Plant Biodiversity of seven Sacred Grove in Palakkad, Kerala

BY

K.U. Praveena

Reg.No. 19PBO015

A Dissertation submitted to the

Avinashilingam Institute for Home Science and Higher Education for Women,

Coimbatore – 641-043.

In Partial Fulfillment of the Requirements for the Degree of

DEGREE OF MASTER OF SCIENCE IN BOTANY

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Signature of the

Head of the Department

Signature of supervisor

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Introduction

Introduction

Nature and natural resources were used from earlier times and still humans are dependadnt on them. Some areas nature workship, is a kind of belief system which indirectly helps in preventing and protecting flora and fauna and also the microbes dwelling in them from human usage. Nature worship has been followed by diverse communities in various parts of the world including India (Malhotra *et al*., 2001). Nature worship involves in maintaining and protecting a patch of forest like structure dedicated for dieties or ancestral spirits. They are called as 'Sacred Groves' or Temple Groves'. These Groves are small forest regions maintained by indegenous tibes or local people with a belief that sacred dieties reside in that area. So it serves as a cultural ritual sites for traditional local peoples (Saikia, 2006).

According to Huges and Chandran (1998), Sacred Grove are a segment of landscape containing trees and other forms of life and geographical features that are delimited and protected by human activities believing that preserving such a patch of vegetation in relatively undisturbed state is necessary for expressing one's relation to the divine or to nature. Sacred grooves were also considered as tracts of virgin forest that are left untouched by local communities, harbours rich biodiversity and are protected by the local people for their spiritual and religious significance (Sukumaran *et al.*, 2019). International Union for Conservation of Nature and Natural Resources (IUCN), has definied Sacred Groves, as one form of nature worship, and are considered as "Sacred Natural Sites" (Oviedo *et al.*, 2005). Ecologically, scared Groves tend to be fragments of the original ecosystem. But in certain cases, few Groves are planted by local people or a family serving similar purposes where even dead woods and twigs were also not removed.

Sacred Groves are known by different names in different parts of of the world but their presence is mostly restricted in Asia and Africa (Hughes and Chandran, 1998). In India, Sacred Groves are distributed in the states of Andhra Pradesh, Karnataka, Kerala, Maharashtra, Manipur, Meghalaya, Orissa, Rajasthan, Tamil Nadu, Uttarakhand, West Bengal and the Union Territory of Puducherry (Malhotra *et al.*, 2001 and Ramanujam *et al.*, 2007). In kerala, Sacred Groves are found in few homes for snake as diety, and so called as 'Kavu' (Snake Temple). Here plants from trees to shrubs are grown and protected over an area of land,

which may also have ponds and small water bodies. This setup in the Grove helps many fauna to inhabit them, due to which it becomes diversity rich area. Sometimes, particular kinds of trees are nurtured in the Groves, associated with the dieties worshiped. Regular religious rites and festivals are carried on to maintain and to pass on the knowledge about the Sacred Grove and its need to the future generations.

As Kavu is the place where a particular diety is present, people believe that sancity has to be maintained there. Because of this reason, people usually entered the Groves with utmost respect for cleanliness and were found not to violate any of the rules and restriction that Kavu holds. This lead to the conservation of plants and trees as restriction of cutting down trees or destroying the wilderness is not allowed.

Kavu are found existing throughout the Kerala state, which account for about 761 (Balasubramanyan and Induchoodan, 1999). Deities presiding in them are worshipped either daily or on auspicious occasions. The ritual prayers carried out in Kavu is a common practice but the customs and whorship of the deities differs from place to place. This existence of Kavu is onway of conserving flora and fauna by our ancestors. It is recorded in many studies that Kavu has be harbouring many plants which are in endangered list and also for many plants which are rare and have medicinal properties (Jeeshna, 2017). Apart from conserving biodiversity, Sacred Groves that are situated in the middle of the human habitation are responsible for conserving water and soil. Kavu presnt in Kerala are distributed in Kasargod, Kannur, Kozhikode, Thrissur, Palakkad, Ernakulam and Alappuzha districts.

Increase in population and demand of land for industrial developments and other needs, nowadays the area of Kavu is decreasing and in few places the Kavu itself is destroyed with only few plants or no plants or no deities. People believed that diety or spirits were dwelling in the trees and Kavu, so they protected them. Inorder to sell the Kavu land or use it for other purpose, the subtle form of diety is moved to some temples and rituals or prayers are done as usual in some special ocassions. Later on the trees are cut down and the ponds were filled and the lands

are used for various purposes. In this present study, few Kavu present in Palakkad district were studied with the following objectives:

1. To identify, select and profile the nearest snake temple Sacred Groves in Palakkad, Kerala.
2. To enlist the flora found in the Sacred Groves.
3. Documentation of species of ethno-botanical importance found in Sacred Groves.

Review of Literature

Review of Literature

A diverse range of ecosystem persists all round, where there is a lot of environmental crisis ongoing. To alleviate the negative effects biodiversity conservation of ecosystem is very important. Protection of environment and life supporting system are interwoven with the conservation of biological diversity. The World Conservation Strategy (WCS) has appreciated the importance of human element and recommended that the cultural connections to conservation practices as prevailed in the classical societies should be encouraged (Heywood 1995; Shankar and Majumdar 1997). This was the theme of UNESCO's initiative "Cultural Sites and Cultural Connections" which provided an impetus to sacred grove research in 1997. During 2010 UN declared the year as "International Year of Biodiversity" and in 2011 as the 'International Year of Forests' stating the importance given to Conservation of Biodiversity (Thandavamoorthy, 2016).

Human society has conserved ecosystem in many ways and religion has always played a notable role. Connecting things with faith is the easiest way to get society's support for a good cause. Sacred groves are the best example of connecting nature with faith (Untawale, 1998; Kulkarni, 2018). Sacred groves represent embracing concept and practice of ancient Indian way of *in situ* conservation of genetic diversity (Krishna and Sanilkumar, 2019). Its a place where gods, goddesses, spirits are believed to reside along with the trees. No one knows the time period from which this type of worship started to prevail, but it is believed that long back the trees in the forests were worshiped for the spirits (Malevolent and Benevolent) dwelling in the jungles and trees. It is believed that the spirits rescued mankind in times of disease and trouble, if men were able to win spirit's favours (Das, 2020).

Sacred groves are the conserved forest patches, or protected areas, which is also one of the informal practices to conserve that regions biodiversity. The conservation is mainly based on cultural, aesthetical, and religion aspects, and play an important role in preservation of depleting resource elements such as medicinal plants. It not only helps in conserving biodiversity it also enriches the soil by its rich litter and the nutrients generated by litter decomposition are not only recycled within the Sacred Groves ecosystem, but also find their way into the adjoining Agro Ecosystems (Jincy and Subin, 2016). Sacred groves are also considered as natural museums of colossal trees, threatened species, medicinal plants, regulator of water sheds, recreation hubs for urban life, laboratory for environmentalists, authentic gardens and gene banks for breeders and botanists (Kandari *et al.*, 2014). They also

serve as mini - ecosystems by ensuring environmental conservation and economic benefits to the local communities (Sreena and Pillai, 2021). These groves are located in various altitudinal regions and hence, play a significant role in the conservation of rare and endangered species of the faunal and floral part (Mgumia and Oba 2003).

The concept of sacred groves or virgin forests has been judged to have originated during the hunting and gathering era, much before the advent of settled agriculture. (Gadgil and Vartak, 1976). Hence it is assumed to be of the pre-Vedic period, which dates back to about 3000 to 5000 BC. The existence of sacred groves has been reported from many parts of the world – Europe (France, Greece, Italy, Spain, the UK, Germany, Finland); Asia (China, Indonesia, India, Sri Lanka, Israel, Korea, Mongolia, Thailand, Japan, Afghanistan, Kazakhstan, Iran, Nepal, Russia, Pakistan) (Bhandary and Chandrashekar, 2003); Oceania (Australia, New Zealand); Africa (South Africa, Benin, Egypt, Ghana, Guinea, Sierra Leone, Bissau, Kenya, Madagascar, Senegal, Tanzania, Zimbabwe, Togo, Nigeria, Morocco, Cameroon, Ethiopia) (Bhandary and Chandrashekar, 2003); South America (Chile, Guatemala, Peru); and North America (Canada, Mexico, the USA) – in a wide variety of habitats (Bhagwat and Rutte 2006). IUCN has recognized Sacred Natural Sites and are defines it as “areas of land or water having special spiritual significance to people and communities” (Wild *et al.*, 2008).

According to Sekaran and Raj, (2017) Sacred Groves are the part of the socioecological system. It is the concept of village as part of a large cultural landscape, with interconnections between the various ecosystem type such as forests, water bodies and human-managed agroecosystem. These types are placed within a resource rich landscape unit providing an appropriate climate for sustaining protected forest ecosystems in the form of sacred groves. In other words, presence of resource rich healthier natural ecosystem type is a prerequisite for conservation of the sacred groves. Vegetation in the sacred grove, including shrubs, climbers and trees are supposed to be under the protection of the diety or spirit believed to be present there. Removal of even a small twig is considered as taboo (Vartak and Gadgil 1973 and Vartak 1983). Sacred groves not only harbour plants, it also with holds many fungal floras and these fungal biodiversity in the kavu which was studied by George *et al*., (2018).

These groves have distinct floral characters making it unique ecosystem (Oommen *et al.,* 2000). It also harbours 100% valuable and medicinal plants beneficial for mankind.

Groves help to maintain water table in that areas. Filling up of ponds and removal of sacred groves, which used to help maintain the ecological balance play a major role for the drop in ground water table (The Hindu Business Line, 2004).

2.1 Classification of sacred groves

According to Tiwari *et al.,* (1998b) sacred grooves are classified into three types as follows:

1. Based on number of trees present in them
    a. Single-tree based groves – the large area of the grove is covered by a single tree (principal sacred tree), under which other plants thrive well.
    b. Multi-trees based groves – there is no principal sacred tree, so all the plants present in the grove are considered and worshipped as a whole.
2. Based on nature of human interferences
    a. No human interference
    b. Partial human interference
3. Based on religion/use
    a. Traditional – has an iconic symbol of a diety in village or home.
    b. Temple groves – groves around temple.
    c. Burial/ cremation groves – groves around burial or cremation grounds.

According to Amrithalingam (2016) sacred groves in India are categorised as follows:

1. Local – maintained by a village. Village comprises of several ethnic groups and several tribal communities.
2. Regional – maintained by temple trust, and deities are worshiped and visited by several people from various districts.
3. Pan-Indian – maintained by temple trust, and deities are worshiped and visited by several people from many countries.
4. Adobe of ancestral spirits – acts both as burial ground and location of diety and ancestor worship.

According to Thandavamoorthy, (2016) the ownership and management are of four types as follows:

1. Privately owned – either by individuals or by a family or by a clan (Kerala, Mehalaya, Tami Nadu).

2. Sacred groves under the control of revenue and other government departments (e.g. Tamil Nadu, Maharashtra) or District Councils (Meghalaya)
3. Sacred groves under the control of State forest departments (Karnataka, Maharashtra etc.)

2.2 Sacred Grove – Global Scenario

Sacred groves are found in various parts of the world. World over, sacred groves have been established for several religious purposes, as burial lands, water management and for retaining water quality (Ormsby and Bhagawat, 2010). Almost all continents of the world, except the poles have sacred groves (Malhotra *et al*., 2007). Many reports from various workers around the globe have informed about the distribution, cultural diversity, conservation priorities and ethnobotanical aspects of sacred groves from different parts of Africa (China (Shengji, 1991), Lebbie and Guries, 1995, Hughes and Chandran, 1997), Mediterranean area (Hughes, 1997), Europe, Australia, Japan and Korea (Hughes and Chandran, 1997), Bangladesh (Hossian, 1997), Afganisthan (Zaman, 1997), Esukawkaw reserve in Ghana (Amoakoa-Atta, 1998), Coastal Ghana (Chouin, 2002), Nepal (Bhattarai and Baral, 2008), Kenya (Kassilly and Tsingalia, 2009), USA and India (Pruthi and Burch, 2009) and Scotland (McIntosh, 2010).

While sacred groves are seen in Asian countries like India, Korea, Japan, China, Thailand and Indonesia, countries like Nigeria, Sierra Leone, Ghana, Ivory Coast, Zimbabwe, Egypt and Kenya have such groves in Africa. Further, considerably large sacred groves have been reported from Europe and Britain also. Most of them are in different stages of degradation. Sacred groves vary in their age and size from few meters to greater than 100 ha. However, severe degradation has been observed in the smaller groves (<1 ha) due to anthropogenic disturbances, climate change and invasion (Ray and Ramachandra, 2010). Sacred groves in Isiala Ngwa North and South of Abia State, Nigeria was studied by Chima and Nuga (2011) to figure out the various reasons and causes for its demolition and ways to reinstate trees.

Samakov and Berkes, (2017) conducted a study on Spiritual commons: sacred sites as core of community- conserved areas in Kyrgyzstan. A detailed study of sacred trees present in various shrines in Japan was conducted by Nilzen (2021) in Nishinomiya shrine, Shimogamo shrine, Hakusan-taga shrine and Kotohiki Hachiman Shrine.

2.3 Sacred Grove – Indian context

Sacred groves are found in almost all agro climatic zones spread across the various states of India (Kulkarni *et al.*, 2018). India used to cherish a large number of sacred groves when compared to any other country in the universe. The conservation of sacred groves by the local people involves strict rules and taboos, tree felling, damaging of plants are strictly prohibited. Generally, inside the grove foot wears, smoking and alcoholic beverage are prohibited and only local people are allowed to visit. In the case of persons damaging the groves properties, fines or punishments are awarded, resulting in the religious taboo and myth, the diversity of the groves is protected (Ganesan, 2009). Hunting and logging are usually strictly banned within these patches. Beyond this forest usage like honey collection and dead wood collection, sometimes permitted on the basis of needs for survival (Divya and Manonmani, 2013). There is a consequent mixing of religious and other spiritual or belief systems. Sacred groves are just one of the many domains where religions or belief systems interact with nature.

Many sacred groves have been well protected over time and have seen little disturbance. Many are demonstrably high in biodiversity and represent a strong biodiversity conservation opportunity (Park 2002). But still the number has got decreased. Number of sacred groves in India is the only place in the globe to have a large number of sacred groves, even when there are human disturbances.

The sacred groves are well distributed all the way from Himalayas to Cape Comorin. Brandis (1897), India's first Inspector General of Forests, acknowledged the existence of sacred groves in India. Compared to any other country around the world, India harbours a large number of Sacred groves. In a developing country like India, this traditional practice might be one of the best ways of biodiversity preservation especially in the threatened biodiversity hotspots like the Western Ghats. It is believed that Sacred Groves are more effective than government protected areas as they are community managed, with a different base of traditional beliefs and cover a wide variety of habitats (Bhagwat and Rutte 2006).

Most of the sacred groves reported from India are in the Western Ghats, North Eastern India and Central India (Gadgil and Vartak 1976, Burman 1992, Rodgers 1994, Balasubramanyam and Induchoodan 1996, Tripathi 2001, Khumbongmayum *et al*., 2005). Sacred groves have been reported in Meghalaya (Boojh and Ramakrishnan 1983, Ramakrishnan 1996, Tiwari *et al.* 1998a, Jamir 2002, Law 2002, Upadhaya 2002, Mishra *et*

al., 2004), Manipur (Khumbongmayum 2004, Khumbongmayum *et al*., 2005), Western Ghats (Gadgil and Vartak 1976).

Table 1: List of other names for Sacred Groves in India

(Hughes and Chandran, 1997; Pushpanghadan *et al*., 1997 and Das, 2020)

S. No	Place	Name
1	Andhra Pradesh	Pavitraskhetraalu
2	Aravalli Hills	Oran
3	Arunachal Pradesh	Gumpha
4	Assam	Than or Madaico
5	Bengal	Garamthan or Harithan or Santhalburithan and Sabitrithan
6	Central India	Dev or Jankor orSarana, Jankor Jaher
7	Chaattishgarh	Matagudi, Devgudi Gaondevi
8	Darjeeling	Deorali
9	Himachal Pradesh	Deorali, Dev van, DeoBhumi
10	Jharkhand	Sarana / Jaherthan
11	Karnataka	Sidharavana or Devarakadu or Pavithravana
12	Khasi Hills	Law Kyntang
13	Kerala	Sarpakavu, Kavu, Sastha Kavu, Maadan Kavu, Amman Kavu, Yakshi Kavu, Ayyapan Kavu
14	Madhya Pradesh	Sharana, Devkot, Matikot, Devsthali, Budhadev
15	Maharashtra	Devrahati, Deorai, Deovan, Devgudi
16	Meghalaya	Ki Law Kyntang, Ki Law Adong, Ki Law Shnong, Ki Law Kinti
17	Manipur	Uumangalai or Mauhak or Gamkhep
18	Mizoram	Ki Law Niam, Mawsmund
19	North-East	Mawphlong
20	Odisha	Jahera and Thakuramma
21	Puducherry	Koilthoppu, Koilkadu, Samicholai
22	Sikkim	Gumpha
23	Rajasthan	Vani, Malvan, Kenkri, Orans, Jogmaya, Shamlatdeh, Devabani
24	Tamilnadu	Kovikadu, Samicholai, Vanakkoil, Kattukovil
25	Uttarakhand	Bugyal, Dev Van
26	West Bengal	Grmthan, Jahera, Haritan Sabitritan

Mitra and Pal (1994) also reported the occurrence of sacred groves in Meghalaya, Bihar, Rajasthan and the states along the Western Ghats. Their existence along the Himalaya, from northwest to northeast, was described by Burman (1992) and Rodgers (1994). Sacred mangroves, experiencing little or no damage at all, with some religious significance, were reported from Rann of Kutch, Maharashtra, Goa, Tamil Nadu and West Bengal (Untawale *et al*., 1998). Brandis reported the occurrence of numerous groves in all provinces of India (Anon, 1996). Four regions listed below are well known for harbouring sacred groves in India, viz.,

1. Khasi and Jainta hills of the Northeast India,
2. Western ghats area,
3. Aravallis of Rajasthan and
4. Bastar area in Central India

Recently many more sacred groves in other parts of India are also been listed and studied. Indian sacred groves are mainly associated with temples / monasteries / shrines and burial grounds. These are usually protected traditionally as small patches of vegetation types which are managed by families or local communities by following a various ways of management practices, which are considered as biological heritage (Manoharan and Chinnappan, 2019).

