# Diversity of plants used for edible and fodder purposes by traditional communities of Coastal Karnataka, India

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## Abstract

Coastal Karnataka region of India, comprising of two districts called Dakshina Kannada and Udupi, is ethnobotanically very rich owing to its floristic and cultural diversity. This is justified by the fact that many ethnobotanical studies have been reported from this area. However, all these studies are concerned only with documentation of traditional knowledge and diversity of medicinal plants and the diverse non-medicinal uses of plants have not received any scientific attention so far. Therefore, this study was undertaken to document the diversity of plants used for edible and fodder purposes.

Plant specimens and associated traditional Information was gathered from the knowledgeable elders belonging to the different indigenous tribal and non-tribal communities of the study area.Methods followed were prior- informed open-ended interviews and discussions with 32 purposively chosen informants in the field, during different seasons of the study period. A total of 93 species of angiosperm plants used for edible and fodder purposes by different traditional and tribal communities were documented during the present study.Among them, 89 species are used either as edible or as fodder plants, and four species are used for both purposes. This study confirms that the traditional communities of the study locality have considerable traditional knowledge about non-medicinal uses of local plants. However, the practical use of wild plants for the studied traditional purposes has gradually decreased due to lack of interest in the newer generation and availability of modern alternatives.

***Keywords:*** Edible plants, fodder plants, Coastal Karnataka, Traditional plant uses.

## Introduction

The documentation of ethnobotanical knowledge pertaining to medicinal uses of plants has received considerable scientific attention all over the world when compared to non-medicinal uses of plants. This is true also for the Coastal regions of Karnataka, a southern State of India. Several ethno-medico-botanical reports are available from this area (Bhandary & Chandrashekar 2001, 2003, 2011; Bhandary*et al*. 1995, 1996; Harsha *et al*, 2003, 2006). However, the non-medicinal aspects of ethnobotany have not received any scientific attention and remains almost

unknown. Therefore, this study was undertaken with the aim of cataloging thediversity of plants used for non- medicinal uses, especially for edible and fodder purposes by the traditional communities of Coastal Karnataka, India.

## Study area and its traditional people

Dakshina Kannada and Udupi are the two coastal districts of Karnataka State, India, which together constitute an area of 8441 $km^2$. They are located between $12^0$29'36'' and $13^0$49'22'' N latitudes, and $74^0$37'24'' and $75^0$41'00'' E longitudes (**Fig.** 1). The 136 km long stretch of coastline facing the Arabian Sea forms the western edge of these districts while the towering heights of unbroken stretch of the Western Ghats marks their eastern boundary.

