



Research Article

EXPLORATION AND DOCUMENTATION OF LOCAL FLORA OF POOMALA AND PATHAZHAKUNDU DAM SITES IN KERALA

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ABSTRACT

Flora identification is widely regarded as necessity around the world, as it plays an important role in the preservation of a country's national reserves. The present investigation was carried out on floristic diversity of proximity around Pathazhakundu dam, which is separated as Poomala region in Thrissur district, Kerala. A total of 96 species of plants belongs to 41 families were collected and identified, in which 93 species were Angiosperms belongs to 39 families and 3 species were Pteridophytes belongs to 2 families. The most leading family was Asteraceae in both study sites with members belongs to 11 genera. The concentration of dominance was recorded highest for herbs in both areas followed by shrubs, climbers, twinnings and trees. Two endemic species encountered during the study include *Moullava spicata* and *Rotala macrandra*. Native species dominates in the area, however presence of invasive exotics is a matter of concern.

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INTRODUCTION

Floristic diversity is a fundamental characteristic of ecological communities that describes the distribution and abundance of organism patterns in relation to their location, climate, and biological productivity. A large proportion of plants over the world are on the verge of extinction because of various anthropogenic activities that cause climate change and disrupt nature's ecological balance. An obvious approach to conserve plant biodiversity is to map distributional patterns and look for concentrations of diversity and endemism (Gentry, 1992). Accurate estimation of extent of biodiversity decline is limited due to the expenses demanded by scientific research and biodiversity monitoring. Floristic analysis is a crucial stage in the conservation strategies for the protection of plant diversity of an area.

Being the most pristine spot of natural beauty and biodiversity, several floristic studies and surveys were performed in different parts of India, especially in Kerala. Till then, the floristic research got continued and now it had transferred to molecular and phylogenetic studies. But the basic of all systematic work is yet the taxonomic survey itself and is continuing. An investigation was carried out by Ganorkar and Kshirsagar (2013) at Shirur region in Pune, Maharashtra which discovered over 161 plants belonging to 49 families, the study also revealed that Floristic vegetation is very much affected by local activities.

The state Kerala is luscious with varied topographical landscapes, high rainfall and geologic conditions that facilitated the formation of various ecosystems ranging from

shola forests on the mountain valleys to the mangrove forests along sea coasts and estuaries. Among these, the most outstanding feature is the formation of tropical rainforests from Southern Western Ghats, lying parallel to the west coast (Sashidharan, 2002). The flora of Kerala has been discussed by many authors like Aiswarya and Arun (201); Sreeja and Unni (2016) and Shilpa *et al.* (2016). The major threat of species diversity and ecosystem balance is the presence of invasive species. In Kerala the humid condition of tropics with highly leached soil like Latin America favors the American native species like *Mikania micrantha*, *Lantana camara*, and *Chromolaena* spp. to establish and invade the tropics (Ramakrishnan, 1991). Riparian zones are the interfaces between aquatic and terrestrial ecosystems. As ecotones, they encompass sharp gradients of environmental factors, ecological processes, and plant communities. Taxonomy, distribution, and ecology of the riparian flora of Pamba River Kerala was evaluated by Paul (2014) supports these evidences.

The present study intended to explore the local flora around two major dam sites in Thrissur district which belongs to a part of Western Ghats.

MATERIALS AND METHODS

Study Area And Geography

Pathazhakundu dam is located at 10.6308° N latitude and 76.2218°E with an elevation 127 and 106 respectively in Thrissur district, Kerala state. The study was conducted in the premises of Pathazhakundu Dam site which is located in Thekkumkara Village, and Poomala Dam, which is located in

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Mulakunnathukavu Village both sites belong to Central Kerala Division. In general, the Thrissur district is characterized by wet type of climate and four types of seasons are identified viz. hot summer season from March to May, the southwest monsoon season from June to September, the northeast monsoon season from October to December and a general cool and salubrious climate period during climate period during January and February. The average annual rainfall ranges between 2310.1 and 3955.3 mm in the district with mean annual rainfall of 3198.133 mm.

Field Survey

The study of the floristic diversity was done by the continuous survey of selected areas during the period of January 2021-March 2021. 500 m² of area within the immediate vicinity of dam site were used for the evaluation of flora. Different habitat types have been recognized in the study areas such as; Aquatic habitats, Pavements, Dry soil, muddy soil etc. The plant parts bearing reproductive parts, such as flowers, fruits, roots, tendrils, and so on, were noted during field survey. The plant parts bearing reproductive parts, such as flowers, fruits, seeds and so on, were noted during field survey.

Collection and Herbarium Preparation

The specimens were collected and noted all characters. Two to five specimens were collected for each taxon. Thus, studied specimens were well dried and made into herbarium by following standard methodology proposed by Forsberg and Sacht (1965) and Jain & Rao (2016).

