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Floristic documentation is imperative for biodiversity conservation

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ABSTRACT: Background: Among all states of India, the Kerala state constitute major flowering plants, in which 20 % are trees and 30 % are Western Ghats endemics **Aim:** The present study was aimed to survey extensively for field observations to find out the floristic diversity in Kottayam District of Kerala. **Method:** The ethno botanical survey was done on the floristic diversity in Kottayam District of Kerala in the year 2015-16. **Results:** The present study reveals that, there are about 152 taxa belong to 135 genera and 63 families were documented from the floristic diversity of Ayyampara, Meenachil Taluk of Kottayam District, Kerala. Among the total documented Flora; Herbs, Shurbs, Trees, Climbers were of 96, 18, 19 and 17 species respectively. The Herbs are dominant growth form. Out of total plants documented, 60 species are utilized as potential source of medicine followed by 72 species for ornamental, 25 species for edible purposes and 38 species for miscellaneous purposes. In addition to these, the present study also noticed some of the threatened factors which are adversely affect the growth and survival of the plants in the study area. **Conclusion:** The survey concluded that proper conservation measures and sustainable utilization of natural resources are very essential for conserving these plants for future generation.

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INTRODUCTION:

The estimated number of flowering plants in Kerala constitutes nearly one-fourth of the total 17,000 flowering plants of India. Among the flowering plants of Kerala, 20 % are trees and 30 % of them are Western Ghats endemics [1]. Based on floristic composition the state of Kerala comes under the Malabar phyto-geographical province [2]. The state harbours 5094 taxa under 1537 genera and 221 families of flowering plants [3]. A total of 1709 taxa that are endemic to Peninsular India are found in Kerala; of which 237 species distributed in 47 families are exclusively endemic to the present political boundary of the state [4].

The Western Ghats also known as the Sahyadris in peninsular India is identified as one of the hotspots in the world. In Western Ghats a region of the Kerala includes, there are about 1170 species with established medicinal properties. The flowering plants of Kerala include 858 exotics that have been introduced as agriculture, forestry as well as accidentally entered species [5]; of which around 200 species have become naturalised in the state. Gymnosperms are represented by just 5 species belonging to 3 genera. The state also harbours 337 species of pteridophytes [6] and 465 taxa of bryophytes [7]. Wild flora is very important in view of aesthetic and recreational value for human beings has always had a vital interest in plants of all kinds. In ancient times a knowledge of which plants were useful, generally as food and other purposes such as medicines, fibers, dyes, religious and ornamental purposes [8]. The present study on the Floristic analysis of Ayyampara, Meenachil Taluk of Kottayam District, Kerala is mainly aimed to achieve some of the objectives like to document the floristic elements of the study area, to assess various economic potentialities of documented flora and also analyse various threatening factors in the study area.

MATERIALS AND METHODS:

Study Area (Ayyampara, meenachil Taluk of Kottayam District, Kerala):

Kottayam district, Kerala. It is covering an area of 55.40 square kilometres (21.39 sq m) and is located in South-Central region of Kerala with a population of 357,533 according to the 2011 census. The general soil type in the district is alluvial soil. The vegetation is mainly tropical evergreen and moist deciduous type. The climate in this district is moderate and pleasant. The particular location site of Kottayam district results in little seasonal temperature variation, with moderate to high levels of humidity.

Ayyampara is a place of natural beauty located in Meenachil Taluk of Kottayam district, Kerala. Meenachil Taluk lies in the North-Eastern region of Kottayam district (9.36° N and 76.17° E). Ayyampara is a big rock mountain; it consists of more than 100 acres (0.40 km^2) of rocks. Climate has a heavy rainy season and mild summer. Summer rains are not infrequent. The hills in the backdrop it never gets very hot, and the climate tends towards windy and cool. This area gets rain from two monsoon seasons, the south-west monsoon and the north-east monsoon. The average rainfall is around 3600 mm per year. The South-West monsoon starts in June and ends in September. The North-East monsoon season is from October to November. Pre-monsoon rains during March to May are accompanied by thunder and lightning; the highest rainfall during this period in December. January and February are cooler, while March, April and May are warmer. The temperature ranges between 38.5 and 15 °C. The flat rocky hill top surrounded by different types of grasses. This weather makes the soil good for all crops. In addition to that, a considerable variety of medicinal plants also grows her, which has been used in making the traditional home remedies (Fig 1 to 7).

Fig 1. Map of India showing Kerala state.

Fig 2. Map of Kerala state showing Kottayam District.

Fig 3. Map of Kottayam District showing Meenachil Taluk.

The present study was based on an extensive survey and field observations during the year 2015 - 2016. In this study an attempts were made to find out various floristic elements from Ayyampara, Meenachil Taluk of Kottayam district, Kerala.

Fig 4. The Satellite image of the study area Ayyampara.

Fig 5. The view of study area 1.

Fig 6. The view of study area 2.

Fig 7. The field observation and documentation.

The documentation was mainly based on the field observation, discussions with local peoples as well as scrutiny of the literature. The collected specimens were identified taxonomically with the help of available Floras and literature [8]. The nomenclature of each species has been brought up to data as per the rules given in the International Code of Nomenclature (ICN). During the field visits, the plant specimens were collected at different reproductive stages to prepare herbarium specimens. The specimens were processed for the preparation of Herbarium by standard procedure [9]. The voucher specimens were deposited in the Herbaria of PG Department of Botany, Deva Matha College Kuravilangad, Kottayam for future reference.

