INTRODUCTION

Floristic explorations and taxonomic studies can provide efficient and convenient information about the nomenclature, distribution, ecology, utility of various plant species, and thus about an ecosystem. Taxonomy is an integrated and, perhaps, intuitive science of identifying, naming and classifying plants. This may be considered as the oldest of sciences in the world, as the primitive man had to distinguish the plants that he can eat safely, from those which are poisonous and inedible. But, often this branch of botany is considered as old-fashioned and out-dated and the appearance of many subjects making use of modern technologies and sophisticated instruments, only added contempt to the neglect (Subramanyam & Nayar, 1974a; Henry & Daniel, 1988). Now there is great revival for this subject in view of the alarming erosion of species and ecosystems. The realisation of the economic potential of the biodiversity and the necessity for its preservation for the future welfare of mankind has suddenly boosted the stock of the subject of Taxonomy (Manilal, 1997). But unfortunately the number of systematic botanists is shrinking, with the result that the extent of ignorance of the number of species of organisms on earth is becoming vast (Swaminathan, 1992). Our knowledge about the diversity and distribution of plant species is very poor and inadequate that we still do not know exactly how many species exist on our earth. Wilson (1988) calculated that the total number of named species is about 1.4 million. It was estimated that around 7500 species of organisms are becoming extinct every year (Chatterjee, 1995) and many of them disappear even before known to the scientific world (Myers et al., 2000; Pimm & Raven, 2000). Current extinction rate is 100-1000 times of what they would be in nature (Reid et al., 1989). The gravity of the situation is so severe in the tropics due to variety of reasons, the foremost being habitat destruction at an alarming rate leading to loss of biodiversity essential for the sustenance of life on earth. Thus, conservation of biodiversity has gained prime consideration all over the world since the Earth Summit at Rio de Janeiro in 1992. It is estimated that tropical forest harbour about 70% of living organisms of the whole world, of which roughly 20% of the total are confined
as exclusive endemics in 18 areas throughout the tropical forests (Myers, 1988). By the destruction of tropical forests alone we may lose about 25% of the total species by the year 2015 (Raven, 1988).

India is one among the 12 mega-biodiversity centres identified in the world having rich biodiversity indices, vast flora and fauna coupled with different topographical, ecological, climatic factors and about 18,664 taxa of vascular plants with 5725 endemics (Nayar, 1996). Presently the flora of India is a relict of only what was dominating before the dawn of civilizations in India (Mani, 1974). Warner (1982) estimated that 80% of the geographical areas of India were under forest cover in 3000 BC, which is now left with 19.1% of the total land area. Among the 34 Biodiversity Hotspots (Myers et al., 2000; CIF, 2004) identified, two are in India. The most important topographic feature of Peninsular India is the 1400 km long Western Ghats along its western margin traversing the states of Tamil Nadu, Kerala, Karnataka, Goa, Maharashtra and Gujarat. Western Ghats is the second largest endemic centre in India with 1550 endemics out of the estimated 4250 species of vascular plants (Nayar, 1997). Recent studies (Sasidharan, 2007; Easa, 2003) showed that more than 5000 species of vascular plants with 1700 endemics were reported from Kerala part of Western Ghats itself. Since many hills of Peninsular India were formed during Archaean and Precambrian periods, the Western Ghats is more senile than the Himalayas (Mani, 1974) and hence the genetic stock of the biodiversity of the Western Ghats is the most attractive for both evolutionists and ecologists. Known locally as the Sahyadri Hills, the Western Ghats cover an area of 125,548 km² in a stretch of 1,600 km that is interrupted only by the 30 km wide Palghat Gap. The Western Ghats being the separating barrier of the two geographical regions of Peninsular India namely, the Malabar Coast and the Deccan (Hooker, 1904; Chaterjee, 1940), has both the Deccan flora along the leeward side and Malabar Coast flora along the windward side. The most outstanding feature of the Western Ghats is the formation of tropical rainforests along the windward sides facing the Arabian Sea. The heavy annual input (250-500 cm) of southwest Monsoon and northeast Monsoon along the windward side favours a typical rain forest and known for many species which are apparently endemic to the region.
As early as in 1904, Hooker had drawn attention to the distinct flora of Western Ghats, which he called the ‘Malabar’ floristic region. The presence of Bamboos, Dipterocarps, Clusiales, Myristicas and Palms has much contributed to its distinction. The major vegetation types identified are tropical evergreen forests, moist deciduous forests, dry deciduous forests, scrub jungles, sholas, and savannas including high rainfall savannas, peat bogs and Myristica swamps. The salient features of the vegetation of the Western Ghats have been discussed by Nair and Daniel (1986) and Subramanyam and Nayar (1974b). In southern Western Ghats, Nilgiri-Silent Valley and Wayanad-Kodagu localities constitute about 150 endemic species (Nayar, 1996). Although the exact number keeps varying with the author and time, what is of interest is that nearly 38% of all species of flowering plants in the Western Ghats are endemic. Sixty three percent of India’s evergreen woody plants are endemic to the Western Ghats (Nayar, 1997).

Recent studies reveal that Kerala part of the Western Ghats itself harbors 4679 taxa of angiosperms with 1637 endemics (Sasidharan, 2004). Many of the endemic flowering plants in this region are very restricted in distribution with small population and it is estimated that about 10% of endemic flowering plants are presumably in danger of extinction. The floristic studies in Kerala, during the last three decades could come up with more than 300 taxa of vascular plants new to science (Manilal & Raveendrakumar, 1998). The loss of habitat and speciation essentially make the periodic plant inventories, especially of biological hotspots, indispensable for futuristic studies. The detailed biological studies in such hotspot areas provide ample scope for formulating effective management practices. Tracing out our cryptic biodiversity and linking it with other inter disciplinary aspects of bioscience provides a platform for all biological research leading to economic benefits and agricultural prosperity. This has also become important in the wake of importance on intellectual property rights on biodiversity, which is being exploited by developed countries.

**The scenario**

The Nilgiris or the Blue Mountains are a compact plateau of about 2,590 sq. km. It is the meeting place of three mountain systems of Peninsular India, the
Sahyadri, joining it opposite to Mukkurthi peak, the southern Ghats across the Palghat Gap in the south, and the Eastern Ghats in the northeastern corner (Chaterjee, 1995). The present study area, Wayanad district lies along the northwest corner of Nilgiri Mountains. The biodiversity of Wayanad district is diverse, but highly threatened and under explored. Available records show that a few sporadic collections have been made from Wayanad during the last century by botanists like Beddome and Lawson. Most of the collections are housed in MH, CAL and K and have been included by Gamble and Fischer in their Flora of the Presidency of Madras (Gamble & Fischer, 1915-1936). Based on those materials, they have published a few new taxa in different issues of Kew Bulletin. After the reorganization of the Botanical Survey of India Ellis and Chandrabose explored ‘Chanthanathodu’ (part of Periya R.F.) and Chedeleth forest ranges intensively during 1965-67. In 1977, a few students made some sporadic collections around Thirunelli, Periya and Begur and these specimens are deposited in the Herbarium of the Presidency College, Madras (PCM). Ramachandran and V.J. Nair (1988) who have studied the flora of Cannanore district covered some floristic regions of northern part of Wayanad district. Among the other works of significance on the Botany of this area is one by Ellis et al., (1968). However, there were no serious attempts made to analyse the floristic composition of this region and there is no comprehensive published account on the flora of Wayanad district. In this context, the present study is an attempt to quantify the diversity of flowering plants of Wayanad district, a biodiversity rich area, with special emphasis on rare, endemic and threatened plants.
STUDY AREA

Wayanad district (Figure 1) is with a hilly terrain on the southern Western Ghats and located in the northeast part of Kerala at a distance of about 76 km from the seashores of Kozhikode. The area lies between North latitude 11° 26’ to 12° 00’ and East longitude 75° 75’ to 76° 56’. The altitude varies from 700-2100 metres above MSL. It is bounded on the east by Nilgiris and Mysore district of Tamil Nadu and Karnataka respectively, on the north by Coorg district of Karnataka, on the south by Malappuram district and on the west by Kozhikode and Kannur districts of Kerala. To the west and south are the low lands of Malabar, to the east rise the Nilgiri hills, to the northeast lies the Mysore plateau, while to the northwest the chain of Ghats stretches away in to the Coorg. Wayanad along with other part of north Malabar remained with the Presidency of Madras even after independence. When the state Kerala was formed in 1956, Wayanad was a part of Cannanore district and the southern part of Wayanad was later added to Calicut district. Wayanad got the status of district in November 1, 1980 and the total geographic area is about 2136 sq. km. The forest records of 1887 show that Wayanad had about 75801 acres of reserve forest and 111897 acres of reserve land. According to the forest department, the present forest cover is about 787 sq. km.