Plant Identification

The systematic treatments of each species were done by identifying the original citation of the correct name followed by Local names, if available, thereby facilitating a reference to various Indian Floras, or other publications. Data's available from Flora of the presidency of Madras (1979), and other regional Floras along with those collected from various blogs and applications like, 'Flowering plants of Kerala' by N. Sasidharan were used for this.

Classification

After describing the species characteristics, the classification is followed as per the APG IV (2016) system, which is the current system of classification. Artificial key had been prepared using easily observable and reliable characters for clear identification. Number of native, exotic, invasive species were analyzed with the help of GISD (Global invasive species database, 2020).

RESULTS

Field Survey Analysis

A total of 96 species (93 flowering plants belongs to 39 families and 3 pteridophytes belong to 2 families) were recorded. Among families, Asteraceae (18%), Fabaceae (7%), Poaceae (6%), Convolvulaceae (7%) and Apocynaceae (7%) were most species diverse in Pathazhakundu and Asteraceae (19%), Fabaceae (8%), Cyperaceae (4%), Rubiaceae (5%) and Malvaceae (5%) were in dominant in Poomala (Table 1, Fig 1).

Table 1 Categorization according to plant habit

| Habit | Pathazhakundu site | Poomala site |
|----------|--------------------|--------------|
| Herbs | 28 | 41 |
| Shrubs | 20 | 10 |
| Twinners | 3 | 1 |
| Climbers | 10 | 7 |
| Trees | 8 | 7 |

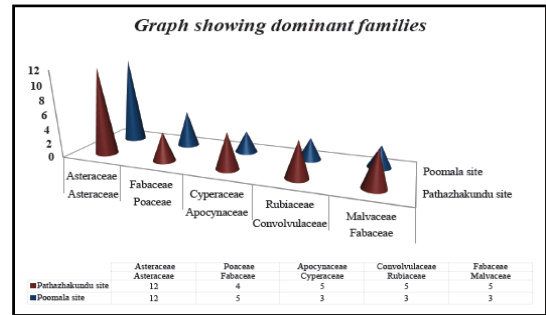


Fig 1 Five dominant families in both study sites

Plant Habit

Herbs are more dominating in both the study sites in general. In Pathazhakundu site with 28 species herbs dominates followed by Shrubs (20), Climbers (10), Trees (8) and Twinners (3). In Poomala also herbs dominate with 41 species followed by Shrubs (10), Trees (7), Climbers (7) and Twinners (1) (Fig 2).

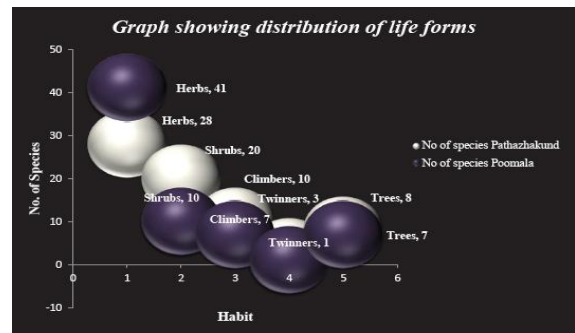


Fig 2 Distribution of life forms in both study sites

Table 2 detailed lists of plants observed from Poomala and Pathazhakundu dam sites

| Plant | Family |
|--|----------------|
| <i>Nymphaea nouchali</i> Burm.f. | Nymphaeaceae |
| <i>Nymphaea omarana</i> Hort. ex Gard. | Nymphaeaceae |
| <i>Colocasia esculenta</i> (L.) Schott. | Araceae |
| <i>Pothos scandens</i> L. | Araceae |
| <i>Vanda tessellata</i> (Roxb.) Hook. ex G.Don | Orchidaceae |
| <i>Cyperus malaccensis</i> Lam. | Cyperaceae |
| <i>Cyperus rotundus</i> L. | Cyperaceae |
| <i>Cyperus tenuispica</i> Steud. | Cyperaceae |
| <i>Eleocharis atropurpurea</i> (Retz.) J.Presl & C.Presl | Cyperaceae |
| <i>Bambusa bambos</i> (L.) Voss | Poaceae |
| <i>Cynodon dactylon</i> (L.) Pers. | Poaceae |
| <i>Pennisetum polystachion</i> (L.) Schult. | Poaceae |
| <i>Saccharum spontaneum</i> L. | Poaceae |
| <i>Cyclea peltata</i> (Lam.) Hook.f. & Thomson | Menispermaceae |
| <i>Tinospora cordifolia</i> (Thunb.) Miers. | Menispermaceae |
| <i>Nelumbo nucifera</i> Gaertn. | Nelumbonaceae |
| <i>Leea asiatica</i> (L.) Ridsdale | Vitaceae |
| <i>Alysicarpus vaginalis</i> (L.) DC. | Fabaceae |
| <i>Cassia fistula</i> L. | Fabaceae |