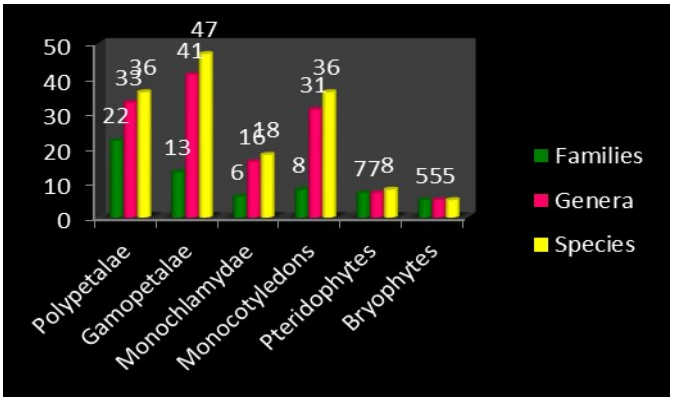

Fig 8. Analysis of the Floristic components in the study area.

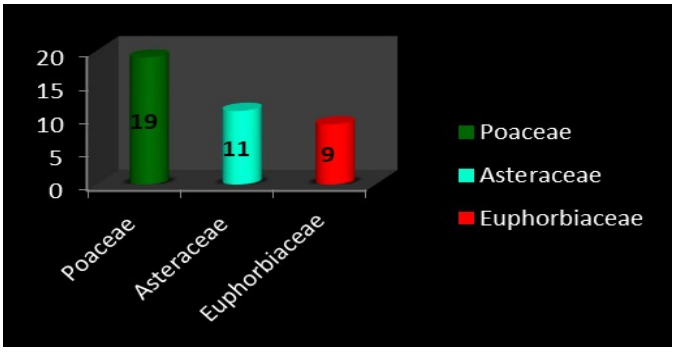

Fig 9. Analysis of the Dominant families of angiosperms.

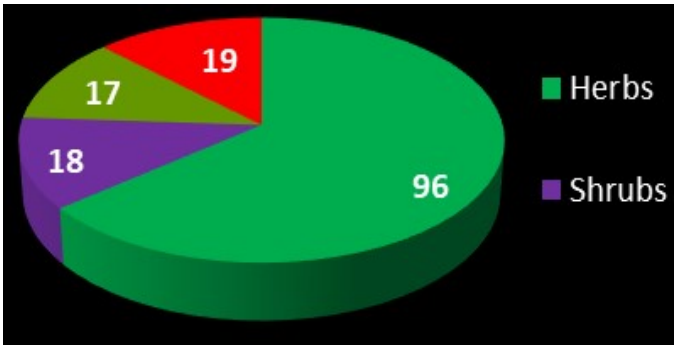

Fig 10. Life form analysis of angiosperms in the study area.

Table 1. Floristic analysis of the study area.

Analysis of Medicinal Plants		Families		Genera		Species	
Dicotyledons	Polypetalae	22	41	33	90	36	101
	Gamopetalae	13		41		47	
	Monochlamydae	6		16		18	
Monocotyledons		8		31		36	
Pteridophytes		7		7		8	
Bryophytes		5		5		5	
Total		61		133		150	

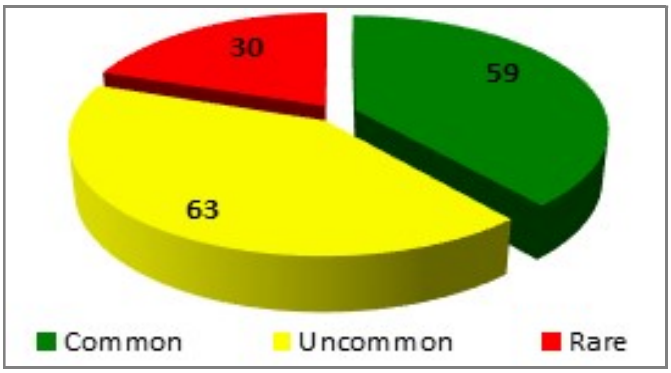

Fig 11. Distribution analysis of the Dominant families of angiosperms.

RESULTS AND DISCUSSION:

Floristic Overview:

The present study on the floristic diversity of Ayyampara, Meenachil Taluk of Kottayam District, Kerala reveals that, there are about 150 taxa belongs to 133 genera and 61 families. In angiosperms, out of 49 families represented *Poaceae* is the first dominant family with 19 species followed by *Asteraceae* is the second dominant family with 11 species and *Euphorbiaceae* is the third dominant family with 9 species and other families represented by 2 and 1 species respectively. Similarly in case of pteridophytes, 8 taxa belongs to 7 genera and 7 families. Out of 7 families represented *Adiantaceae* is the first dominant family with 2 species and other families represented single species each. While, in Bryophtes, 5 taxa belongs to 5 genera and 5 families (Table 1; Fig 8 and 9).

In order to infer the dominant genera of the documented Flora reveals that, the genera like Ipomoeais the dominant ones with 3 species followed by generas like Artocarpus (2 species), Cleome (2 species), Cyperus (2 species), Hyptis (2 species), Stachytarpheta (2 species), Sida (2 species), Pennisetum (2 species), Mimosa (2 species), Kyllinga (2 species), Euphorbia (2 species), Eriocaulon (2 species), Eragrostis (2 species), Oldenlandia (2 species), Phyllanthus (2 species) are other dominant ones. All other genera are represented with single species each (Table 2). Similarly in the case of pteridophytes Adiantum only is having 2 species all others representing each.

Life form Analysis:

In order to infer the total life forms of documented plants present in study area reveals that, Herbs are more dominant form in which 96 species followed by Shrubs with 18 species, Climbers possess 17 species and Trees with 19 species. The present result also indicates that, the plants which are documented from the study area are contributing more to the biodiversity of exiting ecosystem (Fig 10).