They are dedicated to local deities or ancestral spirits, protected through social traditions by local people and taboos that incorporate spiritual and ecological values. These sacred groves are preserved over course of many generations represent native vegetation in a natural habitation or natural state (Sathe, 2017).

In India Himalayan region has various sacred groves, one among is Garhwal and Kumaon Himalayan region where different cultures and traditions are followed. One important example of conservation of biodiversity by religious belief is found in Hariyali and Tarkesh war sacred groves from Garhwal Himalaya (Sinha and Maikhuri 1998, Ghilidiyal *et al*., 2008). Various deities like Golu, Gangnath, Haat Kali, Bhumi Dev, Shyamju, Harju, Kotgari etc resides in these groves and they are worshiped.

Other sacred groves from North India were Thalkedar, Nakuleshwar, Haat Kali, Chamunda Devi, Malay Nath, Patal Bhuvneshwar, Vaishneo Devi sacred groves were reported (Negi 2005, Agnihotri *et al*., 2009, Singh *et al*., 2010, Singh *et al*., 2012, Agnihotri

et al., 2010 and Singh *et al.* 2014). Singh (2019) and his workers studied flora and fauna present in the Himalayan sacred groves and reported that out of 78 plant species, about 91 % had ethano-medicinal properties, which were used to treat various ailments by the local people. According to Mehra *et al.*, (2014) most of the studies that were conducted on sacred groves were merely near documentation and inventory stating the importance of sacred groves in biodiversity conservation. According to Rajasri Ray *et al*., (2014) sacred groves may lose their prominence nowadays, but are still relevant in Indian rural landscapes inhabited by traditional communities.

2.4 Sacred Grove in Kerala – An overview

A rough estimate done by Pushpangadan, (1998) states that there are almost 2000 sacred groves in Kerala, which are distinct and biologically unique. Sacred groves in Kerala are located mainly in Kasargod, Kannur, Kozhikode, Thrissur, Palakkad, Ernakulam and Alappuzha districts. Balasubramanyan and Induchoodan (1999) recorded a total number of 761 sacred groves in Kerala State. In Kerala the common practice among Hindus to assign a part of their land near the Tharavadu or house as the abode of goddess Durga or serpent god Naga or Shasta and the place is called 'Kavu' or 'Sarpakavu'.

Groves or Kavus in Kerala are found in individual households too mostly in the form of 'Sarpakavu's or serpent/snake groves or dedicated to folk dieties. One of the oldest types of nature worship is occurring in Sacred groves and each sacred grove is dedicated to serpent God. Even though worship of serpent common in the temples of India but in Kerala State (Joji, 2018) it is carried out in Sacred Grove. The area with the idol may be considered sacred by the family members and timely religious oblations will be paid. Thus, creating an atmosphere of divinity, the virginity of the region is maintained (Mithy, 2018). These acts as treasure houses of plants and animals and can satisfy scientific, cultural and aesthetic needs of mankind.

Sacred groves (Kavukal) in Kerala State with different types of flora such as mangroves, freshwater swamps, mixed trees, medicinal herbs and so on. Many threatened species existed in the sacred groves of Kerala (Nair and Mohanan 1981) and it preserving unique species of plants, insects and animals (Venkatachalam *et al*. 2005). Therefore it acts as a tool for biodiversity conservation (Gaikwad *et al*. 2004). The kavu helps to conserve the diversity of plants and animals and also to build up and maintain cultural diversity of the

region by providing platform for perfoming arts like “theyyam” and other festivals (Kunhikannan, 2005).

The conservation in the sacred grove is mainly based on cultural, aesthetical, and religion aspects, and in different areas these sacred groves are devoted or dedicated for different Gods ie. serpentine Gods, Nagadevatha, Nagayakshi etc. The sacred groves in Kerala are tightly bound with religional backgrounds. Human activities are highly prohibited in these areas. Touching plants (and animals associated with them) in these sacred groves and gardens was forbidden to all except the temple priest, and his too is restricted to offerings to the Presiding temple Deity and curing the ailments of local people (the temple priest was in variably the village doctor) (Kumar and Udayan, 2018).

Sacred Groves that are in the middle of human habitation not only conserves biological diversity, this habitation are also responsible for conserving water and soil (Praveenkumar, 2018). According to Nair, (1992) in the disturbed zone of sacred groves the number of herbs and shrubs are reported to be more. This is due to urbanization and industrialization coupled with rationalization, scarcity of land leading to the depletion of the cover and shrinkage of these areas as a result the large chunk of the areas are diverted for other activities and only a small portion is left with especially adjacent to the temple (Devaraj., *et al* 2005).

Sacred groves in Kerala fit into the top two categories of Kavu which is given below:

1. Associated with temple
2. Independent groves – belonging to a home or family
3. Independent groves with no temple
4. Associated with burial or cremation grounds.

The Sacred Groves in Kerala are generally dedicated to dieties and the details of kavu name and the diety belonging to that kavu are listed in table 2. These groves are mainly owned and managed by ancestral families, cluster of related families, village communities or temple trust. Some are under the control of Devaswom Board, Government of Kerala.

2.5 Studies on various Sacred Groves in India

In India, sacred groves are especially present in the Himalayan region, Western and Eastern Ghats, Coastal region, Central Indian Plateau, and Western Desert (Sumesh and Sudhikumar, 2018).

Table 2: List of various Kavus dedicated to dieties in Kerala

(Warrier and Warrier, 2019)

S. No	Kavu name	Dedicated to dieties
1	Sarpakkavu (South)	Serpent deities
2	Nagam (North)	Serpent deities
3	Bhagavathykkavu	Godess Bhagavathy
4	Ayyanppankavu or Sasthamkavu or Malamakkavu	Lord Ayyappa
5	Yakshikkavu	Lord Kali
6	Madankavu	Fierce form of Bhadrakali
7	Appoppankavu	Lord of Mountains
8	Daivakkavu (North)	Male God (Vishnumurthy, Siva, Vettakorumakan, Kshethrapalan, Gulikan or Kuttichathan)
9	Kottam	Vettakkorumakan
10	Mundya	Gulikan

Sumesh and Sudhikumar, has worked on the carban stock in sacred groves of Doda district and concluded that these sacred groves act as a very good sink for carbon and the need of conservation of sacred grove.

Amrithalingam, (2016) conducted a study on Sacred Groves of India and determined that the sacred groves are linked with the cultural and economic life of the local communities. Sacred groves fulfilling the economy, medicinal and religious needs of the local communities. Many species that have become extinct in other parts of the country are well preserved in these groves.

Dhwaj sacred grove vegetation, present in Central region of Indian Himalaya was studied in detail by Singh and Kumar (2020). A total of 67 genera with 81 species belonging to 50 families were recorded. Among them number of flowering plants, lichens, bryophytes, pteridophytes and gymnosperms were identified as 40, 23, 7, 12 and 1 respectively.

Jharkhand Sacred Grove and their non-Brahmin priests were studied by Subhashis Das, (2020). They conducted the study by differentiating the areas or plates and studied the plant species present and also identified the threatened species among them.

Northeast Indian Sacred groves were extensively studied for its status and sociology-ecological dimensions by Upadhyay, (2019) and found that sacred groves conserving endemic flora and fauna for natural ecosystem and they promoted in- situ conservation of different threatened species.

Jhabvala District of Madhya Pradesh was taken for conducting case studies on few sacred groves situated there by Rajora and Solanki (2019) as centres of cultural and biodiversity conservation. Their study was conducted in three areas, and upon studying these three sacred groves it was observed that the beliefs and restrictions related to the Deities, led the community to protect these groves as sacred abodes of the Deities they worship with all commitment.

Northern Western Ghats were taken and case studies were conducted there by Kulkarni and his coworkers, (2018) on floristic uniqueness and effect of degradation on diversity. And they figured out the floristic diversity, floristic uniqueness, effect of physical parameters of floristic diversity and effect of degradation relate parameters on floristic diversity.

Kanyakumari District situated in Tamilnadu was taken by Sukumaran and his co-workers, (2018) to carry out the phytosociological studies of the sacred. They determined species composition and their distribution pattern. A total of 102 species was identified in the sacred forest. Five species remained unidentified, included two species of orchids and their phytodiversity study shows sacred groves from various parts of the country shows a total of 111 species were recorded from four sacred groves of (Ramanujam and Cyril 2003).

Cuddalore district from Tamilnadu has many sacred groves, among them Sendirakillai was taken for the study by Gunasekar and his colleagues (2012) and they reported that there were about 180 species.

Koraput district present in Odisha recorded presence of 94 plant species by Debabrata, (2014).

Namakkal district, Tamilnadu was taken to study the Sacred Grove by Manoharan and Chinnappan, (2019) and its floral documentation revealed presence of 77 different plant species belonging to 37 families. These sacred groves were maintained by the local area people with dieties like amman, muniappan, Ayyanar, Karuppanar etc., and the plants present

in these groves had many medicinal properties and few were commercially valuable plants, but still they were maintained without destroying them.

Jaipur district in Rajasthan has Sacred Grove Nai-Ka-Nath, which was taken for the study of biodiversity degradation and their impact on wildlife by Choudhary and Gupt (2016). They determined the problems that are mainly causing the biodiversity degradation of sacred groves and their impacts. The study area is full with rich biodiversity. The grove plays important role in the conservation of biodiversity of the area. Due to some anthropogenic interventions like grazing, mining deforestation, poaching, herb collection, firewood collection, timber collection encroachment, pollution and degradation of sacredness and religious beliefs, the biodiversity of the area is degraded.

A case study **was carried out by Sushma and her co-workers, (2017)** based on sacred groves: Myths Beliefs and Biodiversity Conservation from Western Himalaya, India. Their study was conducted in Kodima village, Uttarakhand. In that Sacred Grove four seasons were observed like short summer, Monsoon, autumn, and long winter. The biodiversity of Hariyali Devi sacred grove was found to be rich in flora and fauna. The 80 plant species identified, represented 75 genera and 44 families with different economic values. The second study area Tungnath sacred grove is contented with many rare, threatened and endangered medicinal plants with a total of 27 plant species which includes 8 trees,10 herbs and 9 shrubs**.**

2.6 Surveys on *Kavu* in Kerala

Sacred groves present in kerala state covering southern western ghats has also received much attention still from earlier times. Ramachandran and Mohanan, (1990) published an inventory of sacred groves of Kerala. A survey of endemic plants in the sacred groves in Kerala was done by Induchoodan and Balasubramanyan, (1991). Prasad, (1995) estimated reasonably well-preserved groves in Kerala. Occurrence of 761 important sacred groves in India was reported by Balasubramanyan and Induchoodan (1996). A detailed review of Sacred Groves present in Kerala was done by Pushpangadan *et al.,* (1997) also.

A total of 245 flowering plants were recorded from Vallikaattu sacred grove of Kozhikode, Kerala (Sreeja and Unni, 2016). Deepa and her Co-workers, (2016) conducted a study on Floristic diversities and medicinal importance of selected sacred groves in Thrissur district, Kerala. They conducted the study in different areas Kavu in Thrissur district, 119

species of angiosperms coming under 104 genera and 15 families representing 8 vulnerable, 12 endemic and 3 near threatened species were collected. Many unique plants were identified, stating the importance of sacred groves.

Vallikkaattu Kaavu (sacred grove), in Kozhikode District recorded 245 flowering plants belonging to 2019 genera and 77 families. Among these 245 species, 75 species are herbs, 71 trees, 55 shrubs and 44 climbers. Out of the 245 species listed from this grove, 236 are medicinal (Sreeja and Unni, 2016).

Chaithra, (2017) and her workers studied about the medicinal plants present in Kanangattukavu and Kavumkara Kozhikode district, Kerala.

Jeeshna, (2017) conducted a study on Phytosociological analysis and floristic diversity of vaneeswaram Kavu in Kannur district, Kerala and found the collection of 50 taxa of including 19 herbs, 13 shrubs 10 trees and 8 climbers. Out of 50 species, 8 were found to be Endemic and 38 medicinally important were collected.

Taxonomical and phytosociological studies on Chithalikavu- A sacred grove, Thrissur district, Kerala was conducted by Deepa (2017) and her co-workers. The study resulted in the collection and identification of 57 species of angiosperms belonged to 54 genus and 35 families. Among them 29.82 % trees, 24.56 % shrubs, 15.79 % herbs and 29.82 % climbers. Almost all the plants found in the grove have medicinal properties.

Gadgil (2018) reported that Sacred Groves are an Ancient Tradition of Nature Conservation and stated its importance in conservation.

A study conducted by Praveenkumar, (2018) revealed the floristic diversity present in the Sacred Grove of Madathody Naga Kavu, Chalavara, Palakkad District, Kerala. This investigation lead to the identification of flora belonging to 50 different species coming under 49 genera and 25 families. Among them, they figured out that 6 were endemic, 8 exotic and 38 were medicinally important.

Joshi, (2018) and his co-workers evaluated a research on Macrolichen Diversity present in the Sacred Groves of Kumaun Himalaya. It revealed the occurrence of 116 macrelichen species, belonging to 38 genera under 13 families. They have also concluded from their study that Parmeliaceae (51 species) was the dominant family in all sacred groves, followed by

Physciaceae (36 species), Collemataceae and Lobariaceae (10 species, each), Peltigeraceae and Ramalinaceae (4 species, each), Cladoniaceae (2 species), Biatoraceae, Candelariaceae, Icmadophilaceae, Stereocaulaceae, Umbilicariaceae and Verrucariaceae (1 species, each). More than 44% population of the macrolichens in all the studied sacred groves composed of family Parmeliaceae and of the 116 species, 107 species of macrolichens were found growing on wood, followed by rock (24 species) and soil (21 species).

Krishna and Sanilkumar, (2019) investigated a total of ten sacred groves from coastline area in Central Kerala. Their study revealed that a total of 121 plant species under 108 species belonging to 60 families. Among these plants 100 of them were used for medicinal purposes by indigenous people.

Sayantani and Ramachandra, (2019) conducted a review study on vegetation in the Sacred Groves Across India. They found 1740 number of plant species and out of that Angiosperms represents maximum 90.45% followed by lichen 4.11%, pteridophyte 1.77%, gymnosperms 1.2%, bryophyte 0.4%, mosses 0.5% and algae 0.28%. This study unravels the detailed picture of angiosperm family to be more than lower groups.

Pradeep and Kousalya (2021) studied the composition of flora in Maniyoor temple, Kannur District, Kerala and recorded about 111 vascular plants among which 105 were found to be 106 genera of angiosperms belonging to 46 families.

2.7 Sacred Grove - Benefits

A case study conducted by Vinay Sankar (2020) Sacred groves in Central Kerala and find out that the physical boundaries of the Kavu are in the form of concrete compound walls. And the Sacred Natural Sites performs various biological and ecological functions at no cost to the dependent communities.

Catrien and her Co-workers, (2016) performed a study and has given a critical review regarding the Sacred Groves in Kerala and its Landscape change and the Role of Religion in Nature conservation. They observed few changes, as reasons for the decreasing rate of sacred groves, and the socio – economic changes reveals several social transformations in Kerala. The three changes that they have mentioned are listed below:

1. It is because of the land reforms introduced by the Communist government in 1957 that caused a large scale fragmentation of the land and this land is used for commercial farming.
2. It is the transformation from joint to nuclear families.
3. It is the clearing of sacred groves for building purposes.

The undisturbed vegetation cover of the groves improves the soil stability of the region and act as soil binder. Sacred groves mimic tropical rainforests in litter accumulation. Leaf fall and litter accumulation in soil returns nutrients into the soil from the standing biomass. Consequently, the water leaching out from sacred groves into the surrounding cultivated land is nutrient rich. In general, physicochemical properties of the soil have been found to be superior in sacred groves than undisturbed forests (high soil porosity, low bulk density). Litter decomposition is also faster in sacred groves due to the preponderance of soil microbial activity signaled by dehydrogenase activity (Sreena and Pillai, 2021).

2.8 Sacred Grove – Future perspective

Sacred groves in Southwestern India are not always pristine primary forest and many are rapidly degrading and shrinking, often to the point where they are reduced to just the central sacred compound containing the deities (Murugan, 2008). To this point, a Brahmin priest who was not a part of the survey explained how the occasional land owner would hire tantric priests to conduct a ceremony to lift up and displace the local snake deity of their sacred grove to another location so as to justify the implementation of plantations or other development in the area (Yuan *et al*., 2020). According to Rajasri Ray *et al*., (2014) sacred groves may lose their prominence nowadays, but are still relevant in Indian rural landscapes inhabited by traditional communities.

Materials and Methods

Materials and Methods

Study Area

Kerala is well known for numerous Sacred Groves for snakes. In this present study seven Kavu were taken from Palakkad (Table. 3). All seven of them were present in Ottappalam Taluk in Palakkad District. This study was carried out during the period of December 2020 to March 2021.

Table 3: List of Kavu visited in Palakad

S.No	Kavu Name	Area	Taluk
1	Payyandath Kavu	Thiruvazhiyode, Palakkad	Ottappalam
2	Aranjikkal Kavu	Thiruvazhiyode, Palakkad	Ottappalam
3	Kunnumel Kavu	Thiruvazhiyode, Palakkad	Ottappalam
4	Thavalakottu Kavu	Thiruvazhiyode, Palakkad	Ottappalam
5	Neerengil Kavu	Kattukulam, Palakkad	Ottappalam
6	Kalarikkal Kavu	Kattukulam, Palakkad	Ottappalam
7	Alagapath Kavu	Thiruvazhiyode, Palakkad	Ottappalam

Vegetation Analysis:

Biodiversity of the nine Sacred Groves were measured in terms of floristic composition which refers to the identity and variety of plants in each of the *Kavu.* The kavu taken for our study are maintained by the families were outsiders are not permitted and yearly once function is carried out for the serpent God which is present in the kavu.