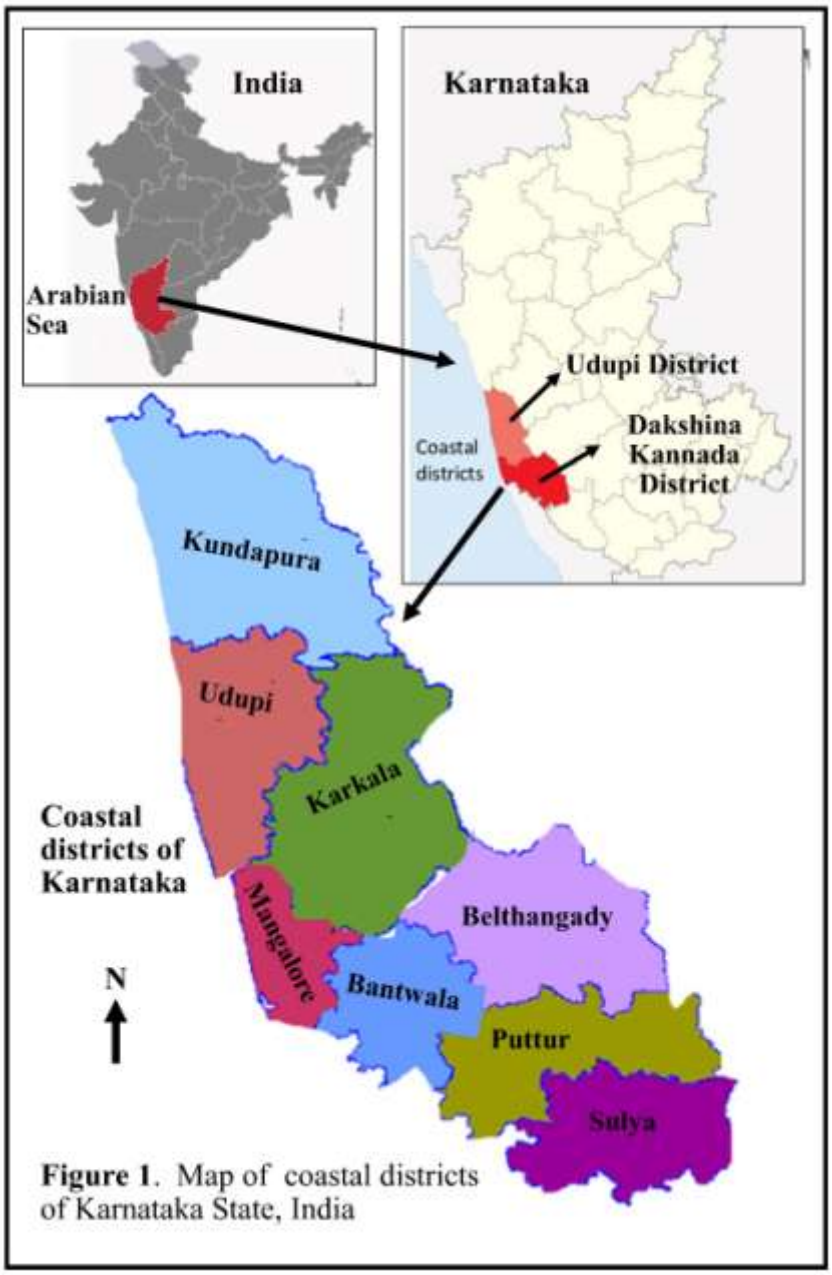

**Figure 1**. Map of coastal districts of Karnataka State, India

Historically, these two districts, together with the northern part of the adjoining Kasaragod district of Kerala State, constitute a historical and cultural landscape called the **Tulunadu**(land of Tulu), called so because of the dominance of traditional communities speaking a language called **Tulu**. These districts are the home for several tribal and other indigenous communities such as the **Billavas, Bunts, Idigas, Mogaveers, Gowdas, Koragas, Malekudiyas, Kunabis, Maratis**and others who have maintained a close association with the

components of nature in their surroundings.
The total population of these two districts was 32,67,010 (Census of India 2011). The area is still predominantly rural and agrarian with about 80 % of the workforce employed in agriculture and allied activities, including cultivation of coconut, areca nut and other horticultural products. More than 70 % of cropland is under cereals with rice as the principal crop. Fishing is the other major traditional livelihood activity with about 1,00,000 people directly engaged in fishing. This region receives heavy rainfall, in the range of 2,500 - 3,000 mm and it harbors different types of vegetation such as littoral, scrub, moist deciduous and typical evergreen. The littoral and the scrub forests are found along the coastal belt, the moist deciduous forests mainly in the inland plateaus extending to the foot of the ghats and the evergreen forests localized only in the ghats. The floristic diversity of this region has been sufficiently studied and documented (Gamble 1967,Bhat 2003).

## Methodology

Information regarding the plants used foredible and fodder was gathered from the knowledgeable elders belonging to the different indigenous communities, including two of the tribes namely the **Koraga** and the **Malekudiya**, residing in the study area. In fact, this study was an extended part of an ongoing comprehensive ethnobotanical documentation project started in the study area in 1995 which has resulted in many publications (Bhandary& Chandrashekar 2001, 2003, 2011, 2014;Bhandary*et al*. 1995, 1996). Data collection was made through prior- informed interviews and discussions with informants in the field, during different seasons of the study period. A total of 32 informants, including 27 males and 05 females were selected as informants to represent different locations of the study area. The informants were chosen based on the opinion and recommendations of the community and village heads. The mean age of all informants was 63 years.

The selected informants were contacted andconvinced about the objectives of the study. Prior oral consents were also obtained from them. Later, they were repeatedly taken to the nearby forest patches and other locations where useful plants are available, and data was gathered by open ended discussions and interviews. Simultaneous to the recording of information on uses, common names, parts used and methods of use of the plants, herbarium materials of the plants were also gathered. They were identified with the help of local floras (Gamble 1967, Bhat 2003) and deposited in the Herbarium of Department of Applied Botany, Mangalore University.