Distribution analysis of the study Area:

The diversity and distribution of floristic members in the study area reveals that, there are about 59 species are commonly distributed. While 63species are Uncommon or sporadically distributed and 30of them are very rarely occur in the study area. This diversity analysis also highlights the value of floristic elements which are documented from the study area can contribute more to the biodiversity of an existing area (Fig 11).

Economic potentiality of documented plants:

Out of total plants documented, 60 species are utilized as potential source of medicine followed 72 species for ornamental, 25 species for edible purposes and 38 species for miscellaneous purposes. The various economic potentialities of these plants are revealed through the survey and also discussion with local inhabitants as well as scrutinizing literature. The survey finding data are given in Table 2 to 5.

Major threats to the study area:

The present study also noticed some threats in the study area are habitat destruction as well as habitat fragmentation along with some anthropogenic pressures. More over the invasion many exotic weeds are also adversely affect the growth and survival of many native

Table 2. List of medicinal plants in the study area.

Sl. No	Botanical Name	Local Name	Family	Plant parts	Medico-potentiality
1	*Adiantum lunulatum* Burm.	Maidenhair Fern	*Adiant-aceae*	Root	Decoction of root is used in the treatment of throat affection.
2	*Aerva lanata* (L.) Juss.	Cherula	*Amaranth-aceae*	Leaf	The juice of leave used for kidney stone.
3	*Ageratum conyzoides* L.	Plakkadi	*Astera-ceae*	Leaf	Used against ring worm. The leaves pastes is mixed with lime and applied on affected part.
4	*Annona reticulate* L.	Aatha	*Annon-aceae*	Bark	Bark in powdered form used for diarrhea and dysentery.
5	*Artocarpus Heterophyllus* Lam.	Plavu	*Mora-ceae*	Leaf	The leaves are useful for curing fever, wounds and skin diseases.
6	*Artocarpus hirsutus* Lam.	Anjili	*Mora-ceae*	Seed	Roasted seeds powder mixed with honey for the treatment of asthma.
7	*Azadirachta indica* A. Juss.,	Aryaveppu	*Melia-ceae*	Leaf and bark	Neem oil is used as folk medicine to control leprosy, intestinal helminthiasis, respiratory disorders.
8	*Biophytum sensitivum* (L.) DC.	Nilamth-engu	*Gerani-aceae*	Whole plant	The whole plant is used in chronic skin troubles.
9	*Capsicum frutescens* L.	Kanthar-imulaku	*Solana-ceae*	Fruit	Fruit is used for various problems with digestion including upset stomach, intestinal gas, stomach pain, diarrhea, and cramps.
10	*Carica papaya* L.	Kappal-anga	*Carica-ceae*	Seed	The air-dried papaya seeds mixed with honey to treat helminthiasis.
11	*Catharanthus roseus* (L.) G. Don,	Nithiya-kalyani	*Apocyn-aceae*	Leaf	The juice of the leaves is a good remedy for wasp sting and it is highly potential in cancer therapeutics.
12	*Centella asiatica* (L.) Urban in Mart.	Kodangal	*Apiaceae*	Leaf	Used for memory problems, leaf paste with raw goat milk daily one time.
13	*Cheilanthes tenuifolia* (Burm. f) Sw.	--	*Cheilanth-aceae*	Leaf	The juice obtained from the leaves is mixed with hot water and taken orally along with honey to treat throat pain.
14	*Cleome viscosa* L.	Kattuk-aduku	*Cleom-aceae*	Leaf	The fine paste of leaves is prepared and applied to the inflammation and boils.
15	*Clidemia hirta* (L.) D. Don	Kattuk-adaly	*Melasto-maceae*	Root	The root juice is used for varicose vein.
16	*Coccinia grandis* (L.) Voight,	Koval	*Cucurbit-aceae*	Leaf	A paste made of leaves is applied to the skin to treat scabies and Juice of unripe fruits and leaves are also used as herbal control for diabetes.
17	*Cocos nucifera* L.	Thengu	*Araca-ceae*	Fruit	Coconut oil is widely used to promote healthy growth of hair.
18	*Coffea Arabica* L.	Kappi	*Rubia-ceae*	seed	The infusion of the ripe and roasted seeds takes care of diarrhea.
19	*Colocasia esculenta* (L.) Schott	Chembu	*Araceae*	Root	Roots are cooked to eat to prevent the risks of a heart attack.
20	*Commelina benghalensis* L.	Kanav-azhai	*Comme-linaceae*	Leaf	The leaf paste is applied on cuts and wounds.