The name Wayanad is said to be derived from different names like ‘Waynad’ (upper land- as its name denotes, an elevated plateau), ‘Vayalnadu’ (land of paddy fields) and ‘Vananad’ (land of forests) (Gopalan Nair, 1911). This district contributes significantly to the foreign exchange earnings of the state through its cash crops like pepper, cardamom, coffee, tea and other condiments like ginger and turmeric. The district is unique for its rich wealth of flora (earning it the sobriquet ‘green paradise’) and for the diverse ethnic cultures that inhabit the land.

A brief history

Historians are of the view that organized human life existed in Wayanad at least ten centuries before Christ (Johny, 2001). The earliest record of a ruling family in Kerala exists in Wayanad in the shape of a rock-inscription in the
Edakkal Caves. One of the inscriptions was suggested by Dr. Hultzch to be ‘the writing of the glorious Vishnu Varma, the propagator of the ‘Kudumbiyil family’ (Gopalan Nair, 1911; Johny, 2001). Recorded history of this district is available from the beginning of 18th century with the rule by the Rajas of the Veda tribe. Wayanad stands unique in its political history and this was the only taluk in Malabar, which never bowed its neck to the Mysore Yoke and defied the British power until its ruler fell, fighting against the troops of the East India Company. This ruler was Kerala Varma Raja of Pazhassi Kovilakam of Kottayam dynasty. His history is practically the political history of Wayanad from 1786 to 30th November 1805. When Hyder Ali became the ruler of Mysore, he invaded Wayanad and brought it under his sway. Though in the days of his successor Tipu Sultan, Wayanad was restored to the Kottayam royal dynasty, the Sreerangapattanam truce that Tippu made with the British lead to British hegemony over the entire Malabar region, though only after facing fierce encounters from Pazhassi Raja (Gopalan Nair, 1911). The British domination changed Wayanad’s historical trajectory particularly after it opened up the plateau for cultivation of tea and other cash crops. Roads were laid across the dangerous slopes of Wayanad, from Kozhikode and Thalassery. These roads were extended to the cities of Mysore and Ooty through Gudalur. Through the roads poured in settlers from all parts of Kerala and the virgin forestlands proved a veritable goldmine with incredible yields of cash crops (Johny, 2001)

**Topography**

Wayanad is a mid level plateau, lies in the northwest corner of the Nilgiris. Placed on the southern tip of the Deccan plateau, Wayanad’s prime glory is the majestic Western Ghats ranging an altitude from 600 to 2100 m above sea level. It is an east-sloping, gently undulating, medium elevation plateau abruptly descending in the west to Kerala plains but merging imperceptibly with the Mysore plateau to the east. Topographically the district can be divided in two parts, the southwestern part and the northeastern part. Along the southwestern corner of Wayanad, there is a knot of isolated high ridges. This is the Chembra-Vellarimala mountain range closely similar to the Nilgiris
in ecological conditions. The northeastern corner of Wayanad rises up to a hill range called the Brahmagiris. This forms the western and southwestern border of the Coorg plateau. Wayanad descends extremely steeply to the plains of Kerala to the west with individual mountain peaks like Sughandhagiri, Kurichiarmala and Banasuramala. In the center of the district, the undulating terrain does not acquire much altitude, except in two places like Kurumbalakota (1100 m) and Manikkunnumala (1450 m). From the highest altitude of the Western Ghats on the southwest and western border of the district, the plateau of Wayanad gradually slopes down towards northeast and eastward. The northeastern sides are flat and open (Wayanad wildlife Sanctuary). Topography of this Sanctuary is gently undulating with occasional hillocks and the highest peak is Karottimala (1158 m).

**Climate and soil**

Wayanad has a salubrious climate. The mean average rainfall in this district is 2608 mm. Lakkidi, Vythiri and Meppadi are the high rainfall areas in Wayanad. Annual rain fall in these high rainfall areas ranges from 3000 to 4000 mm. High velocity winds are common during the southwest monsoon and dry winds blow during March-April. High altitude regions experience severe cold. In Wayanad the mean maximum and minimum temperature for the last five years were 29°C and 18°C respectively. This place experiences a high relative humidity, which goes even up to 95 per cent during the southwest monsoon period. The dale, 'Lakkidi', nestled among the hills of Vythiri taluk has the highest average rainfall in Kerala. There is a decreasing trend in rainfall in this area and the average rainfall data show that the lowest rainfall received from northeast monsoon is in Wayanad district. The soil resources vary by region and consequently the crops, forest types and natural vegetation also varied. These variations bestow the land with a rich natural endowment of biodiversity. On the plateau, the topsoil is rich clayey loam, generally 0.75 to 2.5 m deep with a red gravelly or yellowish clayey sub-soil layer of considerable depth. It promotes a luxuriant growth of vegetation, which makes Wayanad clothed in uniform greenery.
**Rivers**

Due to the peculiar terrain, there are east-flowing and west-flowing streams in Wayanad. Among the 44 major rivers of Kerala, the east-flowing Kabani and its tributaries water almost the entire area of Wayanad district. With a total catchment area of 1934.50 sq. km, the river Kabani has a basin length of 56 km in Wayanad. The river has three major tributaries viz. Panamaram Puzha, Mananthavady Puzha and Bavali Puzha, and 7 minor tributaries (Vinayachandran et al., 2007).

Panamaram Puzha is a major tributary that flows the longest distance through human settlement areas and is contributed by a large number of rivulets originating from the southwestern and the southeastern parts of Wayanad. The streamlet Vythirippuzha originates from Vythiri and flows northwards and on reaching Pozhuthana Panchayat, it narrows down for a short distance and later broadens again to form the stream Pozhuthana Puzha. Moving ahead through Kottathara, the stream reaches Venniyodu and becomes Venniyottu Puzha. Further ahead, the streamlet Venniyottu Cherupuzha also joins the river. It flows further north through several meanders and meets the Karamanthodu, which originates from the valleys of Kurichiyyarmala and Ladysmith Reserve Forest and flows through Kuppadithara to form the Panamaram Puzha. The river now turns further northeast and on reaching Panamaram, it further broadens by receiving water from the streamlet Panamaram Cherupuzha. The rivulet Karappuzha and another one originating from the eastern slopes of Manikkunnnumala bring water to Panamaram Cherupuzha. The rivulet Pathirippuzha originating from Kuppamudi, Ambukotti areas of Nenmeni Panchayath later becomes Chundalpuza that flows into Panamaram Cherupuzha. Narasippuzha originating from Kuppady area of Sultan Bathery panchayath and flowing through Kattayadu, Onivayal, Chirattayampam, Neykkuppa, Pathiriyampam areas, is another important stream that meets the Panmaram Puzha at Neervaram.