Floristic Analysis:

Floristic analysis of the nine Sacred Grove was carried out during December 2020 – March 2021. Only living species (trees, shrubs, herbs and climbers) were enlisted in each *Kavu*.

Fig 1: Map of India and Kerala with Districts

Field data like habit and the family they belong to where registered. The nomenclature of plants studied were updated by using online nomenclature database such as www.theplantlist.org – The Plant List (TPL), www.ipni.org - International Plant Name Index (IPNI) and www.worldfloraonline.org – World Flora Online (WFO). Comparitive study of plant species and their habit present in each Kavu were analysed and represented in graphical pictures. Medicinal

and Economical uses of the plants present in the Kavu were also recorded by studying various articles published.

Photography

Photographs were taken using camera.

Results & Discussion

Result and Discussion

The vegetation in the selected seven Sacred Groves (Payyandath Kavu, Arinjikkal Kavu, Kunnummel Kavu, Thavalakottu Kavu, Neerengil Kavu, Kalarikkal Kavu and Alagapath Kavu) were studied in detail in this present study.

Plate 1: Kavus taken for the study

Payyandath Kavu

Kunnumel Kavu

Plate 2: Kavus taken for the study

Arinjikkal Kavu

Thavalakottil Kavu

Kalarikkal Kavu

Neerengil Kavu

Algapath Kavu

The kavu that are selected in this present study are maintained by family members and these are named after the street name of the house which is maintain this kavu (Plate 1 and 2). The diety worshipped in these seven groves are for sarpam or snake. Every year elaborate rituals are performed as part of festivities. Outsiders are strictly prohibited to venture into these kavus.

4.1 Payyandath Kavu

The vegetation consists of 39 species belonging to 26 family (Table 4). The floristic diversity of Payyandath kavu shows that out of the recorded 39 plants 1 belonged to monocot and 38 as dicots, which is of about 4 % and 96 % respectively. The habit of these 39 taxa which

Table 4: Floristic diversity recorded in the Payyandath Kavu

S. No	Botanical Name	Family	Local Name	Habit
1	*Mangifera indica* Linn.	Anacardiaceae	Mavu	Tree
2	*Ichnocarpus frutescens* (L.) R. Br	Apocynaceae	Palvalli	Climber
3	*Alstonia scholaris* (L.) R. Br.	Apocynaceae	Pala	Tree
4	*Caryota urens* Linn.	Arecaceae	Aanapana	Tree
5	*Mikania micrantha* Kunth.in. HBK.	Asteraceae	Vayara	Climber
6	*Eupatorium odoratum* Linn.	Asteraceae	Communist pacha	Shrub
7	*Bixa orellana* L.	Bixaceae	Kunkumam	Tree
8	*Bombax ceiba* L.	Bombacaceae	Poola	Tree
9	*Calycopteris floribunda* (Roxb.) Poir.	Combretaceae	Pullani	Climber
10	*Terminalia paniculata* Roth.	Combretaceae	Maruth	Tree
11	*Erycibe paniculata* Roxb.	Convolvulaceae	Erumathali	Climber
12	*Discorea bulbifera* Linn.	Discoreaceae	Kavath	Climber
13	*Briedelia scandens* (Roxb.) Willd.	Euphorbiaceae	Kanjikottam	Shrub
14	*Mallotus philippensis* (Lam.) Muell Arg.	Euphorbiaceae	Sindooram	Tree
15	*Cleistanthus collinus* (Roxb.) Benth. Ex Hook. F.	Euphorbiaceae	Odugu	Tree
16	*Derris scandens* (Sw.) Desv.	Fabaceae	Noyalvalli	Climber
17	*Desmodium scorpiurus* (Sw.) Desv.	Fabaceae		Herb
18	*Gliricidia sepium* (Jacq.) Kunth ex Walp.	Fabaceae	Seemakonna	Tree
19	*Adenanthera pavonina* L.	Fabaceae	Manjadi	Tree
20	*Pongamia pinnata* (L.) Pierre.	Fabaceae	Ungu	Tree
21	*Hyptis suaveolens* (Roxb.) Planch.	Lamiaceae	Nattappa	Shrub
22	*Leea indica* (Burn.) Merr.	Leeaceae	Chorianthali	Shrub
23	*Strychnos nux-vomica* Linn.	Loganiaceae	Kanjiram	Tree
24	*Tinospora cordifolia* (Willd) Miers.	Menispermaceae	Chitamruthu	Climber
25	*Mimosa pudica* Linn.	Mimosaceae	Thottavadi	Herb
26	*Ficus racemosa* Linn.	Moraceae	Atthi	Tree
27	*Jasminum malabaricum* Wight.	Oleaceae	Kattu mulla	Climber
28	*Olea diocia* Roxb.	Oleaceae	Edala	Tree
29	*Piper longum* Linn.	Piperaceae	Thippali	Climber
30	*Naravelia zeylanica* (L.) DC	Ranunculaceae	Vathamkodi	Shrub
31	*Oldenlandia umbellate* Linn.	Rubiaceae	Chayaveru	Herb
32	*Canthium rheedei* DC.	Rubiaceae	Edali	Shrub
33	*Chassalia curviflora* (Wall ex Kurz)Thw.	Rubiaceae	Karutha-amalppori	Shrub
34	*Glycosmis pentaphylla* (Retz.) DC	Rutaceae	Panal	Shrub
35	*Zanthoxylem rhesta (Roxb.) DC.*	Rutaceae	Mullilam	Tree
36	*Shleichera oleosa* (Lour.) Oken.	Sapindaceae	Poovam	Tree
37	*Grewia nervosa* (Lour.) Panigrahi.	Tiliaceae	Kotta	Shrub
38	*Holoptelea integrifolia* (Roxb.) Planch.	Ulmaceae	Aavel	Tree
39	*Cissus latifolia* Linn.	Vitaceae	Chunnambuvalli	Climber

are all angiospermic includes climbers, herbs, shrubs and trees which are about 26%, 8%, 23% and 44% respectively (Fig 3). Most of the plants has medicinal properties, which is listed in table. 6. The 39 angiospermic taxa belongs to 26 families (Anacardiaceae, Apocynaceae, Arecaceae, Asteraceae, Bixaceae, Bombacaceae, Combretaceae, Convolvulaceae, Discoreaceae, Euphorbiaceae, Fabaceae, Lamiaceae, Leeaceae, Loganiaceae, Menispermaceae, Mimosaceae,

Table No. 5: Floristic Diversity analysis of Sacred grove - Payyandath Kavu

	Monocots	Dicots	Total
Families	1	24	25
Genera	1	38	39
Species	1	38	39

Fig No.2: Floristic analysis of monoct and dicot plants present in Payyandath Kavu

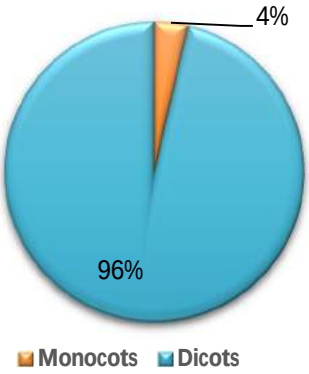


Fig No.3: Floristic analysis of habit of plants present in Payyandath Kavu

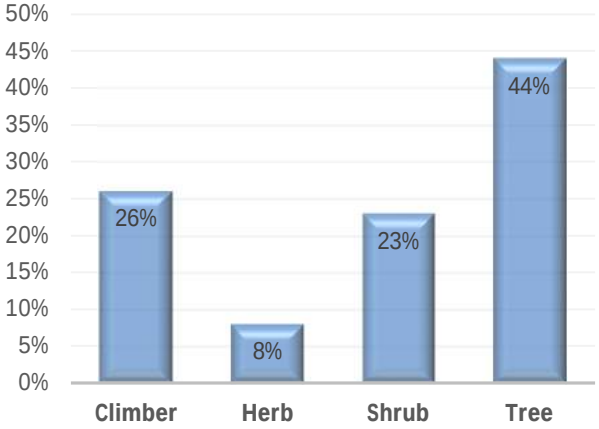
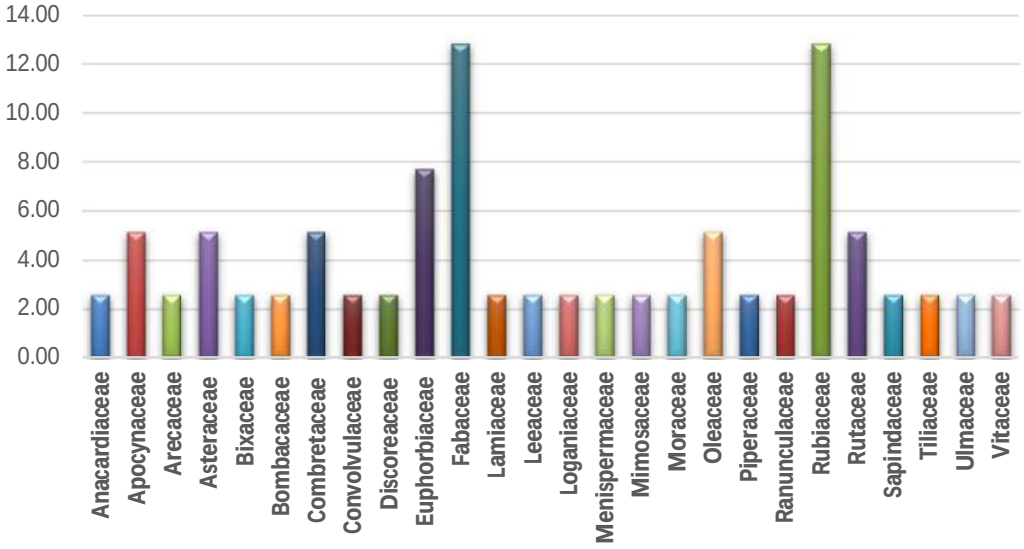


Fig 4: Comparative account of families with number of species in Payyandath Kavu



Moraceae, Oleaceae, Piperaceae, Ranunculaceae, Rubiaceae, Rutaceae, Sapindaceae, Tiliaceae, Ulmaceae and Vitaceae).

Table.No 6: Medicinal properties of plants present in Payyandath Kavu

S. No	Scientific Name	Medicinal Uses (Hurakadle, 2011, Deepa *et al*., 2016, Manoharan *et al.,* 2019, Warrier and Warrier, 2019)
1	*Calycopteri floribunda* (Roxb.) Poir.	Leaves are administered as a cure for dysentery and malaria and applied externally for ulcers.
2	*Derris scandens* (Roxb,) Benth.	Unripe beans loosen the bowels with gripe. Leaves reduced to plasma are good in erysipelas.
3	*Ichnocarpus frutescens (L.) R. Br.*	Leaves are recommended in case of fever. Roots are used in the treatment of skin eruptions.
4	*Mikania micrantha* Kunth in HBK.	Snake bites, eliminating discomfort of hornet, bee and ant stings antimicrobial activity from the leaves.
5	*Jasminum malabaricum* White.	The plant is known for its ethnomedicinal importance as blood purifier and anti-tumor properties.
6	*Erycibe paniculata* Roxb.	In Sri Lanka the bark isused against Cholera.
7	*Tinospora cordifolia* (Lour.) Miers.	Stems used in fever, jaundice, thirst, burning sensation, diabetes, piles, skin ailments, respiratory disorders, neurological disorders and rheumatism.
8	*Discorea bulbifera* L.	Ulcers, piles, leprosy, worm infestation, cardiac diseases, polyuria, urinary caculi, aphrodisiac, dysentery and syphilis.
9	*Cissus latifolia* Lam.	Used for the treatment of burning fever, cough, purifies blood, cure the ulcer of lungs.
10	*Piper longum* L.	Roots and fruits are used to improve intellect memory power. It also cures cough, asthma, indigestion, worm troubles, anaemia and chronic fever.
11	*Oldenlandia umbellate* L.	Leaves and roots are considered expectorant and used in asthma of bronchitis. The root powder has been proved to be a remedy for blood, particularly in Tuberculosis.
12	*Mimosa pudica* L.	Urinary complaints, sores, piles, diarrhoea, leprosy, uterine disorders, haemorrhage, wounds, oedema, skin diseases.
13	*Eupatorium odoratum* L.	Leaf juice is applied on cuts and wounds to stop bleeding.
14	*Canthium rheedei* DC.	Used for whitish ulcers on the surface of a mucous membrane, better for obstructionsof the liver, purifies blood.
15	*Naravelia zeylanica* (L.) DC.	Whole plant is used in helminthiasis, dermatopathy, leprosy, rheumatalgia, odantalgia, inflammations, wounds and ulcers.
16	*Glycosmis pentaphylla* (Retz.) DC.	Leaves-good antidote for inflammations, skin diseases, fever cough, anaemia, bronchitis, helminthiasis, rheumatism, jaundice and hepatopathy.
17	*Briedelia scandens* (Roxb.) Willd.	Bark is used to prepare a mouth wash Leaves and stem cure eczema. Root and stem are recommended in the treatment of asthma, cough and internal sores.
18	*Alstona scholaris* (L.) R.BR	Used to treat diarrhoea, epilepsy, skin diseases, snake bite.

S. No	Scientific Name	Medicinal Uses (Hurakadle, 2011, Deepa *et al*., 2016, Manoharan *et al*., 2019, Warrier and Warrier, 2019)
19	*Hyptis suaveolens* (L.) Poit.	Worm infestation, wounds and inflammations of the navel of the newborn and also emetic. Dyspepsia, diabetes, fever, skin troubles and stones in bladder.
20	*Leea indica (*Bourm.F.) Merr.	Roots used in diarrhoea, dysentery, hyperdipsia, ulcers and skin diseases.
21	*Chassalia curviflora* (Wall ex Kurz) Thw	Root of the plant used to treat cough and malaria.
22	*Grewia nervosa* (Lour.)Panigrahi.	The plant is used for indigestion, eczema and itch, typhoid fever, dysentery and syhlitic ulceration of the mouth.
23	*Mangifera indica* L.	Burning sensation, wounds, ulcers, dyspepsia, anaemia.
24	*Gliricidia sepium* (Jacq.) Kunth ex Walp.	Used for headache, cold and cough.
25	*Ficus racemosa* L.	Skin and vaginal diseases and ulcers.
26	*Caryota urens* L.	The leaf bud, seed and toddy are used for diarrhoea, migaine and scorpion-sting poisoning.
27	*Olea diocia* Roxb.	The leaves, bark, root and fruits used in the traditional medicine to cure skin diseases, rheumatism, fever and cancer
28	*Adenanthera pavonina* L.	Ulcers, pharyngopathy, burning sensation, hyperdipsia, fever vomiting, giddiness, dysentery, joint pain, warts & emetic.
29	*Bixa orellana* L.	Leaf infusion shown to be effective against bronchitis, sore throat, & eye inflammation. Seed-used for soft drinks.
30	*Strychnos nux-vomica* L.	Seeds are useful in intermittent fevers, dyspepsia, chronic dysentery, paralytic and neuralgic affections, colic, importence, heart disease, spermatorrhoea and skin diseases.
31	*Mallotus philippensis* (Lam.) Muell.	Used against tapeworms, abdominal disorders, haemopathy, calculus, flatulence, leprosy, skin diseases and ringworm.
32	*Pongamia pinnata* (L.)Pierre.	Fresh bark is given inter-nalty for bleeding piles, Leaves as poultice is applied to ulcers infested with worms. The fruit is used against urinary diseases. Seeds are used to purify btood.
33	*Holoptelea integrifolia* (Roxb.) Planch.	Juice of boiled bark is applied to rheumatic swellings.
34	*Shleichera oleosa* (Lour.) Oken.	Bark useful in curing ulcers, malaria and inflammations. Seed oil used in leprosy, dermatopathy, boils, ulcers, blood disorders, intermittent fever, snakebite and burns.
35	*Bombax ceiba* L.	Used in calculous affections and ulceration of bladder and kidneys, dysentery, pulmonary tuberculosis, influenza, menorrhagia, fever, burning sensation and skin iruptions.
36	*Terminalia paniculata* Roth.	Bark is cardio tonic and diuretic.
37	*Cleistanthus collinus* (Roxb.)Benth. Ex. Hook.	Leaves, roots and fruits act as gastrointestinal irritant. Fruits used for treating cancer.
38	*Zanthoxylem rhesta* (Roxb.) DC.	Bark and fruits used in dyspepsia,asthma, bronchitis, heart diseases of eye and ear,worm infestation, leprosy, diseases of head rheumatism. Throns are used in treating pimples.

All the plants found in Payyandath Kavu has many medicinal properties (Table 6). Though few trees present here have commercial values, the family incharge of this kavu don't entertain it, and they maintain this kavu near to their house.

4.2 Arinjikkal Kavu

This kavu is also maintained by the family within their permises and it is also sarpa kavu.