21	*Curculigo orchioides* Gaertn.,	Nilappana	*Hypoxid-aceae*	Whole plant	The whole plant extract is also used as herbal control for diabetes.
22	*Cyclea peltata* (Lam.) Hook. F. and Thoms.	Padathali	*Menisper-maceae*	Root	The paste of root and leave is used for wounds and skin diseases.
23	*Cymbopogon flexuosus* (Nees ex Steud.) Wats.	Theruv-appullu	*Poaceae*	Leaf	The leaf extract is used as balm to cure head ache of the children.
24	*Dactyloctenium aegyptium (*L.)	Kavar-apullu	*Poaceae*	Whole plant	The plant extract is applied for worm infection.
25	*Drynaria quercifolia* (L) J. Sm.	--	*Dryna-riaceae*	Fronds	Fronds used for hectic faces and cough. The decoction of the plant is also used in typhoid fever. Fronds are useful in body swelling.
26	*Elephanto pusscaber* L.,	Anach-uvadi	*Aster-aceae*	Root	The root is boiled with water, this mixture used twice daily for piles.
27	*Eleusine indica* (L.) Gaertn.	Raahi	*Poaceae*	Whole plant	The whole plant is used to treat liver complaints.
28	*Emilia sonchifolia* (L.) DC.	Muyal-chevian	*Aster-aceae*	Leaf	The leaf paste is mixed with small amount of salt and used for tonsillitis.
29	*Eragrosti sunioloides* (Retz.)	Karay-ampullu	*Poaceae*	Leaf	The leaf of the grass are crushed in to paste and applied to the wounds.
30	*Euphorbia hirta* L.	Nilampatti	*Euphor-biaceae*	Whole plant	The plant decoction used for dysentery.
31	*Hemidesmus indicus* (L.) R.Br.	Narun-eendi	*Asclepi-adaceae*	Root	The root is boiled with a small amount of water then it is mixed with honey and given orally for stomach disorders and it is also used to cool burning sensation of bodies.
32	*Heteropogon contortus* (L.) Roem.	Shoola-mpullu	*Poaceae*	Whole plant	The plant extract is used to cure toothache.
33	*Hibiscus rosasinensis* L.	Chemb-arathi	*Malv-aceae*	Flower	The flower extract is used against diabetes and it is also used for hair growth.
34	*Holarrhena pubescens* (Buch.-Ham.) Wall.	Kadal-apala	*Apocy-naceae*	Bark	The stem bark and root bark are used to treat amoebic dysentery.
35	*Hyptissuaveolens* (L.) Poit.,	Kattu-malli	*Lami-aceae*	Root	The root paste is used for head ache.
36	*Ipomoea Triloba* L.	Little Bell	*Convolv-ulaceae*	Leaf	The decoction of the leaves is used for treatment for stomach ache.
37	*Kyllinga brevifolia* Rottb.	Nutsedge	*Cyper-aceae*	Whole plant	A decoction of the whole plant for treatment against malaria, whooping cough and The leaves are taken internally in the treatment of diarrhea.
38	*Kyllinga nemoralis* (J. R & G. Forst.)	Peemu-thanga	*Cyper-aceae*	Whole plant	The decoction of whole plant is used to treatment of pimples.
39	*Lantana camara* L.	Kong-inni	*Verben-aceae*	Whole plant	The decoction of plant used for malaria.
40	*Leucas aspera* (Willd.) Link,	Thumba	*Lamia-ceae*	Leaf and Flower	The fresh juice of leaf and flower are mixed with small amount of asafetida (*Ferula asafetida*) and used twice daily for worm infestation in children.

41	*Macaranga peltata* (Roxb.) Muell.-Arg.	Vatta	*Euphorbi-acaea*	Bark	Fresh stem bark extract as a lotion for cuts by iron tools.
42.	*Mimosa pudica* L.	Thottal-vadi	*Mimos-aceae*	Whole plant	The whole plant extract is used as remedy for diabetes and it is also used to cure cuts and wounds.
43.	*Momordica charantia* L.	Paval	*Cucurbit-aceae*	Leaf and Fruit	The juice of leaf and fruit is given orally in empty stomach in early morning to cure diabetes.
44	*Moringa pterygosperma* Gaertn.	Muringa	*Moring-aceae*	Leaf	Leave extract is used to reduce swelling,
45	*Murraya koenigii* (L.) Spreng.,	Kariv-eppila	*Rutaceae*	Leaf	A bunch of curry leaves can be ground up and the juice of the leaves can be consumed to reduce diarrhea.
46	*Myristica Fragrans* Houtt.	Jathi	*Myristi-caceae*	Seed	The seed oil is used to reduce muscular pain and rheumatic pain of joints.
47	*Ocimum Tenuiflorum* L.	Thulasi	*Lamia-ceae*	Leaf	The leaves made into paste are used to cure parasitical diseases of the skin, especially the ringworm.
48	*Panicum Repens* L.	Victoria-Grass	*Poaceae*	Stem	Fresh juice prepared from the inter node portion of the plant and it is filtered. This filtrate is used as eye drop to cure eye irritation.
49	*Parahemionitis cordata* Fras.	--	*Hemionita-daceae*	Leaf	Leaf extract is applied to centipede bite and wounds.
50	*Peperomia pellucida* (L.)	Maship-atcha	*Piper-aceae*	Leaf and Stem	The aerial parts of plant are used as dressing for wounds.
51	*Phyllanthus emblica* L.	Nelli	*Euphorbi-aceae*	Fruit	Mixture of fruit juice of *Phullanthus* and *Curcuma longa* powder is taken in empty stomach to cure diabetes.
52	*Piper nigrum* L.	Kurum-ulaku	*Piper-aceae*	Fruit	Externally it is applied to the boils and ring worm infection in form of paste.
53	*Rauvolfia serpentina* (L.) Benth.	Sarpag-andhi	*Apocyn-aceae*	Root and leaf	Root extract is used for Hyper tension, insomnia and leaf extract is highly potential for poisonous bites (snake, spider etc.)
54	*Ricinus communis* L.	Aavan-nakku	*Euphorbi-aceae*	Leaf and seed	The leaves are used as anti-inflammatory and it stimulate menstruation in women. Seed oil used on burns and wounds against infections.
55	*Scoparia dulcis* L.	Kallur -ukki	*Scrophul-ariaceae*	Leaf and Stem	The juice obtained from both stem and leaf used for kidney stone.
56	*Selaginella delicatula* (Desv) Alston in Journ	Chera-vapipe	*Selagi-nellaceae*	Whole plant	The whole plant juice is applied on wound and healing.
57	*Spilanthes Ciliate* HBK,	Kuppama-niyan	*Astera-ceae*	Inflores cence	The young inflorescence of the plant is used to cure tooth ache.
58	*Syzygium aqueum* (Burm.f.) Alston,	Jamba	*Myrta-ceae*	Leaf	A leaves infusion used in the treatment of stomach aches and dysentery.
59	*Tridax procumbens* L.	Kumi-nippacha	*Aster-aceae*	Leaf	The leaf juice applied on cuts and wounds.
60	*Vernonia cinerea* (L.) Less.	Puvank-urunal	*Aster-aceae*	Leaf	The leaf juice is given orally to cure diarrhea.

