DEPARTMENT OF ENVIRONMENTAL SCIENCES,

ALL SAINTS' COLLEGE, THIRUVANANTHAPURAM

PROJECT REPORT ON

FLORISTIC STUDIES ON FERN POPULATIONS IN OUR LOCALITIES

Year 2021-2022

SUBMITTED BY

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DECLARATION

We, **Akhila M S, Athira A V, Rehitha Prasannan S, Rejitha Muthayyan,** hereby declare that this project "Floristic studies on the ferns of our localities “is the bonafide record of work carried out by us under the supervision and guidance of **Dr. Smitha Asok V**, Assistant Professor, Department of Environmental Sciences. All Saints College, Thiruvananthapuram, and that no part of this work has been previously formed the basis for the award of any degree or diploma.

September 2021

Thiruvananthapuram

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INDRODUCTION

Pteridophytes are considered to be primitive vascular plant group which scattered all over the world. Ferns belonging to Polypodiopsida are the most diverse group of pteridophytes. Recent morphological and molecular phylogenetic analysis indicate the ferns are the sister group of seed plants. The number of known extant fern species is about 10500 but estimates have ranged as high as 15000 the number varying because certain groups are as yet poorly studied and because new species are still being found in unexplored tropical areas. The ferns constitute an ancient division of vascular plants, some of them as old as carboniferous period and perhaps older.

The ferns are extremely diverse in habitat, form, and reproductive methods. In size alone they range from minute filmy plants only 1-1.2 cm tall to huge tree ferns 10 to 25meters in height. Some are twinning and vine like; others float on the surface of ponds. The majority of ferns inhabit warm, damp areas of the earth.

The Western Ghats region is one of the richest centres of biodiversity in India. It is one among the 18 hotspots in the world. Ferns are uncommon and invasive species outside of their natural ranges, although a few occur. One species of water spangles became a major pest in India, blocking irrigation in ditches and rice paddies.

They are beautiful elements of biodiversity and occur in wide range of habitat from sea level to mountain tops. All human activities disturb the vegetation by eliminating many species. So, an up to date study is very important to know about flora especially in the case of pteridophytes.

USES OF FERNS

Ferns are used in various systems of medicines, food and also as ornamentals is due to its diverse fronds.

Source of Food

With very few expectation ferns have not been widely used as a source of food. The fern stems, rhizomes, leaves, young fronds and shoots and some

whole plants are used for food. Blechnum orientalis, rhizome is eaten and whole plant is used as a food. The young fonds is eaten either salad or as vegetable after cooking. The rhizome and young shoots of Nephrolepis biserrata are eaten as vegetable.

Source of Medicine

Over 54 species of ferns and fern allies were identified for medicinal uses. Frond, rhizomes or the whole plant are used as the medicinal source.

For Pest Control

Ferns are widely used in pest control. Filicin which is isolated from the rhizome of Dryopteris filixmas, is a potential insecticide. The ferns are effective in arresting embryonic development in insects.

As Ornamentals

The ferns are cultivated as ornamentals either indoors in the houses or outdoors in the botanical gardens due to their delicate beauty and grace. They can also be grown in baskets for indoor decoration which can be kept on stands or as in hanging baskets.

A large number of ferns are considered to be highly prized as foliage ornamentals whether indoors or outdoors. It has been pointed that most of the nursery supplies as also plants for other economic uses are based on collection from wild population and individuals from forest. Most of the fern sps. are being shade and moisture loving, grow in the interiors of forests. Any disturbance of vegetation leads to the destruction of ferns. In certain forest the pteridophytes have been completely eradicated due to destruction of forest to make way for crop cultivation. Therefore, it is concluded that though exploitation of pteridophytic taxa for their economic value is necessary.

REVIEW OF LITERATURE

Ferns are the most diverse group of vascular plants after seed plants. Recent morphological and molecular phylogenetic analyses indicate that ferns are the sister group of seed plants and include the families Psilotaceae, and Equisetaccae, which have not always been considered as ferns (Pryer et al., 2001). This phylogenetic circumscription and position of ferns has not been accepted by all, especially palaeobotanists who have argued that including fossil taxa in the phylogenies resolves ferns as paraphyletic (Rothwell and Nixon, 2006 Tomescu, 2011).

