PTERIDOPHYTIC DIVERSITY OF CHINGOLI PANCHAYAT, ALAPPUZHA, KERALA

A dissertation work submitted to University of Kerala in partial fulfilment of the requirements for the award of the

Degree of **Bachelor of Science in Botany**

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CERTIFICATE

This is to certify that the dissertation entitled "**Pteridophytic diversity of Chingoli Panchayat, Alappuzha, Kerala.**" submitted to University of Kerala in partial fulfilment of the requirements for the Degree of Bachelor of Science in Botany carried out by **SRUTHY AJAYAN** is based on the result of studies carried out under our guidance and supervision at Bishop Moore College, Mavelikara during the academic year 2021- 2022. This dissertation or any part thereof has not been submitted elsewhere for the award of any degree,diploma, associateship or fellowship of any University or Institution.

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DECLARATION

I do hereby declare that the thesis entitled "**Pteridophytic diversity of Chingoli Panchayat, Alappuzha, Kerala**" submitted to the Kerala University in partial fulfilment of the requirements of the degree of **Bachelor of Science in Botany** has not previously formed the basis for the award of any degree/ Diploma/ Associate/ Fellowship or other similar title.

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CONTENTS

ABSTRACT

Pteridophytes are regarded as one of the pioneer plant species which emerged on Earth. After the invasion of bryophytes, these plants emerged and stood dominant for centuries on earth 's crust. While the emergence of other dominant plant groups had subsided these ones, and is now prevailing as only one of the groups on Earth. After the fifth mass extinction, today mother nature is facing threats of climate change with a greater extent of biodiversity loss, which is the major outcome of anthropogenic activities. India is one among the megadiverse countries, of which Western ghats and Sri Lanks are regarded as one of the hotspots of the total 34 global hotspots. Despite the lush complexity of plants, this plant group is facing the threat of vulnerability and extinction. In this scenario a floristic assessment is the need of the hour in order to determine the present status of plant distribution. Floristic analysis, whether small or large, all have the same stand for contribution to the metadata of science. Present work is based on the Taxonomic studies of Pteridophytes of Chingoli Panchayat of Alappuzha.

ABSTRACT

Pteridophytes are regarded as one of the pioneer plant species which emerged on Earth. After the invasion of bryophytes, these plants emerged and stood dominant for centuries on earth 's crust. While the emergence of other dominant plant groups had subsided these ones, and is now prevailing as only one of the groups on Earth. After the fifth mass extinction, today mother nature is facing threats of climate change with a greater extent of biodiversity loss, which is the major outcome of anthropogenic activities. India is one among the megadiverse countries, of which Western ghats and Sri Lanks are regarded as one of the hotspots of the total 34 global hotspots. Despite the lush complexity of plants, this plant group is facing the threat of vulnerability and extinction. In this scenario a floristic assessment is the need of the hour in order to determine the present status of plant distribution. Floristic analysis, whether small or large, all have the same stand for contribution to the metadata of science. Present work is based on the Taxonomic studies of Pteridophytes of Chingoli Panchayat of Alappuzha.

INTRODUCTION

Pteridophytes are an ancient group of species, characterized as a significant plant group in biography as they are with a large number of relict and endemic taxa (Patil *et al.,* 2016). The body of the sporophyte is well differentiated into root stem and leaves. The root system is always adventitious. The stem is either underground or aerial. The leaves may be microphylls or megaphylls (Kato & lmaichi, 1997). They are free-sporing vascular plants that have a life cycle with alternating free living gametophyte and sporophyte phases that are independent and mature. The name 'Pteridophyte' was originally given to those groups of plants which have developed pinnate or frond-like leaves. Pteridophytes are cryptogams which have developed vascular tissue. Therefore these plants are also known as vascular cryptogams of the plant kingdom.

They are represented by about 400 living and fossil genera. Palaeo botanical studies revealed that these plants were dominant on the earth during the Devonian period and they originated about 400 million years ago in the Silurian period of the Palaeozoic era. Earliest known pteridophyte is Cookersonia (Edwards *et al.*, 1985). India has a rich and varied pteridophytic flora due to its diversified topography, variable climatic conditions and its geographical positions. Western Ghats supports 349 pteridophytic species out of 1100-1200 species of ferns and fern allies in India (Manickam & Irudayaraj 1992). In the world, it has been estimated around 10,000-12,000 species of Pteridophytes are present ranging from the moist and humid, high altitude mountain forests of the temperate and sub temperate zones to the tropical wet forests at the equator. This group of vascular plants lack flowers, fruit and seeds. Species of this group are dispersed in the form of dust-like spores and characterized by a lifecycle alternating with distinct gametophytic and sporophytic generations.

Pteridophytes occur most commonly in coniferous plantations, scrub, cliffs and acidic woodlands and are also frequent in broadleaved plantations in unshaded mix and on the walls of the river banks. Majority of the living pteridophytes are terrestrial and prefer growing in cool, moist and shady places. Some fern members, for example, are aquatic (Marsilea, Azolla), xerophytic (Selaginella rupestris, Equisetum) or epiphytic (Lycopodium squarrosum). Majority of the

pteridophytes are herbaceous but a few are perennial and tree-like Angiopteris. Smallest pteridophyte is Azolla (an aquatic fern) and largest is Cyathea (tree fern).

The plant body is sporophytic and can be differentiated into root, stem and leaves; roots are adventitious in nature with monopodial or dichotomous branching. Internally they are usually branched. Branching is usually monopodial or dichotomous. Branches do not arise in the axils of leaves. In many pteridophytes, the stem is represented by a rhizome. Leaves may be small, thin and scaly (eg: Equisetum), simple and sessile (eg: Selaginella) or large and pinnately compound (eg: Dryopteris, Adiantum). Vascular tissue is present in both stem and root, it consists of xylem and phloem. Xylem consists of tracheids only and phloem has only sieve tubes. The stele may be a protostele (eg: Rhynia, Lycopodium), siphonostele (eg: Equisetum), dictyostele (eg: Adiantum) or polycyclic (eg: Angiopteris). Cambium is absent, hence they do not have secondary growth (Grime, 1985). The cardinal point of the pteridophyte life cycle is the meiotic production of the spores by the sporophyte and the mitotic production of the gamete by the gametophyte. Meiosis indicates the gametophytic generation.

Reproduction takes place by means of spores which produce inside sporangia. Sporangia may be borne either on stems or leaves. On the leaves there may be ventral or marginal or dorsal spores on germination that give rise to multicellular gametophyte bodies called prothalli. Antheridia and archaea are developed on the prothalli. Water is essential for fertilization. Therefore pteridophytes are also known as "Amphibians of the Plant Kingdom". Fertilization results in the formation of zygote, which ultimately develops into a well developed sporophyte. The fertilized egg divides transversely or vertically. Another cross wall forms a quadrant stage producing stem, leaf, foot and root. Plants show heteromorphic alterations of generation. The main plant body is sporophytic and forms a dominant phase in the life cycle (Cousens, 1988).

Pteridophytes are economically very important. The pteridophytes have long been known for their medicinal and therapeutic utility. In the ancient period, these plants were prescribed as herbal extracts for the cure of several diseases. Few of the pteridophytic species are historically in practice in homeopathy as well as the ayurvedic system of medicines. Selaginella bryopteris, Lycopodium clavatum are well known pteridophytes for the homeopathic system of medicine, wherein the Selaginella is prescribed for the cure of neurological disorder and heat stroke affects.