Table 3. List of ornamental plants in the study area.

Sl. No.	Botanical Name	Local Name	Family	Plant parts	Ornamental potentiality
1	*Adenosma indiana* (Lour.)	Kasith-umba	*Scrophular-iaceae*	Flower	Good looking habit with attractive blue flowers.
2	*Adiantum Lunulatum* Burm.	Maiden hair fern	*Adiant-aceae*	Stem	Black wiry stem looks like *"Maiden hair"*
3	*Ageratum conyzoides* L.	Appa	*Astera-ceae*	Leaf and flower	Good looking habit with cottony leaves and blue color inflorescence.
4	*Alstonia scholaris* (L.)	Ezhilam-ppala	*Apocyna-ceae*	Flower	Beautiful white flowers.
5	*Anisomeles Indica* (L.)	Karith-umba	*Lamia-ceae*	Flower	Beautiful habit with small scented violet flower.
6	*Axonopus compressus*	Kaalap-pullu	*Poaceae*	Whole plant	Lawn grass
7	*Biden spilosa* L.	Kitha-chedi	*Asteraceae*	Flower	An attractive cream colored flower.
8	*Biophytum Sensitivum* (L.) DC.	Nilam-thengu	*Geraniaceae*	Leaf flower	Pretty habit with fascinating pinnate leaves and small yellow flower.
9	*Bryophyllum Pinnatum* (Lam.) Kurz,	Elam-ulachi	*Crassulaceae*	flower	Good looking habit with greenish brown flowers.
10	*Catharanthus roseus* (L.)	Nithyak-allyani	*Apocyn-aceae*	Flower	An attractive salvar shaped corolla.
11	*Centros emamolle* Benth	Kattu-payar	*Fabaceae*	Flower	Pleasing pink petals.
12	*Chassalia curviflora*	Yamari	*Rubiaceae*	Flower fruit	Attractive white – purple flowers and purple or black fruit.
13	*Chrysopogonaci culatus* (Retz.)	Asthra-pullu	*Poaceae*	Inflore-scence	Attractive Inflorescence
14	*Cleome burmannii*	Kattuk-adugu	*Cappar-aceae*	Flower	Beautiful violet colored flowers.
15	*Cleome viscosa* L.	Karim-kadugu	*Cappar-aceae*	Flower	Conspicuous yellow flowers.
16	*Clerodendroninf ortunatum* L.	Periyilam	*Verben-aceae*	Flower	An attractive crown like white inflorescence.
17	*Clidemia hirta* (L.) D. Don,	Soapbush	*Melast-omaceae*	Flower	Lovely white flower.
18	*Coccinia grandis* (L.)	Koval	*Cucur-bitaceae*	Flower	Good looking vine habit and white flower.
19	*Commelinabeng halensis* L.	Kanav-azhai	*Comme-linaceae*	Flower	Attractive creeping herb with blue flower.
20	*Crotalaria pallida* Dryand.	Kilukilikki	*Fabaceae*	Flower	Attractive yellow inflorescence.
21	*Curculigo orchioides* Gaertn.	Nilappana	*Hypoxidaceae*	Flower and leaf	An attractive yellow perianth.
22	*Cyanotis axillaris*	Creeping Cradle	*Commel-inaceae*	Flower	Pretty spreading habit with charming blue flower.

23	*Cyathodium cavernarum*	--	*Targioni-aceae*	Thallus	Good looking thallus.
24	*Cycas circinalis* L.	Thedd-appana	*Cycad-aceae*	Leaf	Good looking habit and pinnate leaves.
25	*Cyperus platystylis*	--	*Cypera-ceae*	Whole plant	Fascinating tufted herb.
26	*Dalbergialance olaria* L.	Kann-anvaka	*Fabaceae*	Flower	Attractive light violet flowers.
27	*Desmodiumhete rophyllum*	Spanish clover	*Fabaceae*	Leaf and flower	Gorgeous prostrate herb with trifoliate leaves and small flower.
28	*Drynaria quercifolia* (L)	--	*Drynari-aceae*	Flower	Grown as indoor plant due to its attractive fronds and sori.
29	*Elephanto pusscaber* L.	Aana-chuvadi	*Asteraceae*	Flower	Good looking habit and small inflorescence.
30	*Emilia sonchifolia*	Muyal-chevian	*Asteraceae*	Flower	Good looking habit attractive corolla.
31	*Eriocaulonthwai tesii* Koern.	--	*Eriocaul-aceae*	Flower	Beautiful globose head with white flowers.
32	*Eriocaulon xeranthemum* Mart.	Dry flower pipe wort	*Eriocaul-aceae*	Flower	Attractive white flowers.
33	*Funaria hygrometrica*	--	*Funariaceae*		Attractive habit
34	*Gomphrena globosa* L.	Chend-umalli	*Amara-nthaceae*	flower	Beautiful rose coloured globose head.
35	*Hibiscus rosasinensis* L.	Chemb-arathi	*Malvaceae*	Flower	Erect attractive shrub with red flower.
36	*Holarrhena pubescens* (Buch.-Ham.)	Kadal-apala	*Apocynaceae*	Flower	An attractive white colored flowers.
37	*Hyptis suaveolens* (L.)	Nattap-oochedi	*Lamiaceae*	Flower	Beautiful blue colored flowers.
38	*Ipomoea hederifolia* L.	Theepo-rimulla	*Convol-vulaceae*	Leaf flower	A well branched vine with broadly ovate-cordiform leaves having stunning red flowers
39	*Ipomoea quamoclit* L.	Akasha-mulla	*Convolvu-laceae*	Flower	Attractive flowers.
40	*Ipomoea triloba* L.	Little Bell	*Convol-vulaceae*	Flower	Small beautiful violet color flower.
41	*Lantana camara* L.	Kongini	*Verbenaceae*	Flower	Beautiful and very attractive flowers.
42	*Leucas aspera* (Willd.)	Thumba	*Lamiaceae*	Flower	Delightful 2- lipped white corolla and habit.
43	*Ludwigia-hyssopi folia* (G. Don)	Neerg-rampu	*Onagr-aceae*	Flower	A good looking habit with small yellowish flowers.
44	*Melinis repens* (Willd.)	Thoovalpullu	*Poaceae*	Inflore-scence	The inflorescence are attractive.
45	*Merremia vitifolia* (Burm.)	Manjav-ayaravalli	*Convol-vulaceae*	Flower	An attractive prostrate habit with cream yellowish flowers.
46	*Mussaenda frondosa* L.	Vellila	*Rubiaceae*	Sepal	The good looking petaloid sepals are attractive.