The study on Pteridophytes of Kerala began with Van Rheede (1703) who included 19 illustrations and descriptions of Pteridophytes in his monumental work Hortus Mulabaricus. Beddome (1864) reported 271 species from South India. His collections were mainly from Nilgiris, Anamalais and Kerala mountains of Western Ghats and he has recorded only 38 species from Kerala. After Beddome, three major works only have come out dealing with the Pteridophyte flora of covering the geographical area of Kerala.
Manickam and Irudayaraj (1992) published Pteridophytic flora of the Western Ghats-South India. They have explored the geographical area of Southern parts of Palghat gap and also included some parts of the Eastern Ghats (Yeracaud, Kolli hille Pachamalai). Nayar and Geevarghese (1993), in the Fern flora of Malahar described 170 species. This study was confined to the Northern districts of Kerala- (Calicut, Cannanore, Malappuram, Palakkad and Wayanad) alone. The Fen flora of South India by Nampy and Madhusoodanan (1998) gave an account of Polypodioid ferns (Grammitidaceac, Loxogrammaceae and Polypodiaceae) only.

They described 33 species from the states of Kerala, Tamil Nadu, Karnataka and Andhra Pradesh. Besides these, several new taxa of Pteridophytes have been published from Kerala, Phymatosorus malabaricus by Namby and Madhusoodanan (1994); Helminthostachys zeylanica var. brachyspicae by Madhusoodanan & Nampy (1994). In addition to this, several authors have contributed to the study of the cytology of the Pteridophytes of Kerala. Abraham and Ninan (1965) have reported the eytology of the species of Ophioglossum reticulatum L. and Psilotum nudum (L.) P. Beauv. Abraham et al. (1962) have worked about 100 species of South Indian Pteridophytes which includes many species from Kerala Kuriachan (1968) .

Madhusoodanan & Sevichan (1991) have worked on the genus Adiantum in Kerala. Madhusoodanan & Leena (1994) worked on the genus Christella Lev. Majeed et al. (1994) on the genus Bolbitis and Egenolfia in Kerala. Azeez el a. (1996) have studied Spleen worts (4splenium) of Kerala. Madhusoodanan &Leena (1994) and Prathapchandran et al. (1996) have studied the spore morphology of the thelypteroid and cyathioid ferns.

A study on the taxonomy, eytology and evolution of ferms and lycophvtes were conducted by Ninan and Mathew (2016). They suggest that the existence of very high ploidy levels in the South Indian region is due to the dynamic cytological evolution of ferns in the tropical belt. A study on the cytology, systematic. phylogeny and evolution of Pteridophytes suggests the classification of Smith et al (2006) based on morphological and molecular evidences is the most tenable classification and it is also in conformity with cytological data (Mathew & Cinthya, 2018). A comprehensive study on the cytology of seven apogamous ferns in Kerala highlighted phylogenetic and

evolutionary significance of apogamy in ferns (Mathew & Cinthya, 2019). Fern taxonomists have long employed the characteristics of the rhizome, indusium, sporangia and spores in thcir construction of the systematic treatments of various taxa. Leaf characters like venation pattern, trichomes, epidermis and ontogeny of stomata has been utilized for taxonomic purposes. Likewise, stipe characters have also proved to be of great value (Srivstava 2008). Combination of morphological and anatomical features of the species in cach family favours identification process easier by providing more available data to distinguish each species (Maideen et al., 2013)

MATERIALS AND METHODS

The present study refers to the study of diversity of ferns in our localities and surroundings. Attempts were made to study the diversity in relation to fronds, sporangia, and other morphological characters. Different materials used and various methods adopted for the investigations are described below.

Plant Collection

Fern plants were collected from our home surroundings and also from the area of a nearby water source. Both domesticated as well as wild species were collected. The collected plant specimens where photographed. Morphological data of the plants where identified.

