wet places.	
19	*Cassia tora* L. Chakor, Caesalpiniaceae.	Under shrub and a weed in wasteland.	
20	*Colocasia esculenta* L. Manasaru,Araceae.	Tuberous cultivated herb.	
21	*Chenopodium album* L. Bathua, Chenopodiaceae.	Herb.	
22	Commelina appendiculata Hooke F., Commelinaceae.	A herb in forest.	
23	*Dendrocalamus strictus* Roxb. Banso,Poaceae.	A common bamboo in forest.	
24	*Euphorbia hirta* L Chitakuti,Euphorbiaceae.	Prostrate hairy herb and a weed..	
25	*Leucas cephalotes* Spreng. Gayas, Lamiaceae	A weed in roadsides.	
26	*Mullago pentaphylla* L. Pita gahama Mollaginaceae	A weed in cultivated land.	
27	*Melothria heterophylla*(Lour.) Cogn. Banakunduri, Cucurbitaceae	Herb.	

Sl. No	Botanical name, authors, local name and family	Habit/habitat/domestication	Form of use
28	*Moringa oleifera* Lam. Sajana,Moringaceae.	A cultivated medium sized tree.	
29	*Oxalis corniculata* L. Amliti, Oxalidaceae.	Prostrate herb. A weed in gardens.	
30	*Polygonum plebeium* R.Br. Muthisaga, Polygonaceae.	Prostrate herb and a weed in moist places.	
31	*Portulaca oleracea* L. Bada balbalua,Portulacaceae.	Prostrate herb. A weed of cultivated land, wasteland and road sides.	
32	*Portulaca quadrifolia* L Balbalua, Portulacaceae	A creeping herb in cultivated land.	
33	*Pouzolzia zeylanica* L. Kupachera,Urticaceae.	A herb in village hedges	
34	*Sida cordata* Burm.f Bisiripi, Malvaceae.	A common weed herb.	
35	*Solanum torvum* Sw. Kathakoli, Solanaceae	Shrub in wasteland.	
36	Solanum viarum Dunal in DCBhejibaigana, Solanaceae	Erect prickly under shrub in forest.	
37	*Swietiana chloroxylon* Roxb. Bheru,Rutaceae.	Small tree planted in the gardens and roadsides.	
38	*Trianthema portulacastrum* L. Kachoa, Aizoaceae	A succulent herb and a weed.	
39	*Tamarindus indica* L Tentuli,Caesalpiniaceae.	A forest species.	
40	*Vigna radiate* L. Banamuga,Fabaceae	A cultivated herb.	

TABLE 3 : Wild plant foods: Flowers.

Sl. No	Botanical name, authors, local name and family	Habit/habitat/domestication	Form of use
1	*Bauhinia variegate* L. Kanchana, Caesalpiniaceae.	A medium sized tree species.	Fried with mustard oil and used as vegetable
2	*Bauhinia retusa* Roxb. Choari Caesalpiniaceae	A moderate sized tree species common in gardens and hills.	
3	*Cochlospermum religiosum* L. Kapasia, Cochlospermaceae.	A deciduous tree in forest.	
4	*Celastrus paniculata* wild. Kujri, Celasraceae	A climbing shrub.	
5	*Dregea volubilis* L.f Dugdhika Strychnaceae	A herb common in plains and hills.	
6	*Dillenia pentagyna* Roxb. Rai Dilleniaceae	Deciduous tree in hill regions.	
7	*Holarrhena antidysentrica* Wall.exA.DC. Kurchi, Apocynaceae	A moderate sized tree species common in wasteland and hills.	
8	*Indigofera pulchella* Roxb. Jheli, Fabaceae	A shrub especially in hilly areas.	
9	*Madhuca indica* J.F.Gmel. Mahua, Sapotaceae	A tree in forest and village sides.	
10	*Moringa oleifera* Lam. Sajana, Moringaceae	A cultivated medium sized tree.	
11	*Melia azadirachta* L. Limba, Meliaceae	An aromatic tree of great folklore, considered sacred and a common temple yard plant.	
12	*Phyllochlamys spinosa* Roxb Phutuki, Moraceae	Small evergreen tree in forest.	
13	*Streblus asper* Lour. Sahada, Moraceae	Common in village periphery and foot hill forests.	
14	*Sesbania grandiflora*(L.) Poir. Agasti, Fabaceae	A cultivated ornamental species.	
15	*Tamarindus indica* L. Tentuli, Caesalpiniaceae.	A forest species.	

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TABLE 4 : Wild plant foods: Seeds.

Sl. No.	Botanical name, authors, local name and family	Habit/habitat/domestication	Form of use
1	*Artocarpus heterophyllus* Lamk. Panas Moraceae,	Tree	Roasted and used as vegetable.
2	*Adenanthera pavonina* L. Manda Kaincha, Mimosaceae	A tree found in gardens and village sides	Used raw.
3	*Bambusa bamboo* L.Baunsa, Poaceae	Tufted bamboo	Seeds made into flour and used in cakes.
4	*Cycas circinalis* L. Gurguna,Cycadaceae	Palm tree frequent in forests.	Endosperm is made into flour.
5	*Elaeocarpus serratus* L. Jolopari, Tiliaceae	Medium sized cultivated tree.	After removing harmful substances by putting endosperm and seed overnight in water seeds are roasted and eaten.
6	*Diospyros melanoxylon* Roxb. Kendu Ebenaceae,	Tree	Roasted.
7	*Diospyros pere*grine Gaertn. Makarkendu, Ebenaceae	Tree	Roasted.
8	*Entada rheedii* Spreng. Gila, Mimosaceae	A climber in wasteland.	Endosperm and seed cooked with rice.
9	*Madhhuca indica* J.F. Gmel. Mahula, Sapotaceae	A tree common in forests and village sides.	Roasted
10	*Schleichera oleosa* Lour. Kusuma, Sapindaceae	Tree	Roasted
11	*Semecarpus anacardium* L.f. Valia, Anacardiaceae	A small tree common in forests.	Roasted
12	*Sterculia urens* Roxb. Genduli, Sterculiaceae	A moderate sized tree.	Roasted
13	*Shorea robusta* Gaertn. Sal, Dipterocarpaceae	Tree	Roasted
14	*Tamarindus indica* L. Tentuli, Caesalpiniaceae	Tree	Raw and roasted
15	*Terminalia bellerica* Gaertn. Bahada, Combretaceae	Tree common in forests.	Dried and made into flour for use

TABLE 5 : Wild plant foods: Tubers and Corms.

