DR. BRR GOVT. DEGREE COLLEGE, JADCHERLA

JADCHERLA Dt., TELANGANA

DEPARTMENT OF BOTANY

Student Study Project on

DIVERSITY, DISTRIBUTION AND QUANTIFICATION OF PLANT RESOURCES IN KHAMADHANAM URBAN FOREST PARK, RANGA REDDY DIST, TELANGANA...

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DECLARATION

We are hereby declare that the study project: **"DIVERSITY, DISTRIBUTION AND QUANTIFICATION OF PLANT RESOURCES IN KHAMADHANAM URBAN FOREST PARK, RANGAREDDY , TELANGANA"** is a record of work done by us under the supervision of **Dr. B. Sadasivaiah**, Assistant Professor of Botany, Dr. BRR Government Degree College Jadcherla, Mahabubnagatr District and that the project has not been previously done by any others in this college and any other college/University.

Date : 27/06/2022

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DIVERSITY, DISTRIBUTION AND QUANTIFICATION OF PLANT RESOURCES IN KAMMADANAM URBAN FOREST PARK, RANGA REDDY TELANGANA 3

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CERTIFICATE

This is to certify that the project work entitled "**DIVERSITY, DISTRIBUTION AND QUANTIFICATION OF PLANT RESOURCES IN KAMMADANAM FOREST PARK RESERVED FOREST, RANGA REDDY, TELANGANA" AND Dr. BRR Government College Campus, Jadcherla, Mahabubnagar District, Telangana."** is a bonafide work done by the students of III BZC students **namely E.Santosh Reddy, P.Prakash, C.Harikrishna, G.Mahesh , S.Amith Pandey** under my supervision in Dr BRR Government Degree College Jadcherla, Telangana.

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CHAPTER – I
INTRODUCTION AND NEED OF THE STUDY

Biodiversity is essential for human survival and economic well being and for the ecosystem function and stability. It has attracted world attention because of the growing awareness of its importance on the one hand, and the anticipated massive depletion on the other. In this regard natural forests are critically important for maintaining biological diversity as they not only contain half of the world's total bio diversity and also have the highest species diversity and endemism of any ecosystem type (CBD, 2012).

Forests are recognized as renewable natural resource. These forests in India are diverse and heterogeneous in nature and they cover about 69.09 M ha constituting 21.02% of the total geographical area. Forests in India are considered as a source of livelihood for forest dependent people, as repository of rich biodiversity and source of timber for industries. These forests are under severe pressure due to growing human and cattle population. In addition, the study on impact of climate change on forests in India has revealed that well over a half of the area under forests is vulnerable to the projected climate change. Thus, for Indian forests, climate change forms an additional pressure in addition to human induced pressures such as land use change, over harvesting, over grazing by livestock, wild fires and introduction of new species that degrade the forest ecosystems.

Forests can release the stored carbon as CO_2 that form nearly 17-25% of the total green house gas emissions, at the same time forest conservation, afforestation, reforestation and sustainable forest management can curb about 25% of emissions. Hence, forests besides being home to more than 50% of biodiversity on land also provides an opportunity to promote actions that simultaneously protect climate, biodiversity and provide sustainable livelihoods to forest dependent people. In this context, India has become one of the strong proponents for the idea of reducing emissions from tropical deforestation and degradation.

To integrate forests in to climate change activities by reduction in forest degradation, baseline information about the forest plant diversity, forest structure, carbon sequestration potential in above ground and below ground biomass will be of most useful. Degradation of the tropical forests and destruction of habitats due to anthropogenic disturbances are a major cause of decline biodiversity at global level (Reddy and Ugle, 2008). The dry tropical,