Table No. 7: Plant species recorded in the Arinjikkal Kavu

S.No	Botanical Name	Family	Local Name	Habit
1	*Achyranthus aspera L.*	Amaranthaceae	Katalati	Herb
2	*Alternanthera brasiliana* (L.)	Amaranthaceae	Chuvanna cheera	Shrub
3	*Plumeria rubra* L.	Apocynaceae	Alari	Tree
4	*Pothos scandens* L.	Araceae	Paruvakodi	Climber
5	*Caryota urens* L.	Arecaceae	Aanapana	Tree
6	*Veronia cinerea* (L.) Less.	Asteraceae	Puvankurunal	Herb
7	*Chromolaena odorata* (L.) King & Robins	Asteraceae	Communist pacha	Shrub
8	*Mukia maderaspatana* (L.) Roem.	Cucurbitaceae	Kasappuchedi	Climber
9	*Kyllinga nemoralis L*	Cyperaceae	Muthanga	Herb
10	*Dioscorea bulbifera* L.	Discoreaceae	Kavath	Climber
11	*Phyllanthus amarus* Schum. & Thonn.	Euphorbiaceae	Keezharnelli	Herb
12	*Gliricidia sepium (Jacq.) Kunth ex Walp.*	Fabaceae	Seema konna	Tree
13	*Curculio orchioides* Gaertn.	Hypoxidaceae	Nilappana	Herb
14	*Lindsaea ensifolia*	Lindaceae		Herb
15	*Strychnos nux-vomica* L.	Loganiaceae	Kanjiram	Tree
16	*Dendrophthoe facata* (L.f) Ettingsh.	Loranthaceae	Chuvanna ittikkanni	Climber
17	*Tinospora cordifolia* Jacq.	Menispermaceae	Chitamruthu	Climber
18	*Diploclisia glaucescens* (Blume)Diels	Menispermaceae	Vattavalli	Climber
19	*Diploclisia glaucescens (Blume) Diels.*	Menispermaceae	Vattoli	Climber
20	*Tinospora cordifolia* (Willd) Miers.	Menispermaceae	Chitamruthu	Climber
21	*Mimosa pudica L.*	Mimosaceae	Thottavadi	Herb
22	*Jasminum malabaricum* White.	Oleaceae	Kattu mulla	Climber
23	*Acroceras munroanum*	Poaceae	Pullu	Herb
24	*Digitaria biconis* (Lam.)	Poaceae	Pullu	Herb
25	*Chassalia curviflora* Wall. ex Kurz)Thw.	Rubiaceae	Karutha amalpori	Shrub
26	*Canthium rheedei DC.*	Rubiaceae	Edali	Shrub
27	*Morinda pubescens J.E.*	Rubiaceae	Manja paavutta	Tree
28	*Glycosmis pentaphylla (Retz.) DC.*	Rutaceae	Panal	Shrub

The total number of angiosperms recorded in this kavu are 28. Among the 28 plants 20% of them are monocots and 80% of them are dicots (Fig 4). The habit of the vegetation in this kavu

has climbers, herbs, shrubs and trees which were of about 28%, 32%, 17% and 17% respectively. 28 plants belongs to a total number of 20 families (Amaranthaceae, Apocynaceae, Araceae, Arecaceae, Asteraceae, Cucurbitaceae, Cyperaceae, Discoreaceae, Euphorbiaceae, Fabaceae, Hypoxidaceae, Lindaceae, Loganiaceae, Loranthaceae, Menispermaceae, Mimosaceae, Oleaceae, Poaceae, Rubiaceae and Rutaceae).

Table No. 8: Floristic Diversity analysis of Sacred grove - Arinjikkal Kavu

	Monocots	Dicots	Total
Families	4	16	20
Genera	5	23	27
Species	4	24	28

Fig 5: Floristic analysis of monoct and dicot plants present in Arinjikkal Kavu

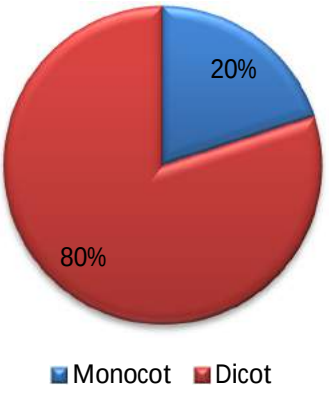


Fig 6: Floristic analysis of habit of plants present in Arinjikkal Kavu

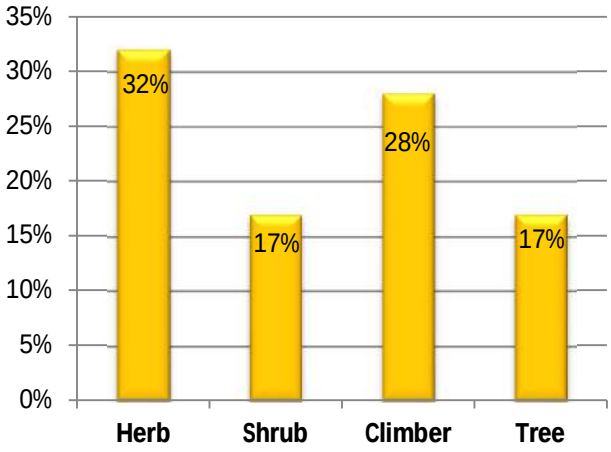


Fig 7: Comparative account of families with number of species in Arinjikkal Kavu

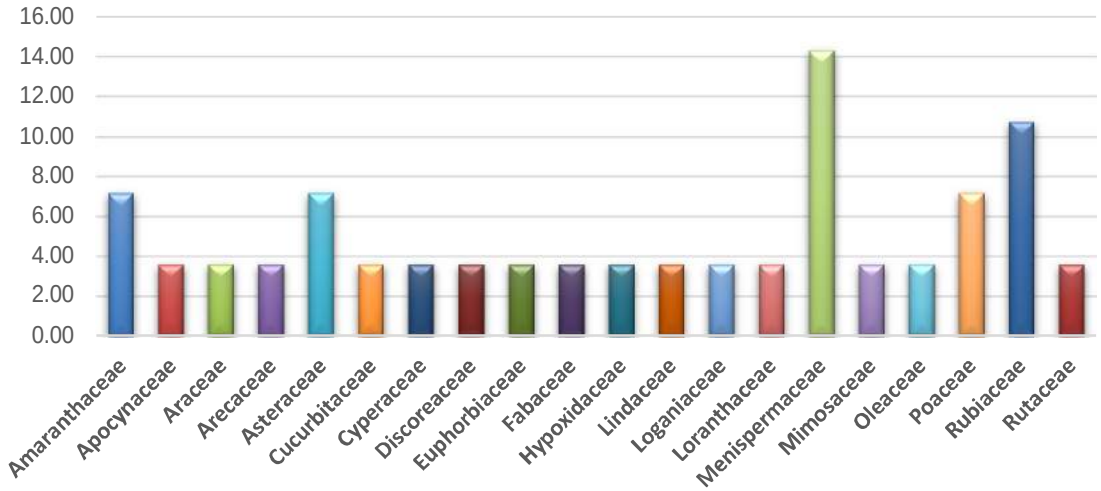


Table.No 9: Medicinal properties of plants present in Arinjikkal Kavu

S.No	Scientific Name	Medicinal Uses (Joseph, 1977, Moss, 1977, Hurakadle, 2011, Thomas et al., 2011, Deepa et al., 2016 and Sindhu et al., 2014)
1	*Achyranthus aspera* L.	Plant is used in the treatment of piles, enlargements of the cervical glands. dropsy, soils, skin eruptions and colic. Leaf juice is applied to wounds. Seeds & leaves are used against hydrophobia. Leaves are used in the preparation of the ointment 'Zambuk'. Paste of seeds with rice washed water, is reckoned to be beneficial in cases of bleeding piles
2	*Acroceras munroanum* (Balansa) Henrard.	Used as fodder
3	*Mimosa pudica* L.	Urinary complaints, sores, piles, diarrhoea, dyspnoea, leprosy, uterine disorders, haemorrhage, wounds, oedema, skin diseases and burning sensation.
4	*Curculio orchioides* Gaertn.	Tuberous roots used in skin troubles, demulcent, diuretic, tonic. Useful in leucorrhoea, urinary diseases, piles, jaundice, asthma, diarrhoea, gonorrhoea, itch and skin diseases.
5	*Kyllinga nemoralis* L	Leaves of the plant are used as antivenom, relief of malarial chills, pruritus of the skin, thirst attributable to fever and diabetes. Paste of rhizomes mixed with milk is used internally for worm infection and rhizome alone is used to treat hepatopathy, splenopathy, fever, tumour and diabetes.
6	*Phyllanthus amarus* Schum. & Thonn.	Plant is used for flu, dropsy, diabetes, jaundice, asthma, bronchial infections, diseases of the liver, stomach, genito-urinary system, liver & kidney. The plant is reported to show antiviral activity against hepatitis B-virus and related hepadna virus.
7	*Digitaria biconis* (Lam.) Roem. & Schult.	Used as fooder when young
8	*Lindsaea ensifolia*	Lindsaea ensifolia has been evaluated for its antibacterial potential and phytochemical contents in various solvent extracts of increasing polarity against certain pathogenic bacteria involved in human skin diseases.
9	*Veronia cinerea* (L.) Less.	A decoction of plant is used to promote perspiration in febrile conditions, as a remedy for spasm of the bladder and strangury. Plant juice - cures piles. Root recommended for dropsy and flowers are administered for conjuctivities.
10	*Chassalia curviflora* (Wall ex Kurz) Thw.	Root of the plant used to treat cough and malaria.
11	*Glycosmis pentaphylla* (Retz.) DC.	Leaf juice used in fever and liver complaints and as a vermifuge. Leaves are good antidote for inflammations, fever, helminthiasis, cough, bronchitis, rheumatism, jaundice, anaemia, hepatopathy & skin diseases.

S.No	Scientific Name	Medicinal Uses (Joseph, 1977, Moss, 1977, Hurakadle, 2011, Thomas et al., 2011, Deepa et al., 2016 and Sindhu et al., 2014)
12	*Chromolaena odorata* (L.) King & Robins.	Leaf juice is applied externally on cuts and wounds to stop bleeding.
13	*Canthium rheedei* DC.	Usedfor whitish ulcers on the surface of a mucous membrane, better for obstructions of the liver, purifies, blood and cheers up the patient.
14	*Alternanthera bettzickiana* (Regel) Voss	Given to anaemic children in order to improve their health.
15	*Tinospora cordifolia* (Willd.) Miers.	Stems used in fever, jaundice, thirst, burning sensation, diabetes, piles, skin ailments, respiratory disorders, neurological disorders and rheumatism.
16	*Diploclisia glaucescens* (Blume)Diels	Leaf powder with milk given in biliousness, gonorrhoea and syphilis
17	*Dendrophthoe facata* (L.f) Ettingsh.	Leaf powder with milk given in biliousness, gonorrhoea and syphilis.
18	*Dioscorea bulbifera* L.	Tubers used for ulcers, piles, leprosy, worm infestation, cardiac diseases, polyuria, urinary calculi, aphrodisiac, rejuvenator, dysentery and syphilis.
19	*Mukia maderaspatana* (L.) Roem.	Whole plant used for burning sensation, flatulence, constipation, ulcers, cough, neuralgia, odontalgia and vertigo. Fruits used for dysuria, piles, polyuria, tuberculosis and alleviating pitta.
20	*Tinospora cordifolia* (Willd Miers).	Stems used in fever, jaundice, thirst, burning sensation, diabetes, piles, skin ailments, respiratory disorders, neurological disorders and rheumatism.
21	*Jasminum malabaricum* White.	The plant is known for its ethnomedicinal importance as blood purifier and anti-tumor properties.
22	*Pothos scandens* L.	Skin diseases, boils, swellings, wounds, ulcers, dropsy, menorrhagia, vomiting, flatulence, strangry and burning sensation
23	*Gliricidia sepium* (Jacq.) Kunth ex Walp.	Leaves, bark and seeds are used to treat headache, cold and cough.
24	*Morinda pubescens* J.E.Smith.	Eczema, fever, ulcers, glandular swellings and digestive disorders especially in children.
25	*Strychnos nux-vomica* L.	Intermittent fevers, dyspepsia, dysentery, paralytic and neuralgic affections, chronic rheumatism, insomnia, colic, impotence, spermatorrhoea and skin and heart disease.
26	*Plumeria rubra* L.	Ulcers, herpes and scabies, itch, rheumatism and gum troubles.
27	*Caryota urens* L.	Fruit is in the treatment of hemicrania. Freshly drawn toddy is laxative.

4.3 Kunnummel Kavu

Kunnummel Kavu comprises 26 plants (Table 10) out of which 2 are monocots and 24 of them are dicot plants, which amouts for 8% and 92% respectively. The habit in vegetation comprises of herbs, shrubs, climbers and trees with a percentage of 15, 7, 23 and 50 respectively.

Table. 10: Plant species recorded in the Kunnummel Kavu

S.No	Botanical Name	Family	Local Name	Habit
1	*Aerva lanata* (L.) Juss.	Amaranthaceae	Cherula	Herb
2	*Ichnocarpus frutescens* (L.) R.Br.	Apocynaceae	Palvalli	Climber
3	*Caryota urens* L.	Arecaceae	Aanapana	Tree
4	*Delonix regia* (Boj. Ex Hook) Rafin.	Caesalpiniaceae	Poomaram	Tree
5	*Ericybe paniculata* Roxb.	Convolvulaceae	Erumathali	Climber
6	*Mallotus philippensis* (Lam.) Muell.-Arg	Euphorbiaceae	Sindooram	Tree
7	*Putrajiva roxburghi* Wall.	Euphorbiaceae	Poothilanji	Tree
8	*Cassia fistula* L.	Fabaceae	Konna	Tree
9	*Gliricidia sepium* (Jacq.) Kunth ex Walp.	Fabaceae	seemakonna	Tree
10	*Adenanthera pavonina* L.	Fabaceae	Manjadi	Tree
11	*Curculigo orchioides* Gaertn.	Hypoxidaceae	Nilappana	Herb
12	*Strychnos nux- vomica* L.	Loganiaceae	Kanjiram	Tree
13	*Tinospora cordifolia* (Willd) Miers.	Menispermaceae	Chitamruthu	Climber
14	*Tiliacora acuminate* (pour.) Miers.	Menispermaceae	Vallikanjiram	Climber
15	*Mimosa pudica* L.	Mimosaceae	Thottavadi	Herb
16	*Ficus benghalensis* L.	Moraceae	Peraal	Tree
17	*Jasminum malabaricum* White.	Oleaceae	Kattumulla	Climber
18	*Digitaria sanguinalis*	Poaceae	Pullu	Herb
19	*Chassalia curviflora* (Wall ex Kurtz)Thw.	Rubiaceae	Karutha amalpori	Shrub
20	*Canthium rheedei* DC.	Rubiaceae	Edali	Shrub
21	*Maorinda pubescens* J. E. Smith	Rubiaceae	Manja paavutta	Tree
22	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae	Panal	Shrub
23	*Zanthoxylem rhesta* (Roxb.) DC.	Rutaceae		Tree
24	*Santalum album* L.	Santalaceae	Chandanam	Tree
25	*Schleichera oleosa* (Lour.) Oken.	Sapindaceae	Poovam	Tree
26	*Cissus latifolia* Lam.	Vitaceae	Chunnambuvalli	Climber

The vegetaion in Kunnummel Kavu belongs to 16 families, out of which the frequency of plants distributed (Fig 10). Fabaceae and rubiaceae were more widely present in this kavu with a frequency of 11.54 each.