Mananthavady Puzha takes its origin from the northwest region of Wayanad and has 2 major tributaries, viz. Niravil Puzha and Periya Puzha. The small
but several rivulets and streamlets originating from the northwestern slopes of Thondarmudimala, Manappadmala, Vallarkottamala, Ottupara, southern part of Periya Reserve Forest and the other adjacent forest areas join together at different places to form the Niravil Puzha. It flows northwards and gets strengthened by streamlets coming from Arimala and Kunjome forest areas. On its course, near Chetokuppi, the river takes an eastward turn and later changes towards north. Meanwhile, another stream formed by the rivulets coming from the northeastern part of Thondarmudi Mala, the western part of Purni Mudi and the adjacent forest areas, and flowing through Makkiaad, Koroth and Paleri joins with Niravil Puzha. Then, the river turns another eastward turn at Kuttamputtur and flows northward through dense scrub jungle and reaches Valatt where it joins with Periya Puzha. From the confluence onwards, the river is known as Mananthavady Puzha. The rivulets contributing to the Periya Puzha originates from the north and the northeastern parts of Periya Reserve Forest, Bangalamala, Chapamala, Varayal and other adjacent forest areas.

On its course the river gets further strengthened by the subsequent inflow of the rivulets coming from Madiyur and Thavinjal forest areas and each of the two streams coming from Kambamala and Vemom regions. From Pandikkadavu the river takes a meandering path towards east though Changada Kadavu, Bungalow Kunnu, Kunnivayal, Thanikkal, Pudiyadam, Kovileri, Pepperkunnu and Mottanka. At Koodalkkadavu, Mananthavady Puzha and Panmaram Puzha merge together and flow northeast as the river Kabani. The river then bifurcates to form two tributaries running parallel to each other which further split up in to narrow streams that rejoin at several points forming a group of islands at Kuruva.

Bavali Puzha that drains water from the northern hill slopes of Wayanad is the third major tributary of the river Kabani. The small rivulets originating from the mountain ranges, viz. Kambamala, Narinirangimala and Brahmagiri that border the northern part of the district supply water to Bavali Puzha. The two streamlets from Karimala join together at 2 km north of Malampady and flows eastward by the name of Thirunelly Puzha. A small river, the Holy
Papanasini originating from the Brahmagiri hills merge with the Thirunelly Puzha at Nittra and then onwards it flows by the name Kalindi for a long distance through the Begur Reserve Forest via Aravanazhy, Chakkodu and Panavally. After reaching Bavali it becomes Bavali Puzha and joins with the river Kabani.

The small stream, Chedeleth Puzha originating from the Kurichiyat Reserve Forest, northeast of the district, flows west and then turns north. The stream becomes Kannarampuzha from Chettipambra where it meets the streamlet the Chettipambra Thodu (Oda Pallam) formed by two small rivulets the Mathamangalam Thodu and the Cheeyambum Thodu. After flowing through Amarakkuni and Vandikkadavu, the Kannarampuzha takes up the name Mavilanthodu and flows along the Kerala-Karnataka border for about 6 km and at Kolavalli it enters into the river Kabani. The Muddoli Thodu originating from Yogimoola in Pulpally Panchayat flows through the Alathoor Church premises and joins Kabani at Pachikkaramukku. The Kadamanthodu arising from the slopes of Kalloni hill in Poothady Grama Panchayat, runs through Kalluvayal and Pulpally areas and reaches Perikkalloor where it meets the river Kabani.

The Manikkadupuzha, also known as the Kurichipatta Thodu, arise from Moozhimala, Kappikkunnu areas of Pulpally Grama Panchayat. Watering the areas, viz. Veliyampam, Kurichippatta and Punchakkolli Vayal, it meets Kabani at Pannikkal.

There are six west-flowing rivers of Kerala that also get originated from the Wayanad district. The southeast and the southwest hill slopes of Wayanad plateau are part of the Chaliyaar watershed. Korappuzha flowing through Kozhikkode district originates from the southwestern slopes at the interjection of the Camel Hump Mountains with the Wayanad plateau. The western slopes located north to the Korappuzha watershed, supply water to Kuttiyadippuzha. North to Kuttiyadi watershed is the catchment areas of Mahi River that flows through the Kannur district. Another major river of the Kannur district, the Ancharakkandippuzha originates from the west-leaning hill slopes located north to the Mahi watershed.
The Meenakshippuzha originating from the north-eastern slopes of Elamkaleri hills and the Nellimundappuzha from the northern parts of Chembra valley merge together and flows eastwards through Kanthanpara and Meenmutti water falls. Then onwards the name changes to Meenmuttipuzha which receives water from Sentinental rock water-falls through the rivulet called Kalladippuzha coming from the southeastern slopes of Elambaleri hills and serves as a major tributary of the Chaliyar. Another rivulet originating in the Ayyankolli areas of Tamil Nadu flows through Wayanad for a short distance and joins the Chaliyar. With a catchment area of 50 sq. km in the district, the Chaliyar runs for 12 km through Wayanad.

**Population, health, and social profile**

Wayanad’s population is 7,80,619 (3,91,273 males and 3,89,346 females) with an average of 316 persons per sq. km, and the tribal population contributes 17%, which is the largest in the state of Kerala (Census, 2001). The female-male sex ratio is 967 per 1000 males. The literacy rate in the region is 85.64%. There are 291 schools in Wayanad including a residential upper primary school at Muthanga and a residential high school at Nallurnadu for Scheduled Tribes.

For the purpose of revenue administration, the district is divided into three taluks, namely Sulthan Bathery, Vythiri and Mananthavady. There are 49 villages under these taluks. There is one revenue division and that is Mananthavady.

The district has an area of 1,13,000 ha. of agricultural land, of which 1853 ha. are uncultivable; horticultural crops are in about 16756 ha., and cash crops like coffee, tea and pepper in 65469 ha. More than 50% of the total cultivable land is used for raising cash crops like coffee, tea, rubber, ginger, cardamom, and arecanut (Table 1). A variety of crops including annuals and perennials are grown in small holdings.
Table 1. Major Agricultural crops

<table>
<thead>
<tr>
<th>Crops</th>
<th>Area (ha)</th>
<th>Production (Tonnes)</th>
<th>Productivity (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>12,343</td>
<td>28,421</td>
<td>2,303</td>
</tr>
<tr>
<td>Coconut</td>
<td>11098</td>
<td>47 (nuts in million)</td>
<td>4,235</td>
</tr>
<tr>
<td>Pepper</td>
<td>42,287</td>
<td>12,173</td>
<td>288</td>
</tr>
<tr>
<td>Tea</td>
<td>6492</td>
<td>7,334</td>
<td>1,130</td>
</tr>
<tr>
<td>Coffee</td>
<td>67,429</td>
<td>63,850</td>
<td>754</td>
</tr>
<tr>
<td>Banana</td>
<td>11,819</td>
<td>80,162</td>
<td>6,782</td>
</tr>
</tbody>
</table>

Irrigation

With a view to irrigate more area under paddy cultivation to overcome the deficiency in food grain production, the possibilities of implementing a few major irrigation projects had been investigated in Wayanad area, out of which the Karapuzha project was found to be the first and most feasible one and was taken up for execution during the 5th five-year plan. The project is to construct an Earth Dam at Vazhavatta in Vythiri Taluk. The partial commissioning of the project was to take place in 1984-85. This was not materialized in view of insufficient funds from 1980-1981 onwards. In addition to the originally envisaged scope of the Project, new proposal for 0.5 to 0.75 MW of power generation and drinking water supply for adjoining towns like Kalpetta and for tourism are under consideration of the concerned departments, for which preliminary investigation has already been conducted.

Tourism and industry

As a remote region of the virgin rainforests and mist-clad mountain ranges, Wayanad attracts over 4.6 lakhs of tourists a year (2003) including domestic and foreign travelers. The important spots of attraction include places of historical importance (Edakkal caves, Pazhassi tomb), nature’s trails (Wayanad Wildlife Sanctuary, Chembra peak, Lakkidi, Pookkode lake, Karlad lake), places of religious importance (Thirunelly temple, Valliyooravu temple, Pallikkunnu church), water falls (Kanthan para, Meenmutty, Soochippara), and dam sites (Banasurasagar, Karapuzha) etc.
In Wayanad district so far 4370 small-scale industrial units have been registered. Of these, 1829 are in Sulthan Bathery Block, 1332 in Kalpetta Block and the remaining 1219 are in Mananthavady Block. There are 803 agro-based industries, 276 timber-based industries, 1649 garment making units, 757 engineering units, and 144 building material units in the district. In addition to the above, about 1017 small-scale industries in various sectors are also registered. Most of the industries are located in Kalpetta Municipality and Sulthan Bathery, Meenangadi and Mananthavady Grama Panchayaths.