47	*Naregamia alata* Wight	Nilana-ragam	*Rutaceae*	Leaf and flower	Attractive trifoliate leaves with small white scented flowers.
48	*Oldenlandiaherbacea* (L.)	Monga-nampullu	*Rubiaceae*	Flower	Beautiful habit with very small white flowers.
49	*Osbeckia aspera* (L.)	Kattuma-ntharam	*Melasto-maceae*	Flower	Attractive pink flowers.
50	*Parahemionitiscordata* (Roxb.)		*Hemionit-idaceae*	Fronds	Due to an attractive fronds, this fern is known as "Rabbit ear fern"
51	*Passiflora foetida* L.	Chadayan	*Passiflo-raceae*	Flower	Beautiful white – purple flower.
52	*Peperomia pellucida* (L.)	Maship-atcha	*Piperaceae*	Leaf	Beautiful succulent habit and attractive leaves.
53	*Pennisetumpedicellatum* Trin.	Oolapp-ullu	*Poaceae*	Inflore-scence	The plants with white or purplish panicles.
54	*Pennisetumpolystachyon* (L.)		*Poaceae*	Inflore-scence	A good looking habit with cream-yellow panicles.
55	*Pileamicrophyla* (L.)	Artillery Plant	*Urticaceae*	Leaf	Enchanting small succulent herb and their leaves are attractive.
56	*Platycladusorientalis* (L.)	Thuja	*Cupre-ssaceae*	Leaf	Good looking habit with attractive leaves.
57	*Pueraria phaseoloides* (Roxb.) Benth.	Thotta-payar	*Fabaceae*	Flower	Beautiful flowers.
58	*Rauvolfiaserpentina* (L.)	Sarpag-andhi	*Apocyna-ceae*	Flower	Very attractive white colored inflorescence.
59	*Rivina humilis* L.	Raktha-nelli	*Phytolac-caceae*	Flower and fruit	Small white colored flowers and red round fruit.
60	*Rungia parviflora* (Retz.) Nees in Wall.	--	*Acanthaceae*	Flower	Attractive habit with small white flowers.
61	*Selaginelladelicatula* (Desv)	--	*Selagine-llaceae*	Fronds	Attractive fronds.
62	*Sida acuta* Burm. f.	Anaku-runthotti	*Malvaceae*	Flower	Charming yellow flowers.
63	*Spilanthes ciliata*HBK	Kuppa-maniyan	*Asteraceae*	Flower	Enchanting yellow florets.
64	*Stachytarphetacayennensis* (	Cayenn-esnake weed	*Verbenaceae*	Flower	Good looking sessile white flowers.
65	*Stachytarphetajamaicensis* (L.)	Kattup-unnuthu	*Verbenaceae*	Flower	Good looking sessile light blue flowers.
66	*Tithoniadiversifolia (*Hemsl.)	Kaippa-npachha	*Asteraceae*	Flower	Attractive yellowish flowers.
67	*Torenia bicolor* Dalz.	Kakka-poovu	*Scrophul-ariaceae*	Flower	Beautiful dark blue petals.
68	*Triumfettarhomboidea* Jacq	Oorpam	*Tiliaceae*	Flower	Pleasing flowers in leaf opposed cymes.
69	*Utricularia cecilii*	Krishnapoo	*Lentibul-ariaceae*	Flower	Very small good looking habit with blue colored flowers.
70	*Vernonia cinerea* (L.)	Poovam-kurunthala	*Asteraceae*	Flower	Good looking habit with pink to purple capitula.
71	*Wattakakavolubilis* (L. f.)	Vattakakkakkoti	*Asclepia-daceae*	Flower	Beautiful greenish cream colored flowers.
72	*Wedeliatrilobata* (L.)	Manjakanjunni	*Asteraceae*	Flower	Attractive yellow flowers.

Table 4. List of edible plants in the study area.