The Pteris vittata commonly called “Bracken fern”has also shown antimicrobial activities against a number of gastro-intestinal bacterial strains. Fertilizers are also made from pteridophytes. The cultivation of pteridophyte species viz. Azolla, Salvinia and Marsilea in the paddy fields have enhanced agricultural productivity twice. In a few countries the mulching of soil with these pteridophytes along with a few more are in common practice. Thus, pteridophytes have an efficient trait of nitrogen fixation which directly or indirectly (developing transgenic) can be utilized as a resource (Singh *et al.*, 2010).

As a part of our project we decided to focus our work on the pteridophytic diversity of the Chingoli panchayat in Alappuzha district. There are 13 wards in Chingoli panchayat. It is a place rich with many plant species. We collected most of our plant species from humid, shady places as well as wetland regions.

OBJECTIVES

- Floristic documentation of pteridophytes of Chingoli Panchayat, Alappuzha, India
- Photo documentation of collected Pteridophytes for future reference
- Herbarium preparation of the collected plant specimens and its deposition at The Herbarium, Department of Botany and Biotechnology, Bishop Moore College, Mavelikara, Alappuzha.

REVIEW OF LITERATURE

WORKS ON PTERIDOPHYTA OF THE WORLD

Bhattarai and Kunwar (2022), have studied the Nepalese pteridophytes that are used as antimicrobials and discuss the challenges and opportunities of pteridophytes. The pteridophytes constitute an important component of Nepalese flora with 580 taxa of pteridophytes and Central Nepal has the greatest number of species within Nepal. The study discusses the bioactive compounds and chemical compounds isolated from Nepalese pteridophytes that have shown anti-microbial properties. The study reveals that pteridophytes play a potential role in Nepalese pharmacopeia and drug discovery.

Haq (2022), documented the diversity of pteridophytes in Sino-Japanese territory through multivariate statistical analysis in 2022. 58 plant species from 15 habitat types were recorded. Through cluster analysis and two ways indicator species analysis, five plant associations were sorted out. The study showed that environmental variables have a great impact on the distribution and association of the majority of the species.

Irfan *et al*., (2021) documented the floristic diversity, chorotype analysis and occurrence of pteridophytes in Pakistan. 168 taxa belonging to 45 genera and 19 families were recorded from the study area. Pteridaceace and Dryopteridaceace were the largest families with 35 taxa each.

Ojha and Devkota (2021), have studied the use of edible and medicinal pteridophytes in Nepal in 2021. They have found that a total of 26 species were used as food and 43 species of pteridophytes were used as traditional medicines belonging to twenty families. Among them, 14 species were used as both food and traditional medicines. Apart from the use as food and medicinal value, some pteridophytes are used as fuel, animal bedding and also for decoration purposes. Their study revealed that there is a treasure of knowledge about the food and medicinal use of pteridophytes in Nepal.

Abotsi *et al.*, (2020), have studied about the pteridophytic diversity and distribution based on the ecological drivers such as human disturbances and climatic factors in Togo, West Africa. 90% of pteridophyte species in Togo were concentrated on sub-montane forests. Humidity, isolation and human disturbances are the main drivers of their distribution. The study data represent 130 plots of 500 sq.m depicting all ecological zones of the country. The study shows that the conservation of pteridophytes in Togo requires the implementation of less harmful practices in terrestrial species habitats in agroforests and the protection of sub-montane forests.

Khine and Schneider (2020), studied the pteridophyte species of Myanmar in 2020. This study is the first contribution of pteridophyte species for the plant conservation and assessment of the conservation gaps and priority regions. Pteridophyte species belonging to 29 families and 97 genera were recorded. The first evaluation of pteridophyte conservation status is accomplished by using the global occurrence data. The assessment of conservation gaps and priority regions are based on three indices: species composition, species richness and the proportion of threatened species based on the geographic range. Kachin (389 species) shows the highest species richness. The major challenges for the assessment in Myanmar are the data availability and topography. The study shows that the first evaluation of the conservation status of pteridophytes contributes significantly to the conservation planning in Myanmar.

Mehrabian *et al*., (2020), have analyzed the overall distribution patterns and priorities of Iranian pteridophytes. It describes ecosystem based and species based conservation priorities for the protection of habitat. By covering the geographical boundaries of Iran including a total area of 1.6 million sq km, 62 taxa of 27 genera of the Iranian pteridophyte flora belonging to 16 botanical families were recorded.

Mildawati *et al.*, (2020), studied the diversity of pteridophyte species in the Siberut National Park, Mentawai Islands, West Sumatra (Indonesia) in order to collect its taxonomic information with the help of morphological data. A total of 69 species of pteridophytes belonging to 36 genera and 20 families were recorded. Polypodiaceae family shows the most species diversity with 12 species of 6 genera.

Meza *et.al*., (2015), have studied the circumscription of complicated species of Ophioglossum from South America in 2015. They analyzed the most valuable and consistent sculpture patterns

of spores from ten critical taxa from the study area and the morphology of sporophyte were compared with the palynological data. The species studied in this region include O. crotalophoroides, O. nudicaule, O. opacum and O. vulgatum.

Ranil *et al.*, (2015), studied the under-exploited opportunity of ornamental pteridophytes in the Sri Lankan floriculture industry in 2015. Sri Lanka is blessed with a huge diversity of pteridophyte taxa with an extensive diversity of appearance, foliage patterns and plant form. The study states that public awareness programmes should be initiated based on sustainable utilization of ferns and conservation and also promoting *in-situ* and *ex-situ* conservation and domestication. This will bring new directions for the Sri Lankan floriculture industry and solve the conservation issues of threatened and endangered pteridophyte species in Sri Lanka.

WORKS ON PTERIDOPHYTA OF INDIA

Maridass (2021), studied the antibacterial potential of selected eleven species of pteridophytes in Southern Tamil Nadu, active against the three human bacterial pathogens. All the selected species of pteridophytes were air -dried, powdered and separately extracted with 90% ethanol for cold method and their extracts were evaluated for an antibacterial activity done by disk diffusion method. The results of the 90% ethanolic extract of all the selected pteridophytes had the best antibacterial activity observed against Salmonella typhi, Vibrio cholerae and Pseudomonas aeruginosa.

Chowdhury *et al.,* (2016) focused on the diversity, ecology and utilization of pteridophytes species in various tea gardens in Duars of West Bengal. During the survey, a total of 44 species of pteridophytes representing 17 families were recorded from different tea gardens of the study area. Signifies the importance of this region as a rich repository of pteridophytic plant wealth.

Patil *et al.,* (2016), studied the diversity and distribution of 86 species of pteridophytes from Satara district, Maharashtra. The maximum diversity of pteridophytes from the study area was observed at the high rainfall zone, high altitude zone, high atmospheric humidity and low temperature zone. Eightysix species of pteridophytes from Satara district were studied and

grouped on the basis of elevation gradient, rainfall zones, atmospheric humidity and temperature. The study also shows that moisture plays an important role in fern distribution.

Kachhiya patel *et al*., (2015), studied the distribution and occurrence of some pteridophytes in Gujarat. Extensive field work in hilly regions, plain lands, wetlands, agricultural fields and arid regions of the Gujarat state was carried out in all 33 districts in 2013-2014. From the total collection, five species differed from the earlier reported species. On critical study and detailed analysis they were identified. All newly identified species are found to be a new record for the Gujarat state.

Sathiyaraj *et al.,* (2015), studied the ethnomedicinal importance of fern and fern allies in Palni hills, Kodaikanal. 50 species belonging to 35 genera in 19 families were recorded from the study area for their medicinal values. Among the 50 species, 74% were terricolous, 18% were saxicolous, 4% were both hydrophytes and epiphytes. They collected information on the medicinal properties of fern and fern allies traditionally used by the inhabitants of Palni hills by conducting a survey on the area.