Community profile

No one religion is predominant in the district; the major religious groups of the state are all more or less equally represented. The ethnic diversity of the district is very impressive as evidenced by ten different tribal groups. Among them, five dominant tribal groups are ‘Kurichya’, ‘Mullu Kuruma’, ‘Paniya’, ‘Adiya’ and ‘Kattunaikka’. Others are ‘Thachinadan mooppan’, ‘Karimbalar’, ‘Urali Kuruma’, ‘Pathiyar’ and ‘Wayanadan Kadar’. These are the communities which still hold knowledge on biodiversity.

Kurichya: The ‘Kurichyas’ are the first tribe from the plains of Malabar who colonized Wayanad for Agriculture. They form the second largest tribal community of Wayanad with 16.8 per cent of total tribal population. They are excellent bowmen and played an important role in the armed rebellion against the British in 1805 under Pazhassy Raja (Thurston, 1909). They are matrilineal settled agriculturists and land is collectively owned and hence land-holdings are relatively larger. The Kurichyas cultivate several traditional varieties and are rooted in cultural wisdom to the extent that they do not change the land use for the cultivation of cash crops (Vedavalli et al., 1998).

Mullu Kuruma: ‘Mullu Kuruma’, often referred to as ‘Kuruma’ is found in Wayanad and the adjoining areas of the Gudalur Taluk and Nilgiri district of Tamil Nadu. They are distributed within a radius of about 30 kilometers, including the eastern part of Wayanad and the western part of Gudalur Taluk (Janah, 1994). Their language is basically Malayalam with a spattering of
Kannada and Tamil words. Agriculture is the main occupation of this settled land-owning community. The main crop is paddy, which is cultivated in the fallows and flat lands as well as on moderate slopes. Generally, each Kuruma settlement has three categories of lands, determined by the topography. The first is Vayal (wet lands), which are essentially paddy fields. The traditional rice varieties of Wayanad are cultivated by the community, among which are the famous scented varieties like Jeerakasala and Gandhakasala, along with other traditional varieties like Chennellu, Thondy, etc. The higher level lands next to the vayal are called Thottam, which support coffee, banana, jack trees, pepper, vegetables, etc. The drier lands with shallow soil are termed as Uzhavuparambu where tapioca, chillies and drought-resistant varieties of paddy are grown. In the past (about 20 to 25 years back), hunting and fishing were as important a means to garner food as agriculture; several of their religious rites and life cycle rituals prescribe the offering or use of the meat of animals killed in the hunt (Janah, 1994).

**Paniya:** The Paniya constitutes the single largest Scheduled Tribe in Kerala and is mainly found in the Wayanad district and the neighboring areas of Karnataka. They have a distinct language of their own, closely related to Malayalam. There is a theory that the Paniyas were brought to Wayanad by the Gounders who trained them to be agricultural laborers in their fields (Thurston, 1909). The community, almost entirely, depend on wage-labour in the paddy fields and farms of the land owning classes for their livelihood. The huts were generally single-roomed. The walls were of bamboo wattle plastered with mud, while the roofs were of bamboo, thatched with paddy straw or grass. They are non-vegetarian, but generally avoid beef (Singh, 1994).

**Adiya:** The Adiyas are known traditionally as ‘Ravulayar’ and are believed to be migrated from Coorg. They are one among the slave-tribal sects in Kerala. The Malayalam word ‘Adiyar’ literally means slaves. Up to 4 or 5 decades ago, like ‘Paniya’ tribes, these masses were also sold, purchased and exchanged by their landlords in front of Valliyoor-kavu Bhagavathi temple during its annual festival. The ‘Adiya’ community is divided in to 20 classes called ‘Mandu’. The
head of the ‘Mandu’ is called ‘Chommikkaran’ or ‘Peruman’. Their immense contribution in the agricultural land makes the district still luxuriantly green (Gopalan Nair, 1911).

**Kattunaikka:** The Kattunaikkas are referred to variously as ‘Jenu Kuruman’, ‘Tenu Kurumban’ and ‘Naickan’. The term ‘Kattunaikkan’ has been derived from the word ‘Kadu’, meaning forest, and ‘Naikkan’ meaning leader or headman (Thurston, 1909). The community is now predominantly distributed in the Wayanad district of Kerala. They speak the Kattunaikka dialect, which is close to the Dravidian language, Kannada. They are non-vegetarians and eat a diverse variety of meat. Rice and ragi are their staple cereals supplemented by roots and tubers. The Kattunaikka are divided into exogamous clans (Luiz, 1962). Food gathering, hunting, fishing and trapping of birds and animals are the traditional occupations of the Kattunaikka, which a few of them continue to pursue to the day. A few of them are land-owning cultivators. They worship trees, rocks, the sun, moon, local deities and the spirits of their ancestors.

**Other socio-cultural groups:** ‘Others’ represent all major socio-cultural groups such as Hindus, Jains, Christians and Muslims. Wayanadan Chettys are an agricultural community who came to Wayanad from Panthaloor area of Tamil Nadu. Over the years their dress and life styles have come to closely resemble the Nair community. A small representation by way of the Gounders who came from Karnataka constitutes the Jain community of Wayanad, many of whom are planters with sizeable land holdings. Muslims came to Wayanad from Malappuram, and Kozhikode districts, Christians from Travancore area of south Kerala and most of the Hindus from Kozhikode and Kannur districts.

**Vegetation**

Wayanad district converges different vegetation types along the windward and leeward side of the Western Ghats and dominated by Malabar floristic elements and the total area under forests in Wayanad is 787 sq. km. It is an east sloping mid-level plateau, lies in the northwest corner of the Nilgiris, gently undulating and abruptly descending in the west to Kerala plains but
merging imperceptibly with the Mysore plateau to the east. The Chembra-Vellarimala mountain ranges along the southwestern corner of Wayanad closely similar to the Nilgiris and the mountains are in tenuous connection with the Nilambur forests and again with the Wayanad western slope forests. Wayanad descends extremely steeply to the plains of Kerala to the west with individual mountain peaks like Sugandhagiri-Amba hills, Kurichiarmala and Banasuramala. These hill ranges although very attenuated and broken in four distinct locations, skirts around the entire west and north face of Wayanad. The northeastern corner of Wayanad rises up to a hill range called the Brahmagiris. This forms the western and southwestern border of the Coorg plateau. The Brahmagiri slope also extends towards southeast into the Wayanad plateau almost up to the Pulpally discontinuity. There are a few scattered very small pockets of forests on the northern and western parts of the plateau. Along the state border on the eastern edge of Wayanad, there is highly degraded belt of forests stretching along the part of the way.

The forest area in the district is administratively divided into Wayanad Wildlife Sanctuary (Sulthan Bathery, Muthanga, Kurichiad and Tholpetty Ranges 344.44 km$^2$) and other reserve forests. The reserve forest of the district is under two administrative divisions namely Wayanad north (214.29 km$^2$) and Wayanad south divisions (325.339 km$^2$). North division constitutes Mananthavady, Periya and Begur ranges, which is dominated by evergreen and moist deciduous forests. South division forms Kalpetta, Meppady and Chedeleth ranges, which is also dominated by evergreen and moist deciduous forests. The northern part of the district is bordered by Aralam Wildlife Sanctuary and Kottiyoor forest range of Kannur district, and the southwest parts are continuous with the Kuttiyady and Vazhikadavu forest ranges of Kozhikkode and Malappuram districts respectively. Evergreen forest is the major forest type in the region. There is a stretch of moist deciduous forests along the state border to the east. These forests adjoining the southeastern side of Wayanad in the old Mysore State had become Wayanad Wildlife Sanctuary in 1941, and later became the part of Bandhipur National Park. The forests along the northeastern corner of Wayanad, across the Kabani in Karnataka, became the Nagarhola National Park in 1955. At the opposite end,
in the southeastern corner across the state border in Tamil Nadu, Mudumalai in the Gudalur-Wayanad region was declared as Wildlife Sanctuary in 1940 (Nair, 1991).