Sl. No.	Botanical Name	Local Name	Family	Plant parts	Edible potentiality
1	*Annona reticulate* L.	Aatha	*Annon-aceae*	Fruit	Ripe fruit is edible .it is a cream-white flesh and numerous brown seeds.
2	*Artocarpus heterophyllus* Lam.	Plavu	*Moraceae*	Fruit and leaf	It is a nutritious fruit, rich in vitamins A, B and C, potassium, calcium, iron, proteins and carbohydrates. Pulp of ripe fruit is eaten fresh or made into various local delicacies including jam, jelly.
3	*Artocarpus hirsutus* Lam.	Anjili	*Moraceae*	Fruit	Fruits are sweet, edible, bright yellow, ovoid covered with spines, seeds ovoid and white. These are usually used as an ingredient in snacks.
4	*Capsicum frutescens* L.	Kappal-mulaku	*Solan-aceae*	Fruit	Fruits are used as condiments.
5	*Carica papaya* L.	Kappa-langa	*Caric-aceae*	Fruit leaf	Ripe fruit is edible. Its juice is a popular beverage, and its young fruits are cooked as a vegetable.
6	*Centella asiatica*L.	Kudakan	*Apiaceae*	Leaf	The young leaves are used as vegetable
7	*Coccinia grandis* (L.)	Koval	*Cucurbi-taceae*	Fruit	Fruits and leaves are used as vegetables.
8	*Cocos nucifera* L.	Thengu	*Areca-ceae*	Fruit	The fruit oil is commonly used for the prepare foods.
9	*Coffea arabica* L.	Kappi	*Rubia-ceae*	Fruit	Coffee powder is prepared from dried fruits.
10	*Colocasia esculenta* (L.)	Chembu	*Areceae*	Leaf	Corns are cooked before eating.
11	*Eleusine indica* (L.) Gaertn.	Ragipullu	*Poaceae*	Seed	The seed is rather small, it is used as a famine food and it is used in making cakes. Cooked young seedlings are used as a side dish with rice.
12	*Hibiscus rosasinensis* L.	Chemba-rathi	*Malva-ceae*	Flower	The flowers are used as vegetable
13	*Mangifera indica* L.	Mavu	*Anaca-rdiaceae*	Fruit	Ripened fruit is edible. The fruit is commonly pickled with salt, oil, and spices.
14	*Manihot esculenta*	Kappa	*Euphor-biaceae*	Tuber	Stem tubers are cooked before eating. Tubers contain vitamin A, C and E and several minerals.
15	*Momordica charantia* L.	Paval	*Cucur-bitaceae*	Fruit	Fruits are also used as vegetables
16	*Moringa pterygosperma* Gaertn.	Muringa	*Moring-aceae*	Leaf fruit	The leaves and fruit area highly nutritious antioxidant.it used as a vegetable.
17	*Murraya koenigii* (L.) Spreng.	Kariv-eppila	*Rutaceae*	Leaf	The leaves provide the flavor to the curries. The main nutrients found in curry leaves are carbohydrates, energy, fibre, calcium, phosphorous, iron, magnesium, copper and minerals, vitamin, vitamin A, B and E.
18	*Musa paradisiaca* L.	Vazha	*Musaceae*	Fruit	The yellow to black stages of fruit is used in sweet dishes. Steam-cooked fruit are considered a nutritious food for infants and the fruits and inflorescences also used as vegetable.

19	*Myristica fragrans* Houtt.	Jathi	*Myristic-aceae*	Seed	The seed oil is used as a natural food flavoring in baked foods, syrups, beverages ,sweets etc.
20	*Passiflora foetida* L.	Ammum-mapa-zham	*Plassiflo-raceae*	Fruit	The fruits are edible.
21	*Phyllanthus emblica* L.	Nelli	*Euphorb-iaceae*	Fruit	Fruits are edible also used to prepare pickles.
22	*Piper nigrum* L.	Kurum-ulaku	*Pipera-ceae*	Seed	When cooking, add pepper just before removing the dish from heat to ensure best flavour.
23	*Syzygium aqueum* (Burm.f.)	Chamba	*Myrta-ceae*	Fruit	Ripened fruit is edible and this fruit is commonly pickled with salt, oil, and spices.
24	*Tamarindus indica* L.	Valampul i	*Fabaceae*	Fruit	The fruits are edible, more over this also used as condiments.
25	*Terminalia catappa* L.	Thalli-thenga	*Combre-taceae*	Fruit	The fruits are edible.

Table 5. List of plants which are used for miscellaneous purposes.

Sl. No.	Botanical Name	Local Name	Family	Plant parts	Miscellaneous uses
1	*Alloteropsis cimicina* L.	--	*Poaceae*	Whole plant	Used as fodder
2	*Annona reticulate* L.	Aatha	*Annon-aceae*	Seed, leaf fruit	The seeds, leaves and young fruits have insecticidal properties. The plant is poisonous and has a potential as a pesticide for non-vertebrates.
3	*Artocarpus heterophyllus* Lam.	Plavu	*Moraceae*	Leaf	The wood is used in manufacturing musical instruments, furniture, doors, windows and roof constructions and their young leaves can be used as fodder for cattle.
4	*Artocarpus hirsutus* Lam.	Anjili	*Moraceae*	Wood	The wood is used for making frames of doors and windows. The wild jack wood timber has been in the production of ships and boats.
5	*Axonopus compressus*	Kaalap-pullu	*Poaceae*	Whole plant	Used as fodder
6	*Azadirachta indica* A. Juss.	Arya-veppu	*Meliaceae*	Seed	The seed pulp is useful for methane gas production. Bark contains tannins which are used in dye production. In south India its wood is used to make the furniture.
7	*Brachia riaramosa* L.	Chama-pothaval	*Poaceae*	Grains	Grains are used as cereals
8	*Chloris barbata* Sw.	Kodap-pullu	*Poaceae*	Whole plant	Used as fodder
9	*Chrysopogon aciculatus*	Asthra-pullu	*Poaceae*	Whole plant	Used as fodder
10	*Cocos nucifera* L.	Thengu	*Areca-ceae*	Leaf and wood	The leaf is used for thatching and their wood is used as making furniture and as formwork in concrete construction.
11	*Commelina benghalensis* L.	Kanav-azhai	*Comme-linaceae*	Whole plant	Used as fodder.
12	*Cymbopogon flexuosus* Wats.	Theruva-ppullu	*Poaceae*	Leaf	The leaves of the grasses are kept in the boxes as insect repellent.

