COMPENDIUM OF WILD EDIBLES FROM CHENBAGARAMANPUTHOOR
PANCHAYATH, KANYAKUMARI DISTRICT, TAMIL NADU, SOUTH INDIA.

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#### **ABSTRACT**

Wild edible plants are those that are not tamed or accomplished as food source but are wildly appearing as a part of the verdure. India being a diverse country with varied ethnic groups and phytogeography the preference of wild edibles their occurrence also varied greatly in different regions. To best of our knowledge, there is no previous report on this survey of wild edible plants. The sight of the present investigation is to analyze the possible wild edible plants in the selected study area (Chenbagaramanputhoor). The current study recorded 50 wild edible plants, among that, 4 species are annuals and 46 species are perennials. Based on the mode of regeneration of wild edible plants, 34 species are regenerated by seeds, followed by 13 species are by stem cutting, 3 species are by budding or grafting. Among the collected plants, 48 plants are used as medicinal, 2 plants are grown as ornamental. There are about species of angiosperms belonging to 40 genera and 29 families of wild edible plant species were reported. The predominant family are Myrtaceae, Solanaceae, Anacardiaceae with 4 species; Arecaceae, Phyllanthaceae, Piperceae, Sapotaceae contains 3 species

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each; Moraceae, Rutaceae, Cucurbitaceae, Fabaceae, Amaranthaceae contains 2 species each;

Annonaceae, Apiaceae, Apocynaceae, Cactaceae, Caesalpinioideae, Caricaceae contains one species

each. Therefore, this study may be pivotal and provocative source for advance ethno botanical studies

in the region. The wild plants will be devoid of fertilizers and pesticides, and some suggest that, they

come with higher antioxidant content. Therefore, there is a need to fabricate awareness among the

local people for the importance as well as conservation of these wild edible in their original habitat.

**Key words:** Alleviating, domesticated, eradication, malnutrition, pesticides.

INTRODUCTION

Wild edible plants (WEPs) are devoured as staple food, accretion to main dish, filling the gap of

food shortage and safety net during famine period (Shumsky et al., 2014; Addis et al., 2013;

Ashagre et al., 2016). As a result, food and nutrition security can better be attained through the

use of WEPs as food, nutraceuticals, and source of income and available under harsh

environmental conditions due to the broader limberness of WEPs (Zhang et al., 2016; Ebert,

2014). Human health depends on the quality of the territory in which they live (Panda, 2014).

The status and predictable of biodiversity prevalent in a country/state/region is dependent on the

land (soil, topography), climate and people (their habitats and population density) inhabiting the

region (Nayar, 2011). Biodiversity and bio resources are keysin fastening different fundamental

human needs (Ehrlich et al., 1992; Coe et al., 1996; Kaimowitz and Douglas, 2007). India is one

of the 17 mega-biodiversity rich regions and the North-Eastern part of the country harbors rich

and s unique biodiversity (Hazarika et al., 2012).

Forest plays a large indispensable role in improving the food security and livelihood of the tribal society (Yesodharan and Sujana, 2007). Forest resources reduce the vulnerability of local communities to food insecurity and provide a buffer in times of food shortage (Balemie and Kebebew, 2006; Misra *et al.*, 2008).

Wild edible plants are those plants with edible parts that grow naturally on farm land and on fallow or uncultivated land (Addis *et al.*, 2009; Teketay *et al.*, 2010). Wild edible plants have always been an essential and widespread food source for food-insecure families living in poverty in developing countries (Mavengahama *et al.*, 2013; Yumkham *et al.*, 2017). Wild edible plants are of crucial importance in all parts of the world in supporting the global food basket (Chakravarthy *et al.*, 2016). According to Lulekal *et al.*, (2011) about one billion people in the world use wild foods (mostly from plants) on a daily basis.

Wild edible plants are nutritionally rich and can especially supplement vitamins and micronutrients (Awas *et al.*, 2007). Market Values of Wild Edible Plantshousehold economic capability to acquire food in the market is a key for the food access pillar (Meragiaw *et al.*, 2015). According to Balemie and Kebebew, (2015) income derived from the sale of wild plants is of particular importance to the poorer households, which must supplement food production with cash in order to meet their basic needs. There was a strong belief, mainly by the indigenous people, that wild foods have a greater capacity to maintain the good health conditions of those who depend on them (Guyu and Muluneh, 2015; Anbessa, 2016).