Established in 1973, the Wayanad Wildlife Sanctuary is contiguous to the protected area network of Nagarhola and Bandhipur of Karnataka on the northeast and Mudumalai of Tamil Nadu on the southeast. Dry deciduous forests are lying along this track of Protected Areas. Rich in biodiversity, the sanctuary is an integral part of the Nilgiri Biosphere Reserve, which has been established with the specific objective of conserving the biological heritage of the region. The total extent of the area is 344.44 km² and is divided into two discontinuous portions with revenue lands in between. The northwest portion of the sanctuary has only one range, viz. Tholpetty and has an area of 77.67 km². This range is contiguous to Rajiv Gandhi National Park in Nagarhola in the northeast, Kakkankotte Reserve Forest in the north and Brahmagiri Hills of north Wayanad division in Kerala in the east. The southern portion of the Sanctuary comprises an area of about 266.77 km². It is contiguous to Mudumalai Wildlife Sanctuary of Tamil Nadu in the east and Bandhipur Tiger Reserve (BTR) of Karnataka in the north and northeast. These areas are the moist deciduous forest gradually descends to the dry deciduous forests and joins with Deccan plateau. There are, however, a few patches of West-coast semi-evergreen forests within this contiguous forest. About 110 sq. km of the sanctuary is under different plantations. Teak and Eucalyptus are the major plantation species in sanctuary and reserve forest areas. Small-scale plantations of Bamboo, Grevillea and Pinus are retained in some forest area.

The mid-level plateau of the district is the most densely populated area and it covers a major part of the land. Most of the natural vegetation of these areas has been replaced by Coffee, Tea, Eucalyptus, Banana and Rubber plantations. The natural flora of this area is that of the evergreen and moist deciduous forests consisting of a mixture of evergreen and deciduous elements. Some of the dominant trees of this region are Artocarpus hirsutus, Albizia odoratissima, Pterocarpus marsupium, Gmelina arborea, Acrocarpus fraxinifolius, Mallotus tetracoccus and Terminalia crenulata. Epiphytic orchids
common in these plantations are *Rhynchostylis retusa, Aerides ringens* and *Cleisostoma tenuifolium*.

By following Chandrasekharan (1962c) and Champion and Seth (1968) the natural vegetation of the study area can be broadly classified into the following types:

1. West-coast tropical evergreen forests (evergreen)
2. West-coast tropical semi-evergreen forests (semi-evergreen)
3. Southern moist-mixed deciduous forests (moist deciduous)
4. Southern dry-mixed deciduous forests (dry deciduous)
5. Southern montane wet-temperate forests (shola)
6. Southern wet-montane grasslands (grasslands)

Apart from the above mentioned vegetation types, certain edaphic types such as reed brakes, moist bamboo brakes, secondary evergreen forests, pseudosholas and marshy grasslands are also present in the district.

**West-coast tropical evergreen forests**

This forest type is the major vegetation in the Meppady, Kalpetta Periya and Manathavady forest ranges at an altitude ranging from 600m to 1300m and is continuous with the Nilgiri-Nilambur hill ranges towards south and southwest and Aralam-Coorg ranges towards north. These forests are common around the hills and valleys of Vythiri, Chembra, Chooralmala, Vaduvanchal, Thalimala, Mundakai, Manikkunnumala-Nalukettumchola, Sugandhagiri, Pozhuthana, Ladysmith, Thariodu, Banasuramala, Kurichiarmala, Niravilpuzha, Kunjome, Chanthanathodu, Periya, Palchuram, Narinirangimala, Makkimala, Kambamala and Thirunelli. These forests exhibit luxuriant growth, particularly of trees and woody climbers, and the canopy is closed. High humidity, shade and sheltered condition provide ideal habitat for epiphytic as well as terrestrial orchids, ferns, mosses and herbaceous flowering plants. Epiphytes and mosses tend to increase with altitude while woody climbers decrease. It has been observed that there is difference in the composition of species with altitude and latitude. The ‘evergreen families’ of Western Ghats namely, Clusiaceae, Dipterocarpaceae and Myristicaceae are
well represented in this forest. The major associations of trees in these areas are Mesua-Palaquium-Cullenia, Hopea-Dipterocarpus-Vateria and Polyalthia-Myristica-Calophyllum associations. The top canopy species are *Hopea parviflora*, *Dipterocarpus indicus*, *Polyalthia coffeoides*, *Palaquium ellipticum*, *Pterygota alata*, *Vateria indica*, *Calophyllum astroindicum*, *Antiaris toxicaria*, *Artocarpus hirsutus*, *Mesua thwaitesii*, *Holigarna grahamii*, *Lophopetalum wightianum*, *Mangifera indica*, *Myristica beddomei*, *Cynometra travancorica*, *Canarium strictum*, *Terminalia travancorensis*, *Kingiodendron pinnatum*, *Knema attenuata*, *Syzygium malabaricum*, *Elaeocarpus tuberculatus*, *Bischofia javanica*, *Cullenia exarillata*, etc. *Poeciloneuron indicum*, *Prunus zeylanica*, *Toona ciliata* and *Mesua ferrea* are also seen in the upper stratum at an altitude above 800 m.

The trees of the middle canopy comprises medium sized trees which are adapted themselves to the more shady conditions and are dominated by *Aglaia malabarica*, *Cinnamomum malabatrum*, *Dimocarpus longan*, *Drypetes oblongifolia*, *Diospyros paniculata*, *Epirunus mallotiformis*, *Garcinia morella*, *Gordonia obtusa*, *Syzygium laetum*, *Hydnocarpus pentandra*, *Baccaurea courtallensis*, *Otonephalium stipulaceum*, *Meliosma simplicifolia*, *Humboldtia brunonis*, *Syzygium cumini*, *Vepris bilocularis*, *Syzygium munronii*, *Symlocos macrophylla ssp. rosea*, *Turpinia malabarica* etc. A few palms like *Arenga wightii*, *Caryota urens* and *Pinanga dicksonii* are also conspicuous. Reeds appear mainly as *Ochlandra* brakes along the streams.

The lower storey trees are *Antidesma montanum*, *Antidesma menasu*, *Olea dioica*, *Memyecylon heyneanum*, *Casearia ovata*, *Meiogyne ramarowii*, *Turraea villosa*, *Ixora elongata*, *Orophea erythrocarpa*, *Phaeandus malabarica*, etc. The shrubby plants are mainly *Psychotria* spp., *Aporusa acuminata*, *Gomphandra coriacea*, *Ligustrum robustum*, *Glycosmis macrorcapa*, *Strobilanthes* spp., etc. and the important herbs are *Begonia malabarica*, *Elatostema lineolatum*, *Girardinia diversifolia*, *Ophiorrhiza* spp., etc. Of the rhizomatous monocotyledons *Curcuma* spp., *Costus speciosus*, *Globba ophioglossa*, *Schumannianthus virgatus* and *Zingiber* spp. are important. Some of the lianas intertwining the trees are *Carissa inermis*, *Adenia hondala*, *Artabotrys*
zeylanica, Cissus spp., Derris brevipes, Entada rheedeii, Erythrophalum populifolium, Caesalpinia spicata, Desmos lawii, Bauhinia phoenicea, Spatholobus purpureus, Ventilago bombaiensis, Salacia beddomei, Sarcostigma kleinii, Caesalpinia cucullata, Toddalia asiatica and Thunbergia mysorensis.

**West-coast semi-evergreen forests**

This forest type is found below 900m and is intermediate vegetation between the moist-deciduous and wet-evergreen forests. It is a heterogeneous mixture of species that are common in evergreen and moist-deciduous forests. This forest type is seen mainly in slopes of Manikkunnumala, Chooralmala, Mundakai, Kurichairmala, Thariodu, Soojipara, Kanthanpara, Makkimala, Muttilmala, Thirunelli area, etc. The three-tier structure of the tree canopy is evident in this forest types also. The top canopy is composed of trees like Bischofia javanica, Bombax cieba, Chukrasia tabularis, Minusops elengi, Polyalthia fragrans, Pterospermum reticulatum, Terminalia bellirica, Artocarpus hirsutus, Elaeocarpus tuberculatus, Hopea parviflora, Lagerstroemia microcarpa, Mangifera indica, Sterculia guttata, Terminalia paniculata, etc.