Deepa *et al.,* (2011), studied enumeration of pteridophytes in Madhuguni forest, Central western Ghats, Karnataka. In this region, not much light has been thrown on the pteridophyte diversity. A total of 23 species of pteridophytes could be collected and identified. The majority of the ferns here are terrestrial except two epiphytes, one scandent and one aquatic fern.

Rout *et al*., (2009), studied ethnomedicinal importance on medicinal values of pteridophytes in Similipal Biosphere reserve, Orissa. They had not been studied taxonomically or ethno-botanically. The plant parts, leaves, roots, rhizomes and fronds were used in raw or cooked forms for the treatment of malaria, gonorrhea, leprosy, rheumatism *etc*. It was designed to assess the medicinal uses of 33 pteridophyte species belonging to 21 families on the basis of field surveys and taxonomic identification of plants.

Goswami *et al*., (2006), studied the diversity and distribution of pteridophytes from lower Gondwana formations of the Ib River Coalfield, in Orissa and identified numerous fossiliferous beds in the lower Gondwana deposits. Six exposures of the Barakar and lower Kamthi

formations yielded diverse and abundant plant remains. The flora includes twenty - three genera representing nine groups.

Khade *et al*., (2002), studied arbuscular mycorrhizal fungi associated with some pteridophytes from Western Ghats of Goa. Commonly occurring pteridophytes from two sites namely Mollem and Chorlem were located in the study area. During the study all the pteridophytic species examined exhibited the presence of arbuscular mycorrhizal association. A fairly good diversity of AM fungi was observed in the rhizosphere of pteridophytes of this region. A total of 17 AM fungal species belonging to five genera namely Acaulospora, Glomus, Gigaspora, Sclerocystis, and Scutellospora were recorded.

WORKS ON PTERIDOPHYTA OF KERALA

Archana & Gayatri (2021) carried out studies to analyze the distribution of flora present in the two main sacred ponds namely Chirakkal chira and Rajarajeshwara chira of Kannur district, Kerala. A total of twenty seven genera of algae, ten genera of fungi, four pteridophytes and twenty angiospermes were recorded.

Christy & Thomas (2020), studied the phytodiversity of chasmophytic habitats at Olichuchattam water falls, Kerala, India. A total of 120 plant species belonging to 49 families and 93 genera were documented. Of these, 5 species are Bryophytes, 10 species are pteridophytes and 105 species are angiosperms.

Arjun *et al.,* (2019) studied the diversity of pteridophyte flora in Rajamala, a tourist impacted site inside Eravikulam National park in Kerala, India. Eravikulam National Park is located in the high Kannan Devan hills of the southern western ghats in the Devikulam taluk of Idukki district. The study was to enumerate the fern diversity in the disturbed landscapes of Rajamala; the distribution of pteridophytes in the study area varies widely. 54 species of pteridophytes belonging to 16 different families including fern and fern allies were found from the Rajamala region. In this region there are lots of medicinally important ferns that were also listed. Eleven species of medicinally important pteridophytes are identified.

Praveen Kumar & Udayan (2018), conducted a survey on the pteridophyte flora of the 18 selected sacred groves in Chalavara grama panchayath, Palakkad district, Kerala leading to the collection of 26 species of pteridophytes coming under 20 genera and 14 families.

Rekha and Athira (2017), studied the diversity of 24 species of pteridophyte flora in Akamala forest station, Thrissur, Kerala. The collected species belong to 17 genera,14 families and 2 classes. Most of the collected species were terrestrial. A few numbers of epiphytes, lithophytes and aquatic species were also reported. The study area was rich in pteridophyte diversity.

Cherullipadi & Paul (2016), studied the diversity of herbaceous riparian flora in the lower stretch of Bharathappuzha river, Kerala. The research approach involved a taxonomic vegitational survey of the lower stretch of Bharathappuzha river. There are 176 angiosperms belonging to 63 families and 4 pteridophytes in 2 families and 1 gymnosperm.

Lubaina *et al.,* (2019), studied the pteridophytic diversity at the Neyyattinkara municipality, Thiruvananthapuram, Kerala that resulted in the documentation of 37 species of ferns and lycophytes under 26 genera belonging to 16 families.

Resmi *et al.,* (2016), studied the anatomical features of selected three species of Adiantum L. from Kerala. The studied species were Adiantum caudatum L., Adiantum latifolium Lam. and Adiantum lunulatum Burm. The study determined the position and structure of vascular components of mature fern and also the indications of phylogenetic relationships.

Vijisha & Rajesh (2016), studied a total of 69 species of pteridophytes including 63 ferns and 6 lycophytes from the Aralam sanctuary in the Western Ghats of Kerala. In this sanctuary, some of the rare and endemic species including the members of Hymenophyllaceae, the most sensitive fern family, were also reported.. The Aralam wildlife sanctuary lies between north latitude 11°50'and 11°52'and east latitude 75°49'and 75°57'. The temperature of foothills varies from 21°C to 40°C. Aralam wildlife sanctuary is rich in a congregation of endemic flora, fauna in a small area about 55sq km.

Joseph & Thomas (2015), studied 15 species of chasmophytic pteridophytes belonging to 11 families and 11 genera that were distributed in the rocky cliffs and crevices of Urumbikkara hills

of Idukki district, Kerala. They also emphasized certain medicinal and ornamental potentialities of plants.

Kishore kumar (2015), studied the diversity floristics, ethnobotanical and ecological aspects of about 674 taxa of vascular plants in Anamudi Shola National Park, Munnar, Idukki district, Kerala which include 76 species of pteridophytes. Pteridophytes belonged to 46 genera under 24 families. Among the 76 pteridophytes, terrestrial taxa constituted 55%. The 76 pteridophytes collected from the park form 23% of the total pteridophyte flora of the state.

Prajeesh *et al.* (2014), studied the diversity of vascular plants associated with wetland paddy fields of Wayanad district in Western Ghats, India. The plants were recorded from the paddy fields. One hundred and eighty nine genera were recorded (308 Angiosperms, 11 Pteridophytes).

Ramachandran *et al*., (2014), studied the diversity and distribution of potential ornamental pteridophytes from Adimali region, Idukki district, Kerala, India.

Gayathri *et al*., (2005), undertook preliminary studies on the immunomodulatory and antioxidant properties of Selaginella species found in the Western ghats of Kerala.

Kumar (1998), studied the fern flora of Kerala with special reference to the Sylvan valley, Munnar.

Sequiera (1998), studied the diversity, systematics, distribution and taxonomy of epiphytic pteridophytes of Kerala, part of Western Ghats, South India.

MATERIALS AND METHODS

STUDY AREA

The study was carried out to assess and analyze the pteridophytes flora of Chingoli Grama Panchayath, located in Chingoli village under the Muthukulam block in Karthikappally Taluk of Alappuzha district in Kerala, India. Chingoli Grama Panchayath lies between 9° 14'53.304"N and 76° 27' 9.4356"E. (Figure 1). The total area of the Panchayat is 6.60 sq.km and is divided into 13 ward divisions .

FIELD COLLECTION

The floristic exploration was conducted from the month of January to March 2022. Plants were collected through a random sampling method. While collecting, it was ensured that all plant parts such as rhizomes, petioles and fronds were included. In most of the cases sporophylls were also collected. The specimens were collected using polythene bags, in order to retain the moisture and prevent desiccation. Date of collection, locality, habit, habitat, altitude, morphological features and collection number were recorded in the field book. Clear legible photographs were also taken from the field itself using a mobile camera.

HERBARIUM PREPARATION

To prepare herbarium, the collected specimens were dried by keeping them in newspapers with regular changing of newspapers every 24 hours for the first week. This was done to prevent any fungal or bacterial attack on the specimen. The dried specimens were mounted on herbarium sheets using glue with a label containing essential information regarding the collection date, locality and binomial. The Herbarium prepared for the present study was deposited in the Herbarium, Department of Botany and Biotechnology, Bishop Moore College, Mavelikara, Alappuzha.