Rapid deterioration of WEPs may be due to improper harvesting and postharvest handling practices. Assimilation of wild edible plants into the diet has much larger implications in terms of environmental sustainability, when the world is plagued with the grave crises of climate

change and food insecurity, and could lessen the footprints of agriculture and allow for a shift toward more sustainable food systems (Ray *et al.*, 2020).

### **MATERIALS AND METHODS**

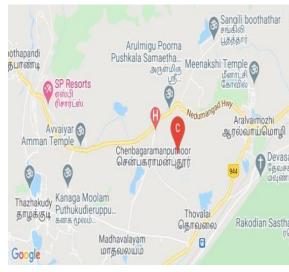
# Study area:

The study area Chenbagaramanputhoor Panchayath is situated in Thovalai Taluk, Kanyakumari district, Tamil Nadu, India. The Chenbagaramanputhoor previously called as Kattumadam. It is previously under the surveillance of Thiruvithangur Samasthanam. It is located 12 Km towards North from district headquarters, Nagarcoil, 4km from Thovalai, 718 km from state capital Chennai. This place is in the border of the Kanyakumari district and Thirunelveli district. The latitude is 8.2473885 and longitude is 77.508892 are the geo-coordinate of Chenbagaramanputhoor. Agriculture is the main proposing of the people in Chenbagaramanputhoor (Plate 1 and 2).

## PLATE 1 PLATE 2

### STUDY AREA MAPS





#### **Documentation:**

A field survey was conducted from January 2022 to March 2022 (3 months), to record the wild edible plants are growing in different parts of Chenbagaramanputhoor Panchayath. One visit was made at every week end. Thus, a total of twelve visits were made to all the practically possible places in search of wild edible plants. The periodical trips were under taken to the different part of the study area to get information about wild edible plants. The identification of plant was done using taxonomic literatures and with the help of experts. All the voucher specimens were maintained in the herbarium Department of Botany, S.T. Hindu College, Nagercoil.

### **RESULT AND DISCUSSION**

The present study divulged that the wild edible plants of the study area. A total of 50 plant species under 40 genera was recorded belonging to 29 families (Table 1, 2, 3). Among the 29 families, Euphorbiaceae was the dominant family with 47 species followed by Myrtaceae, Solanaceae, Anacardiaceae with 4 species Arecaceae, Piperaceae, Sapotaceae contains 3 species each, Moraceae, Rutaceae, Cucurbitaceae, Fabaceae, Amaranthaceae contains 2 species each; Annonaceae, Apiaceae, Apocynaceae, Cactaceae, Caesalpinioideae, Cariaceae, Euphorbiaceae, Lamiaceae, Lythraceae, Malvaceae, Meliaceae, Moringaceae, Oxalidaceae, Rhmnaceae, Rubiaceae contains single species each (Table 3). Based on the percentage of composition, the family Euphorbiaceae, Myrtaceae, Solanaceae (8%); Anacardiaceae, Arececeae, Piperceae, Sapotaceae (6%); Amaranthaceae, Cucurbnitaceae, Fabaceae, Moraceae, Rutaceae (4%); Annonaceae, Apocyanaceae, Apiaceae, Cactaceae (2%); Caesalpinioideae, Cariaceae, Euphorbiaceae, Lamiaceae, Lythraceae, Malvaceae, Meliaceae, Moringaceae, Oxalidaceae, Rhamnaceae, Rubiaceae (2%) are distributed in the study area. From the recorded plants most of them are trees (27 species), herb (13), shrub (3), climber (7) (Table: 2). The