| Plant | Family |
|--|----------------|
| <i>Centrosema molle</i> Benth. | Fabaceae |
| <i>Gliricidia sepium</i> (Jacq.) Walp. | Fabaceae |
| <i>Mimosa pudica</i> L. | Fabaceae |
| <i>Moullava spicata</i> (Dalzell) Nicolson | Fabaceae |
| <i>Senna occidentalis</i> (L.) Link. | Fabaceae |
| <i>Ziziphus oenoplia</i> (L.) Mill. | Rhamnaceae |
| <i>Ziziphus rugosa</i> Lam. | Rhamnaceae |
| <i>Ficus hispida</i> L.f. | Moraceae |
| <i>Mukia maderaspatana</i> (L.) M.Roem. | Cucurbitaceae |
| <i>Turnera subulata</i> Sm. | Passifloraceae |
| <i>Croton bonplandianus</i> Baill. | Euphorbiaceae |
| <i>Macaranga peltata</i> (Roxb.) Mull.Arg. | Euphorbiaceae |
| <i>Tragia involucrata</i> L. | Euphorbiaceae |
| <i>Phyllanthus reticulatus</i> Poir. | Phyllanthaceae |
| <i>Phyllanthus virgatus</i> G. Forst. | Phyllanthaceae |
| <i>Rotala macrandra</i> Koehne | Lythraceae |
| <i>Ludwigia octovalvis</i> (Jacqui.) P.H Raven | Onagraceae |
| <i>Cardiospermum halicacabum</i> L. | Sapindaceae |
| <i>Naringi crenulata</i> (Roxb.) Nicolson | Rutaceae |
| <i>Ailanthus excelsa</i> Roxb. | Simaroubaceae |
| <i>Helicteres isora</i> L. | Malvaceae |
| <i>Sida acuta</i> Burm.f. | Malvaceae |
| <i>Sida rhombifolia</i> L. | Malvaceae |
| <i>Urena lobata</i> L. | Malvaceae |
| <i>Cleome rutidosperma</i> DC | Cleomaceae |
| <i>Achyranthes aspera</i> L. | Amaranthaceae |
| <i>Alternanthera sessilis</i> (L.) R.Br. ex DC. | Amaranthaceae |
| <i>Boerhavia erecta</i> L. | Nyctaginaceae |
| <i>Glinus oppositifolius</i> (L.) Aug.DC. | Molluginaceae |
| <i>Canthium coromandelicum</i> (Burm.f.) Alston | Rubiaceae |
| <i>Morinda citrifolia</i> L. | Rubiaceae |
| <i>Oldenlandia diffusa</i> (Willd.) Roxb. | Rubiaceae |
| <i>Strychnos nux-vomica</i> L. | Loganiaceae |
| <i>Calotropis gigantea</i> (L.) Dryand. | Apocynaceae |
| <i>Cryptolepis dubia</i> (Burm.f.) M.R. Almeida | Apocynaceae |
| <i>Dregea volubilis</i> (L. f.) Benth. ex Hook.f. | Apocynaceae |
| <i>Hemidesmus indicus</i> (L.) R. Br. ex Schult. | Apocynaceae |
| <i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz | Apocynaceae |
| <i>Coldenia procumbens</i> L. | Boraginaceae |
| <i>Heliotropium indicum</i> L. | Boraginaceae |
| <i>Argyreia nervosa</i> (Burm.) Bojer | Convolvulaceae |
| <i>Evolvulus nummularius</i> (L.) L. | Convolvulaceae |
| <i>Ipomoea eriocarpa</i> R. Br. | Convolvulaceae |
| <i>Ipomoea obscura</i> (L.) Ker Gawl. | Convolvulaceae |
| <i>Merremia tridentata</i> (L.) Hallier f | Convolvulaceae |
| <i>Solanum torvum</i> Schultdl. | Solanaceae |
| <i>Limnophila aquatica</i> Alston | Plantaginaceae |
| <i>Limnophila indica</i> (L.) Druce. | Plantaginaceae |
| <i>Lindernia crustacea</i> (L.) F.Muell. | Linderniaceae |
| <i>Lindernia rotundifolia</i> (L.) Alston. | Linderniaceae |
| <i>Dipteracanthus prostratus</i> (Poir.) Nees | Acanthaceae |
| <i>Hygrophila auriculata</i> (Schumach.) Heine | Acanthaceae |
| <i>Rungia pectinata</i> (L.) Nees | Acanthaceae |
| <i>Spathodea campanulata</i> P. Beauv. | Bignoniaceae |
| <i>Lantana camara</i> L. | Verbenaceae |
| <i>Stachytarpheta jamaicensis</i> (L.) Vahl | Verbenaceae |
| <i>Anisomeles indica</i> (L.) Kuntze | Lamiaceae |
| <i>Clerodendrum infortunatum</i> L. | Lamiaceae |
| <i>Hyptis suaveolens</i> (L.) Poit. | Lamiaceae |
| <i>Tectona grandis</i> L. f. | Lamiaceae |
| <i>Nymphoides indica</i> (L.) Kuntze. | Menyanthaceae |
| <i>Ageratum conyzoides</i> Hieron. | Asteraceae |
| <i>Blumea axillaris</i> (Lam.) DC. | Asteraceae |
| <i>Blumea laevis</i> (Lour.) Merr. | Asteraceae |
| <i>Blumea oxyodonta</i> DC. | Asteraceae |
| <i>Chromolaena odorata</i> (L.) R.M.King & H. Rob. | Asteraceae |
| <i>Cyanthillium cinereum</i> (L.) H.Rob | Asteraceae |
| <i>Eclipta prostrata</i> (L.) L. | Asteraceae |
| <i>Emilia sonchifolia</i> (L.) DC. ex DC. | Asteraceae |