subtropical and woodlands covered more than half of the world's tropics (Janzen 1988), but have decreased considerably during the last decennia. A total of 52% of the forests are tropical in world and in India, approximately 86% are tropical (Singh and Singh 1988). These forests, however, are strongly impacted by anthropogenic activities (Champion and Seth 1968; Singh et al. 1991). Because of high anthropogenic pressures in the past several decades, the dry deciduous forest cover in most parts of India is being converted into dry deciduous scrub, dry savannah and dry grasslands which are progressively species poor. This situation calls for in-depth study of dry deciduous forests with respect to species diversity, structure and regeneration. The density–diameter (d–d) distribution of stems has been used repeatedly to represent the population structure of the forests (UNESCO/UNEP/FAO 1978). The population structure of a species in a forest can convey its regeneration behaviour (Saxena and Singh 1984); these data have also been used by several workers to interpret the succession patterns (Shugart and West 1980). The population structures, characterized by the presence of sufficient population of seedlings, saplings and adults, indicate a successful regeneration of forest species (Saxena and Singh 1984), and the presence of saplings under the canopies of adult trees also indicates the future composition of a community (Austin 1977). According to West et al. (1981), the information on the d–d distribution can be a basis for making inferences about stand history as well as for developing strategies to achieve a desired condition of composition and size classes. The long-term permanent plot studies can potentially provide information about spatio-temporal forest composition, structure and dynamics (Ayyappan and Parthasarathy 1999). Such large-scale permanent plot studies are important for conservation and management of tropical forests (Field and Vazquezyanes 1993). The large-scale permanent plot studies have drawn increasing attention over the last two decades, and about 11 large scale (16 ha) permanent inventory plots have been established in the major tropical forest formations of the world (Condit 1995). There is a lack of information from large-scale permanent inventory plots from dry tropical forests of India although these forests account for 46% of the forest land in India (Singh and Singh 1988). Population structure and recruitment patterns are influenced by many factors such as disturbance and competitive interactions among trees and these population structure studies are important for understanding the mechanism of species coexistence and long term ecological processes of natural forests.

Ranga Reddy Dist Forest Range has a total of 900 ha. area. It has 18 forest beats, of which khamadhanam is one of the urban forest area. Khamadhanam urban forest has 900 ha. area and it is near to Khamadhanam villege,Ranga Reddy Dist town and they are rich with diversified habitats supporting a wide array of plant and animal life and provides livelihood for indigenous tribal communities as well other forest dwellers. The local people has rich traditional botanical knowledge and is using over 250 plant species for curing different ailments. Forest dwellers collect process and market different types of Non-Timber Forest Produce, worth to mention the fruits, herbaceous medicinal plants, gums and beedi leaf. Besides, large amounts of fuel wood, fodder harvested from the forested tracts form the basic livelihood of rural populations. Despite of the ecological and economic importance of forests of khamadhanam urban forest, these ecosystems have been subjected to great stress, and continue to face multiple threats. Deforestation and forest degradation in the Khamadhanam urban forest continue unabated. Even the protected areas face tremendous pressures from local communities living inside and around the forests and other 'biosphere people'. Heavy biotic interference primarily pertaining to over-exploitation of wild plant resources is leading to alarming loss of species populations in the study area.

Lack of complete and consolidated information on plant resource is a major stumbling block in the whole process of conservation and utilization of plant resources of Khamadhanam urban forest of RangaReddy dist. It is important to have an assessment of the existing status of the natural strands of these resources, their geographic distribution and population structure to arrive at sustainable levels of harvesting and to develop working plans for the forest resources.

The present study is based by random sampling method by lying of nested quadrates in different vegetation types of Khamadhanam of RangaReddy, Telangana state and documents the diversity of plants, composition and regeneration of the dry tropical forest. With this background, a holistic attempt has been made on plant diversity, distribution and the structure of Khamadhanam urban Forest to fulfil the following objectives:

OBJECTIVES:

- *Inventory of plant taxa encountered in the sampling units*
- *To know the structure of Khamadhanam Urban forests of RangaReddy Dist*
- *Estimation of Above ground biomass by Allometric equation*

- *To know the regeneration capacity of tree species in Khamadhanam forests*
- *To determine the disturbance index of different forest sites in Khamadhanam*
- *To know the threats to flora of Khamadhanam Urban forest and to propose effective strategies for its conservation.*

CHAPTER – II

REVIEW OF LITERATURE

The literature pertaining to the present work is presented below.....