present study recorded 4 annuals and 46 perennials are distributed in the study area. Based on the mode of regeneration of wild edible plants, 34 species are regenerated by seeds, followed by 13 species are by stem cutting, 3 species are by budding or grafting. Among the collected plants, 48 plants are used as medicinal, 2 plants are grown as ornamental (Table: 3). The most frequently consumed WEPs found in this study areas are trees, which is similar to results from other studies around the world, probably because trees frequently produce edible fruits that are highly valued by people. By contrast, a review on plants used by indigenous groups in Mexico, including the Mayans, found that herbs were consumed more often than products from trees or shrubs. This study agrees with several other studies showing that fruits are the most commonly used plant part (Pardo-de-Santayana (2005); Menendez-Baceta, 2011). Solanaceae is considered a family of high global importance. This is of importance as Meso-america has been one of the most active places in plant domestication in the world. The percentage of medicinal edibles reported in this study (29.5%) is comparable to percentages observed by Uprety (2012) (24%), (69%) or did not find a clear role of medicinal edibles in the region Menendez-Baceta (2011). The surroundings of the dwellings and early foot paths are normally preferred places of food gathering and therefore most WEPs are usually related to such areas. It is a well-known fact that many wild food plants are also used for medicinal purposes (Etkin, 1996). Some of them are still used as medicinal herbs (e.g. Acalypha indica and Ocimum tenuiflorum), whereas, in other cases (Carica papaya and Cirtus limon), the former medicinal purpose has been lost and the consumption of their young shoots is simply regarded as a food use. Most of the species used for herbal teas and also have this double purpose. Initially utilized for their digestive properties, nowadays they are sometimes simply considered as beverages. The 'medicinal properties' of wild edibles in the past included their contribution to health by adding variety to the human diet. Many wild plants were

probably a good source of vitamins and minerals, especially for children, when cultivated fruits and vegetables were not as easily available as they are today. The wild edibles from 49 botanical families were identified as used by the Vasavas in Dediapada Taluka. This is a high number of species compared to other studies previously undertaken in India: 61 species from Maharashtra located near Gujarat Mallesh (2012) and 22 species from the deciduous forests of Chhattisgarh in Central India (Kala 2009). From the Northeastern state of Manipur, there were reports of 32 wild edibles and 68 species by Thongam (2016). The leafy vegetable plants, 24 species were identified in the present study, which is comparable to 21 species reported from Uttarakhand by Misra *et al.*, (2008).

90 from the Mekong Delta region of Vietnam (Ogle *et al.*, 2003). 54 from Tibetan communities of the eastern part of the Tibetan Plateau (Kang *et al.*, 2016); Zou *et al.*, (2010). The latter being very heterogeneous in terms of elevation, inhabitants and vegetation.

There are about species of angiosperms belonging to 40 genera and 29 families of wild edible plant species were reported. The predominant family is Myrtaceae, Solanaceae, Anacardiaceae with 4 species, Arecaceae, Phyllanthaceae, Piperaceae, Sapotaceae contains 3 species each, Moraceae, Rutaceae, Cucurbitaceae, Fabaceae, Amaranthaceae contains 2 species each Annonaceae ,Apiaceae, Apocynaceae, Cactaceae, Caeselpinioidaeceae, Caricaceae. Euphorbiaceae, Lamiaceae, Lythraceae, Malvaceae, Meliaceae, Moringaceae, Oxalidaceae, Rhmanceae, Rubiaceae contains single species each. All plant species scientific name, family, vernacular name, time of availability, edible part and mode of consumption are provided. Different plant parts were used as wild edible. Among these leaves and fruits were used (39%), followed by seeds (2%), shoot (leaves and stem) with (9%).

Table- 1: Survey of wild edible plants in the study area.

S.NO	NAME OF THE PLANTS	FAMILY	COMMON NAME
1.	Acalypa indica L.	Euphorbiaceae	Kuppaimeni
2.	Aerva lanata (L.)Juss.ex schlt.	Amaranthaceae	Mountain knot grass
3.	Amaranthus viridis L.	Amaranthaceae	Green amaranth
4.	Anacardium occidentale L.	Anacardiaceae	Cashew
5.	Annona squamosa L.	Annonaceae	Sugar apple
6.	Artocarpus heterophyllus L.	Moraceae	Jack fruit
7.	Artocarpus hirsutus L.	Moraceae	Ayani sakkai
8.	Averrhoa bilimbi L.	Oxalidaceae	Bilimbi
9.	Azadirachta indica L.	Meliaceae	Neem
10.	Borassus flabellifer L.	Arecaceae	Palm
11.	Carica papaya L.	Caricaceae	Papaya
12.	Catharanthus roseus L.	Apocyanaceae	Periwinkles
13.	Centella asiatica (L.)Urban.	Apiaceae	Vallarai keerai
14.	Cissus quadrangularis L.	Vitaceae	Pirandai
15.	Citrus medica L.	Rutaceae	Narthangai
16.	Citrus limon L.	Rutaceae	Lemon
17.	Coccinea indica	Cucurbitaceae	Kovakkai
18.	Cocos nucifera L.	Arecaceae	Coconut
19.	Coffea arabica L.	Rubiaceae	Coffee
20.	Ficus racemosa L.	Moraceae	Athi palam
21.	Lantana camara L.	Verbenaceae	West indian lantana
22.	Mangifera indica L.	Anacardiaceae	Mango
23.	Manilkara zapota L.	Sapotaceae	Sapodilla
24.	Mimusops elengi L.	Sapotaceae	Spanish cherry
25.	Momordica charantia L.	Cucurbitaceae	Bitter gourd
26.	Moringa oleifera L.	Moringaceae	Drumstick
27.	Ocimum tenuciflorum L.	Lamiaceae	Tulsi
28.	Opuntia littoralis (Engelm.) Cockerell.	Cactaceae	Opuntia
29.	Passiflora foetida L.	Passifloraceae	Passionflower
30.	Phoenix pusilla Roxb.	Arecaceae	Ceylon date palm
31.	Phyllanthus emblica L.	Euphorbiaceae	Indian gooseberry
32.	Phyllanthus acidusL.	Euphorbiaceae	Sheema nellikai
33.	Phyllanthus niruri L.	Euphorbiaceae	Keelanelli
34.	Piper betle L.	Piperaceae	Betal
35.	Piper longum L.	Piperaceae	Long pepper