Table No. 11: Floristic Diversity analysis of Sacred grove - Kunnummel Kavu

	Monocots	Dicots	Total
Families	2	24	26
Genera	2	24	26
Species	2	24	26

Fig 8: Floristic analysis of monoct and dicot plants present in Kunnummel Kavu

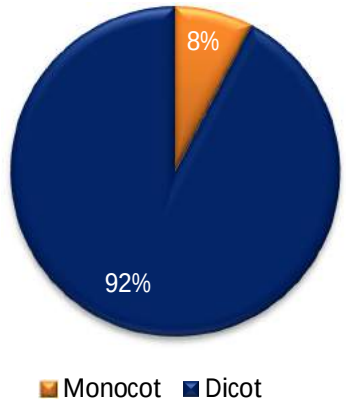


Fig 9: Floristic analysis of habit of plants present in Kunnummel Kavu

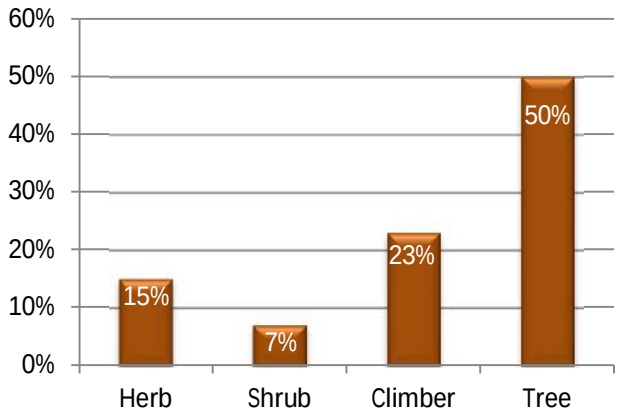


Fig 10: Comparative account of families with number of species in Kunnummel Kavu

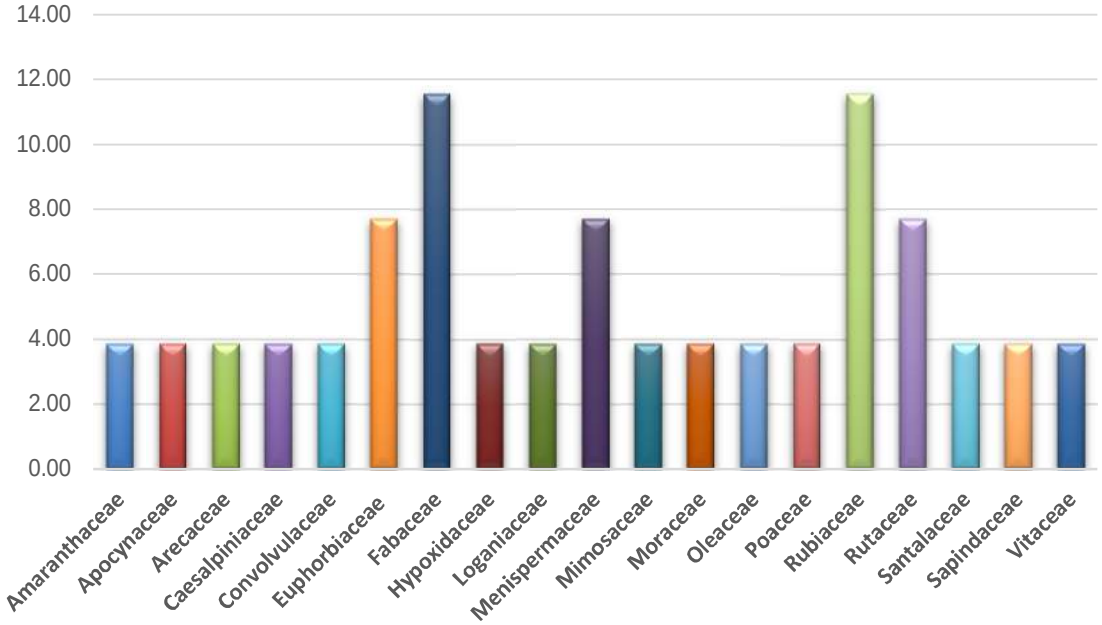


Table.No 12: Medicinal properties of plants present in kunnummel Kavu

S.No	Scientific Name	Medicinal Uses (Deepa et al., 2016 and Hurakadle, 2011)
1	*Mimosa pudica* L.	Urinary complaints, sores, piles, diarrhoea, dyspnoea, leprosy, uterine disorders, haemorrhage, wounds, oedema, skin diseases and burning sensation.
2	*Aerva lanata* (L.) Juss.	Used in urinary obstructions, bladder stones and haemorrhages associated with pregnancy.
3	*Digitaria sanguinalis* (L.) Scop.	A decoction of the leaves is used for the treatment of gonorrhoea. A folk remedy for cataracts and debility, it is also said to be emetic.
4	*Curculigo orchioides* Gaertn.	Tuberous roots used in skin troubles, demulcent, diuretic, tonic. Useful in leucorrhoea, urinary diseases, piles, jaundice, asthma, diarrhoea, gonorrhoea, itch and skin diseases.
5	*Chassalia curviflora* (Wall ex Kurtz)Thw.	Root of the plant used to treat cough and malaria.
6	*Glycosmis pentaphylla* (Retz.) DC.	Leaf juice used in fever and liver complaints and as a vermifuge. Leaves considered good antidote for inflammations, fever, helminthiasis, cough, bronchitis, rheumatism, jaundice, anaemia, hepatopathy and skin diseases.
7	*Canthium rheedei* DC.	Usedfor whitish ulcers on the surface of a mucous membrane, better for obstructions of the liver, purifies, blood and cheers up the patient.
8	*Jasminum malabaricum* White.	Plant is known for its ethnomedicinal importance as blood purifier and anti-tumor properties
9	*Ichnocarpus frutescens* (L.) R.Br.	Dyspepsia, diabetes, fever, skin troubles and stones in bladder.
10	*Ericybe paniculata* Roxb.	In Sri Lanka the bark is used against Cholera.
11	*Cissus latifolia* Lam.	Used for the treatment of burning fever, cough, purifies blood, cure the ulcer of lungs.
12	*Tinospora cordifolia* (Willd) Miers.	Stems used in fever, jaundice, thirst, burning sensation, diabetes, piles, skin ailments, respiratory disorders, neurological disorders and rheumatism.
13	*Tiliacora acuminata* (Poir.) Miers ex Hook. f. & Thomas.	Roots are used as an antidote to snake poison.
14	*Cassia fistula* L.	Remedy for skin diseases, leprosy, fever, promotes digestion, leucoderma, eczema, diabetes, cardiac diseases, jaundice, polyuria, and urticaria.
15	*Schleichera oleosa* (Lour.) Oken.	Bark useful in curing ulcers, malaria and inflammations. Seed oil used in leprosy, dermatopathy, boils, ulcers, blood disorders, intermittent fever, snakebite and burns.

S.No	Scientific Name	Medicinal Uses (Deepa et al., 2016 and Hurakadle, 2011)
16	*Delonix regia* (Boj. Ex Hook) Rafin.	*Leaves are used for diseases vata, constipation, inflammations, arthritis, hemiplegia and dysmenorrhoea.*
17	*Caryota urens* L.	The leaf bud, seed and toddy are used for diarrhoea, migraine and scorpion-sting poisoning.
18	*Ficus benghalensis* L.	Bark is used in skin diseases, cures dysentery, diarrhoea, leucorrhoea, nervous disorders and reduces blood sugar in diabetes.
19	*Gliricidia sepium* (Jacq.) Kunte ex Walp.	Used for headache, cold and cough.
20	*Mallotus philippensis* (Lam.) Muell.-Arg	Used against tapeworms, abdominal disorders, haemopathy, calculus, flatulence, leprosy, skin diseases and ringworm.
21	*Maorinda pubescens* J. E. Smith	It is used for eczema, fever, ulcers, glandular swellings and digestive disorders especially in children.
22	*Strychnos nux- vomica* L.	Seeds are useful in intermittent fevers, dyspepsia, chronic dysentery, paralytic and neuralgic affections, insomnia, chronic rheumatism, colic, impotence, heart disease, spermatorrhoea and skin diseases.
23	*Zanthoxylem rhesta* (Roxb.) DC.	Bark and fruits used in dyspepsia, asthma, bronchitis, heart diseases, toothache, diseases of eye and ear, worm infestation, leprosy, diseases of head and rheumatism. Seeds are used in cholera. Thorns are used in treating pimples.
24	*Adenanthera pavonina* L.	Ulcers, pharyngopathy, burning sensation, hyperdipsia, vomiting, fever, giddiness, dysentery, pain in joints, warts and emetic.
25	*Santalum album* L.	Wood is made into a paste and applied to headache and skin diseases. Oil from heartwood is used in the symptomatic treatment of dysuria, gonorrhoeal urethritis and cystitis.
26	*Putrajiva roxburghi* Wall.	Leaves and seeds are used for burning sensation, thrist, stomatopathy, opthalmopathy, constipation, elephantiasis and habitual abortion.

4.4 Thavalakottu Kavu

Thavalakottu Kavu comprises of 29 plants belonging to 17 different families. Overall the 3% of monocot and 97% of dicots were observed in this vegetation. Rubiacee members were found more with a frequency of 13.79 % while 3.45 % was found in 11 families (Amaranthaceae, Apocynaceae, Arecaceae, Loganiaceae, Loranthaceae, Phyllanthaceae, Piperaceae, Poaceae, Rutaceae, Sapindaceae, Ulmaceae and Vitaceae).

Table 13: Plant species recorded in the Thavalakottu Kavu

S.No	Botanical Name	Family	Local Name	Habit
1	*Aerva lanata* (L.) Juss. Ex Schult.	Amaranthaceae	Cherula	Herb
2	*Alstonia scholaris* (L.) R.Br.	Apocynaceae	Pala	Tree
3	*Caryota urens* L.	Arecaceae	Aanapana	Tree
4	*Phyllanthus reticulatus* Schum. & Thonn	Euphorbiaceae	Neeruri	Shrub
5	*Macaranga peltata* (Roxb.) Muell-Arg.	Euphorbiaceae	Uppela, vatta	Tree
6	*Mallotus philippensis (*Lam.) Muell-Arg.	Euphorbiaceae	Sindooram	Tree
7	*Derris scadens* (Roxb.) Benth.	Fabaceae	Noyalvalli	Climber
8	*Gliricidia sepium* L.	Fabaceae	Seemakonna	Tree
9	*Adenanthera pavonina* L.	Fabaceae	Manjadi	Tree
10	*Strychnos nux-vomica* L.	Loganiaceae	Kaanjiram	Tree
11	*Dendrophthoe falcata* (L.f) Ettingsh.	Loranthaceae	Chuvanna ittikkanni	Climber
12	*Tinospora cordifolia* (Willd.) Miers	Menispermaceae	Chitamruthu	Climber
13	*Diploclisia glaucescens*	Menispermaceae	Vattavalli	Climber
14	*Tiliacora acuminate* Miers ex Hook. F. & Thomas (Poir.)	Menispermaceae	Vallikanjiram	Climber
15	*Ficus racemosa* L.	Moraceae	Atthi	Tree
16	*Atrocarpus hirsutus* Lam.	Moraceae	Plavu	Tree
17	*Ficus benghalensis* L.	Moraceae	Peraal	Tree
18	*Cleistanthus collinus* (Roxb.) Benth. ex Hooked. f.	Phyllanthaceae	Odugu	Tree
19	*Piper longum* L.	Piperaceae	Thippali	Climber
20	*Panicum notatum* Retz.	Poaceae		Herb
21	*Canthium rheedei* DC.	Rubiaceae	Edali	Shrub
22	*Chassalia curviflora* (Wall ex Kurtz) Thw.	Rubiaceae	Karutha amalpori	Shrub
23	*Ixora coccinea* L.	Rubiaceae	Thechi	Shrub
24	*Morinda pubescens* J. E. Smith.	Rubiaceae	Manja paavutta	Tree
25	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae	Panal	Shrub
26	*Schleichera oleosa* (Lour.) Oken.	Sapindaceae	Poovam	Tree
27	*Holoptelea integrifolia* (Roxb.) Planch.	Ulmaceae	Tree	Tree
28	*Leea indica (*Burm.f.) Merr.	Vitaceae	Nakku	Shrub
29	*Cissus latifolia* Lam.	Vitaceae		Climber

The vegetation has plants belonging to four types of habits herbs, shrubs, climbers and trees with a frequency of 6%, 13%, 24% and 48% respectively.

Table No. 14: Floristic Diversity analysis of Sacred grove - Thavalakottu Kavu

	Monocots	Dicots	Total
Families	1	16	17
Genera	1	27	28
Species	1	28	29

Fig 11: Floristic analysis of monoct and dicot plants present in Thavalakottu Kavu

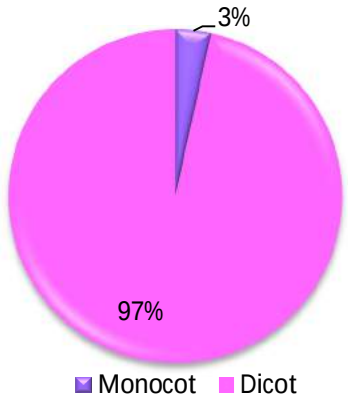


Fig 12: Floristic analysis of habit of plants present in Thavalakottu Kavu

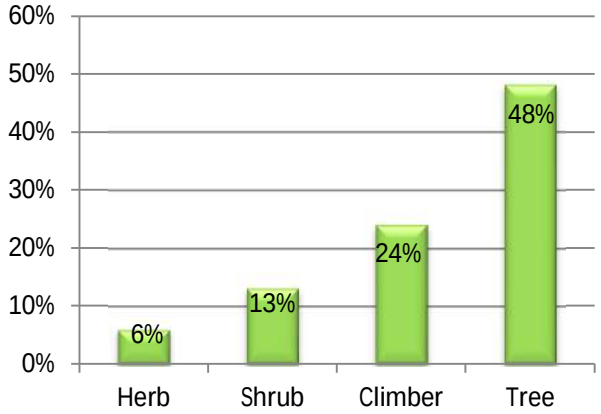


Fig 13: Comparative account of families with number of species in Thavalakottu Kavu

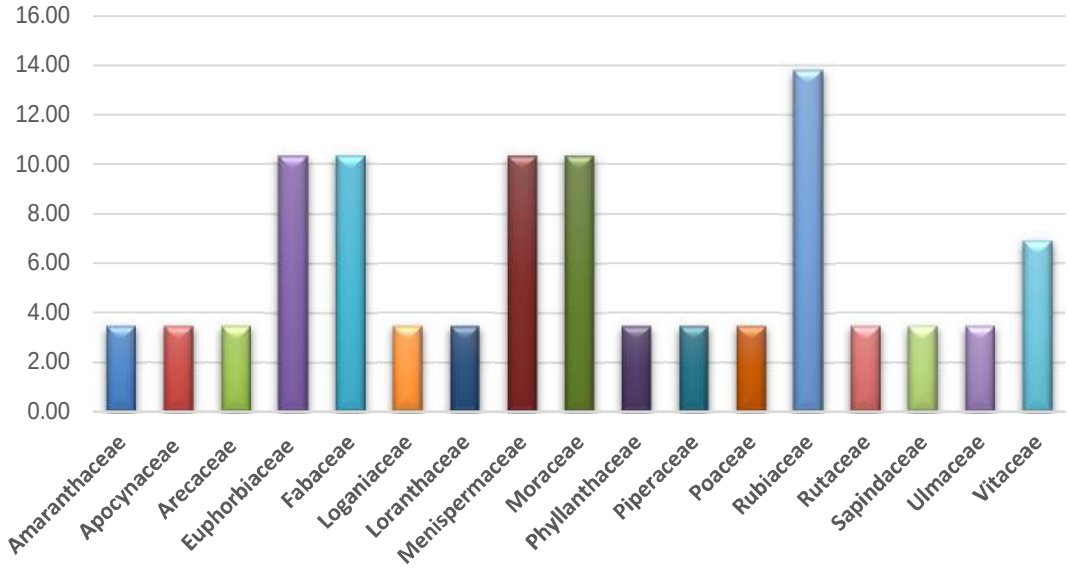


Table.No 15: Medicinal properties of plants present in Thavalakottu Kavu

S.No	Scientific Name	Medicinal Uses (Deepa et., 2016, *Devendran, G. Gnanavel 2020*)
1	*Aerva lanata* (L.) Juss. Ex Schult.	Used in urinary obstructions, bladder stones and haemorrhages associated with pregnancy.
2	*Panicum notatum* Retz.	
3	*Glycosmis pentaphylla* (Retz.) DC.	Leaf juice used in fever and liver complaints and as a vermifuge. Leaves considered good antidote for inflammations, fever, helminthiasis, cough, bronchitis, rheumatism, jaundice, anaemia, hepatopathy and skin diseases.
4	*Leea indica (*Burm.f.) Merr.	Diarrhoea, dysentery, hyperdipsia, ulcer and skin diseases.
5	*Canthium rheedei* DC.	Usedfor whitish ulcers on the surface of a mucous membrane, better for obstructions of the liver, purifies, blood and cheers up the patient.
6	*Chassalia curviflora* (Wall ex Kurtz) Thw.	Root of the plant used to treat cough and malaria.
7	*Ixora coccinea* L.	It act as a cure for various ailments like hepatic disorder, cancer, microbial infection, inflammatory etc. Pharmacological studies of this plant shows that, it possess antioxidant, antibacterial, gastro protective, hepato protective, anti-diarrhoeal, anti-nociceptive, anti-mutagenic and chemo preventive effects.
8	*Phyllanthus reticulatus* Poir.	Rheumatism, dysentery and venereal diseases, burning sensation, gastropathy, obesity, ophthalmodynia, sores, burns, and skin eruptions.
9	*Piper longum* L.	Roots and fruits are used for improve intellect memory power and regain health by dispelling diseases. It also cures cough, asthma, indigestion, worm troubles, anaemia and chronic fever.
10	*Derris scadens* (Roxb.) Benth.	Unripe beans loosen the bowels with gripe. Leaves reduced to plasma are good in erysipelas.
11	*Cissus latifolia* Lam.	Used for the treatment of burning fever, cough, purifies blood, cure the ulcer of lungs.
12	*Tinospora cordifolia* (Willd.) Miers	Stems used in fever, jaundice, thirst, burning sensation, diabetes, piles, skin ailments, respiratory disorders, neurological disorders and rheumatism.
13	*Diploclisia glaucescens* (Blume) Diels.	Leaf powder with milk given in biliousness, gonorrhoea and syphilis.
14	*Tiliacora acuminate* Miers ex Hook. F.&Thomas (Poir.)	Antidote to snake poison
15	*Dendrophthoe falcata* (Linn. f.) Etting	Bark is used to treat men- strual troubles, tuberculosis and asthma.
16	*Ficus racemosa* L.	Used to treat against skin and vaginal diseases and ulcers

S.No	Scientific Name	Medicinal Uses (Deepa et., 2016, *Devendran, G. Gnanavel 2020*)
17	*Gliricidia sepium* L.	Headache, cold and cough.
18	*Caryota urens* L.	Diarrhoea, migraine and scorpion-sting poisoning.
19	*Atrocarpus hirsutus* Lam.	Anorexia, small pimples, cracks on the skin and sores.
20	*Macaranga peltata* (Roxb.) Muell.-Arg.	Used as vulnerary. Gum used for venereal sores.
21	*Mallotus philippensis* (Lam.) Muell.-Arg.	Used against tapeworms, abdominal disorders, haemopathy, calculus, flatulence, leprosy, skin diseases and ringworm.
22	*Strychnos nux-vomica* L.	Intermittent fevers, dyspepsia, dysentery, paralytic and neuralgic affections, chronic rheumatism, insomnia, colic, impotence, spermatorrhoea and skin and heart disease.
23	*Morinda pubescens* J. E. Smith.	Eczema, fever, ulcers, glandular swellings and digestive disorders especially in children.
24	*Adenanthera pavonina* L.	Ulcers, pharyngopathy, burning sensation, hyperdipsia, vomiting, fever, giddiness, dysentery, pain in joints, warts and emetic.
25	*Holoptelea integrifolia* (Roxb.) Planch.	Juice of boiled bark is applied to rheumatic swellings.
26	*Cleistanthus collinus* (Roxb.) Benth. ex Hook. f.	Leaves, roots and fruits act as gastrointestinal irritant. Fruits used for treating cancer.
27	*Schleichera oleosa* (Lour.) Oken.	Bark useful in curing ulcers, malaria and inflammations. Seed oil used in leprosy, dermatopathy, boils, ulcers, blood disorders, intermittent fever, snakebite and burns.
28	*Ficus benghalensis* L.	Skin diseases, dysentery, diarrhoea, leucorrhoea, nervous disorders and reduces blood sugar in diabetes.
29	*Alstonia scholaris* (L.) R.Br.	Malaria, asthma, skin and respiratory diseases, cardiac troubles, beri-beri, fever, abdominal disorders, leprosy, foul ulcers, bronchitis and congested liver.

4.5 Neerengil Kavu

The vegetation present in Neerengil kavu consists of 21 species belonging to 15 families. In them 5% belongs to monocots and 95 % of them were dicots. The plant habits belongs to four habits namely herbs, shrubs, climbers and trees which are of about 28%, 23%, 19% 28% respectively.