## Results and Discussion

A total of 93 species of angiosperm plants used for edibleand fodder purposes by different traditional and tribal communities of the study area were documented during the present study. Number of plant species, genera and families used for each of these purposes are summarized in table 1.

As many as 89 of the 93 species are used for only one of the two purposes whereas four species are used for both purposes.*Asparagus racemosus*Willd. (Asparagaceae), *Ficus racemosa* L. (Moraceae), *Marantaarundinacea* L. (Marantaceae) and *Xyliaxylocarpa* (Roxb.) Taub. (Fabaceae) are used both for edible and fodder purposes.

**Table 1**. Number of plant species, genera and families used for different non-medicinal purposes by traditional communities of Coastal Karnataka, India:

| Sl. No. | Use Purpose | Number of species used | Number of genera | Number of families |
|---|---|---|---|---|
| 1 | Edible | 76 | 62 | 41 |
| 2 | Fodder | 21 | 18 | 13 |

**Plants used for edible purpose**

As shown in table 2, people of Coastal Karnataka use different parts of 65 species of plants for edible purpose. This list excludes popularly cultivated vegetable and fruit plants.

**Table 2.** List of plants used by traditional communities of Coastal Karnataka for edible parts

| Sl. No. | Name of the species and Family | Local Name(s) | Part(s) Used | Method of Use |
|---|---|---|---|---|
| 1. | *Aglaia elaegnoidea* (A. Juss.) Benth. (Meliaceae) | Puccheparndu | Fruit | Raw |
| 2. | *Alangiumsalvifolium* (L.f.) Wangerin (Alangiaceae) | Ankole hannu, Mullankole | Fruit | Raw |
| 3 | *Alocasia macrorrhizos (L.) G. Don (Araceae)* | Mundi kesu | Tuber | Cooked |
| 4 | *Alternanthera sessilis* (L.) R. Br. Ex DC. (Amaranthaceae) | Honagonne | Leaf, Stem | Cooked |
| 5 | *Amaranthus spinosus* L. (Amaranthaceae) | Mulluharive, Mullupadpe | Leaf, Stem | Cooked |
| 6 | *Amaranthus tricolor* L. (Amaranthaceae) | Harive, Padpe | Leaf, Stem, Seed | Cooked |
| 7 | *Artocarpus altilis* (Parkinson ex F.A.Zorn) Fosberg (Moraceae) | Deevihalasu, Deegujje | Fruit | Cooked |
| 8 | *Artocarpus gomezianus* Wall ex. Trec. (Moraceae) | Hebbalasu, Pejakkayi | Fruit | Cooked |
| 9 | *Asparagus racemosus*Willd. (Asparagaceae) | Halavumakkalaberu, Udrikande | Tuber | Cooked |
| 10 | *Atalantiamonophylla* (Roxb.) DC. (Rutaceae) | Kaadunimbe, Kaipe Puli | Fruit | Raw |