Predominate trees in the middle canopy are Syzygium cumini, Litsea floribunda, Harpullia arborea, Mallotus tetracoccus, Mastixia arborea, Vitex altissima, Chionanthus mala-elengi, Croton malabaricus, Trewia nudiflora, Phoebe lanceolata, Flacourtia montana, Ficus callosa, Holigarna grahamii, Schleichera oleosa, etc. The lower storey trees and shrubs are Clausena indica, Antidesma montanum, Ixora brachiata, Leea asiatica, Mussaenda bellila, Psychotria dalzelli, Pavetta zeylanica, Cipadessa baccifera, Aporusa acuminata, Turraea villosa and Allophyllus cobbe.

Some of the lower stratum species found in this forest type are Acroanchia pedunculata, Agrostistachys indica, Antidesma menasu, Callicarpa tomentosa, Mallotus philippensis and Hunteria zeylanica. Major lianas are Erycibe paniculata, Ancistrocladus heyneanus, Salacia oblonga, Derris brevipes, Toddalia asiatica, Hiptage bengalensis, etc. The lower shrubby layer is composed of Gomphandra tetrandra, Barleria courtallica, Dichapetalum geloniiodes, Dracaena terniflora, Leea indica, etc.
Southern moist-mixed deciduous forests

Moist deciduous forest is the dominant vegetation type in the Wayanad Wildlife Sanctuary (Muthanga, Begur, Tholpetty forest ranges) and Kurichiad, Naikkuppa, Pathiri and Kuruva forest areas of Chedeleth range (elevation of 700 m-900 m). During wet season, because of the thick foliage, the canopy looks similar to that of semi-evergreen forests. During January-April, the trees become more or less deciduous but the forests never become deciduous in toto. The leafless period varies from a few weeks to five months depending on the species.

Major upper canopy trees are *Pterocarpus marsupium*, *Tectona grandis*, *Terminalia paniculata*, *T. crenualata*, *Lagerstroemia microcarpa*, *Bombax ceiba*, *Tetrameles nudiflora*, *Dalbergia lanceolaria*, *Dalbergia sissoides*, *Grewia tiliifolia*, *Stereospermum colais*, *Diospyros montana*, *Semecarpus anacardium*, *Madhuca indica*, *Terminalia chebula*, *Shorea roxburghii*, *Syzygium cumini*, *Scheleicheria oleosa*, *Bauhenia malabarica*, *Haldina cordifolia*, *Mitragyne parviflora*, *Bridelia retusa*, *Radermachera xylocarpa*, etc. Middle canopy trees are *Olea dioica*, *Dillenia pentagyna*, *Gmelina arborea*, *Grewia tiliifolia*, *Litsea coriacea*, *Careya arborea*, *Dillenia pentagyna*, *Buchanania lanzan*, *Glochidion ellipticum*, *Phyllanthus emblica*, *Glochidion tomentosum*. *Butea monosperma*, *Lannea coromandelica*, *Cassia fistula*, etc. The lower storey trees are *Wrightia tinctoria*, *Helicteres isora*, *Catunaregum spinosa*, *Casearia tomentosa*, *Cipadessa baccifera*, *Holarrhena pubescens*, *Naringi crenulata*, *Tamilnadia uliginosa*, etc. The shrubby layer is composed of *Maesa indica*, *Solanum torvum*, *Lantana camera*, *Pavetta tomentosa*, *Desmodium pulchellum*, *Flemingia strobilifera*, *Chromolaena odorota*, etc. Climbers like *Spatholobus purpurea*, *Dalbergia volubilis*, *Dioscorea spp.*., *Hemidesmus indicus*, *Combretum ovalifolium*, *Calycopteris floribunda*, *Cissus repens*, *Ipomoea spp.*., *Hiptage benghalensis*, etc. are also very common in these forests.

Southern dry mixed-deciduous forests

Eastern side of the Wayanad Wildlife Sanctuary continuous with the deciduous forests of Mudumalai ranges of Tamil Nadu and Bandhipur-Nagarhola National Park of Karnataka is dominated by this forest type.
Anogeissus latifolia, Schrebera swieteniioides, Phyllanthus emblica, Phyllanthus indofischerii, Cleistanthus collinus, Premna tomentosa, Terminalia chebula, T. paniculata, Shorea roxburghii, Stereospermum suaveolens, Lagerstroemia parviflora, etc. are the dominant trees of this region. Parasites such as Viscum orientale and Dendrophthoe falcata are frequent. Ground flora is rich with medicinal plants. Epiphytes are few; however Aerides ringens, Luisia zeylanica, Oberonia spp. etc. are common. Herbaceous flora is very rich and thick during rainy season. This substratum supports high density of herbivores in these regions.

Southern montane wet-temperate forests

This forest type is seen in the district above 1500 m altitude (1500 m-2000 m), and is essentially a stunted evergreen forest. It is found in Chembra peak, Vellarimala, Kattimattam, Kurichiarmala, Banasuramala and Brahmagiri. Short-bole trees with low but dense branching and stout branchlets densely covered with mosses and other epiphytes are the features of this forest type. There is no stratification of trees, and leaves in general are small. Epiphytic species are more and climbers are few. New shoot of the different trees form scenic mosaic canopy during winter. Plants belonging to Lauraceae and Myrtaceae are common. The major tree components are Syzygium spp., Cinnamomum wightii, Cinnamomum sulphuratum, Vernonia arborea, Actinodaphne spp., Litsea wightiana, Atlantia wightii, Euonymus indicus, Eurya nitida, Elaeocarpus munronii, Glochidion ellipticum, Lasianthus jackianus, Ixora sivarajiana, Pittosporum neelgherrense, Symplocos spp., Casearia spp., Eugenia spp., Glyptopetalum grandiflorum, Euonymus serratifolius, Syzygium lanceolatum, Syzygium hemisphericum, Syzygium densiflorum, Neolitsea cassia, Neolitsea scrobiculata, Phoebe lanceolata, Litsea ghatica, Litsea beddomei, Litsea bourdillonii, Cryptocarya beddomei, etc. Some of the species in shola margins are Rauvolfia verticillata, Strobilanthes spp., Maesa indica, Elaeagnus conferta, Leucas beddomei, Plectranthus malabaricus, etc. A number of epiphytic orchids like Trichoglotis tenera, Pteroceras leopardinum, Eria polystachya, Dendrobium jerdonianum, Dendrobium microbulbom, Bulbophyllum fusco-purpureum, Bulbophyllum acutiflorum,
Coelogyne nervosa, etc. are also found specific to this forest. Medinilla malabarica and a number of Impatiens species are peculiar to this forest type.

**Southern wet-montane grasslands**

This type of vegetation is confined to the hilltops where the altitude is above 1200m mainly at Chembra hills, Sugandhagiri-Amba, Manikkunjumala, Banasaramala, Kurichiarmala and Brahmagiri hills. The vegetation is dominated by grasses, herbs and sub-shrubs. Some of the important species of grasses found are Arundinella setosa, Chrysopogon hackelli, Jansenella griffithiana, Ischaemum indicum var. indicum, Apluda mutica, Dimeria lawsonii, Themeda spp., and Cymbopogon flexuosus. Some of the species that are commonly interspersed with grasses are Curcuma neigherrensis, Euphorbia rothiana, Exacum bicolor, Swertia beddomei, Ceropegia spp., Satyrium nepalensis, Hypericum mysorensne, Habenaria longicorniculata, Habenaria heyneana, Ipsea malabarica, Justicia nilgherrensis, Knoxia mollis, Leucas vestita, Murdannia lanuginosa, Pectilis gigantea, Peristylis spiralis and Swertia lawii. Along the hilltops Phoenix humilis var. pedunculata grows in a scattered manner.