TAXONOMIC DESCRIPTION AND IDENTIFICATION

Taxonomic descriptions of collected plant specimens were written. Dissection and Compound microscopes were used to examine the micromorphological traits. After describing the characters, identification was done. Various regional flora on pteridophytes were used for the identification, such as Manickam, 1986; Manickam & Irudayaraj, 1992. Help from experts in the field were also sought.

PRESENTATION OF DATA

The plants of the study area were tabulated along with botanical descriptions and arranged according to the PPG 1 system of Pteridophyte classification (Schuettpelz *et al.*, 2016) and the species were presented with their systematic position. Detailed descriptions of species were noted and photos were also taken. The correct name of the species is followed by the author/s name and original publication.

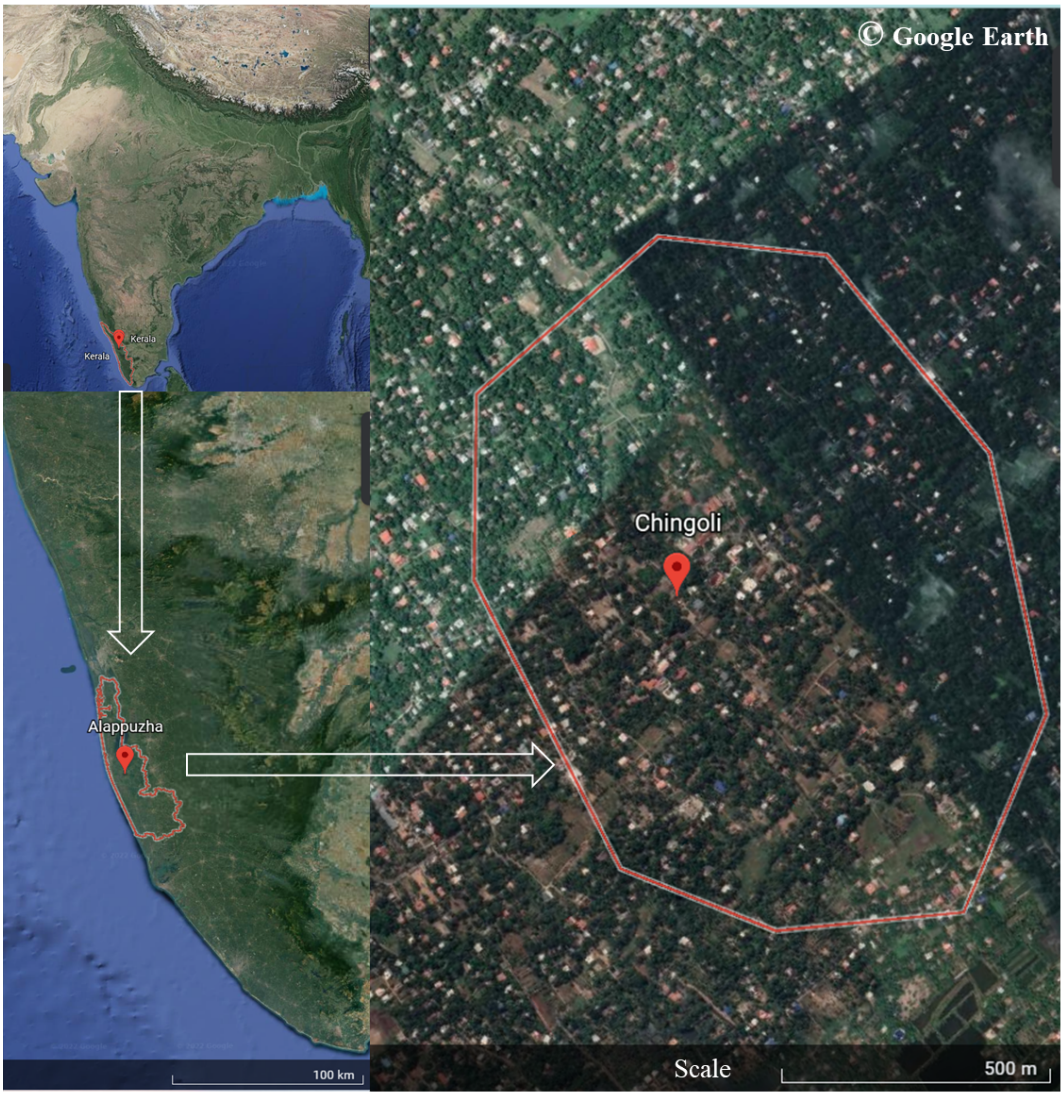

Figure 1. Chingoli Panchayat

RESULTS AND DISCUSSION

The present study could report a total of 16 pteridophytes. These identified plants are listed below along with their taxonomic descriptions and phytogeographical affinities. The data is represented and arranged according to the recent PPG1 classification.

1. Salvinia molesta D. Mitch

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Salviniales

Family : Salviniaceae

DESCRIPTION:

Aquatic fern that lacks roots. It has 2 types of fronds, floating and submerged fronds. The fronds grow bigger in size and the edges crinkle up when growing in waters congested with Salvinia molesta. The floating fronds are approximately oval, being heart-shaped near the base and rounded at the tip. They are densely covered in white, bristly hairs.

Plate 1, fig d.

PHYTOGEOGRAPHICAL AFFINITY:

Tropical and Subtropical areas around the world

2. Salvinia minima

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Salviniales

Family : Salviniaceae

DESCRIPTION:

Salvinia minima is a free floating, rootless aquatic fern. It has horizontal branching rhizomes that float just below the water surface and produce, at each node, two floating leaves (fronds), and a third, submersed leaf that is dissected into filaments. The leaves are distributed in whorls of 3.

Plate 3, fig a.

PHYTOGEOGRAPHICAL AFFINITY:

Southern Mexico, Brazil, Southern America, Asia.

3. Marsilea minuta L.

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Salviniales

Family : Marsileaceae

DESCRIPTION:

Marsilea minuta is a perennial fern with slender, rooted, creeping, branching rhizomes bearing erect leaves (sterile fronds) along their length . The leaves, which consist of four, 'clover- like' leaflets at the apex of a slender erect stalk, arise along the length of each rhizome. At the base of the petioles the sporocarps are formed . The sporocarps are oblong with rounded ends (when seen laterally), with their long axis at right angles to the stalk. The bean- shaped sporocarps contain both megasporangia and microsporangia. The features of the sporocarps are important for distinguishing the species. A typical characteristic of M. minuta is that the sporocarps are unribbed and have two basal teeth. The upper tooth is sharply pointed, the lower tooth is shorter and obtuse.

Plate 3, fig c.

PHYTOGEOGRAPHICAL AFFINITY:

Southern Mexico, Brazil, Southern America, Asia.

4. Pteris biaurita L.

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Pteridineae

Family : Pteridaceae

DESCRIPTION:

The Pteris biaurita consist of terrestrial, epipetric or epiphytic perennials. The stems are rhizomatous, the rhizomes dictyostelic, creeping, ascending, erect, or scandent climbing, shoot apices with non-clathrate scales. The leaves are usually monomorphic, rarely di‑morphic, simple or pinnate to decompound; veins pinnate or forking, free to anastomosing, with or without included veinlets.

Plate 2, fig d.

PHYTOGEOGRAPHICAL AFFINITY:

Asia, Africa, and America.

5. Ceratopteris thalictroides (L.) Brongn.

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Pteridineae

Family : Pteridaceae

DESCRIPTION:

Epiphytic pantropical aquatic fern with dimorphic pale green fronds, erect rhizome and thick, long fibrous fleshy roots. Sterile fronds are wider than fertile fronds. The stipes of mature plants are spongy and air filled. Scales occur on the rhizome and the young leaf possesses both scales and hairs. The sporangia are located along the veins.