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|---|---|---|---|---|
| 11 | *Bambusabambos* (L.)Voss (Poaceae) | Bidiru, Kanile | Tender stem | Cooked |
| 12 | *Basella alba* L. (Basellaceae) | Basale | Leaf, Stem | Cooked |
| 13 | *Boehraviadiffusa*L. (Nyctaginaceae) | Nelakomme, Teglame | Leaf | Cooked |
| 14 | *Borassus flabellifer* L. (Arecaceae) | Thaale, Thaari | Fruit | Raw |
| 15 | *Bulbophyllum sterile* (Lam.) Suresh (Orchidaceae) | Marabaale | Petiole | Cooked |
| 16 | *Caesalpinia mimosoides* Lam. (Fabaceae) | Kengige, Chimullu | Tender leaf, Seed | Cooked |
| 17 | *Canna indica* L. (Cannaceae) | Baare poo | Rhizome | Cooked |
| 18 | *Canthiumcoromandelicum* (Burm. F.) Alston (Rubiaceae) | Kaarekayi, Adkaare | Fruit | Raw/ Cooked |
| 19 | *Centella asiatica* (L.) Urban (Apiaceae) | Ondelaga, Thimare | Leaf | |
| 20 | *CentrosemapubescensBenth. (Fabaceae)* | Kadu alasande | Fruit | Cooked |
| 21 | *Cheilocostus specious* (J. Koen.) C. Specht (Costaceae) | Naayikarmbu | Leaf | Cooked |
| 22 | *Cissus quadrangularis* L. (Vitaceae) | Mangaravalli, Sanduballi | Stem | Cooked |
| 23 | *Cleome viscosa* L. (Cleomaceae) | Kaadusasive, Santhemi | Leaf | Cooked |
| 24 | *Colocasia esculenta* (L.) Schott. (Araceae) | Kesu, Thevu | Leaf, Corm | Cooked |
| 25 | *Cordia dichtoma*Forst.f. (Boraginaceae) | Mannadake, Challehannu | Fruit | Raw |
| 26 | *Cynodondactylon* (L.) Pers (Poaceae) | Kadikke | Leaf | Cooked |
| 27 | *Dioscoreaalata* L. (Dioscoreaceae) | Mudigenasu, Soonakereng | Tuber, Bulbil | Roasted/ Cooked |
| 28 | *Dioscoreahispida*Dennst. (Dioscoreaceae) | Nore | Tuber | Roasted/ Cooked |
| 29 | *Dioscoreaoppositifolia* L. (Dioscoreaceae) | Nore | Tuber | Roasted/ Cooked |
| 30 | *Elaeagnus confertа*Roxb. (Elaeagnaceae) | Halagehannu | Fruit | Raw |
| 31 | *Entada rheedei*SpremgSpreng (Fabaceae) | Palle | Seed | Cooked |
| 32 | *Ficus racemosa* L. (Moraceae) | Atthi, Arthi | Fruit | Raw / Cooked |

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|---|---|---|---|---|
| 33 | *Flacourtia indica* (Burm.f.) Merr. (Salicaceae) | Mulluhannu | Fruit | Raw |
| 34 | *Flacourtiamontana* Graham (Salicaceae) | Abbaluhannu, Arpuparnd | Fruit | Raw |
| 35 | *Garcinia indica*Thouars) Choisy (Clusiaceae) | Murgala, Punarpuli | Fruit | Raw |
| 36 | *Garcinia xanthochymus*Hook. F. ex. T. Anderson (Clusiaceae) | Jarige | Fruit | Raw |
| 37 | *Glycosmis pentaphylla* (Retz) DC. (Rutaceae) | Pandilu | Fruit | Raw |
| 38 | *Hibiscus cannabinus* L. (Malvaceae) | Pundisoppu | Leaf | Cooked |
| 39 | *Hibiscus hispidissimus* Griff. (Malvaceae) | Kaira puli | Tender Leaf, Fruit | Cooked |
| 40 | *Hibiscuss rosa-sinensis* L. (Malvaceae) | Dasavala | Leaf, Flower | Cooked |
| 41 | *Holigarnaferruginea* Marchand (Anacardiaceae) | Holegeru, Chere | Tender Leaf | Cooked |
| 42 | *Hugoniamystax* L. (Linaceae) | Ankole, | Fruit | Raw |
| 43 | *Ixora coccinea* L. (Rubiaceae) | Kiskaara, Kepula | Fruit | Raw |
| 44 | *Madhuca longifolia* (L.) J.F. (Sapotaceae) | Irpe | Flower, Seeds | Cooked |
| 45 | *Mamordica dioica*Roxb. ex. Willd. (Cucurbitaceae) | MadaHaagala, KaatKanchel | Fruit, Root | Cooked |
| 46 | *Maranta arundinacea* L. (Marantaceae) | Koove | Rhizome | Cooked |
| 47 | *Melastomamalabathricum* L. (Melastomataceae) | Nekkarika, Nekkare | Fruit | Raw |
| 48 | *Moringa oleifera* Lam. (Moringaceae) | Nugge, Nurge | Leaf, Fruit | Cooked |
| 49 | *Musa paradisiaca* L. (Musaceae) | Baale, Baare | Stem | Cooked |
| 50 | *Oxalis corniculata* L. (Oxalidaccae) | Puliyarile, Pullampuruche | Leaf | Cooked |
| 51 | *Pandanus odorifer* (Forssk.) Kuntze (Pandanaceae) | Mundovu, Mundige, Kedige | Fruit | Raw |
| 52 | *Persicaria chinensis* (L.) H. Gross (Polygonaceae) | Nelagumbala, Bili konde | Leaf, Root | Cooked |
| 53 | *Physalis angulata* L. (Solanaceae) | Guppate | Fruit | Raw |
| 54 | *Portulaca oleracea* L. (Portulacaceae) | Golisoppu, Golipadpe | Leaf | Cooked |
| 55 | *Remusatia vivipara* (Roxb.) Schott. | Mara kesu, Mara | Leaf, | Cooked |