**Bamboos and reeds**

Gregarious growth of bamboos is found in moist deciduous forests of Wayanad Wildlife Sanctuary, Naikuppa, Kuruva and Pathiri. Reeds are growing in areas within the evergreen and semi-evergreen forests along the riverine areas. Important reeds in the district are Ochlandra travancorica, O. beddomei and O. scriptoria. Canes are sparsely distributed in the evergreen forests of Vythiri, Brahmagiri, Kurichiarmala and Chembra. Common rattans in the Wayanad district are Calamus thwaitesii, C. pseidotenuis, C. gamblei, C. hookerianus, and C. travancoricus.

**Riparian vegetation**

Kabani and its tributaries constitute a powerful river system in the landscape of Wayanad and are associated with a more or less defined riparian
flora. Along the banks of streams dense thickets of *Ochlandra* and *Pandanus* species are common. Trees like *Lophopetalum wightianum*, *Syzygium cumini*, *Syzygium heyneanum*, *Hydnocarpus pentandra*, *Neolamarckia cadamba*, *Madhuca nerifolia*, *Vepris bilocularis*, *Diospyros malabarica*, *Calophyllum apetalum*, *Diospyros paniculata*, *Ochrenauclea missionis*, *Hopea ponga*, *Pongamia pinnata*, *Salix tetrasperma*, *Vateria indica*, etc. are common along the banks of this river. *Rotula aquatica*, *Homonoia riparia*, etc. are the common shrubs in the area.

**Forest plantations**

Apart from the above mentioned types of vegetations, forest plantations occupy a major part of the district. Teak and Eucalyptus are the most extensively raised species in forest areas of Kalpetta and Meppady ranges and in many part of the Wildlife Sanctuary. Total area of the plantation in the Wayanad Wildlife Sanctuary area is about 73.27 km$^2$ which includes Pepper (2.1 km$^2$), Eucalypts (13.55 km$^2$), Teak (36.53 km$^2$) and mixed softwood species (21.09 km$^2$). Eucalyptus plantations do not have any other tree species except a few saplings of *Cassia fistula* and *Terminalia* spp.
Systematic floristic exploration in India started with the arrival of Europeans who came to the Malabar Coast for spice trade. *Coloquis dos Simples* (Garcia de Orta, 1565), a checklist of the medicinal plants of India, is the first published botanical work on the plants of Western Ghats. After a century van Rheede, the Dutch Governor of Malabar surpassed all the previous work by compiling his monumental and historic work in 12 volumes, the *Hortus Indicus Malabaricus* (1678-1703).

Britishers made major contributions to the floristic studies in India. Among those who contributed to the botany of Peninsular India, Wight's name is the most important. His contributions include 28 publications. Among them, *Illustrations of Indian Botany* (1840) and *Icones Plantarum Indicarum Orientalis* (1838-1853) are the most important. Wight together with Arnott published *Prodromus Florae Peninsularae Indicae Orientalis* (1834) in which several new taxa were described. The other notable contributions during the 19th century were *The Flora Sylvatica for Southern India* (Beddome, 1869-1874), *Icones Plantarum Indicarum Orientalis* (Beddome, 1868-1874) and *Flora Indica* (Roxburgh, 1820-1824).

The *Flora of British India* published by J. D. Hooker during 1872-1897 is still remaining as the most relevant reference on the phanerogams of India with phytogeographical information. Subsequently regional floras like *Flora of the Presidency of Bombay* (Cooke, 1901-1908) and *Flora of the Presidency of Madras* (Gamble & Fischer, 1915-1936) were published and the latter work is adjudged as the best among regional floras. *The Forest Trees of Travancore* by Bourdillon (1908) is the first comprehensive work on the tree flora of Travancore and it dealt with 582 indigenous trees. The important works on flora of southern Peninsular India are the *Flowering Plants of Travancore* (Rama Rao, 1914), *Flora of Anamalai Hills Coimbatore District, Madras Presidency* (Fischer, 1921) and *Flora of South Indian Hill Stations* (Fyson, 1932). Since then, the work on regional as well as local floras were undertaken with the view of preparing a complete and comprehensive flora of India and
major work was done by the Botanical Survey of India. *The Flora of Tamil Nadu, India* (Nair & Henry, 1983; Henry et al., 1987 & 1989) and the *Flora of Karnataka* (Sharma, 1984) were published as part of the aforementioned project. The *Flora of Tamil Nadu-Carnatic* (1981a, 1983) by Matthew has immense value and very relevance with regard to the deciduous floristic elements. Few volumes of *Flora of India* have been published (Sharma et al., 1993a, 1993b, 1993c; Hajra et al., 1995) and others are in the process of completion.

The notable floristic publications of Kerala are *Flora of Calicut* (Manilal & Sivarajan, 1982), with 983 species of angiosperms in 566 genera and 132 families; *Flora of Cannanore* (Ramachandran & Nair, 1988) mentions 1132 species of flowering plants in 658 genera; *Flora of Silent valley* (Manilal, 1988), describes 966 flowering plants in 559 genera and 234 families; *Flora of Palghat* (Vajravelu, 1990), accounts for 1355 species belonging to 737 genera and 196 families; *Flora of Thiruvananthapuram District* (Mohanan & Henry, 1994), recorded 1336 species of vascular plants in 251 genera spread over 195 families; *Flowering plants of Thrissur Forests* (Sasidharan & Sivarajan, 1996), dealt with 1225 species of flowering plants belonging to 703 genera under 129 families; *Flora of Nilambur* (Sivarajan & Philip Mathew, 1997) describes 1132 species of flowering plants in 665 genera; *Flora of Agasthyamala* (Mohanan & Sivadasan, 2002) recorded 1117 flowering plants in 585 genera; *Flora of Pathanamthitta* (Anil Kumar et al., 2005) shows 1249 species under 658 genera belonging to 148 families, and *Flora of Alappuzha District* (Sunil & Sivadasan, 2009) with 1111 angiosperms in 617 genera.

Floristic studies of some places that have been completed as Ph. D. programmes are *Studies on the flora of Kasaragod division, Cannanore District* (Ansari, 1985), *Flora of Malappuram District excluding Nilambur forest* (Babu, 1990), *Flora of Kottayam District* (Antony, 1989), and *Flora of Periyar Tiger Reserve* (Jomy Augustine, 2000). The flora of protected areas such as *Shenduruny Wildlife Sanctuary* (Sasidharan, 1997), *Chinnar Wildlife Sanctuary* (Sasidharan, 1999), *Parambikulam wildlife Sanctuary* (Sujanapal, 2005) have also been studied.
Besides the above general floristic studies, revisionary studies of several genera and families were also carried out. *Introduction to Orchids* by Abraham and Vatsala, (1981), *Rare and endemic species of Indian Commelinaceae* by Kammathy (1983), *Revision of the Indian species of Oberonia* by Ansari and Balakrishnan (1990), *Legumes of India* by Sanjappa (1991) are worth mentioning. The work on grasses (Sreekumar & Nair, 1991) revealed the presence of a total of 296 species belonging to 106 genera and 24 tribes. Interestingly, this study has also resulted in the discovery of 2 new genera, *viz.* *Chandrasekharania* and *Silentvalleya* and 26 new species in addition to several other records. *Taxonomy of Cyperaceae of Kerala* by Rejani (1991), *Taxonomic and Phylogenetic study of south Indian Zingiberaceae* by Sabu (1991), *The family Eriocaulaceae in India* revised by Ansari and Balakrishnan (1994), *Monograph on Indian Leucas* by Singh (2001), *The Indian Verbenaceae - a taxonomic revision* by Rajendran and Daniel (2002), *Taxonomic revision of Hedyotis in Indian sub-continent* by Ratna Dutta and D. B. Deb (2004), *Monograph on Indian Diospyros* by Singh (2005), *Strobilanthes in Peninsular India* (Venu, 2006), *A revision of Indian Amorphophallus* (Jaleel, 2001), *Taxonomic study of Araceae of south India* (Sivadasan, 1982), and *Epiphytes and Parasites of Kerala* (Shanavaskhan & Sivadasan, 2007) are some other important revisionary studies. *A comprehensive hand book on Zingiberaceae and Costaceae* by Sabu (2006) is the first detailed account of the family in south India. It covers a total of 10 genera, 65 species and 2 varieties of which 29 species are endemic to this region and six are exotic.