Plate 2, fig a.

PHYTOGEOGRAPHICAL AFFINITY:

Asia, Africa, North-America, Central America, South America and Europe.

6. Pityrogramma calomelanos (L.) Link

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Pteridineae

Family : Pteridaceae

DESCRIPTION:

Pityrogramma calomelanos is a terrestrial shrubby fern with upright fronds and short, erect rhizome which is covered by scales. Fronds are oblong,acuminate apex and bipinnate. The fronds are arranged in tufts, erect to arching. Leaf blade is oblong to lanceolate, bipinnate to 3- pinnatifid. The leaf blade has a herbaceous to a slightly coriaceous texture.Pinnae are sessile, sub opposite, lanceolate, entire or lobed and acute at apex. Sporangia is placed along the veins and freely throughout the lower surface of fronds. They wear a white powdery coating at the lower surface of lamina.

Plate 2, fig b.

PHYTOGEOGRAPHICAL AFFINITY:

Asia, Africa, Mexico, Central and South America.

7. Adiantum latifolium Lam.

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Pteridineae

Family : Pteridaceae

DESCRIPTION:

Terrestrial fern forming dense stands where growing conditions are ideal. Rhizome long creeping; scales dark brown, linear or lanceolate, clathrate, margin entire or slightly toothed; fronds distinctly spaced. Stipe dark brown or black, pectinate scales dense along stipe and rachis surfaces. Lamina bi-pinnate, deltate or ovate shape, 1 or 2 pairs of lateral pinna with apical ones, dimidiate, trapeziform, sometimes falcate, acroscopic base truncate, basicopic base cu-neate, apex rounded or acute, basiscopic margin entire, acroscopic margin serrate or lobed in fertile.pinnules, not hairy, petiolules very short or absent; veins free, simple or forked, ending in marginal serration or lobed.

Plate 3, fig d.

PHYTOGEOGRAPHICAL AFFINITY:

Asia, Africa, Mexico,Central and South America.

8. Adiantum incisum Forssk.

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Pteridineae

Family : Pteridaceae

DESCRIPTION:

Terrestrial or lithophyte. Rhizome short, erect, set with subulate rhizome-scales . Fronds tufted, arching, membranous, often proliferous at apex of a naked extension of rhachis; stipe castaneous to black, set with numerous brown hairs; lamina linear to cultrate, pinnate, attenuate; pinnae mostly oblong, but reduced and obcuneate towards apex of frond, shortly petiolate, incised irregularly on acroscopic margin into mostly emarginate lobes, thinly set on both surfaces with pale brown multicellular hairs. Sori borne at apices of pinna lobes; indusial flaps lunate to oblong, glabrous to thinly pilose.

Plate 4, fig d.

PHYTOGEOGRAPHICAL AFFINITY:

South and South West Africa, Yemen, India

9. Acrostichum aureum L.

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Pteridineae

Family : Pteridaceae

DESCRIPTION:

It is a mangrove fern, and thrives well under full sun. The stem (rhizome) of this species is stout, erect, and covered with relatively large scales. Dark green, erect fronds are composed of 24 - 30 pinnae (leaflet-like structure) in alternate arrangement. The petiole of the frond (known as the stipe) is usually about .The 5 - 8 pairs of pinnae near the tip are fertile with their underside covered in reddish brown sporangia (except the midrib), while the remaining pinnae are infertile. The pinnae are oblong with a blunt tip and bright red when immature. Its spores are dispersed by wind.

Plate 1, fig c.

PHYTOGEOGRAPHICAL AFFINITY:

Tropical and Subtropical areas around the world

10. Stenochlaena palustris (Burm. fil) Bedd.

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Aspleniineae

Family : Blechnaceae

DESCRIPTION:

It is an epiphytic, terrestrial, coarse climbing fern of indefinite length. Stems are brown, smooth and sparingly branched. Frond stalks are well spaced on the rhizome. Mature fronds are stiff, leathery and dark green, young fronds are pale reddish- green. Fronds are pinnate compound and fertile fronds are shorter than sterile fronds. The rhizomes can attach themselves to the trunk of trees by means of adhesive roots.

Plate 1, fig b.

PHYTOGEOGRAPHICAL AFFINITY:

Asia, Africa, Mexico,Central and South America.

11. Christella dentata (Forssk.) Brownsey & Jermy

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Aspleniineae

Family : Thelypteridaceae

DESCRIPTION:

Small fern is somewhat soft and delicate, producing numerous tufts of pinnate fronds from a stout, woody creeping, usually semi exposed rhizome. Rhizome is covered in the frond base remnants. Fronds broadly ovate to oblong in outline. Stipe is long, pale to

grayish brown, minutely pubescent to sub glabrous. Leaves are often somewhat dimorphic and evergreen. Lamina is oval shaped with a narrow end at the base. Sori are circular in shape with a hairy closed covering.

Plate 2, fig c.

PHYTOGEOGRAPHICAL AFFINITY:

Asia, Africa, temperate parts of Australia and New Zealand.

12. Christella parasitica (L) H. Lev.

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Aspleniineae

Family : Thelypteridaceae

DESCRIPTION:

Christella parasitica is a species of fern in the Thelypteridaceae family.Rhizome short- to long-creeping; scales lanceolate, Fronds tall. Stipe softly hairy. Lamina simply pinnate-pinnatifid. The basal ones are deflexed, not or only slightly reduced; largest pinnae, acuminate, deeply lobed; lobes oblong, rounded truncate; veins are pairs. the lowest pair joined to form an excurrent vein to the sinus-membrane, lower surfaces of lobes typically covered with soft spreading hairs and thick orange or very pale ellipsoid glands usually present on the costules and veins. Indusia hairy.

Plate 4, fig a.

PHYTOGEOGRAPHICAL AFFINITY:

Asia, Africa, North-America, Central America, South America and Europe.

13. Cyclosorus interruptus (Willd.) H.

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Aspleniineae

Family : Thelypteridaceae

DESCRIPTION:

Rhizomes long-creeping with stipes bearing scattered scales. Rhizome scales ovate to broadly ovatepale to dark brown, entire. Fronds held stiffly upright. Stipes , yellow-brown to chestnut-brown, almost black at base, glabrous or scaly near base, slightly polished. Laminae 1-pinnate, usually elliptic or ovate, sometimes narrowly, rarely broadly so, abruptly narrowed to a pinnatifid apex, ren on both surfaces or sometimes lighter on abaxial surface, coriaceous. Ovate or broadly ovate, pale brown scales with hairy margins on abaxial surface of pinna midribs.

Plate 3, fig b.

PHYTOGEOGRAPHICAL AFFINITY:

Mexico, Argentina, Asia.

14. Nephrolepis brownii (Desv.) Hovenkamp & Miyam.

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Polypodiineae

Family : Nephrolepidaceae

DESCRIPTION:

Perennial herb. It generally forms tufts of five or six fronds on upright rhizomes. The plant spreads by stolons, which often form stilts that support the upright rhizome. Stolons branch in widely diverging angles. Scales on stolons can be sparse, appressed, or spreading. Fronds become dark green when dry, and bear scattered, linear scales along their veins.Pinnae are covered with basal scales,which are peltate and appressed. The scales on the rachis are dense,spreading, with a translucent appearance or light brown. The scales on the lamina are usually persistent, often also persistent on the upper surface. Hairs on lamina are absent, but constantly present on midrib. Sori are round and marginal, and they form 25 to 27 pairs on fully fertile pinnae.