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|---|---|---|---|---|
| | (Araceae) | thevu | Rhizome | |
| 56 | *Salacia chinensis* L. (Celastraceae) | Ekanayaka | Fruit | Raw |
| 57 | *Schleicheraoleosa*(Lour.)Merr. (Sapindaceae) | Chakatekayi | Fruit | Raw |
| 58 | *Senna sophera* (L.) Roxb. (Fabaceae) | Kaasamarda | Leaf | Cooked |
| 59 | *Senna tora* (L.) Roxb. (Fabaceae) | Tajank | Leaf | Cooked |
| 60 | *Smilax zeylanica* L. (Smilacaceae) | Chennereballi, Chennerebooru | Fruit | Raw/Cooked |
| 61 | *Solanum americanum* Mill. (Solanaceae) | Kooki | Fruit | Raw |
| 62 | *Solanum lasiocarpum* Jacq. (Solanaceae) | Mullubadane | Fruit | Cooked |
| 63 | *Solanum torvum* Sw. (Solanaceae) | Kudane | Fruit | Cooked |
| 64 | *Solena heterophylla*Lour. (Cucurbitaceae) | Karvolu | Fruit | Raw |
| 65 | *Spondias pinnata* (L.F) Kurz. (Anacardiaceae) | Ambate | Fruit | Raw/Cooked |
| 66 | *Sterculia foetida*L. (Malvaceae) | Peenari, Atte kayi | Seed | Roasted |
| 67 | *Syzygiumcaryophyllatum* (L.) Alston (Myrtaceae) | Kuntanerale, Kuntangeru | Fruit | Raw |
| 68 | *Syzygiumcumini* (L.) Skeels (Myrtaceae) | Nerale | Fruit | Raw |
| 69 | *Tamilnadiauliginosa*(Retz.)Tirv. &Sastre (Rubiaceae) | Adka Bare | Fruit | Raw |
| 70 | *Terminalia bellirica* (Gaertn.) Roxb. (Combretaceae) | ShaanthiKaayi | Seed | Raw |
| 71 | *Toddalia asiatica* (L.)Lam.(Rutaceae) | Are madala | Fruit | Raw |
| 72 | *Xyliaxylocarpa* (Roxb.) Taub (Fabaceae) | Jamba, Chirve | Seed | Cooked |
| 73 | *Zanthoxylum rhetsa* (Roxb.) DC. (Rutaceae) | Jummanakaayi, Kaavate, Gaamate | Fruit | Raw/Cooked |
| 74 | *Ziziphus mauritiana* Lam. (Rhamnaceae) | Bore hannu | Fruit | Raw |
| 75 | *Ziziphus oenoplia* (L.) Mill (Rhamnaceae) | Choorimullu | Fruit | Raw |
| 76 | *Ziziphus rugosa* Lam. (Rhamnaceae) | Kotte mullu, Kotte parndu | Fruit | Raw |

Fruits, leaves, tubers and rhizomes are the commonly used edible parts. Fruits are generally eaten fresh in raw form while other parts like leaves and tubers are consumed, usually after cooking. Analysis indicated that fruits/seeds are the most widely used edible part (54%) followed by leaves (16%), stems/rhizomes (6%) and tubers (6%). In 18% of plants, more than one part of the same plant is used for edible purpose.

A notable feature of traditional use of wild edible plants in Coastal Karnataka is that some of the plants have to be customarily consumed during some specific seasons of the year or during some specific cultural occasions. For example, tender stem of *Bambusabambos* (L.)Voss which is locally called **kanile**, and leaves of *Colocasia esculenta* (L.) Schott. (**kesu or thevu**), *Sennatora* (L.) Roxb. (**tajank**) and *Remusatia vivipara* (Roxb.) Schott. (**mara kesu** or **mara thevu**) are invariably consumed during a**ati**which is theforth month in Tulu calendar coinciding with July/August months of the English calendar. These plants which are considered as good for health are collected from wild for personal use by families and are also sold in the local markets of the study area during this season (**Fig**. 2). Aati month is generally considered as an inauspicious month with some prohibitions and restrictions, and is also associated with other local traditional practices like mass drinking of a decoction prepared from the stem bark of *Alstoniascholaris*(L.) R. Br. (Apocynaceae) which are believed to be improving immunity.