36.	Piper nigrum L.	Piperaceae	Black pepper
37.	Pithecellobium dulce L.	Fabaceae	Kodukkapuli
38.	Pouteria campechiana L.	Sapotaceae	Egg fruit
39.	Psidium guajava L.	Myrtaceae	Guava
40.	Punica granatum L.	Lythraceae	Pomegranate
41.	Senna auriculata (L.)Roxb.	Caesalpinioideae	Aavarampoo
42.	Solanum nigrum L.	Solanceae	Black nightshade
43.	Solanum procumbens (L).	Solanaceae	Bitter sweet
44.	Solanum torvum Sw.	Solanaceae	Turkey berry
45.	Solanum virginianum (L.)	Solanaceae	Kantakathri
46.	Syzgium cumini L.	Myrtaceae	Java plum
47.	Syzgium samarangense (blume) Merr.&L.M.Perry.	Mytaceae	Rose apple
48.	Tamarindus indica L.	Fabaceae	Tamarind
49.	Theobroma cacao L.	Malvaceae	Cacao
50.	Zizipus mauritiana L.	Rhamnaceae	Illanthai

Table- 2: Habit wise distribution of wild edible plants in the study area.

S.NO	NAME OF THE PLANTS	FAMILY	HABIT
1.	Acalypa indica L.	Euphorbiaceae	Herb
2.	Aerva lanata (L.) Juss.ex schlt.	Amaranthaceae	Herb
3.	Amaranthus viridis L.	Amaranthaceae	Herb
4.	Anacardium occidentale L.	Anacardiaceae	Tree
5.	Annona squamosa L.	Annonaceae	Tree
6.	Artocarpus heterophyllus L.	Moraceae	Tree
7.	Artocarpus hirsutus L.	Moraceae	Tree
8.	Averrhoa bilimbi L.	Oxalidaceae	Tree
9.	Azadirachta indica L.	Myrtaceae	Tree
10.	Borassus flabellifer L.	Arecaceae	Tree
11.	Carica papaya L.	Caricaceae	Tree
12.	Catharanthus roseus L.	Apocyanaceae	Herb
13.	Centella asiatica (L.)Urban.	Apiaceae	Herb
14.	Cissus quadrangularis L.	Vitaceae	Climber
15.	CitrUS medica L.	Rutaceae	Shrub
16	Citrus limon L.	Rutaceae	Shrub
17.	Coccinea indicaL.	Cucurbitaceae	Climber
18.	Cocos nucifera L.	Arecaceae	Tree
19.	Coffea arabica L.	Rubiaceae	Shrub