| Plant | Family |
|--|--------------|
| <i>Grangea maderaspatana</i> (L.) Poir. | Asteraceae |
| <i>Mikania micrantha</i> (L.) Willd. | Asteraceae |
| <i>Sphaeranthus indicus</i> Gaertn. | Asteraceae |
| <i>Synedrella nodiflora</i> (L.) Gaertn. | Asteraceae |
| <i>Tridax procumbens</i> (L.) L. | Asteraceae |
| <i>Marsilia minuta</i> L. | Marsileaceae |
| <i>Ceratopteris thalictroides</i> (L.) Brongn. | Pteridaceae |
| <i>Pityrogramma calomelanos</i> (L.) Link | Pteridaceae |

Factors Affecting Species Population

The current panoramic review aimed to investigate the ecological impact according to species population. As per the investigation, only 19.35% are noted as exotics and remaining 80.6% was native species itself. Among weeds, 11.82% is distributed as exotic weeds and 5.37% is allocated as native weeds. The invasive category is observed as 25.8% native invasive and 13.97% exotic invasive (Fig 3).

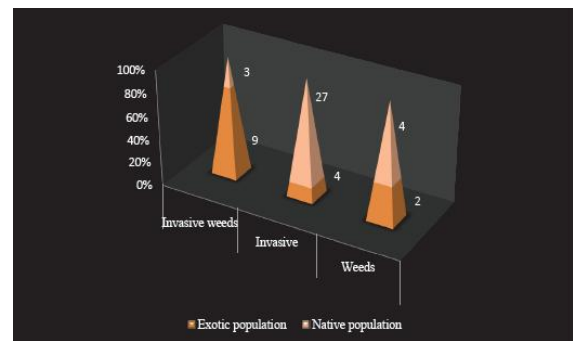


Fig 3 Graphical representation of plants affecting natural species population

Endemism

In this analysis, two endemic species was ascertained, viz. *Moullava spicata*, which was spotted from Pathazhakundu belongs to family Fabaceae, which is regionally known as poomullu valli. And *Rotala macrandra* from Poomala dam site, which belongs to Lythraceae family. As the population trend was premeditated, 99% of the species showed stable or increased growth, except *Vanda tessellata*, that revealed a declining trend (Fig 4).



Fig 4 Pictorial representation of population trend and endemism

DISCUSSIONS

From both the selected dam sites, a luscious vegetation of flowering plants was observed along with a small cluster of pteridophytes. As in every floristics studies, here also the Asteraceae family is observed as the dominant one as it is considered as one of the most flourished and advanced family from all dicotyledons which includes about 25,000 species (Gupta, 1995; Okunade, 2002). Genus to family' and 'species to genus' ratios indicate the establishment of diverse vegetation in the study site. Nearly one third of the species

have been observed flowering throughout the year. Distribution of pattern of different life forms indicates comparatively least occurrence of tree forms, which can be considered as result of extensive anthropogenic activities.

Invasive alien species are issue that requires collaboration among government and nongovernmental organizations (Kumar, 2018). The present study discovered about 18 exotic and 78 native species. Three exotic plants were found to be innocuous and had not been reported as weeds or invasives so far. There were two exotic plants reported as weeds and four exotic plants reported as invasive species. Nine exotic plant species have been discovered to be invasive weeds. At present native species shows dominance over others but the presence of highly invasive and weed species is a matter of concern which might become a challenge for remaining species in the future.

Table 3 Risk categorized group of plants

| Plants | Decreasing population | Endemic | Threatened | Vulnerable |
|-------------------------|-----------------------|---------|------------|------------|
| <i>Vanda tessellata</i> | +++ | | | |
| <i>Rotala macrandra</i> | | +++ | | |
| <i>Moullava spicata</i> | | +++ | | |

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