The leaves of *Senna tora* are used in the treatment of leprosy, ring worm, flatulence, colic, dyspepsia, constipation, cough, bronchitis and cardiac disorders in the Ayurvedic systems of medicine (Mazumder 2005).Phyto-pharmacological studies of *Colocasia esculenta*has proved its antimicrobial, antihepatotoxic, anti-cancer, antioxidant, antibacterial, antifungal, anthelmintic,antidiabetic, hypolipidemic, anti-melanogenic, estrogenic and neuropharmacological effects. Leaves of *Remusatia vivipara* have been found to be having high anti-oxidant activity (Asha *et al*. 2013). Many of the other plants used for edible purposes also reported to be having various ethno-medicinal uses in coastal Karnataka (Bhandary& Chandrashekar 2014). All these scientific evidences indirectly endorse the use of many of the above plants as seasonal foods to promote health.


**Fig. 2.** Seasonal edible plants sold in the markets of coastal Karnataka, India. **A**. Leaves of*Senna tora*(Tajank),**B**. Leaves of *Colocasia esculenta* **(**Thevu**)** and tender shoots of *Bambusabambos*(Kanile),and **C.** Leaves of *Remusatia vivipara*(Mara thevu).

**Plants used as fodder**

Agriculture with animal husbandry is the predominant traditional livelihood of the study area. Livestock rely mostly on fresh fodder extracted from local ecosystems.In the domestic cattle-rearing practice of Coastal Karnataka, a variety of local plants are used as fodder and galactogogues. Parts of these plants are fed to cattle, either raw or after cooking and mixing with other materials like paddy husk or rice-bran. A list of commonly used fodder and galactogenic plants is given as table3. These species comprises of a mix of trees, shrubs and herbs and are available during different seasons of the year. This ensures an uninterrupted supply of fodder to livestock throughout the year (Rashid 2012).

**Table 3.**Plants used as fodder and galactogogues by traditional communities of Coastal Karnataka, India

| Sl No. | Name of Species and Family | Local Name(s) | Part(s) Used |
|---|---|---|---|
| 1 | *Albizia lebbeck* (L.) Benth. (Fabaceae) | Baage | Leaf |
| 2 | *Aporosacardiosperma* (Gaertn) Merr. (Phyllanthaceae) | Saroli | Leaf |
| 3 | *Asparagus racemosus*Willd. (Asparagaceae) | Udrikande | Tuber |
| 4 | *Dilleniapentagyna*Roxb. (Dilleniaceae) | Mucchir | Leaf |
| 5 | *Dracaena terniflora*Roxb. (Asparagaceae) | KaaduKoove | Leaf |
| 6 | *Elephantopusscaber* L. (Asteraceae) | Nelamucchir | Entire plant |
| 7 | *Ficus racemosa* L. (Moraceae) | Arthi, Atti | Leaf |
| 8 | *Ficus hemicordata*Buch.-Ham. (Moraceae) | Arthi, atti | Leaf |
| 9 | *Flemingiastrobilifera* (L.) W. T. Aiton (Fabaceae) | Kankuta | Entire plant |
| 10 | *Ipomoea batatas* (L.) Hallier (Convolvulaceae) | Genasu, Kereng | Entire plant |
| 11 | *Ipomoea mauritiana* (L.) Hallier (Convolvulaceae) | Nelagenasu, NelaKereng | Entire plant |
| 12 | *Lagenandratoxicaria*Dalzel (Araceae) | NeerKoove | Leaf |
| 13 | *Maranta arundinacea* L. (Marantaceae) | Koove | Leaf |
| 14 | *Merremia tridentata* (L.) Hall. f. (Convolvulaceae) | Kulovu | Stem, Leaf |
| 15 | *Merremia umbellate* ( L.) Hall. f. (Convolvulaceae) | Kulovu | Stem, Leaf |
| 16 | *Mussaendalaxa* (Hook. F.) Hutch. Ex Gamble (Rubiaceae) | Bolletappu | Leaf |
| 17 | *Pothos scandens* L. (Araceae) | Arke | Stem, Leaf |
| 18 | *Pterocarpus marsupium*Roxb. (Fabaceae) | Honne | Leaf |
| 19 | *Sida cordata* (Burm.f.) Borss. (Malvaceae) | Kurundoti | Entire Plant |
| 20 | *Trema orientalis* (L.) Blume (Ulmaceae) | Bedikeri | Leaf |
| 21 | *Xyliaxylocarpa* (Roxb.) Taub. (Fabaceae) | Jambe | Leaf |