Plate 4: Fig b

PHYTOGEOGRAPHICAL AFFINITY:

Southeast asia and Tropical America

15. Aglaomorpha quercifolia (L.) Hovenkamp & S. Linds

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Polypodiineae

Family : Polypodiaceae

DESCRIPTION:

Aglaomorpha quercifolia is an epiphytic, occasionally epilithic medicinal Pteridophyte with a short-creeping rhizome, dimorphic fronds, and pinnatifid lamina. Two types of fronds are present, fertile foliage fronds and sterile nest fronds. The dark green foliage fronds are large, long with elongated stalks. They are deeply lobed or pinnate, winged, and bear sori on the bottom surfaces. The nest fronds are smaller rounded leaves basal to the foliage fronds. They do not bear sori. The rhizomes are creeping and densely covered in brown scales.

Plate 4, Fig c.

PHYTOGEOGRAPHICAL AFFINITY:

Native to India, Southeast Asia, Malaysia, Indonesia, Philippines, New Guinea and Australia

16. Pyrrosia piloselloides (L) M.G. Price

SYSTEMATIC POSITION:

Class : Polypodiopsida

Subclass : Polypodiidae

Order : Polypodiales

Suborder : Polypodiineae

Family : Polypodiaceae

DESCRIPTION:

Small epiphytic fern, rhizome long and creeping. Covered with small, almost round or heart-shaped scales. Scales have a dark center and paler edges, with relatively long hairs that are white when very young, but soon turn brown. Light green, fleshy fronds are oval to circular with smooth edges (entire leaf margin); leaves are simple and entire. Sterile leaves are without stalks, fertile leaves have a stalk. The sori are arranged in a broad band along the edge of the leaf.

Plate 1, fig a.

PHYTOGEOGRAPHICAL AFFINITY:

Northeastern India, Southeast Asia to Papua, New Guinea and northern Australia.

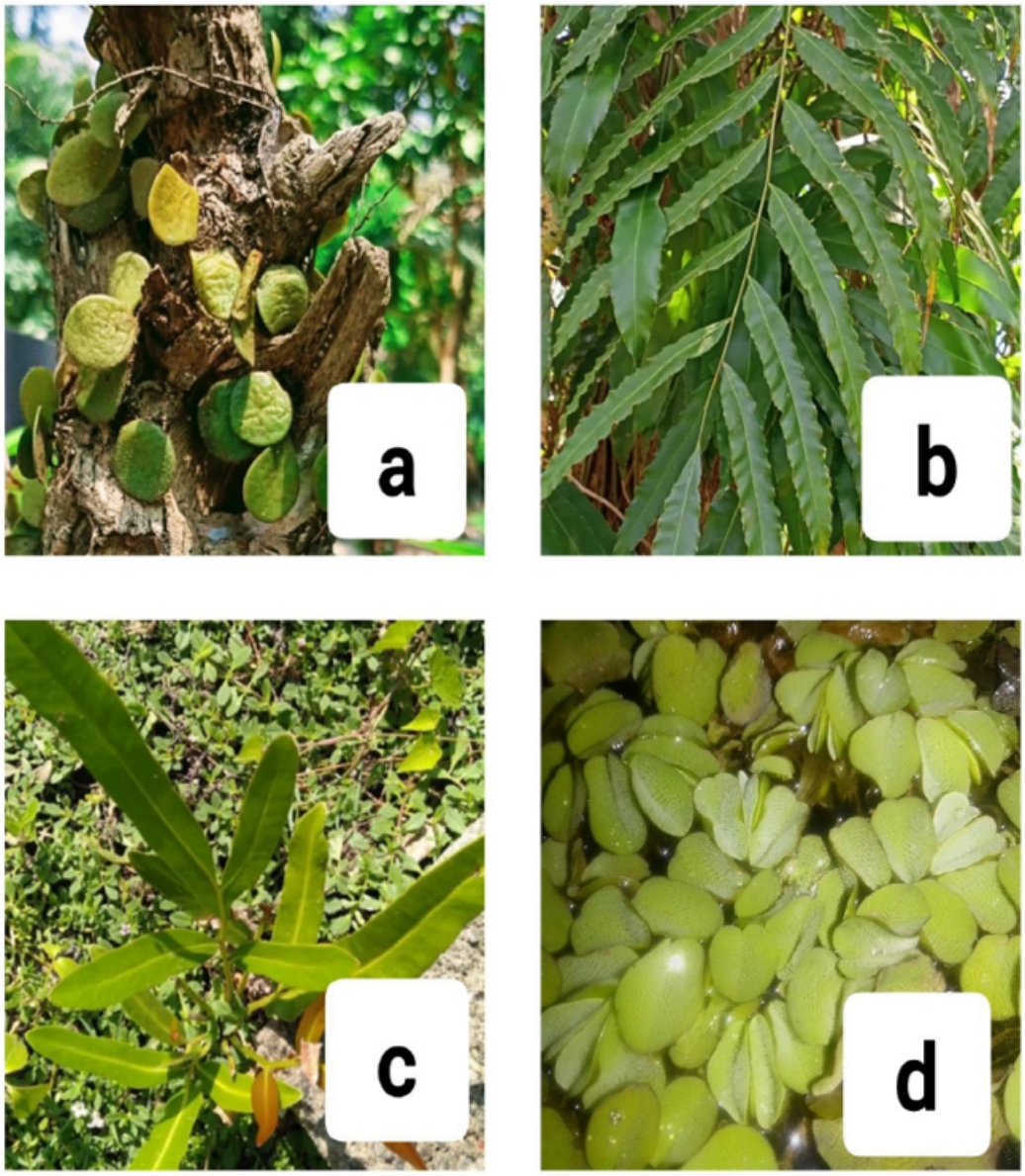

Plate 1: fig. **a** *Pyrrosia piloselloides* (L.) M.G. Price **b** *Stenochlaena palustris* (Burm. fil.) Bedd.**c** *Acrostichum aureum* L.**d** *Salvinia molesta* D.S. Mitch.