Identification of Ferns

Identification of the ferns were done based on the characters such as a rhizome type, stipe, lamina, venation and sori. The collected specimens were critically studied and identified with the help of authentic taxonomic literature. The Ferns of Southern India (Beddome, 1864); The Pteridophytic Flora of Western Ghats -South India (Manickam and Irudayaraj, 1992); Fern Flora of Malabar (Nayar and Geevarghese, 1993) and Fern Flora of South India (Nampy and Madhusoodanan, 1998) The identified ferns were classified following the classification of Smith (2006).

RESULTS AND DISCUSSION

In the study on the diversity of ferns in our home surroundings and in the wild, an attempt has been made to collect and identify the fern species of the locality by considering diagnostic characters such as rhizome type, stipe, lamina venation and sori. This is achieved by collecting the specimens both wild and from our home surroundings and observing the specimens under the microscope.

The fen body consists of 3 major parts - the rhizome, the fronds and the sporangia. When classifying fern species, vegetative characters such as the rhizome becomes important. The rhizome is the stem of the fern plant. lt can be creeping, vertical or erect. In the case of ferns, it may grow into a short or tall trunk (a vertical rhizome), or it may be a solid mass that gives rise to a tuft of fronds (an erect rhizome). Very often, the rhizome grows underground. The rhizome produces roots and new fronds. The stipe is only the petiole from the rootstock to the beginning of the leaf tissue, or lamina. The continuation of the structure within the lamina is then termed a rachis.

Each fern plant may have one to many fronds. The lamina is the flat, green leafy blade of the frond. The lamina includes the rachis and the pinnae. Some ferns, rather than having spores borne on all leaflets, have separate specialised spore bearing leaflets and separate photosynthetic, sterile leaflets. Sori come in all shapes, sizes and locations. They may appear as dots, dashes or lines on the leaf blade. Sori are yellowish or brownish mass on the underside of a fertile frond. In some species, they are protected during development by a scale or film of tissue, called as the indusium, which forms an umbrella-like cover. Sori occur on the sporophyte generation, the sporangia within produces haploid meiospores. As the sporangia mature, the indusium shrivels, so that spore release is unimpeded. The sporangia then burst and release the spores.

Nearly eight different species with some cultivar varieties were collected and observed. The description of the ferns is explained based on the observation descriptions from the various flora and other literature.

1.*Christella dentata* Forssk

Common name.: Soft fern, Downy wood fern

Rhizome is long creeping, sparsely scaly; scales lanceolate, pale brown, acuminate at apex, margin hairy. Stipes up to 20 cm long, pale brown, scaly at base. Lamina up to 75×5cm,oblong-lanceolate, simply pinnate, dark green, herbaceous; pinnae up to 15 pairs, basal pinnae progressively reduced, reduced pinnae opposite, unreduced pinnae alternate, sessile, acuminate at apex, broadly cuneate at base, margin lobed half way to the costa ; veins up to 8 pairs, one and a half pairs of basal veins anastomosing; acicular hairs densely distributed on the rachis and upper surfaces of costa. Sori median on veins, round, industate, indusia with shoot hairs; spores monolete.

2.*Davallia fejeenis* Hook

Common name.: Rabbit's foot fern, Hare's foot fern

Rhizome stout, woody, up to 15 mm in diameter, rhizome scales pale golden brown, peltate, narrowly lanceolate, hair pointed, up to 8 mm long with paler margins. Fronds widely spaced, arching, thinly coriaceous. Stipe up to 44 cm long firm, wiry glabrous at maturity, with scales similar to those on the rhizome, at the extreme base. Pinnae alternate, with petiole up to 3 cm long; basal pinnae largest and developed basiscopically, others progressively smaller upwards. Rhachis and secondary rhachis glabrous, slightly winged towards the apices. Sori up to 1mm in diameter, solitary, terminal on segments and on vein ends, variously subtended by 1 or 2 blunt or sharp teeth, covered by a pouch like membranous, entire indusial.

3.*Adiantum latifolium* Lam.

Common name: Broadleaf Maiden's hair fern

Rhizome long creeping, branched, densely scaly all over, scales lanceolate, pale brown, acuminate at apex, margin sparsely fimbriate, Stipes arranged in two alternate rows, up to 21 cm long, rounded abaxially, grooved adaxially, black, glossy. Lamina broadly ovate, dark green, glabrous, herbaceous, acute at apex, broadly cuneate at base; pinnae one or two pairs alternate, stalked; pinnules oblong, slightly falcate; veins distinct, forked up to five times, reaching the margin. Sori along the upper margin, oblong, indusiate.