FLORISTIC STUDIES

According to Ellis (1987, 1990), studies on Nallamalais dates back to 1870's. R.H. Beddome during 1870-73 and 1881, Lushington in 1915; sporadic collections made by Hooker in 1883; J.S. Gamble during1883-87, C.A. Barber, in 1899, 1902 and 1906; Barber collections in Diguvametta and Gundlabrahmeswaram area during 1915-1920; Jacob 1917 and Fischer in 1921. Rangachari and personnel of the unit of Grass Survey of IARI also collected plants from Nallamalais. But no published data is available on any of these collections (Ellis, 1987). They made only random collections and kept in various herbaria in India as well as Royal Botanical Gardens, Kew, England (Raju & Pullaiah, 1995).

The major studies on plant resources of Nallamalais in the past 25 years include Champion and Seth (1968) recognized 6 major forest types in Nallamalis. Ellis (1987) studied the flora of Nallamalais and reported 743 taxa. Raghava Rao (1989) studied the Flora of Mahaboobnagar district collected most of the plants from Nallamalais. Shali Saheb (2008) studied the medicinal plants of Nallamalais and reported 501 taxa. Murthy and Benjamin (2008) made a critical study on floristics of Nagarjuna Sagar Tiger Reserve and reported 962 species. NRSA (2007) using remote sensing and GIS has brought out an additional dimension to bio-resources management perspective. They recorded 252 economically important species from Eastern Ghats of Andhra Pradesh as a part of the Phase II biodiversity project including 123 trees. They also reported 261 medicinally important species and their indicative uses covering 93 tree species. Most of the above mentioned works are done in Nallamalais of Andhra Pradesh except Raghava Rao.

QUANTIFICATION STUDIES

Vegetation mapping and monitoring is a primary requirement for management and planning activities at the local, modeling species distribution using environmental surrogates of known locations planning, when primary information is lacking (Anderson and Meyer, 2004). Association of a particular species with specific environmental conditions has been documented (Colding and Folke, 1997; Hubbell, 2005), but quantitative analysis have been

possible only recently (Cullen *et al.*, 2001) with advent of new tools, as well as availability of continuous spatial data on various environmental parameters (Keer and Ostrovsky, 2003).

Sampling inventories

Many quantitative ecological methods have been proposed to study plants of ethno botanical importance by Johns *et al.* (1990), Moerman (1991) and Cotton (1997). Dallmeier (1992) opined that floristic inventories and studies on forest dynamics usually rely on sampling plots. He monitored various types of primary and secondary tropical forests through plotting method in biosphere reserves of Bolivia, Peru, Peurto Rico, US Virgin Islands and other sites. The effects of plot size and the influence of plot shape on the estimates of plant diversity were assessed by Kilburon (1966), Greg-Smith (1983) and Laurance *et al.* (1998) respectively. Van Claster *et al.* (2008) laid 255 plots of 10x10m for study the over storey and under storey. Zakaria *et al.* (2009) analyses the plant communities from six study plots within the Penang forest reserves, Malaysia, through a sampling size of 20mx20m.

In India, quantitative inventory studies was initiated by Rai (1981) by studying all trees ≥10cm dbh in four plots of different sizes at Devimane, Malimane, Kodkami and Katleken areas of Western Ghats. Quantitative studies have been made through belt transect method in Chocopo tribe area in Northern Bolivia by Boom (1989). Most of the studies have followed the plot methods including square plots of 100mx100m (Gentry, 1988); 10mx10m (Shali Saheb, 2008) to rectangular plots 10x1000m by Boom (1989). Kharkwal *et al.* (2005) examined the phytodiversity and growth form in relation to altitudinal gradient in the Central Himalayan (Kumaun) region of India. Supriya Devi and Yadava (2006) studied the diversity index of shrubs and herbs were found to be higher than the tree species in Manipur. Mukesh Kumar *et al.* (2008) worked on sub-tropical Sal forest of Doon valley with 1x1m quadrates.

Sahu *et al.* (2007) made a study in the dry deciduous forests of Boudh district of Orissa in Northern Eastern Ghats. They used a nested quadrate of size 5x5m for quantifying the shrubs, climbers and also herbaceous flora.