## Conclusions

The use of as many as 93 species of local wild plantsfor non-medicinal purposes, such as edible, and fodder, by the different traditional and tribal communities of coastal districts of Karnataka, India indicate that these communities possess a rich wealth of traditional ecological knowledge. Many of the wild edible plants, including those which are the part of seasonal food customs, have proven nutritional and medicinal advantages. Use of fodder plants of different

habits and habitats ensures an uninterrupted supply of fodder to livestock throughout the year. However, the practical use of wild plants for the studied traditional purposes has gradually decreased in the study area due to decrease and disappearance of plant diversity, lack of interest in the newer generation and availability of easily available modern alternatives.

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## References

1. Asha D, Nalini MS, Shylaja MD. 2013. Evaluation of phytochemicals and antioxidant activities of Remusatia vivipara (Roxb.) Schott., an edible genus of Araceae. *Der Pharmacia Lettre* 5(5): 120-127.
2. Balick M. Cox PA. 1996. Plants, People and Culture – The Science of Ethnobotany. Scientific American Library, New York.
3. Bhandary MJ, Chandrashekar KR, Kaveriappa KM. 1995. Medical Ethnobotany of the Siddis of Uttara Kannada district, Karnataka. India.*Journal of Ethnopharmacology* 47:149-156.
4. Bhandary MJ, Chandrashekar KR, Kaveriappa KM. 1996. Ethnobotany of the Gowlis of Uttara Kannada, Karnataka, *Journalof Economic and Taxonomic Botany* 12:244-249.
5. Bhandary MJ, Chandrashekar KR.2001. Treatment for poisonous snake-bites in the ethnomedicine of Coastal Karnataka. *Journal of Medicinal and Aromatic Plant Sciences* 22: 505-510.
6. Bhandary MJ, Chandrashekar KR.2003. Veterinary herbal medicine of Coastal Karnataka. *Journal of Economic and Taxonomic Botany*27: 645-655.
7. Bhandary MJ, Chandrashekar KR. 2011. Herbal therapy for herpes in the ethno-medicine of Coastal Karnataka. *Indian Journal of Traditional Knowledge* 10(3): 528-532
8. Bhandary MJ, Chandrashekar KR. 2014.Diversity and use of ethnomedicinal plants in coastal Karnataka, India. *Biodiversitas*15(1) 89-93.
9. Bhat KG. 2003. Flora of Udupi. Indian Naturalists, Udupi, Karnataka.
10. Census of India. 2011. https://censusindia.gov.in/2011
11. Gamble JS.1967. Flora of Presidency of Madras, Vol I-III. Botanical survey of India, Calcutta.
12. Harsha VH, Hebbar SS, Shripathi V, Hegde GR. 2003. Ethnomedicobotany of Uttara Kannada District in Karnataka, India, Plants in the treatment of skin diseases. *Journal of Ethnopharmacology* 84:37-40.
13. Harsha VH, Shripathi V, Hegde GR. 2006. Ethnoveterinary practices in Uttara Kannada District of Karnataka. *Indian Journal of Traditional Knowledge* 4: 253-258

14. Mazumder A, Lahkar V, Sahay J, Oraon A, Mazumder R, Pattnaik AK. 2005. Pharmacognostical studies on the leaves of Cassia tora Linn (Fam. Caesalpiniaceae). *Ancient Science of Life* 25(2) 74-78.
15. Rashid A, Sharma A. 2012. Exploration of economically important fodder plants of district Rajouri, Jammu and Kashmir State. *International Journal of Life Science and Pharma Research* 2(4): 142-149.