4.*Adiantum philippense* L.

Common name : Walking maiden hair feen, Black maiden hair

Rhizome short, suberect or creeping; rhizome scales dark brown. Fronds tufted, herbaceous, arching. Stipe up to 20 cm long, dark brown to black, shiny, glabrous. Lamina pinnate, lineate to lanceolate in outline, excluding a glabrous extension of the rachis of varying length. Which often ends in a proliferous bud or lamina with a terminal pinna. Rhachis, petiole and pinnae glabrous. Pinnae numerous, persistent, lunulate, petiolate, alternate, reduced in size towards the apex, the midrib forms the lower margin, outer margin irregularly incised into broad lobes. Sori elongate on apices of the pinna lobes, indusial flap linear to shallowly lunate, glabrous.

5.*Pteris ensiformis* cv Victoriae Burm.

Common name: Silver leaf Fern, Sword brake Fern

Erect to 45 cm, with narrow sword like leaves with a central white stripe. Fronds fertile to 30cm, central leaf; narrow, long basal pinnae, 4mm wide; sori along edges covered by rolled edge. Parent species lacks the silver-white stripes.

6.*Nephrolepis duffi* T. Moore

Common name: Duffi fern, Lemon Button Fern

The duffi fern is a compact plant compared to the standard nephrolepis cordifolia. It reaches a height of about 4" to 12" inches. The arching fronds contain a single row of rounded leaves on each side. The leaves have a faint citrus scent, especially when crushed.

7.*Blechnum orientale* L.

Common name: Centipede fern

It is an evergreen tropical fern with arching fronds up to 200cm height originating from a thick rhizome that arises to an erect trunk. The fronds are pinnate and rarely simple. Pinnae are linear, entire, or dentate. Sori are on the underside of the pinnae, linear and aligned to the midrib. The indusia are narrow and open towards the midrib. The rhizome is densely covered with narrow, dark brown scales.

8.*Doryopteris ludens* (Wall.ex Hook) J.Sm.

Common name: Sword fern, Boston fern

The fronds are 50-250 cm long and 6-15 cm broad, with alternate pinnae, each pinna being 2-8 cm long. The pinnae are generally deltoid. The pinnate vein pattern is also visible on these highly compound leaves. The edges appear slightly serrate. The rachis bears monochrome sprout soups. The leaflets are entire, undestroyed and oblong lanceolate up to 4.8 inches long and up to 0.9 inches wide. The spores are warty and wrinkles. The sori are rounded.

All human activities disturb the vegetation by eliminating many species. So, an up to date study is very important for knowing about flora, especially in the case of pteridophytes, their correct identity, distribution, present status, economic and medicinal importance, and inter relationship in this area.

SUMMARY AND CONCLUSION

The study is on a search for the fern diversity of our localities. Many ferns coming under the Class Polypodiopsida were considered for the identification and study. Almost 8 species, including many cultivar varieties were collected and studied.

Ferns immediately capture the imagination of all who are fortunate enough to notice them. With their large, highly dissected and shiny green leaves, ferns are so visually appealing that many are sold as ornamentals. Most moist woodlands will have a number of fern species blanketing the understory with their pungent foliage. In tropical woodlands, ferns are often at eye level or above, providing an aesthetic and delicate subcanopy. Even in arid lands or on newly exposed surfaces such as burns, clear-cuts or landslides, ferns can be present and sometimes dominant, catching your full attention as you push through fern thickets or get snagged by their spines. Beyond their immediate visual appeal, ferns are curious objects. How do plants of such ancient origin persist in the modern world? How can something so fragile survive trampling, burning, logging or grazing? Ferns and lycophytes were long considered as mystical plants, because people did not understand how they could reproduce without ever producing a flower, a fruit or a seed. The study on the assessment of fern diversity in our localities enabled to find out the richness of species as well as gave an outlook on the necessity for the conservation of each and every species in nature. Enriching biodiversity of the campus helps to develop pupils' experience by providing activities that involve conservation of nature, environmental awareness and bio aesthetics.

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