Tree size has been used for enumeration of girth class distribution. Studies include the enumeration of individual trees as small as 2.5 cm dbh (Knight, 1975), 4.5cm dbh (Bunyavejchewin, 1999), 5cm dbh (Valencia *et al.*, 1994; Upadhaya *et al.*, 2003) and 10 cm gbh (Venkateshwaran and Parthasarathy, 2003), 30cm gbh (Kanade *et al.*, 2008), 91 cm gbh (Poore, 1968), 152.4 cm gbh class. The frequently used girth thresholds are 10cm dbh or

30cm gbh, this size class plays a major role in forest structure and functioning than the lower sizes (Newbery *et al.*, 1992).

Sukumar *et al.* (1992) found that the deciduous forest of Mudumalai had a more or less expanding population structure with a deficiency of individuals in the smallest size class. Some species had few or no individuals in the smallest size class (<5cm dbh) compared to the largest area. Sundriyal *et al.* (1994) stated that all the individuals <10 cm dbh were considered as regenerating individuals. Ayyapan & Parthasarathy (1999) and Henle *et al.* (2004) stated that the future composition of forests depends on potential regenerative status of tree species within the forest stand. Pandey (2000) investigated the biotic pressure and their impact on regeneration and growth of wild plants in tropical moist deciduous forests of Katerniahat wildlife sanctuary in north India. Sagar & Singh (2005) examined the impact of disturbance on the pattern of diversity, forest structure and regeneration of tree species in the Vindhyan dry tropical forest of India. Kumar and Swamy (2007) studied the tree population structure and regeneration potential of six sacred groves of Tamil Nadu and concludes that level of disturbance in the sacred groves influenced the tree population structure and stand quality.

Kadavul & Parthasarathy (1999) suggested that the variation in species richness of various forest types is not only determined by edaphic factors but also by their proximity to village and the plot dimensions. NRSA (2007) sampled 4170 plots in Eastern Ghats with a quadrat size of 20x20m for trees, one 10x10m for shrubs and for herbs five, 1x1m for each plot. Shali Saheb (2008) quantified the medicinal plant resources of Nallamalais in 0.3ha area. The plant diversity inventories in dry forests revealed a varied range of plant diversity owing to different study sites and field methodology – Sacred groves in southern Eastern Ghats have 158 tree species. Nallamalais of Andhra Pradesh and Telangana constitute 729 herbaceous and 249 tree taxa (Sadasivaiah, 2009; Basha, 2009) and stressed that Northern Nallamalais harbor good forest pockets with good number of endemic species. But due to overexploitation of medicinal plants, fuel wood collection, habitat destruction and grazing, may lead to extinction of many valuable species. Thus several authors have stressed the need for better conservation of the dry forests and especially in Eastern Ghats which includes good portion of dry deciduous forests with rich plant wealth of medicinal and economic value (Ellis, 1987; Rawat, 1997).

Murthy et al, (2015) worked on species composition, density and community structure in tropical dry deciduous forests of Kawal Wildlife Sanctuary from Telangana by laying 81 random sampling plots and recorded a total of 177 species, of which 71 herbs, 55 trees, 33 climbers and 18 shrubs with Shannon-Weiner index is 4.15, Simpson index is 0.91, Margalef's index is 5.20.

Srinivasrao et al, (2015) carried out phytosociological studies on tree diversity of Khammam district, Telangana and recorded 110 tree species belongs to 82 genera and 40 families, of which species like *Mangifera indica, Tamarindus indica, Ficus religiosa, Xylia xylocarpa, Madhuca longifolia, Terminalia bellerica, Ficus benghalensis, Ficus hispida, Semecarpus anacardium,* and *Terminalia chebula* are having high IVI value.