Manilal and Raveendrakumar (1998) have compiled a list 625 taxa of flowering plants as additions to the flora of Kerala after the publication of the Flora of the Presidency of Madras. Morphological observations on 599 collections of 21 taxa of *Curcuma* in India are synthesized and presented by Velayudhan et al. (1999) and highlighted the taxonomic importance of underground structures of the genus *Curcuma*. Muktesh Kumar (1998) reported the epiphytic flora in the tropical ecosystem of Western Ghats and Joseph (1991) conducted a study on the Aquatic angiosperms of Malabar. Sivadasan and Balakrishnan (1989) reported a new species of *Oberonia* and a new variety of *Amorphophallus* (Sivadasan & Jaleel, 2000) from Wayanad.

The endemic species in the flora of a geographical region reveal the biogeography of the area, center of speciation and adaptive evolution (Nayar, 1996 & 1997). The degree of endemism increases with the increase in size of a homogenous biogeographical area having the same floristic history and ecological conditions. The catalogues by Henry et al. (1979), and Jain and Sastry (1984) revealed that a large number of threatened plants are recorded from southern Western Ghats in Peninsular India. The three volumes of Red Data Book on Indian Plants by Nayar and Sastry (1987, 1988, 1990) present information on 614 taxa of vascular plants for whole of India. Out of these, 185 taxa of flowering plants are reported from southern Western Ghats alone, under various categories of threatened plants. The various publication brought out on these lines indicate that among the 600 taxa considered to be rare or threatened in the flora of the Peninsular India, about 90% are in the Western Ghats (Ahmedullah & Nayar, 1986). Abraham and Mehrotra (1982), and Stephan and Vajravelu (1991) analysed the endemic and rare plants of the Montane flora of the Nilgiris. Manilal and Pandey (1996), and Mohanan and Sivadasan (1996) studied the taxonomy and conservation need of rare and endemic plants of Agasthyamala. Sivadasan (1999a) reported some rare and endemic species of Araceae from Silent valley and neighborhood.

Besides many individual publications on rediscoveries and conservation status of rare and threatened species of Western Ghats, IUCN (2006) published a checklist of rare and threatened plants of Indian region. Sasidharan (2004) documented 4679 species of flowering plants from Kerala of which 1637 are listed under endemic category.
MATERIALS AND METHODS

Intensive seasonal floristic collections were carried out from different habitats of the district during 2000-2005. During first three years intensive field trips and camping were conducted in each month. Field trips were conducted based on the exploration coefficient (coefficient is the cumulative of diversity within the habitat, season, number of previous collections, phytogeographical importance and richness of the flora). Frequent field trips were conducted to Chembra hills, Manikkunnalamala, Vythiri hills, Sughandhagiri, Kurichairmala, Periya hills, Bramhagiri, Tholpetty and Muthanga, where maximum diversity was observed. Few remote areas were left with one or two visits due to the difficulties in access to the area. Specimens with 3800 field numbers were collected. Repeated collections were made of certain tree specimens to get all essential parts of the plant. Usually four specimens of each species were collected from different locations to study the range of variations. Field data including height, colour and nature of bark (inside and outside), colour of latex and other exudates, presence of buttress, odour and colour of vegetative and floral parts were recorded. Separate collections were made for dioecious plants. For parasites and epiphytes details of the host plants were also recorded. In some cases as in orchids, live specimens were collected and have grown in the garden of Community Agrobiodiversity Centre of M.S Swaminathan Research Foundation (CAbC, MSSRF), for further observations and identification. The collected specimens were preserved or pressed immediately. For preservation of specimens, the wet method (Fosberg & Sachet, 1965) using 70% methylated alcohol and 5% solution of formaldehyde was employed. The herbarium specimens were prepared as per the standard specifications (Fosberg & Sachet, 1965; Bridson & Forman, 1991). Processed herbarium specimens are deposited in the herbaria of the MSSRF (MSSH) and Calicut University (CALI).

The specimens were provisionally identified by using pertinent literatures and comparing with authentic specimens available in the herbaria of the Kerala Forest Research Institute (KFRI), Calicut University (CALI) and southern circle of the Botanical Survey of India (MH). Literature on
phytogeography and endemism were referred to assess the distribution and endemism of each species. Available revisions and monographs were also consulted. For confirming identity of doubtful specimens they were referred to concerned experts in Kew (K), Rijksherbarium (L) and Kerala Forest Research Institute (KFRI).

**Plan of presentation of data**

For general format of Flora, the format proposed by Radford *et al.* (1974) was followed. The families were arranged according to the classification of Bentham and Hooker (1862-1883) with necessary alterations, based on split up of various families as proposed by Hutchinson (1926, 1934, 1956 & 1973) and Brummit & Powell (1992). An artificial diagnostic key is provided for the identification of families. Dichotomous parallel keys are provided for the identification. Keys for identification of genera under each family and that for the species under each genus are given in respective places. The genera under each family are arranged in alphabetic sequence. Full name of the authors and citation of the original publication of the generic name is given (Farr *et al.*, 1979; IPNI, 2004-2009). Generic descriptions of all the genera with more than one species are provided and the descriptions include the entire salient vegetative as well as reproductive features of the included species. The keys for identification of intraspecific taxa are given after the description of the respective species. Illustrations and photographs are provided for some of the rare and endemic species.

The species under each genus are also arranged in alphabetic order. The correct name of the species is written in bold Roman letters followed by the author citation and full reference of the original publication. Basionym (if any), important synonyms and citation of the names included in important Indian Floras including regional Floras are also given. The Indian Floras cited are: *Flora of British India* (J.D. Hooker, 1872-1897), *Flora of the Presidency of Madras* (Gamble & Fischer, 1915-1936), *Flora of India* (Sharma *et al.*, 1993), *Flora of Calicut* (Manilal & Sivarajan, 1982), *Flora of Silent Valley* (Manilal, 1988), *Flora of Canannore* (Ramachandran & Nair, 1988), *Flora of Palghat*
District (Vajravelu, 1990), Flowering Plants of Thrissur Forests (Sasidharan & Sivarajan, 1996), Flora of Nilambur (Sivarajan & Philip Mathew, 1997), Flora of Agasthyamala (Mohanan & Sivadasan, 2002), Flora of Pathanamthitta (Anil Kumar et al., 2005) and Flora of Alapuzha District (Sunil & Sivadasan, 2009). Citations of Icons of Wight (1838-1853) and Beddome (1868-1874) are also given. Abbreviations of the periodicals are mainly according to those given in Botanico Periodicum Huntianum (B-P-H) (Lawrence et al., 1968). Synonyms relevant to Indian Flora only are given and are written in italics. All the relevant monographs and revision works are also cited. The detailed description of each species is given after the nomenclature citations. The description of the species is in the following sequence: habit, branchlets, leaves, inflorescence, flower, calyx, corolla, stamens, ovary, fruit and seed. The flowering and fruiting periods are given after species description. The geographical distribution, the status of the species in relation to the conservation point of view, the abundance in the study area indicating the type of vegetation and the name of the collector followed by collection number and name of the locality are given. Cultivated or other ornamental plants seen in the district were named at the end of respective families.

**Abbreviations used in the thesis**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ca.</td>
<td>about</td>
</tr>
<tr>
<td>CALI</td>
<td>Calicut University Herbarium</td>
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<td>cm</td>
<td>centimeter/s</td>
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<tr>
<td>diam.</td>
<td>diameter</td>
</tr>
<tr>
<td>KFRI</td>
<td>Kerala Forest Research Institute</td>
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<td>m</td>
<td>meter</td>
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<td>RNMK</td>
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