20.	Ficus racemosa L.	Moraceae	Tree
21.	Lantana camera L.	Verbenaceae	Herb
22.	Mangifera indica L.	Anacardiaceae	Tree
23.	Manilkara zapota L.	Sapotaceae	Tree
24.	Mimusops elengi L.	Sapotaceae	Shrub
25.	Momordica charantia L.	Cucurbitaceae	Climber
26.	Moringa oleifera L.	Moringaceae	Tree
27.	Ocimum tenuiflorum L.	Lamiaceae	Herb
28.	Opuntia littoralis (Engelm.) Cockerell.	Cactaceae	Herb (Succulent)
29.	Passiflora foetida L.	Passifloraceae	Climber
30.	Phoenix pusilla Roxb.	Arecaceae	Shrub
31.	Phyllanthus emblica L.	Euphorbiaceae	Tree
<i>32</i> .	Phyllanthus acidus L.	Euphorbiaceae	Tree
33.	Phyllanthus niruri L.	Euphorbiaceae	Herb
34.	Piper betle L.	Piperaceae	Climber
35.	Piper longum L.	Piperaceae	Climber
36.	Piper nigrum L.	Piperaceae	Climber
37.	Pithecellobium dulce L.	Fabaceae	Tree
38.	Pouteria campechianaL.	Sapotaceae	Tree
39.	Psidium guajava L.	Myrtaceae	Tree
40.	Punica granatum L.	Lythraceae	Tree
41.	Senna auriculata (L.)Roxb.	Caesalpiniaceae	Herb
42.	Solanum nigrum L.	Solanaceae	Herb
43.	Solanum procumbens (L.)	Solanceae	Herb
44.	Solanum torvum Sw.	Solanaceae	Herb
45.	Solanum virginianum (L.)	Solanaceae	Herb
46.	Syzgium cumini L.	Myrtaceae	Tree
47.	Syzgium samarangense (Blume)Merr.&L.M.Perry.	Meliaceae	Tree
48.	Tamarindus indica L.	Fabaceae	Tree
49.	Theobroma cacao L.	Malvaceae	Tree
50.	Zizipus mauritiana L.	Rhamnaceae	Tree

Table-3: Economic importance of identified wild edible plants in the study area

S.NO	NAME OF THE PLANTS	USES
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1.	Acalypa indica L.	Crushed leaves mixed with salt, or a decoction of plant, is used for scabies and other skin problems. Root infusion or decoction is taken for asthma, and also to clean the liver and kidneys.
2.	Aerva lanata (L.) Juss.ex schlt.	Anti-inflammatory, anti-helmintic, anti-bacterial and mild analgesic effects.
3.	Amaranthus viridis L.	Eaten as a boiled green or as a vegetable in many parts of the world.

4.	Anacardium occidentale L.	Leaves are used as treatment for reducing fever, malaria, toothache, and gum problems.
5.	Annona squamosa L.	The leaves are used as a vermicide, for treating cancerous tumors, also applied to abscesses, insect bites and other skin complaints
6.	Artocarpus heterophyllus L.	The seeds and the flesh of jackfruit are consumed as curries and boiled forms, while the flesh in fully ripen stage can be eaten directly as a fruit.
7.	Borassus flabellifer L.	Anti-inflammatory and anti-oxidant properties.
8.	Averrhoe bilimbi L.	They are used as edible. It is used to give sour or an acidic flavor to food, substituting tamarind or tomato.
9.	Azadirachta indica L.	Young bitter leaves of neem are cooked and eaten in India. They are eaten raw or fried along with other vegetables. Flowers are used for flavor; they are bitter unless cooked. Fully ripe fruit pulp is eaten raw or cooked and used for drinks.
10.	Carica papaya L.	They used to eaten as edible fruits. Diets high in antioxidants may reduce the risk of heart disease.
11.	Catharanthus roseus L.	An infusion of the flowers is used to treat mild diabetes A decoction of the roots is taken to treat dysmenorrhea.

10		Centella is used as a leafy green in Sri Lankan cuisine, being
12.	Centella asiatica (L.) Urban.	the predominantly locally available leafy green, where it is called gotu kola.

ds, wounds, broken bones, ndigestion.
lmintic, appetizer, and tonic, latulence, hemorrhoids, skin
n acid flavor.
jaundice.
ed in cooked dishes, or dried
eds are used as a stimulant, n central nervous system,
s, diarrhea, inflammatory y and urinary diseases.
pe though like many fruit are l green.
parts of plant are used as a at, diaphoretic, stomachic, uretic and to treat diarrhea, achitis, cough, hypertension, leucorrhoea, haemorrhage
wounds, ulcers, neuralgia, d thrush in babies.