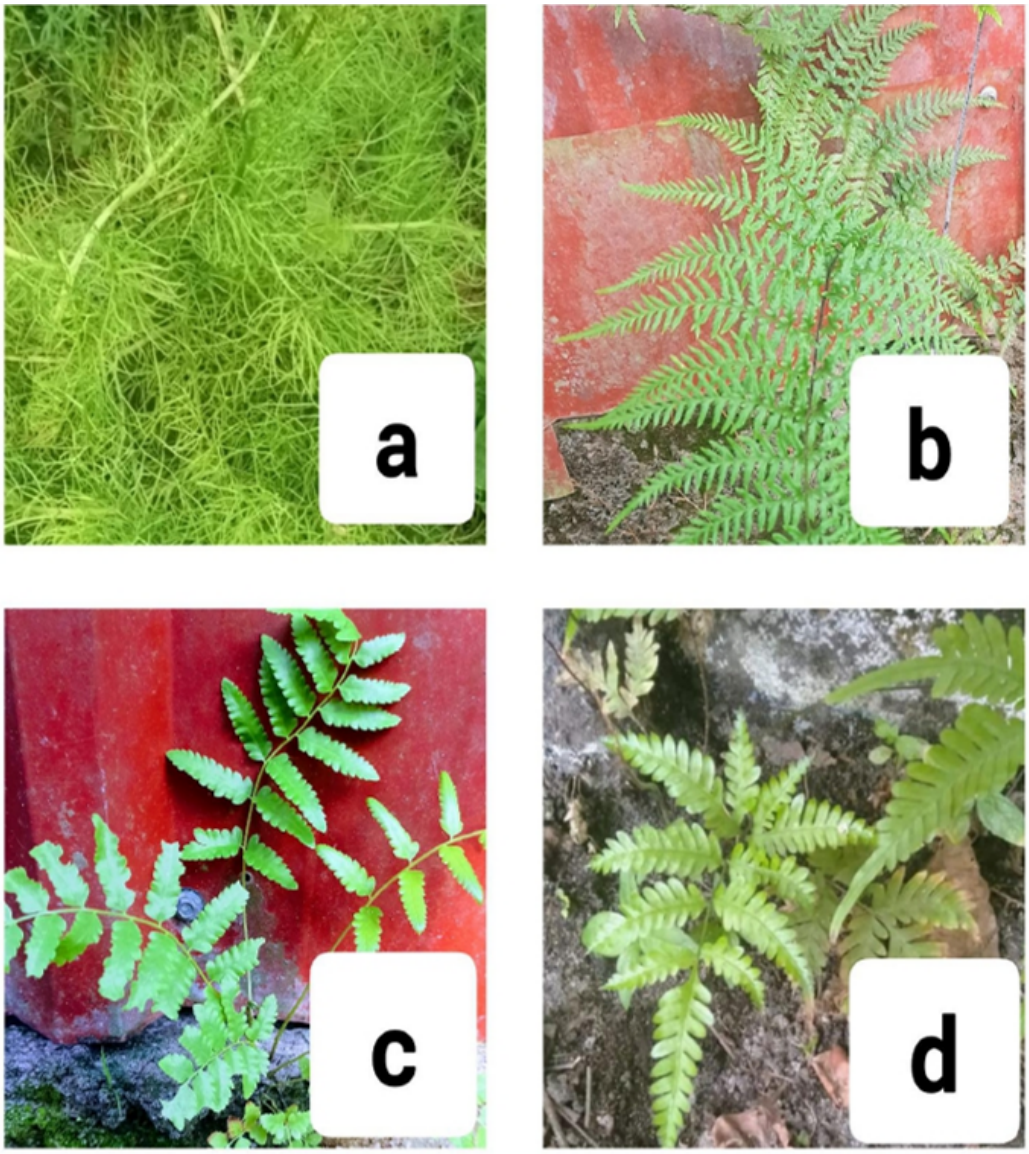

Plate 2:fig. **a** *Ceratopteris thalictroides* (L.) Brongn.**b** *Pityrogramma calomelanos* (L.) Link **c** *Christella dentata* (Forssk.) Brownsey & Jermy **d** *Pteris biaurita* L.

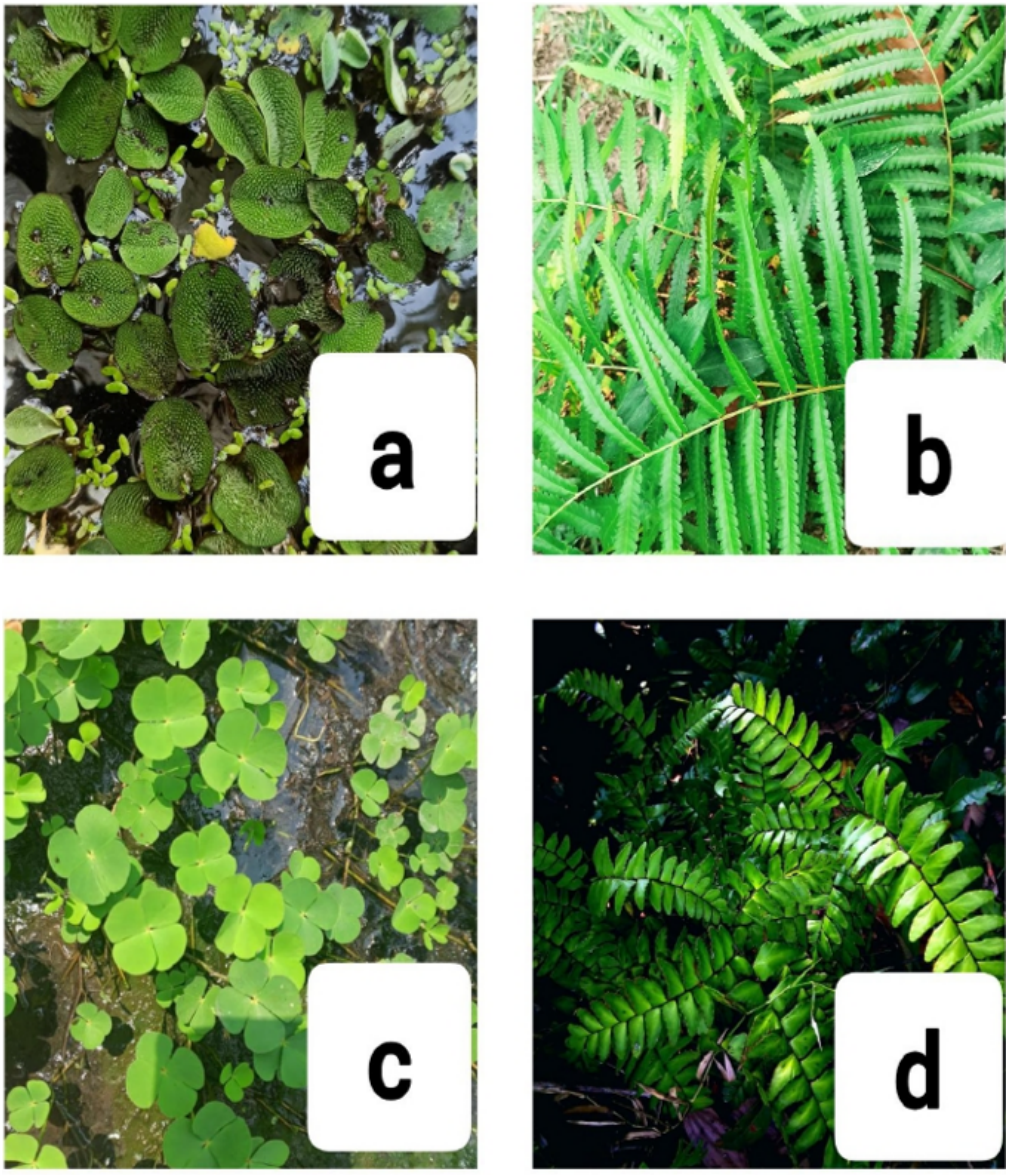

Plate 3: fig.**a** *Salvinia minima* **b** *Cyclosorus interruptus* (Willd.) H. Itô **c** *Marsilea minuta* L.**d** *Adiantum latifolium* Lam.