Sl. No.	Botanical name, authors, local name and family	Habit/habitat/domestication	Form of use
1	*Amorphophallus paeonifalius*,Dennst. Olua, Araceae	A cultivated tuberous herb.	Corm.
2	*Asparagus racemosus* .Wild. Satabari, Liliaceae	Shrub	Tuberous root
3	*Bambusa bamboo* L. Baunsa, Poaceae	Shrub	Tufted bamboo
4	*Colocasia esculenta* L. Saru, Araceae	A cultivated tuberous herb	Corm
5	*Costos speciosus* Koenig. Koukaka, Zingiberaceae	Herb	Tubers
6	*Curculigo orchioides* Gaertn. Talamuli, Hypoxidaceae	Herb	Tuberous roots.
7	*Dioscorea glabra* Roxb. Kanta alu	Tuberous climber	Corm
8	*Dioscorea sativa* Thunb. Pita alu, Dioscoreaceae	Tuberous climber	Corm
9	*Dioscorea alata* L. Khamba alu, Dioscoreaceae	A cultivated climber	Corm.
10	*Dioscorea daemona* Roxb. Bainya alu, Dioscoreaceae	Tuberous climber	Corm
11	*Dioscorea oppositifolia* L. Pitil kanda,Dioscoreaceae	Tuberous climber	Corm.
12	*Dioscorea pentaphylla* L. Karba, Dioscoreaceae	Tuberous climber	Corm
13	*Dioscorea tomentosa* Koenig. Targa, Dioscoreaceae	Tuberous herb	Corm.
14	*Dioscorea belophylla* Voigt ex Haines. Pathar kanda, Dioscoreaceae	Tuberous climber	Tuberous stem.

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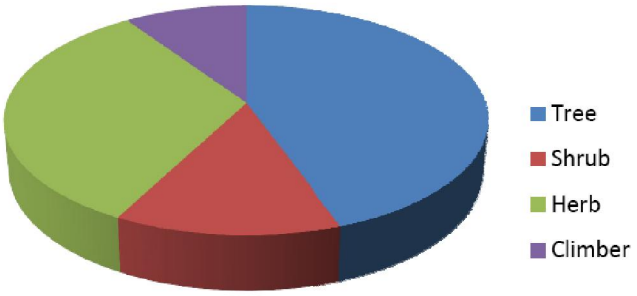

Figure 2 : Percentage of different plants used as food.

Varieties of leaves, flowers, fruits, seeds, tubers and corm were collected in different seasons, eaten in raw or cooked forms. Out of 53 identified fruits, 40 are popular among tribes and eaten frequently in different season. Among these Banakunduri, Kankada, Bhejibaigan, Tentuli, Ambada, Asadua and Karkotta are cooked and eaten as vegetables while others are eaten ripe. There are varieties of edible leaves which are ignorant to modern people but primitive people use them as food. Among 40 types of leaves, 30 are very popular among all the tribes and frequently eaten according to their availability. Most of them are herbs and are seen in open fields and on the bank of ponds. Common leaves used as food are Puruni, Anasorisa, Kunduri, Kansiri, Amilti, Balbalua, Kantaleutia, Madaranga, Muthisaga, Sajana, Veru and Mamuri. Tribal people used the leaves and leafy shoots by cutting it into small pieces and cooked with salt, chilli and garnished by mustard seeds.

Common edible flowers consumed by most of the tribal people are Agasti, Kanchan, Kuruchi, Mahua, Moringa, Neem etc. Flowers are first boiled and then fried by adding salt and spices. The fleshy thalamus of mahua flower is sweet and used for various purposes and eaten in various forms. During food scarcity the seasonal edible flowers with seeds become a major part of diet.Out of 15 types of seeds, Sal and Tentuli seeds are popular among all the tribes in Dhenkanal district. Sometimes seeds are eaten raw or roasted and also used as vegetables in curries. Edible oil is extracted from edible seeds by tribal people in their houses. In the present study most of the identified tubers belong to family Dioscoreaceae under the class monocot. Some tubers are eaten as curries, some are boiled and eaten while some are cut, dried and made into flour. Tubers of Pani alu and Tunga alu are available during rainy season. Others matured during spring season. Pita alu is acrid in taste. Its' hairy coat is removed, whole tuber is sliced and left in running water for a day or two to remove the harmful elements. Then it is suitable for eating. *Dioscorea belophylla* or Patharkanda is found among the fissures of rocks. This is one of the excellent yam not only edible but also having medicinal value.

CONCLUSIONS AND RECOMMENDATIONS

The study has identified 137 types of wild plant food which are integral part of tribal diet. Many of this unknown food can be exploited to meet the food and nutrition security of the nation. In the study most of the older people were noted as being better informant due to their personal experience of using plants since old times. This research can provide a wealth of information regarding both past and present relationship between plants and traditional societies of Dhenkanal district, Odisha. Attention need to be paid for the collection and preservation of such taxa which are being grown in backyards of these tribals in remote forest areas.

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