Table 16: Plant species recorded in the Neerengil Kavu

S.No	Botanical Name	Family	Local name	Habit
1	*Alstonia scholaris* (L.) R.Br.	Apocynaceae	Pala	Tree
2	*Caryota urens* L.	Arecaceae	Aanapana	Tree
3	*Emilia sonchifolia* (Linn.) DC.	Asteraceae	Muyalchevi	Herb
4	*Eupatorium odoratum* L.	Asteraceae	Communist pacha	Shrub
5	*Mikania micrantha* Kunth in HBK.	Asteraceae	Vayara	Climber
6	*Dioscorea bulbifera* L.	Dioscoreaceae	Kavath	Climber
7	*Microstachys chamaelea* (L.)	*Euphorbiaceae*	Kodiyavannakku	Herb
8	*Briedelia scadens* (Roxb.) Willd.	Euphorbiaceae	Kanjikottam	Shrub
9	*Derris scadens* (Roxb.) Benth.	Fabaceae	noyalvalli	Climber
10	*Gliricidia sepium* (Jacq.) Kunth ex Walp	Fabaceae	Seemskonna	Tree
11	*Adenanthera pavonina* L.	Fabaceae	Manjadi	Tree
12	*Leea indica* (Burm.F.) Merr.	Leeaceae		Shrub
13	*Mimosa pudica* L.	Mimosaceae	Thottavadi	Herb
14	*Ficus benghalensis L.*	Moraceae	Peraal	Tree
15	*Boerhaavia diffusa* Linn.	Nyctaginaceae	Thazhuthama	Herb
16	*Piper nigrum* L.	Piperaceae	Kurumulaku	Climber
17	*Oldenlandia umbellata* L.	Rubiaceae	Chayaveru	Herb
18	*Chassalia curviflora* (Wall ex Kurz)Thw	Rubiaceae	Karutha amalpori	Shrub
19	*Linderina ciliata* (Colsm) Pennell.	Scrophulariaceae		Herb
20	*Triumfetta rhomboidea* Jacq.	Tiliaceae	Oorpam	Shrub
21	*Citharexylum spinosam* L.	Verbenaceae	Parijatham	Tree

Table No. 17: Floristic Diversity analysis of Sacred grove - Neerengil Kavu

	Monocots	Dicots	Total
Families	1	15	16
Genera	1	20	21
Species	1	20	21

Fig 14: Floristic analysis of monoct and dicot plants present in Neerengil Kavu

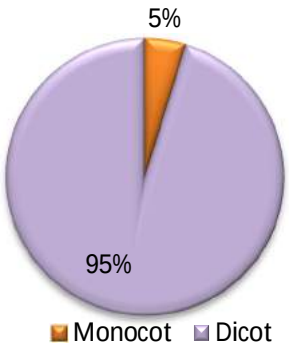


Fig 15: Floristic analysis of habit of plants present in Neerengil Kavu

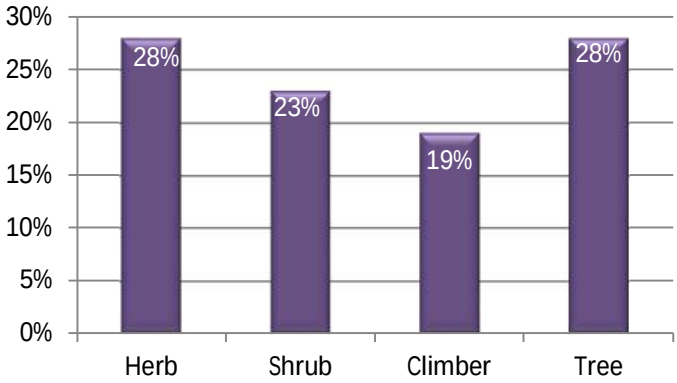
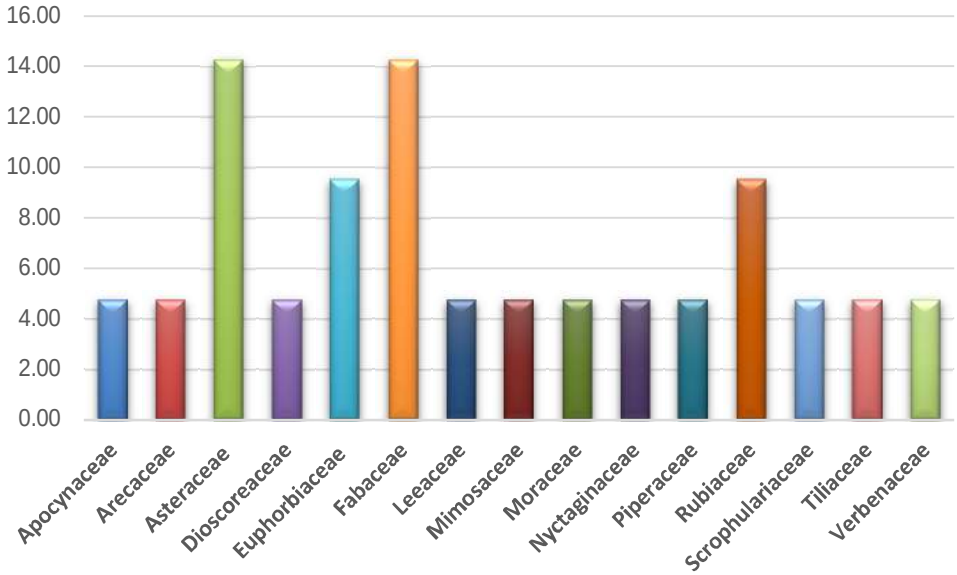


Fig 16: Comparative account of families with number of species in Neerengil Kavu



The familiesAsteraceae and Fabaceae hold a frequency of 14.29 %, while others were less compared to them. Other families apart feom Asteraceae and Fabaceae are Apocynaceae, Arecaceae, Dioscoreaceae, Euphorbiaceae, Leeaceae, Mimosaceae, Moraceae, Nyctaginaceae, Piperaceae, Rubiaceae, Scrophularaciae, Tiliaceae and Verbinaceae.

Table.No 18: Medicinal properties of plants present in Neerengil Kavu

S.No	Scientific Name	Medicinal Uses (Moss, 1977; Thangaraj, 2013; Arun et al., 2010, Deepa et al., 2016 and Balázs et al., 2006)
1	*Emilia sonchifolia* (Linn.) DC.	Decoction of the plant is given against tympanites and bowel complaints. Leaf juice is used to treat eye inflammation and night- blindness Roots are recommended for diarrhoea. The juice of the plant boiled with equal quantity of coco- nut oil is applied on the head against tonsiiitis. A paste prepared from the plant is applied over the throat.
2	*Microstachys chamaelea* (L.)	Plant extract along with coconut milk and cuminum cyminum seeds boiled and the residue is removed and is takenorally for rheumatism and arthritis.
3	*Mimosa pudica* L.	Urinary complaints, sores, piles, diarrhoea, dyspnoea, leprosy, uterine disorders, haemorrhage, wounds, oedema, skin diseases and burning sensation.
4	*Boerhaavia diffusa* Linn.	A decoction of the roots in milk is often prescribed in oedema with much benefit. Roots are used also in the treatment of asthma, anaemia and internal infla- mmation.
5	*Oldenlandia umbellata* L.	The leaves and roots are considered expectorant and used in asthma of bronchitis. The root powder has been subjected to clinical trails and it has been proved to be an efficacious remedy for blood, particularly in the condition of Tuberculosis.
6	*Linderina ciliata* (Colsm) Pennell.	Lindernia ciliata is traditionally used in the treatment of jaundice.
7	*Eupatorium odoratum* L.	Leaf juice is applied externally on cuts and wounds to stop bleeding.
8	*Leea indica* (Burm.F.) Merr.	Roots used in diarrhoea, dysentery, hyperdipsia, ulcer and skin diseases.
9	*Chassalia curviflora* (Wall. ex Kurz) Thw	Used to treat against cough and malaria.
10	*Briedelia scadens* (Roxb.) Willd.	Bark is used to prepare a mouth wash Leaves and stem cure eczema. Root and stem are recom- mended in the treatment of asthma, cough and internal sores.
11	*Triumfetta rhomboidea* Jacq.	Roots used in dysentery, intestinal ulcers and their hot infusion hasten parturition. Bark and leaves used in diarrhoea. Leaves and flowers used in leprosy.
12	*Derris scadens* (Roxb.) Benth.	Unripe beans loosen the bowels with gripe. Leaves reduced to plasma are good in erysipelas.
13	*Dioscorea bulbifera* L.	Ulcers, piles, leprosy, worm infestation, cardiac diseases, polyuria, urinary calculi, aphrodisiac, rejuvenator, dysentery and syphilis.
14	*Mikania micrantha* Kunth in HBK.	Snake bites, eliminating discomfort of hornet, bee and ant stings antimicrobial activity from the leaves

S.No	Scientific Name	Medicinal Uses (Moss, 1977; Thangaraj, 2013; Arun et al., 2010, Deepa et al., 2016 and Balázs et al., 2006)
15	*Piper nigrum* L.	Roots and fruits are used for improve intellect memory power and regain health by dispelling diseases. It also cures cough, asthma, indigestion, worm troubles, anaemia and chronic fever.
16	*Alstonia scholaris* (L.) R.Br.	Malaria, asthma, skin and respiratory diseases, cardiac troubles, beri-beri, fever, abdominal disorders, leprosy, foul ulcers, bronchitis and congested liver.
17	*Caryota urens* L.	The leaf bud, seed and toddy are used for diarrhoea, migraine and scorpion-sting poisoning.
18	*Gliricidia sepium* (Jacq.) Kunth ex Walp.	Used for headache, cold and cough.
19	*Adenanthera pavonina* L.	Ulcers, pharyngopathy, burning sensation, hyperdipsia, vomiting, fever, giddiness, dysentery, pain in joints, warts and emetic.
20	*Ficus benghalensis L.*	Bark is used in skin diseases, cures dysentery, diarrhoea, leucorrhoea, nervous disorders and reduces blood sugar in diabetes.
21	*Citharexylum spinosam* L.	This tree possesses medicinal properties and is useful in the treatment of various ailments (Cordero, 1978; Lachman-White et al., 1992). The leaves are used as a source of an antiallergic and as an alternative in hepatic disorders

4.6 Kalarikkal Kavu

There were 36 species in this kavu belonging to 30 different families (Table 19). The vegetation comprises of 17% herbs, 9% shrubs, 13% climbers and 56% trees. Among the 36 species monocts were 8% and dicots wer 92%. Among the 30 families Fabaceae family plants were seen abundant that others with 13.73% of frequency in occurrence.

Table 19: Plant species recorded in the Kalarikkal Kavu

S.No	Botanical Name	Family	Local Name	Habit
1	*Andrographis paniculata* (Burn. F.) Wall. Ex. Nees.	Acanthaceae	Nilamkanjiram	Herb
2	*Aerva lanata* (L.) Juss.	Amaranthaceae	Cherula	Herb
3	*Mangifera indica* L.	Anacardiaceae	Mavu	Tree
4	*Ichnocarpus frutescens* (L.) R. Br.	Apocyanaceae	Palvalli	Climber
5	*Plumeria rubra* L.	Apocynaceae	Alari	Tree
6	*Alstonia scholaris* (L.) R. Br	Apocynaceae	Pala	Tree
7	*Cocos nucifera* L.	Arecaceae	Thengu	Tree
8	*Emilia sonchifolia* (L.) DC.	Asteraceae	Muyalchevi	Herb
9	*Eupatorium odoratum* L.	Asteraceae	Communist pacha	Shrub
10	*Bixa orellana* L.	Bixaceae	Kunkumam	Tree
11	*Bombax ceiba* L.	Bombaceae	Poola	Tree
12	*Delonix regia* (Boj.. ex Hook.) Rafin	Caesalpineaceae	Poomaram	Tree
13	*Calycopteris floribunda* (Roxb.) Poir.	Combretaceae	Pullanni	Climber
14	*Terminalia paniculata* Roth	Combretaceae	Maruthu	Tree
15	*Dioscorea bulbifera* L.	Dioscoreaceae	Kavath	Climber
16	*Phyllanthus amarus* Schum. & Thonn	Euphorbiaceae	Keezharnelli	Herb
17	*Microstachys chamaelea* (L.)	Euphorbiaceae	Kodiyavannakku	Herb
18	*Briedelia scadens* (Roxb.)	Euphorbiaceae		Shrub
19	*Mallotus philippensis* (Lam.) Muell-Arg.	Euphorbiaceae	Sindooram	Tree
20	*Macaranga peltata* (Roxb.) Muell-Arg.	Euphorbiaceae	Uppela, vatta	Tree
21	*Desmodium scorpiurus* (Sw.) Desv.	Fabaceae		Herb
22	*Derris scadens* (Roxb.) Benth.	Fabaceae	Noyalvalli	Climber
23	*Gliricidia sepium* (Jacq.) Kunth ex *Walp.*	Fabaceae	Seemakonna	Tree
24	*Adenanthera pavonina* L.	Fabaceae	Manjadi	Tree
25	*Cassia fistula* L.	Fabaceae	Konna	Tree
26	*Pongamia pinnata* L.	Fabaceae	Ungu	Tree
27	*Albizia odoratissima* (L. f.) Benth.	Fabaceae	Vaka	Tree
28	*Curculigo orchioides* Gaertn.	Hypoxidaceae	Nilappana	Herb
29	*Leea indica* (Burm. F.) Merr.	Leeaceae		
30	*Lindernia ciliata* (Colsm.) Pennell.	Linderniaceae		Herb
31	*Strychnos nux-vomica* L.	Loganiaceae	Kanjiram	Tree
32	*Tinospora sinensis* (Lour.) Merr.	Menispermaceae	Kattamruthu	Climber
33	*Tiliacora acuminata* (Poir.) Miers. ex Hook. f. & Thoms.	Menispermaceae		Climber
34	*Ficus racemosa* L.	Moraceae	Tree	Tree
35	*Ficus benghalensis* L.	Moraceae	Peraal	Tree
36	*Artocarpus hirsutus* Lam.	Moraceae	Plavu	Tree

S.No	Botanical Name	Family	Local Name	Habit
37	*Cleistanthus collinus* (Roxb.) Benth. Ex Hook.	Phyllanthaceae	Odugu	Tree
38	*Piper nigrum* L.	Piperaceae	Kurumulaku	Climber
39	*Panicum notatum* Retz.	Poaceae		Herb
40	*Bambusa bambos* (L.) Voss.	Poaceae	Mula	Tree
41	*Putranjiva roxburghii* Wall.	Putranjivaceae	Poothilanji	Tree
42	*Chassalia curviflora* (Wall ex Kurz)	Rubiaceae	Karutha amalpori	Shrub
43	*Canthium rheedei* DC.	Rubiaceae		Shrub
44	*Morinda pubescence* J.E. Smith.	Rubiaceae	Manja paavutta	Tree
45	*Glycosmis pentaphylla* (Retz.) DC	Rutaceae	Panal	Shrub
46	*Zanthoxylem rhesta* (Roxb.) DC.	Rutaceae	Mullilam	Tree
47	*Santalum album* Linn.	Santalaceae	Chandhanam	Tree
48	*Schleichera oleosa* (Lour.) Oken.	Sapindaceae	Poovam	Tree
49	*Holoptelea integrifolia* (Roxb.) Planch.	Ulmaceae	Aavel	Tree
50	*Citharexylum spinoum* L.	Verbinaceae	Paarijatham	Tree
51	*Leea indica* (Burm.f.) Merr.	Vitaceae		Tree

Table 20: Floristic Diversity analysis of Sacred grove - Kalarikkal Kavu

	Monocots	Dicots	Total
Families	2	28	30
Genera	3	48	51
Species	3	49	52

Fig 17: Floristic analysis of monoct and dicot plants present in Kalarikkal Kavu

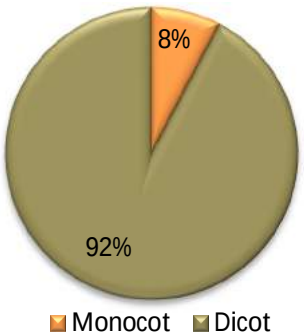


Fig 18: Floristic analysis of habit of plants present in Kalarikkal Kavu

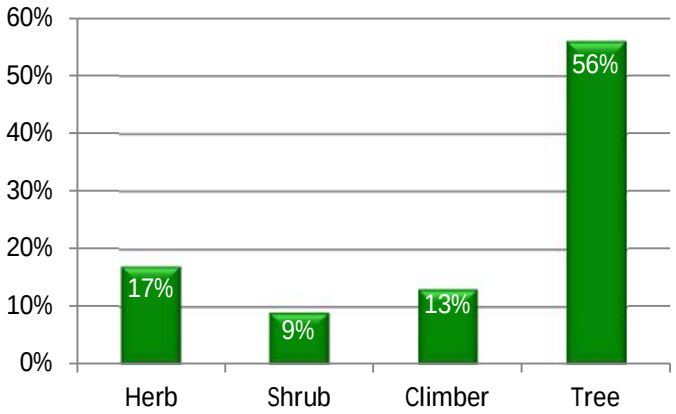


Fig 19: Comparative account of families with number of species in Kalarikkal Kavu