13	*Dactyloctenium aegyptium* L.	Kavar-apullu	*Poaceae*	Whole plant	Used as fodder
14	*Dalbergia lanceolaria* L. f.	Kann-anvaka	*Fabaceae*	Wood	The Timber is strong, tough. It is used for making superior quality furniture.
15	*Desmodium heterophyllum* (Willd.) DC.	Spanish clover	*Fabaceae*	Root	The spreading habit of this species can prevent soil erosion.
16	*Digitaria ciliaris* Retz.	Henry's crabgrass	*Poaceae*	Whole plant	Used as fodder
17	*Eleusine indica* (L.)	Kattut-hina	*Poaceae*	Grains	Grains are used as cereals
18	*Eragro stisviscosa* (Retz.)		*Poaceae*	Whole plant	Used as fodder
19	*Heteropogon contortus* (L.)	Shoola-mpullu	*Poaceae*	Whole plant	It used as fodder and it is also used for paper making.
20	*Hevea braziliensis* (Willd.)	Rubber	*Euphor-biaceae*	Latex	The tree produces milky fluid called latex. This latex is turned into rubber (elastic material). it is the main resource in tyre industry, leather industry and other rubber related products
21	*Holarrhena pubescens* (Buch.-Ham.)	Kadal-apala	*Apocy-naceae*	Wood	It is used to make combs, picture frames, carved boxes, toys, spoons, and sometimes for furniture and ploughs. It has been used to make paper.
22	*Leucas aspera* (Willd.) Link	Thumba	*Lami-aceae*	Flower	It is most used pooja flower in Kerala temples.
23	*Macaranga peltata* (Roxb.) Muell.-Arg.	Vatta	*Eupho-rbiaceae*	Wood	The wood is used to for the manufacture of inferior quality furniture.
24	*Mangifera indica* L.	Mavu	*Anacar-diaceae*	wood	It is used for making furniture.
25	*Manihot esculenta*	Kappa	*Euphor-biaceae*	Resin	The resin is used to manufacture biodegradable bags, reusable gloves, capes.
26	*Musa paradisiaca* L.	Vazha	*Musa-ceae*	Fruit peel	Banana peel is used food for animals.
27	*Ocimum tenuiflorum* L.	Tulasi	*Lamia-ceae*	Leaf flower	The leaves and inflorescence is used in temples for pooja.
28	*Oplismenus compositus* (L.)	--	*Poaceae*	Whole plant	Fodder plant; also called as 'Buffallo grass'
29	*Panicum repens* L.	Victoria Grass	*Poaceae*	Whole plant	Used as fodder
30	*Paspalum conjugatum* Berg.	Hilogras	*Poaceae*	Whole plant	Used as fodder
31	*Pennisetum polystachyon* (L.)	--	*Poaceae*	Whole plant	Used as fodder
32	*Phyllanthus emblica* L.	Nelli	*Eupho-rbiaceae*	Fruit	Fruit is used in inks, shampoos and hair oils, the high tannin content of Indian gooseberry fruit serves as a mordant for fixing dyes in fabrics.
33	*Pseudanthi-stiria umbellate*	--	*Poaceae*	Whole plant	Used as fodder
34	*Ricinus communis* L.	Aavan-nakku	*Eupho-rbiaceae*	Seed	The seed oil is commonly used for the preparation of hair-oils, hair fixers and aromatic perfumes.

35	*Sida alnifolia* L.	Kurun-thotti	*Malva-ceae*	Whole plant	The whole plant is used for making a natural shampoo.
36	*Synedrella nodiflora* (L.) Gaertn.	Mudian-pacha	*Astera-ceae*	Whole plant	It is used as fodder plants
37	*Syzygium aqueum* (Burm.f.)	Jamba	*Myrta-ceae*	Wood	The wood is hard and can be used to make tools.
38	*Tamarindus indica* L.	Vala-mpuli	*Fabaceae*	Wood	It wood is used for making agricultural instruments.

plant species. Hence, an urgent attention is required to protect and conserve these valuable plant species for future generation.

CONCLUSION:

The present study on the floristic diversity of Ayyampara, Meenachil Taluk of Kottayam District, Kerala reveals that, there are about 152 taxa belongs to 135 genera and 63 families. Out of 63 families represented *Poaceae* is the first dominant family with 19 species. *Asteraceae* is the second dominant family with 11 species respectively and *Euphorbiaceae* is the third dominant family with 9 species and other families represented by 2 and 1 species respectively.

Among the total documented Flora, Herbs (96 species) are dominant growth form, followed by Shrubs (18 species), Trees (19 species) and Climbers (17 species). The human beings can depend the plants for various needs in their daily life activities such as medicinal, edible, ornamental and miscellaneous uses. Out of total plants documented 60 species are utilized as potential source of medicine followed 72 species for ornamental, 25 species for edible purposes and 38 species for miscellaneous purposes.

In addition to these, the present study also noticed some of the threatened factors which are adversely affect the growth and survival of the plants in the study area. The present exploration highlights the role of the present study area for the contribution of phyto-diversity as well as the biodiversity of that area, which is highly remarkable. Hence proper conservation measures and sustainable utilization of natural resources are very essential for conserving these plants for future generation.

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