23.	Mimusops elengi L.	Mainly used for dental ailments such as bleeding gums, pyorrhea, dental caries, and loose teeth.
24.	Momordica charantia L.	Cancer prevention, treatment of diabetes, fever, HIV infections.
25.	Moringa oleifera L.	Diuretic, rubefacient, and laxative.
26.	Ocimum tenuiflorum L.	Aiding cough, asthma, diarrhea, fever, dysentery, arthritis, eye diseases, indigestion, gastric ailments, etc.
27.	Opuntia littoralis (Engelm.)Coclrell.	The leaves and egg-shaped fruit of all Opuntias are edible.
	T	
28.	Phoenix pusilla Roxb.	Treat bladder stones, Piles, Fevers, Dysentery, Rectal prolapses, Pies, Cough, Urinary tract infections.
29.	Phyllanthus emblica L.	Treatment of diarrhea, jaundice, and inflammation.
30.	Phyllanthus acidus L.	To treatinflammatory, rheumatism, bronchitis, asthma, respiratory disorder, hepatic diseases and diabetes
31.	Phyllanthus niruri L.	Diuretic, boosting the excretion of sodium in the urine.
32.	Piper betle L.	A mixture of betel leaves and other ingredients is used as a masticatory.
33.	Piper longum L.	Dried, unripe berries are used as a condiment in curries and pickles, and also as an adulterant of black pepper.
34.	Piper nigrum L.	It is used as flavouring, particularly for savoury foods, meat dishes, sauces and snack foods. It is also used as a table condiment.

412-431

35.	Pithecellobium dulce L.	The abundance of vitamins B1, B2 elevate metabolism while ample vitamin B6 content ensures optimal functioning of the brain, bolstering memory, mood and concentration.
36.	Artocarpus hirsutus L.	Jackfruit paste is applied to the skin for poisonous bites.
37.	Pouteria campechiana L.	The fruit is excellent when eaten raw, it can also be used in cakes, pies, ice creams, puddings etc.
38.	Psidium guajava L.	It is used against dysentery, diarrhea, hepatitis, gonorrhea, coughs, stomach pain, skin problems, ringworms, wounds, and ulcers.
39.	Punica granatum L.	The fruit juice can be used in soups, sauces, jellies, ice cream, cakes etc.
40.	Senna auriculata (L.)Roxb.	People use <i>Cassia auriculata</i> for diabetes, eye infections (conjunctivitis), joint and muscle pain (rheumatism), constipation, jaundice, liver disease, and urinary tract disorders.
41.	Solanum procumbens (L.)	To treat pneumonia, aching teeth, stomach ache, tonsillitis, ring worms, pain, inflammation .
42.	Solanum nigrum L.	Green berries contain the toxic alkaloid, solanum, like the foliage.
43.	Solanum torvum Sw.	Fruit and leaves can be used to control a range of microbial activities.
44.	Solanum virginianum (L.)	A decoction of the fruits used for treatment of diabetes, cough, chest pain, against vomiting, hair fall, leprosy, itching scabies, skin diseases and cardiac diseases associated with edema.
45.	Passiflora foetida L.	The fruits is edible.
46.	Syzgium cumini L.	To treat chronic diarrhea and other enteric disorders.
47.	Syzgium samarangense(blume) Merr.&L.M.Perry	It is mainly eaten as a fruit and also used to make pickles (chambakka achar).

48.	Tamarindus indica L.	In traditional medicine, it is used in wound healing, abdominal pain, diarrhea, dysentery, parasitic infestation, fever, malaria and respiratory problems.
49.	Theobroma cacao L.	Widely used in the confectionery industry to made chocolate confections, cakes, ice cream, drinks etc.
50.	Zizipus mauritiana Lam.	Fruits have a sweet, apple-like flavor and can be eaten as a nutritious snack.

## **CONCLUSION**

A good number of wild edible plants are seen in Chenbagaramanputhoor Panchayath, Kanyakumari District, Tamil Nadu, and India. Wild edible plants play an important role in local people's daily life, and the ethno botanical information of the wild edible plants collected from ethnic groups could provide key scientific data to promote the traditional cultural value among the young generation and relief the stress of human. The wild plants will be devoid of fertilizers and pesticides, and some suggest that, they come with higher antioxidant content. Wild edible plants refer to edible species that are not cultivated or domesticated. WEPs have an important role to play in poverty eradication, security of food availability, diversification of agriculture, generation of income resources, and alleviating malnutrition.

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