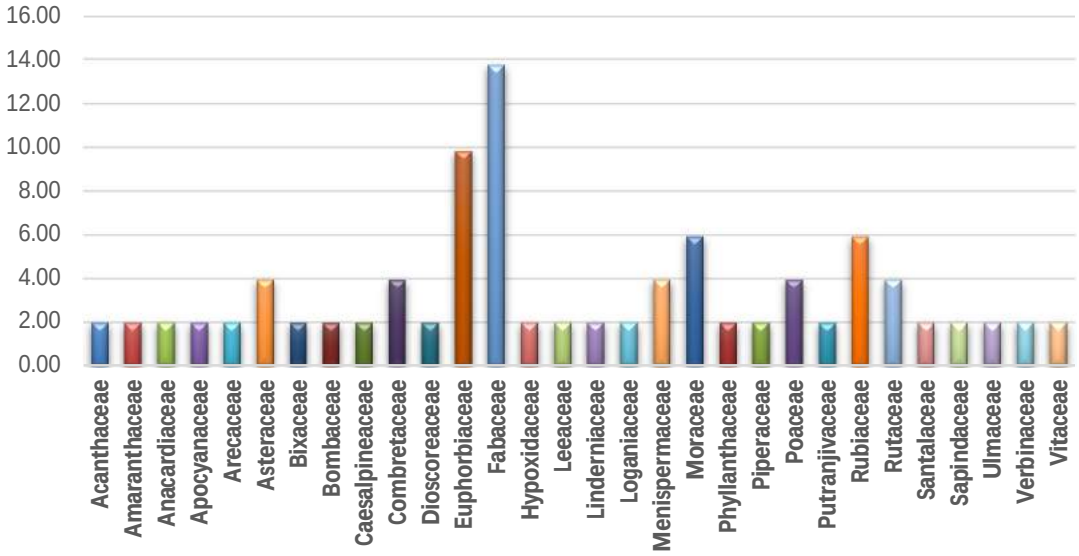


Table 21: Medicinal properties of plants present in Kalarikkal Kavu

S.No	Scientific Name	Medicinal Uses (Balázs et al., 2006; Ayeb-Zakhama et al., 2015; Deepa et al., 2016; Deepa et al., 2017 and Thangaraj, 2013)
1	*Phyllanthus amarus* Schum. & Thonn.	Used for flu, dropsy, diabetes, jaundice, asthma, bronchial infections, diseases of the liver, stomach, genito-urinary system, liver and kidney. It is reported to show antiviral activity against hepatitis B-virus and related hepadna virus.
2	*Aerva lanata* (L.) Juss.	Used in urinary obstructions, bladder stones and haemorrhages associated with pregnancy.
3	*Curculigo orchioides* Gaertn.	Tuberous roots used in skin troubles, demulcent, diuretic, tonic. Useful in leucorrhoea, urinary diseases, piles, jaundice, asthma, diarrhoea, gonorrhoea and itch.
4	*Andrographis paniculata* (Burn. F.) Wall. Ex. Nees.	Plant is administered i n cases of debility. dysentery, dyspepsia and bronchitis. Root and Leaves are used syphilitic cachexia and foul syphilitic ulcers.
5	*Emilia sonchifolia* (L.) DC.	Decoction of the plant is given against tympanites and bowel complaints. Leaf juice is used to treat eye inflammation and night- blindness Roots are recommended for diarrhoea. The juice of the plan boiled with equal quantity of coconut oil is applied on the head against tonsiiitis. A paste prepared from the plant is applied over the throat.
6	*Panicum notatum Retz.*	
7	*Microstachys chamaelea* (L.)	Plant extract along with coconut milk and cuminum cyminum seeds boiled and the residue is removed and is taken orally for rheumatism and arthritis.
8	*Desmodium scorpiurus* (Sw.) Desv.	Used for the treatment of constipation, cough, convulsion, haemauria, general venereal infections, ringworm etc.

S.No	Scientific Name	Medicinal Uses (Balázs et al., 2006; Ayeb-Zakhama et al., 2015; Deepa et al., 2016; Deepa et al., 2017 and Thangaraj, 2013)
9	*Lindernia ciliata* (Colsm.) Pennell.	Lindernia ciliata is traditionally used in the treatment of jaundice.
10	*Eupatorium odoratum* L.	Leaf juice is applied externally on cuts and wounds to stop bleeding..
11	*Briedelia scadens* (Roxb.)	Bark is used to prepare a mouth wash Leaves and stem cure eczema. Root and stem are recom- mended in the treatment of asthma, cough and internal sores.
12	*Leea indica* (Burm. F.) Merr.	Roots used in diarrhoea, dysentery, hyperdipsia, ulcer and skin diseases.
13	*Chassalia curviflora* (Wall ex Kurz)	Root of the plant used to treat cough and malaria.
14	*Canthium rheedei* DC.	Usedfor whitish ulcers on the surface of a mucous membrane, better for obstructions of the liver, purifies, blood and cheers up the patient.
15	*Glycosmis pentaphylla* (Retz.)DC	Leaf juice used in fever and liver complaints and as a vermifuge. Leaves considered good antidote for inflammations, fever, helminthiasis, cough, bronchitis, rheumatism, jaundice, anaemia, hepatopathy and skin diseases.
16	*Calycopteris floribunda* (Roxb.) Poir.	Leaves are administered as a cure for dysentery and malaria and applied externally for ulcers.
17	*Piper nigrum* L.	Powdered fruit with ghee, honey and sugar may be taken in cases of alteration of voice and cough (Mooss, 1977). Fruit is used as a stimulant in weakness following fever, vertigo and coma; as stomachic in dyspepsia and flatulence; as anti-periodic in malarial fever and as alterative in paraplegia and arthritic diseases.
18	*Tinospora sinensis* (Lour.) Merr.	Stems used for treatment of piles and ulcerated wounds, liver complaints, chronic rheumatism and also as muscle relaxant.
19	*Derris scadens* (Roxb.) Benth.	A decoction of the roots in milk is often prescribed in oedema with much benefit (Mooss, 1977). Roots are used also in the treatment of asthma, anaemia and internal inflammation
20	*Dioscorea bulbifera* L.	Tubers used for ulcers, piles, leprosy, worm infestation, cardiac diseases, polyuria, urinary calculi, aphrodisiac, rejuvenator, dysentery and syphilis.
21	*Tiliacora acuminata* (Poir.) Miers. ex Hook. f. & Thoms.	Roots are used as an antidote to snake poison.
24	*Plumeria rubra* L.	Ulcers, herpes and scabies, itch, rheumatism and gum troubles.

S.No	Scientific Name	Medicinal Uses (Balázs et al., 2006; Ayeb-Zakhama et al., 2015; Deepa et al., 2016; Deepa et al., 2017 and Thangaraj, 2013)
25	*Alstonia scholaris* (L.) R. Br	Malaria, asthma, skin and respiratory diseases, cardiac troubles, beri-beri, fever, abdominal disorders, leprosy, foul ulcers, bronchitis and congested liver.
26	*Cocos nucifera* L.	Bronchitis, hepatopathy, uterine disorders, helminthiasis, gastritis, haemorrhage, polyuria, leucorrhoea, hyperdipsia, tumours, skin diseases, dysentery, diarrhoea, dehydration and diabetes.
27	*Ficus racemosa* L.	Skin and vaginal diseases and ulcers.
28	*Gliricidia sepium* (Jacq.) Kunth ex *Walp.*	Used for headache, cold and cough.
29	*Adenanthera pavonina* L.	Ulcers, pharyngopathy, burning sensation, hyperdipsia, vomiting, fever, giddiness, dysentery, pain in joints, warts and emetic.
30	*Ficus benghalensis* L.	Bark is used in skin diseases, cures dysentery, diarrhoea, leucorrhoea, nervous disorders and reduces blood sugar in diabetes.
31	*Delonix regia* (Boj.. ex Hook.) Rafin	Leaves are used for diseases of vata, constipation, inflammations, arthritis, hemiplegia and dysmenorrhoea.
32	*Morinda pubescence* J.E. Smith.	It is used for eczema, fever, ulcers, glandular swellings and digestive disorders especially in children.
33	*Schleichera oleosa* (Lour.) Oken.	Bark useful in curing ulcers, malaria and inflammations. Seed oil used in leprosy, dermatopathy, boils, ulcers, blood disorders, intermittent fever, snakebite and burns.
34	*Strychnos nux-vomica* L.	Seeds are useful in intermittent fevers, dyspepsia, chronic dysentery, paralytic and neuralgic affections, insomnia, chronic rheumatism, colic, impotence, heart disease, spermatorrhoea and skin diseases.
35	*Mallotus philippensis* (Lam.) Muell.-Arg.	Used against tapeworms, abdominal disorders, haemopathy, calculus, flatulence, leprosy, skin diseases and ringworm.
36	*Bombax ceiba* L.	Used in calculous affections and ulceration of bladder and kidneys, dysentery, pulmonary tuberculosis, influenza, menorrhagia, fever, burning sensation and skin eruptions.
37	*Cassia fistula* L.	Remedy for skin diseases, leprosy, fever, promotes digestion, leucoderma, eczema, diabetes, cardiac diseases, jaundice, polyuria, and urticaria.
38	*Cleistanthus collinus* (Roxb.) Benth. ex Hook. f.	Leaves, roots and fruits act as gastrointestinal irritant. Fruits used for treating cancer.
39	*Zanthoxylem rhesta* (Roxb.) DC.	Bark and fruits used in dyspepsia, asthma, bronchitis, heart diseases, toothache, diseases of eye and ear, worm infestation, leprosy, diseases of head and rheumatism. Seeds are used in cholera. Thorns are used in treating pimples.

S.No	Scientific Name	Medicinal Uses (Balázs et al., 2006; Ayeb-Zakhama et al., 2015; Deepa et al., 2016; Deepa et al., 2017 and Thangaraj, 2013)
40	*Putranjiva roxburghii* Wall.	Leaves and seeds are used for burning sensation, thrist, stomatopathy, opthalmopathy, constipation, elephantiasis and habitual abortion.
41	*Leea indica* (Burm.f.) Merr.	Roots used in diarrhoea, dysentery, hyperdipsia, ulcer and skin diseases.
42	*Macaranga peltata* (Roxb.) Muell.-Arg.	Decoction of leaves and bark used as vulnerary. Gum used for venereal sores.
43	*Terminalia paniculata* Roth	Bark is a cardio tonic and diuretic.
44	*Santalum album* L.	Wood is made into a paste and applied to headache and skin diseases. Oil from heartwood is used in the symptomatic treatment of dysuria, gonorrhoeal urethritis and cystitis.
45	*Citharexylum spinoum* L.	This tree possesses medicinal properties and is useful in the treatment of various ailments (Cordero, 1978; Lachman-White et al., 1992). The leaves are used as a source of an antiallergic and as an alternative in hepatic disorders.
46	*Pongamia pinnata* L.	Fresh bark is given internally for bleeding piles, Leaves in the form of a poultice is applied to ulcers infested with worms. The fruit is used against urinary diseases (Narayana Aiyar & Kolammal, 1960). Seeds are used to purify btood.
47	*Albizia odoratissima* (L. f.) Benth.	Insect bites, ulcers, leprosy, skin diseases, cough, bronchitis, diabetes and burning sensation.
48	*Holoptelea integrifolia* (Roxb.)Pianch.	Juice of boiled bark is applied to rheumatic swellings.
49	*Bixa orellana* L.	Seeds of Bixa orellana used as a condiment as well as laxative, cardiotonic, hypotensive, expectorant, and antibiotic. In addition, it has anti-inflammatory activity for bruises and wounds and has been used for the treatment of bronchitis and for wound healing purposes. Oil is also obtained from this plant. The infusion of the leaves has been shown to be effective against bronchitis, sore throat, and eye inflammation. The pulp, which includes the seed, is used for soft drinks and febrifuge.
50	*Artocarpus hirsutus* Lam.	Anorexia, small pimples, cracks on the skin and sores.
51	*Bambusa bambos* (L.) Voss.	Haemorrhoid, diarrhoea, wounds, skin diseases, fever, cough, shortness of breath, vomiting, cardiac diseases and skin diseases.

4.7 Alagapath Kavu

There are about 43 plants belonging to 32 families. The vegetation consists of 17% hererbs, 9% shrubs, 13% climbers and 56% trees. Among 43 plants present in this kavu, 8% of them belonged to monocots, while 92% belonged to dicots. In the 32 families of plants present

Fabaceae was found to be more predominantly presentwith a frequency rate of 18.60%. The dominant family Fabaceae had 8 species, followed by Rubiaceae (4 species), Euphorbiaceae (3 speices) and Arecaceae (3 speices).

Table 22: Plant species recorded in the Alagapath Kavu

S.No	Botanical Name	Family	Local Name	Habit
1	*Kyllinga nemorallis* (J.R.Forst. & G.Forst.) Dandy ex Hutch. & Dalziel	Cyperaceae	Muthanga	Herb
2	*Adhathoda vasica* Nees.	Acanthaceae	Aadalodakam	Shrub
3	*Aerva lanata* (L.) Juss. ex Schult.	Amaranthaceae	Cherula	Herb
4	*Anacardium ocidentale*	Anacardiaceae	Tree	Tree
5	*Plumeria rubra* L.	Apocynaceae	Alari	Tree
6	*Alstonia scholaris* (L.) R. Br	Apocynaceae	Pala	Tree
7	*Borassus flabellifer* L.	Arecaceae	Pana	Tree
8	*Cocos nucifera* L.	Arecaceae	Thengu	Tree
9	*Caryota urens L.*	Arecaceae	Aanapana	Tree
10	*Bombax cieba* L.	Bombacaceae	Poola	Tree
11	*Caesalpinia pulcherrima*	Caesalpiniaceae	Rajamalli	Shrub
12	*Calycopteris floribunda (*Roxb.) Poir	Combretaceae	Pullanni	Climber
13	*Phyllanthus amarus* Schum. & Thonn.	Euphorbiaceae	Keezharnelli	Herb
14	*Macaranga peltata* (Roxb.) Muell.-Arg.	Euphorbiaceae	Uppela, vatta	Tree
15	*Mallotus philippensis* (Lam.) Muell.-Arg	Euphorbiaceae	Sindooram	Tree
16	*Derris scadens* (Roxb.) Benth.	Fabaceae	Noyalvalli	Climber
17	*Tamarindus indica* L.	Fabaceae	Puli	Tree
18	*Cassia fistula L.*	Fabaceae	Konna	Tree
19	*Gliricidia sepium* (Jacq.) Kunth ex Walp.	Fabaceae	Seema konna	Tree
20	*Pongamia pinnata* Linn.	Fabaceae	Ungu	Tree
21	*Albizia odoratissima* (L. f.) Benth.	Fabaceae	Vaka	Tree
22	*Albizia saman* F.Muell (Jacq.)	Fabaceae	Mazhamaram	Tree
23	*Adenanthera pavonina* L.	Fabaceae	Manjadi	Tree
24	*Strychnos nux-vomica* L.	Loganiaceae	Kanjiram	Tree
25	*Lawsonia inermis* L.	Lythraceae	Mailanchi	Shrub
26	*Hibiscus rosa-sinensis* L.	Malvaceae	Chembarathi	Shrub
27	*Aglaia elaeagnoidea* (A. Juss.) Benth	Meliaceae		Tree
28	*Mimosa pudica* L.	Mimosaceae	Thottavadi	Herb
29	*Artocarpus hirsutus* Lam.	Moraceae	Plavu	Tree
30	*Ficus benghalensis* L.	Moraceae	Peraal	Tree
31	*Jasminum grandiflorum* Linn.	Oleaceae	Pichakamulla	climber
32	*Jasminum malabaricum* White	Oleaceae	Kaattumulla	Climber
33	*Acroceras munroanum*	Poaceae		Herb
34	*Axonopus compressus* (Balsana) Henrard.	Poaceae	Kaalappullu	Shrub

S.No	Botanical Name	Family	Local Name	Habit
35	*Chassalia curviflora* (Wall. ex Kurz) Thw	Rubiaceae	Karutha amalpori	Shrub
36	*Ixora coccinea* L.	Rubiaceae	Thechi	Shrub
37	*Canthium rheedei* DC.	Rubiaceae	Edali	Shrub
38	*Morinda pubescence* J. E Smith	Rubiaceae	Manja paavutta	Tree
39	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae	Panal	Shrub
40	*Zanthoxylem rhesta* (Roxb.) DC.	Rutaceae	Mullilam	Tree
41	*Santalum album*	Santalaceae	chandhanam	Tree
42	*Schleichera oleosa* (Lour.) Oken	Sapinddaceae	Poovam	Tree
43	*Holoptelea integrifolia* (Roxb.) Planch.	Ulmaceae		Tree