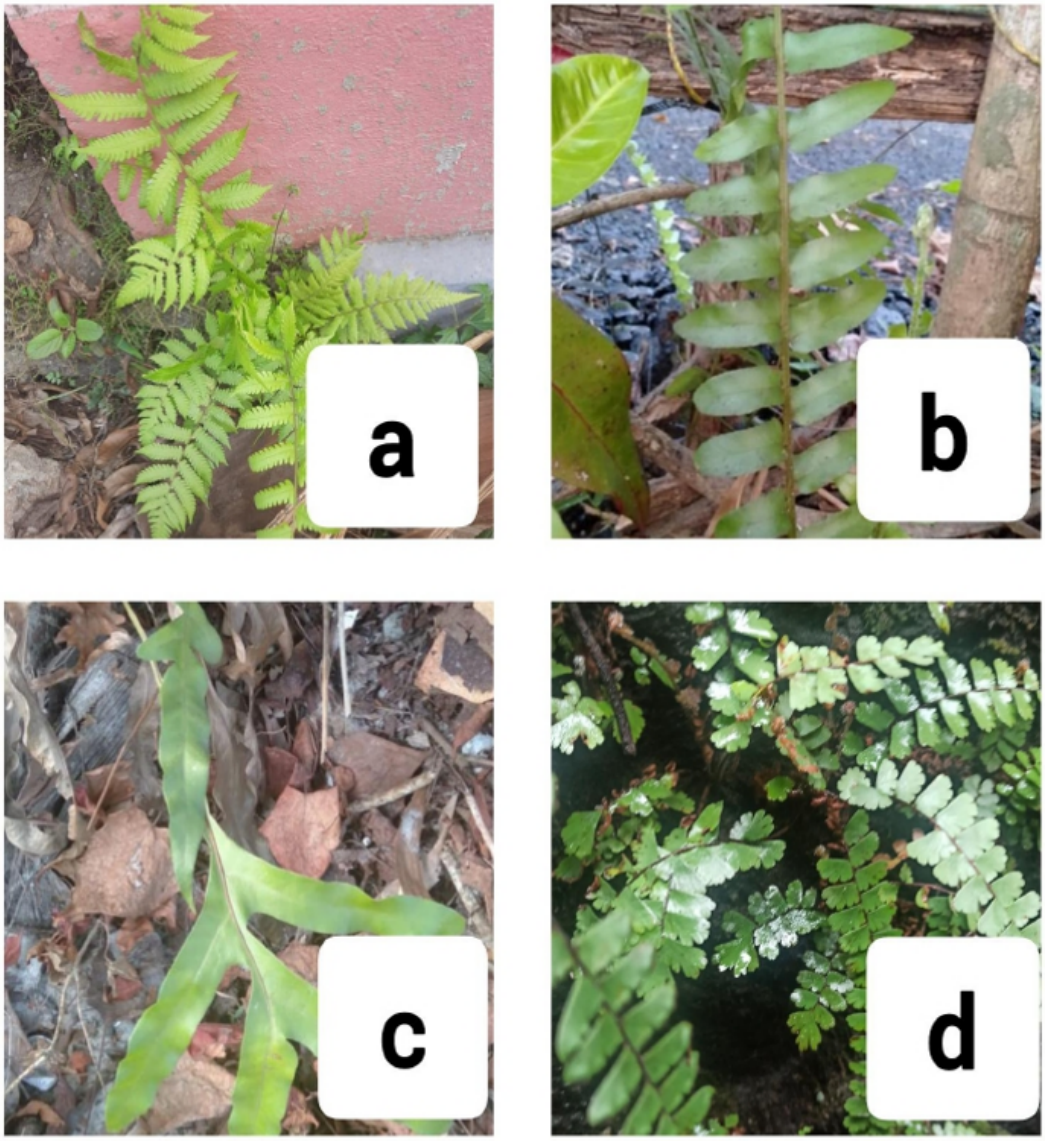

Plate 4: fig. **a** *Christella parasitica* (L.) H.Lév.**b** *Nephrolepis brownii* (Desv.) Hovenkamp & Miyam.**c** *Aglaomorpha quercifolia* (L.) Hovenkamp & S. Linds **d** *Adiantum incisum* Forssk.

Sl. No.	Name of the Plant	Family
1	**Salvinia molesta** D. Mitch	Salviniaceae
2	**Salvinia minima**	Salviniaceae
3	**Marsilea minuta** L.	Marsileaceae
4	**Pteris biaurita** L.	Pteridaceae
5	**Ceratopteris thalictroides** (L.) Brongn.	Pteridaceae
6	**Pityrogramma calomelanos** (L.) Link	Pteridaceae
7	**Adiantum latifolium** Lam.	Pteridaceae
8	**Adiantum incisum** Forssk.	Pteridaceae
9	**Acrostichum aureum** L.	Pteridaceae
10	**Stenochlaena palustris** (Burm. fil) Bedd.	Blechnaceae
11	**Christella dentata** (Forssk.) Brownsey & Jermy	Thelypteridaceae
12	**Christella parasitica** (L) H. Lev.	Thelypteridaceae
13	**Cyclosorus interruptus** (Willd.) H.	Thelypteridaceae
14	**Nephrolepis brownii** (Desv.) Hovenkamp & Miyam.	Nephrolepidaceae
15	**Aglaomorpha quercifolia** (L.) Hovenkamp & S. Linds	Polypodiaceae
16	**Pyrrosia piloselloides** (L) M.G. Price	Polypodiaceae

Table 1. List of collected plant species with their family

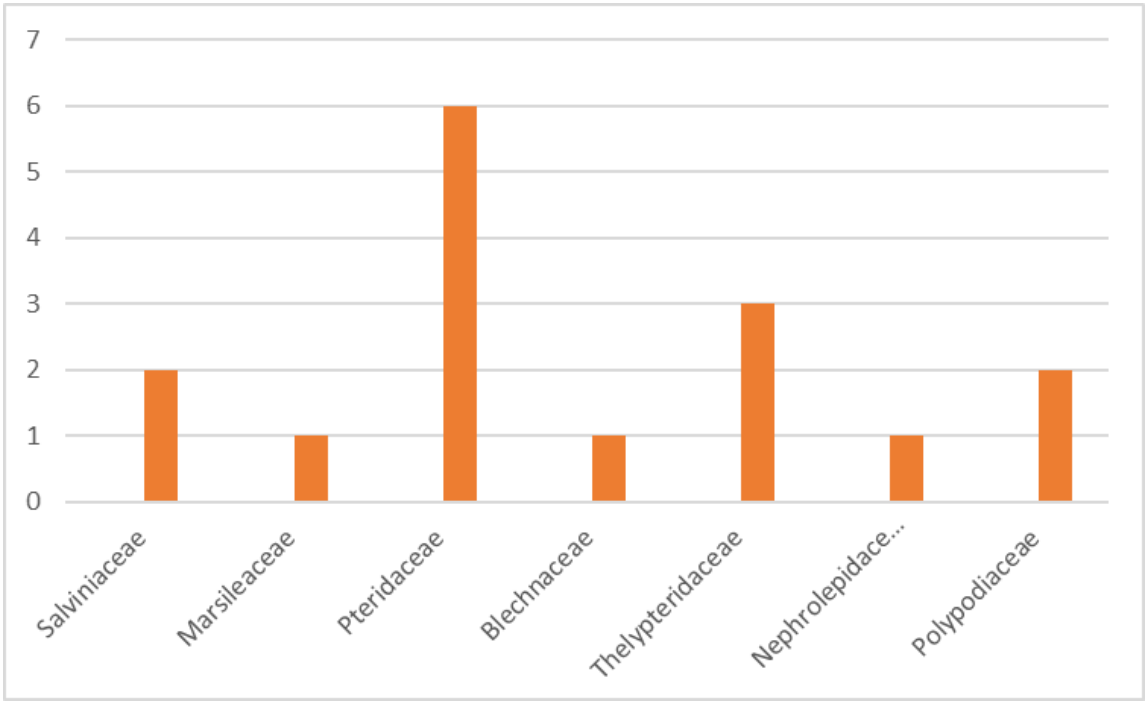

Figure 2. Number of recorded taxa with their respective family.

CONCLUSION

The present floristic documentation could report a total of 16 Pteridophyte species belonging to various families. The families include Salviniaceae, Marsileaceae, Pteridaceae, Blechnaceae, Thelypteridaceae, Nephrolepidaceae and Polypodiaceae. Of the total 16 Species, 6 of the members belong to the family Pteridaceae (Figure 2) hence making it the dominating Pteridophyte family of Chingoli panchayat. Following Pteridaceae, Thelypteridaceae comes second with 3 species, followed by Salviniaceae and Polypodiaceae with two species each. Photo documentation of the collected plants will help in future references. Herbarium prepared with Industrial standards will surely work as an aid to identification and clarifications among confusing taxa. Being a suppressed plant group, the overall diversity of Pteridophytes in the selected area was less. Climatic conditions, study duration, humidity, temperature etc. could be the contributing factors.

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