Table 23: Floristic Diversity analysis of Sacred grove - Alagapath Kavu

	Monocots	Dicots	Total
Families	3	21	24
Genera	3	39	42
Species	3	40	43

Fig 20: Floristic analysis of monoct and dicot plants present in Alagapath Kavu

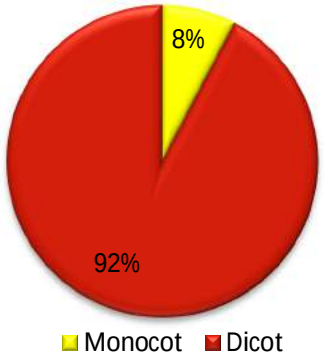


Fig 21: Floristic analysis of habit of plants present in Alagapath Kavu

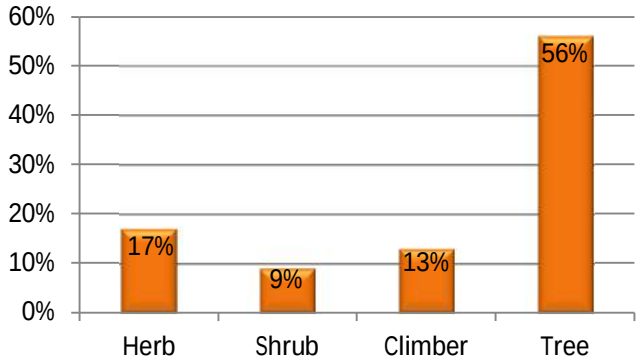


Fig 22: Comparative account of families with number of species in Alagapath Kavu

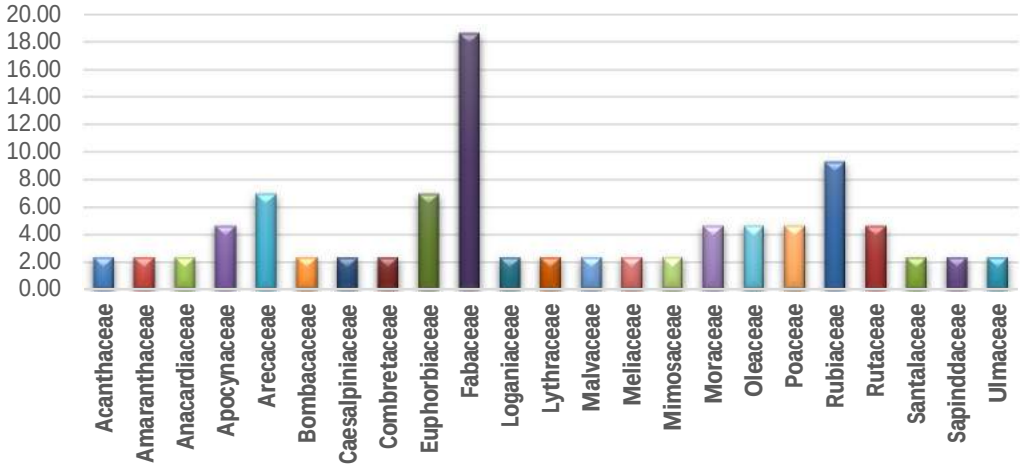


Table. 24: Medicinal properties of plants present in Alagapath Kavu

S.No	Scientific Name	Medicinal Uses (Sandeep and Paarakh, 2009; Adnan et al., 2010; Pankaj, 2011, Sindhu et al., 2014; Deepa et al., 2016; Dymock et al., 2016; Gumadu et al., 2016; Manoharan et al., 2019 and Anisha and Gnanavel, 2020)
1	*Aerva lanata* (L.) Juss. ex Schult.	Plant is used to treat lithiasis. Root is used against strangury.
2	*Phyllanthus amarus* Schum. & Thonn.	The plant is used for flu, dropsy, diabetes, jaundice, asthma, bronchial infections, diseases of the liver, stomach, genito-urinary system, liver and kidney. The plant is reported to show antiviral activity against hepatitis B-virus and related hepadna virus.
3	*Acroceras munroanum*	
4	*Kyllinga nemorallis* (J.R.Forst. & G.Forst.) Dandy ex Hutch. & Dalziel	Leaves of the plant are used as antivenom, relief of malarial chills, pruritus of the skin, thirst attributable to fever and diabetes. The paste of rhizomes mixed with milk is used internally for worm infection and the rhizome alone is used to treat hepatopathy, splenopathy, fever, tumour and diabetes.
5	*Mimosa pudica* L.	Urinary complaints, sores, piles, diarrhoea, dyspnoea, leprosy, uterine disorders, haemorrhage, wounds, oedema, skin diseases and burning sensation.
6	*Axonopus compressus*	Used to treat common cold and diabetes in Southern Nigeria
7	*Chassalia curviflora* (Wall. ex Kurz) Thw.	Root of the plant used to treat cough and malaria.
8	*Lawsonia inermis* L.	Traditionally in India, mehndi is applied to hands and feet. Henna symbolizes fertility. leaves, flowers, seeds, stem bark and roots are used in traditional medicine to treat a variety of ailments as rheumatoid arthritis, headache, ulcers, diarrheoa, leprosy, fever, leucorrhoea, diabetes, cardiac diseases, hepatoprotective.
9	*Adhathoda vasica* Nees.	Plant parts are used in Indian traditional medicine for the treatment of asthma, joint pain, lumber pain, sprains, cold, cough, eczema, malaria, rheumatism, swelling and venereal diseases. The various preparation of leaves used for curing bleeding, haemorrahge, skin diseases, wounds, headache and leprosy in Southeast Asia. Root paste, powder and decoction is used for curing tuberculosis, diphtheria, malarial fever, leucorrhoea and eye diseases in Southeast Asia
10	*Glycosmis pentaphylla* (Retz.)DC.	Leaf juice used in fever and liver complaints and as a vermifuge. Leaves-good antidote for inflammations, fever, helminthiasis, cough, bronchitis, rheumatism, jaundice, anaemia, hepatopathy and skin diseases.

S.No	Scientific Name	Medicinal Uses (Sandeep and Paarakh, 2009; Adnan et al., 2010; Pankaj, 2011, Sindhu et al., 2014; Deepa et al., 2016; Dymock et al., 2016; Gumadu et al., 2016; Manoharan et al., 2019 and Anisha and Gnanavel, 2020)
11	*Ixora coccinea* L.	Coccinea used in Ayurveda and in distinct traditional folks to treat numerous ailments. The roots, leaves, flower and barks are widely used in the traditional folks. It is practiced for treating diarrhoea, dysentery, bronchitis, colic, eczema etc. It also has several properties like antidiarrheal, anti-dysenteric, anti-cancer, antifertility and anti-inflammatory.
12	*Caesalpinia pulcherrima* L.	The wood is bitter, dry, sour, cooling; cure "Vata", biliouness, fever, delirium, ulcers, strangury, urinary concentration and blood complaints. It is considered astringent and sedative. It is useful in vitiated conditions of pitta. An infusion of the wood is a powerful astringent and emmenagogue. It is used in atonic diarrhea and dysentery, and its paste in rheumatism, hemorrhages and to treat wounds.
13	*Hibiscus rosa-sinensis* L.	Hypotensive, anti-pyritic, anti-inflammatory, anti-diabetic, wound healing, abortifacient activities.
14	*Canthium rheedei* DC.	Usedfor whitish ulcers on the surface of a mucous membrane, better for obstructions of the liver, purifies, blood and cheers up the patient
15	*Jasminum grandiflorum* Linn.	The plant is bitter, astringent, acrid, thermogenic, aphrodisiac, antiseptic, anodyne, depurative, emmenagogue, emollient, diuretic, anthelmintic, deobstruant, dentrifrice, suppurative and tonic. Roots are used for cephalalgia, vitiated condition of vata, paralysis, facial paralysis, mental debility, chronic constipation, flatulence, strangury, sterility, dysmenorrhoea, amenorrhoea, ringworm, leprosy, skin diseases and giddiness. Leaves are used for odontalgia, fixing loose teeth, ulcerative stomatitis, leprosy, skin diseases, ottorhoea, otalgia, strangury, dysmenorrhoea, ulcers, wound and corns. Flowers are used for in stomatopathy, cephalopathy, odontopathy, ophthalmopathy, leprosy, skin diseases, pruritis, strangury, dysmenorrhoea, ulcers, as refrigerant, ophthalmic and vitiated conditions of pitta.
16	*Jasminum malabaricum* White.	The plant is known for its ethnomedicinal importance as blood purifier and anti-tumor properties.

S.No	Scientific Name	Medicinal Uses (Sandeep and Paarakh, 2009; Adnan et al., 2010; Pankaj, 2011, Sindhu et al., 2014; Deepa et al., 2016; Dymock et al., 2016; Gumadu et al., 2016; Manoharan et al., 2019 and Anisha and Gnanavel, 2020)
17	*Derris scadens* (Roxb.) Benth	A decoction of the roots in milk is often prescribed in oedema with much benefit (Mooss, 1977). Roots are used also in the treatment of asthma, anaemia and internal inflammation.
18	*Calycopteris floribunda* (Roxb.) Poir	Leaves are administered as a cure for dysentery and malaria and applied externally for ulcers.
19	*Plumeria rubra* L.	Ulcers, herpes and scabies, itch, rheumatism and gum troubles.
20	Borassus flabellifer L.	Root, leaves, fruit, and seeds are used for various human disorders. Leaves are used for thatching, mats, baskets, fans. The different parts of the plant are being used for antihelminthic & diuretic. The fruit pulp has been used in traditional dishes and the sap, has been used as a sweetener for diabetic patients.
21	*Tamarindus indica* L.	Blood tonic, jaundice, laxative, skin cleanser, hepatoprotective.
22	*Zanthoxylem rhesta* (Roxb.) DC.	Bark and fruits used in dyspepsia, asthma, bronchitis, heart diseases, toothache, diseases of eye and ear, worm infestation, leprosy, diseases of head and rheumatism. Seeds are used in cholera. Thorns are used in treating pimples.
23	*Strychnos nux-vomica* L.	Neurological disorders, vatha diseases.
24	*Bombax cieba* L.	Used in calculous affections and ulceration of bladder and kidneys, dysentery, pulmonary tuberculosis, influenza, menorrhagia, fever, burning sensation and skin eruptions.
25	*Anacardium ocidentale* L.	Bark Of the plant used for Hemorrhoids and severe diarrhoea. Treatment of lower extremity pains and skin injury; exerts anti-inflammatory effects. Leavesused for Diarrhea, fever, skin rashes, and sore.
26	*Cocos nucifera* L.	Anti- helminthic, anti-inflammatory, anti-fungal, anti-tumor activities, anti-microbial.
27	*Santalum album* L.	Wood is made into a paste and applied to headache and skin diseases. Oil from heartwood is used in the symptomatic treatment of dysuria, gonorrhoeal urethritis and cystitis.
28	*Artocarpus hirsutus* Lam.	Anorexia, small pimples, cracks on the skin and sores.

S.No	Scientific Name	Medicinal Uses (Sandeep and Paarakh, 2009; Adnan et al., 2010; Pankaj, 2011, Sindhu et al., 2014; Deepa et al., 2016; Dymock et al., 2016; Gumadu et al., 2016; Manoharan et al., 2019 and Anisha and Gnanavel, 2020)
29	*Cassia fistula L.*	Skin and cardiac diseases, leprosy, fever, promotes digestion, leucoderma, eczema, diabetes, jaundice, polyuria, and urticaria.
30	*Caryota urens L.*	Diarrhoea, migraine and scorpion-sting poisoning.
31	*Gliricidia sepium* (Jacq. Kunth ex Walp.	Headache, cold and cough.
32	*Pongamia pinnata* Linn.	Fresh bark is given inter-nalty for bleeding piles, Leaves in the form of a poultice is applied to ulcers infested with worms. The fruit is used against urinary diseases. Seeds are used to purify btood.
33	*Holoptelea integrifolia* (Roxb.) Planch.	Juice of boiled bark is applied to rheumatic swellings.
34	*Albizia odoratissima* (L. f.) Benth.	Insect bites, ulcers, leprosy, skin diseases, cough, bronchitis, diabetes and burning sensation.
35	*Morinda pubescence* J. E Smith	Eczema, fever, ulcers, glandular swellings and digestive disorders especially in children.
36	*Alstonia scholaris* (L.) R. Br	Diarrhoea, epilepsy, skin diseases, snake bite.
37	*Ficus benghalensis* L.	Skin diseases, dysentery, diarrhoea, leucorrhoea, nervous disorders and reduces blood sugar in diabetes
38	*Aglaia elaeagnoidea* (Juss.) Benth.	Fruit is recommended for inflammation and leprosy.
39	*Albizia saman* F.Muell (Jacq.)	Stomach cancer, colds, diarrhoea, headache, intestinal ailments and stomach ache, sore throat, Mycobacterium tuberculosis.
40	*Macaranga peltata* (Roxb.) Muell.-Arg.	Used as vulnerary. Gum used for venereal sores.
41	*Mallotus philippensis* (Lam.) Muell.-Arg	Used against tapeworms, abdominal disorders, haemopathy, calculus, flatulence, leprosy, skin diseases and ringworm.
42	*Adenanthera pavonina* L.	Ulcers, pharyngopathy, burning sensation, hyperdipsia, vomiting, fever, giddiness, dysentery, pain in joints, warts and emetic.

In all the seven kavus, about fifteen plants were seen to present (Table 25). Though these kavu are not maintained by temple or community or government, it is strictly hidden but maintained by individual kavu. Even though the size of them are small, the speciation in them seems to be goo. Sankar (2020) also reported in his studies that that sacred groves are transforming from being an inclusive, democratic and 'unrestricted' ecological commons, to an exclusive, elitist,

'closed' and increasingly concretised temple spaces controlled by private individuals through a complex process of political mobilisation.

SL. NO	Common Plants Present in the Seven Sacred Groves
1	*Aerva lanata* (L.) Juss. ex Schult.
2	*Alstonia scholaris* (L.) R.Br.
3	*Discorea bulbifera* Linn.
4	*Caryota urens* L.
5	*Canthium rheedei* DC
6	*Eupatorium odoratum* L.
7	*Ficus racemosa* L.
8	*Ficus benghalensis* L.
9	*Gliricidia sepium* (Jacq.) Kunth ex Walp.
10	*Glycosmis pentaphylla* (Retz.) DC.
11	*Jasminum malabaricum* White.
12	*Mimosa pudica* L.
13	*Plumeria rubra* L.
14	*Schleichera oleosa* Lour.) Oken
15	*Strychnos nux-vomica* L.

Plate 3a: Plants found in all the seven Kavu


Alstonia scholaris (L.) R.Br..


Caryota urens L.

Plate 3b: Plants found in all the seven Kavu


Ficus benghalensis L.


Discorea bulbifera Linn.


Plumeria rubra L.


Mimosa pudica L.


Ficus racemosa L.


Delonix regia (Boj. Ex Hook)

Plate 3b: Plants found in all the seven Kavu

Plate 3c: Plants found in all the seven Kavu


Caesalpinia pulcherrima


Gliricidia sepium


Holoptelea integrifolia


Mallotus philippensis


Bambusa bambos


Kyllinga nemoralis L.


Leea indica (Burm.f.)


Schleichera oleosa (Lour.)


Triumfetta rhomboidea

Plate 3d: Plants found in all the seven Kavu

Plate 3e: Plants found in all the seven Kavu

Plate 3f: Plants found in all the seven Kavu


Adhathoda vassica


Hibiscus rosa-sinensis L.


Alternanthera brasiliana L


Oldenlandia umbellate L.

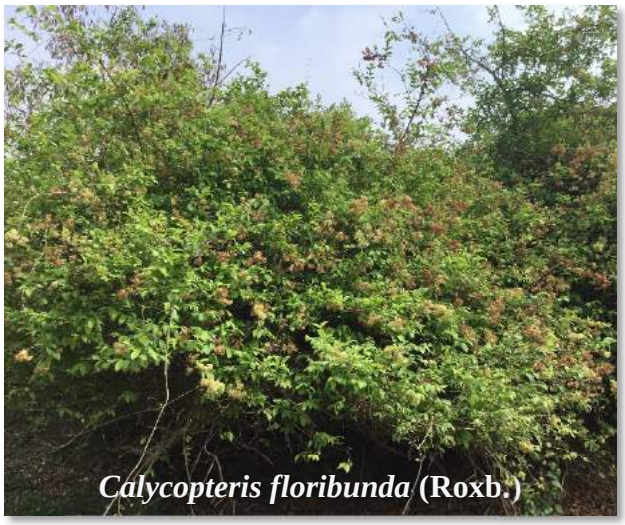

Chassalia curviflora


Phyllanthus reticulatus


Curculio orchioides


Hyptis suaveolens (Roxb.)

Plate 3g: Plants found in all the seven Kavu


Calycopteris floribunda (Roxb.)


Glycosmis pentaphylla (Retz.)


Piper longum L.


Pothos scandens L.

Summary & Conclusion

Summary and Conclusion

In this present study Sacred Grove maintained by families inside their own premises are studied. The vegetation was found to be vast and though there were few ornamental and invasive plants, native plants and huge years-old trees were also found.

The vegetation in Payyandath kavu consists of 39 species belonging to 26 family. The floristic diversity of Payyandath kavu shows that out of the recorded 39 plants the monocots and dicots present were 4 % and 96 % respectively. The diversity based on the habit which includes climbers, herbs, shrubs and trees which are about 26%, 8%, 23% and 44% respectively.

The total number of angiosperms recorded in Arinjikkal kavu are about 28, among them 20% of them are monocots and 80% of them are dicots. The habit of the vegetation in this kavu has climbers, herbs, shrubs and trees which were of about 28%, 32%, 17% and 17% respectively.

Kunnummel Kavu comprises 26 plants out of which 8% were monocots and 92% of them are dicot plants. The habit in vegetation comprises of herbs, shrubs, climbers and trees with a percentage of 15%, 7%, 23% and 50% respectively. The vegetaion in Kunnummel Kavu belongs to 16 families, out of which the frequency of plants distributed. Fabaceae and rubiaceae were more widely present in this kavu with a frequency of 11.54 % each.

Thavalakottu Kavu comprises of 29 plants belonging to 17 different families. Overall, 3% of monocot and 97% of dicots were observed in this vegetation. Rubiacee members were found more with a frequency of 13.79 % while 3.45 % was found in 11 families (Amaranthaceae, Apocynaceae, Arecaceae, Loganiaceae, Loranthaceae, Phyllanthaceae, Piperaceae, Poaceae, Rutaceae, Sapindaceae, Ulmaceae and Vitaceae). The vegetation has plants belonging to four types of habits herbs, shrubs, climbers and trees with a frequency of 6%, 13%, 24% and 48% respectively.

The vegetation present in Neerengil kavu consists of 21 angiospermic species belonging to 15 families. In them 5% belongs to monocots and 95 % of them were dicots. The plant habits belong to four habits namely herbs, shrubs, climbers and trees which are of about 28%, 23%, 19% 28% respectively. The families Asteraceae and Fabaceae hold a frequency of 14.29 %, while others were less compared to them.

There were 36 species in Kalarikkal kavu belonging to 30 different families. The vegetation comprises of 17% herbs, 9% shrubs, 13% climbers and 56% trees. Among the 36 species monocts were 8% and dicots were 92%. Among the 30 families Fabaceae family plants were seen abundant that others with 13.73% of frequency in occurrence.

There are about 43 plants belonging to 32 families in Alagapath kavu. The vegetation consists of 17% hererbs, 9% shrubs, 13% climbers and 56% trees. Among 43 plants present in this kavu, 8% of them belonged to monocots, while 92% belonged to dicots. In the 32 families of plants present Fabaceae was found to be more predominantly present with a frequency rate of 18.60%. The dominant family Fabaceae had 8 species, followed by Rubiaceae (4 species), Euphorbiaceae (3 speices) and Arecaceae (3 speices). In all the seven kavus, about fifteen plants were seen to present. In all the kavus plants belonging to Fabaceae and Rubiaceae were predominant.

The seven kavu taken for the study are maintained by family inside their permises. Eventhough when there is lot of pressure in extending house building or commercialization of the land, still people are maintaining kavu. But the land area has decreased because awareness is not there to tell them how important kavu are, and the benefits directly or indirectly that we receive from them. So conducting programs to give awareness to commoners to save kavu and improve the floral diversity in them is very important.

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