Mastan et al, (2020) enumerated 5 ha. of tree diversity of Sri Lankamalleswara Wildlife Sanctuary, Southern Eastern Ghats and recorded 97 trees belongs to 75 genera and 40 families with the Shannon-Weiner index 3.38 and Simpson index 0.074. Phytosociological attributes were conducted in sacred grove of Downuru, Koyyuru Mandal from Visakhapatnam district of Andhra Pradesh by Satyavathi et al, (2020) and reported 50 tree species and 28 shrub species and 80 species of herbs and climbers. Dominate IVI tree species are Bridelia montana with 18.733 followed by Gyrocarpus americanus with 17.740, Wrightia tinctoria with 16.984, Alangium salvifolium with 16.896, Acacia catechu with 16.810, Diospyros chloroxylon with 14.716 and Casearia tomentosa with 12.774. Naidu et al, (2021) worked on ecological status and tree diversity of Visakhapatnam of Andra Pradesh from Eastern Ghats by laying 12 belt transects with the size of 5 × 1000 m and reported 151 tree belongs to 106 genera and 46 families. Venkata Ramana and Sridhar Reddy (2021) worked on estimation of tree biomass by Non- Destructive method in Dry Deciduous Forests of Seshachalam Hills from Southern Eastern Ghats and ten belt transects with size 10 x 100 m were randomly laid, reported a total of 6483 individuals having ≥30cm gbh belongs to 110 tree species and 43 families. Satyavathi et al, (2021) studied tree diversity of Borra Sacred Groves in Anathagiri from Visakhapatnam District, Andhra Pradesh and reported 31 tree species belongs to 28 genera and 20 families with 59 stems per 0.5 ha^{-1} and basal area is 4.080346912 m^2 ha^{-1}.

CHAPTER – III

STUDY AREA

Mahabubnagar is the largest district in telangana state in terms of area (5,285. 1 sq. km) covered. It is also known as palamoor. It is located between 15º 55' and 17º 29' N latitudes and between 77º 15' and 79º 15' E longtitudes. The area of the district is 5,285.1 sq. kms. It is bounded on the north side by Ranga reddy district, on the east side by Nagarkurnool district, on the south by Wanaparthy and Jogulamba – Gadwal districts and on the west by Karnataka state. The Krishna river flows through the district, as well as the Tungabhadra. The district has most interesting place called the famous banyan tree called Pillalamari, which is about 4 km from the town. It is 700 year old banyan tree, looks like a large green umbrella and its branches extend over an area of 3 acres.

MahaboobNagar Forest Division lies in the western part of MahaboobNagar District between latitudes 15º 50' 12" N & 17º 14' 13" N and longitudes 77º 14' 55" E & 78º 48' 07" E. Geographical area of the Division is 14068.25 Km2 which is 76.15 % of the area of the District. The Division has an average altitude of 498 m above MSL. The hill range is interspersed by several deep valleys which are almost inaccessible from the plains. Two important rivers, viz. Krishna and Tungabhadra flow through the district. The notified forest area of the Division is 573.18 Km2 which 4.07% of the geographical area. Reserved, Protected and un-classed forests constitute 442.44 Km2 (77.19%), 118.77 Km2 (20.72%) and 11.97 Km2 (2.09%) of the forest area respectively. Forests of Division fall under different vegetation types like Tropical Dry Deciduous, Tropical Moist deciduous, Tropical Semi-evergreen and Tropical Thorn Forest types.

Mahabubnagar Forest Range has a total of 28,616.31 ha. of area. It has 18 forest beats, of which Appanapally is one of the reserved forest area. Appanapally reversed forest has 1,440.62 ha. area and it is near to Mahabubnagar town.

Climate

Generally, the climate of Mahabubnagr district is pleasant from January to March with an average temperature varies from 24º to 30ºC and in April and May the climate is too hot with an average temperature of 35ºC-45ºC. The maximum temperature ranges during this

season is 45^{o}C and minimum is 30^{o}C. The average rainfall for Mahabubnagar district is about 600-900mm.

Soil

The district is mainly covered by three types of soils Viz. red soil, sandy soil black cotton soils and .

Drainage:

The entire district lies in Krishna river basin. The Krishna and Tungabhadra are two principal rivers that flow through the district.

Fauna

wild animals are bears, wolves, deers, wild boars, gaint squirrels, owls, peacocks and hens, langoors, Birds, different varieties of snakes, scorpions, spiders (including poisonous ones), butterflies, moths, and insects.

CHAPTER – IV
MATERIALS AND METHODS

The present study aims at a first ever systematic attempt towards a fine scale assessment of the plant resources of Appanapally Reversed forest, Manabubnagar dristrict of Telangana state based on filed explorations.

FLORISTIC STUDIES

Before initiating the field work, a check list of plant taxa of Mahabubnagar and Telangana state will be prepared based on past literature. Further a through perusal of literature was done referring almost all recent publications published on plant taxa with references to taxonomy, quantification, economic importance plants of Mahabubnagar of Telangana state.

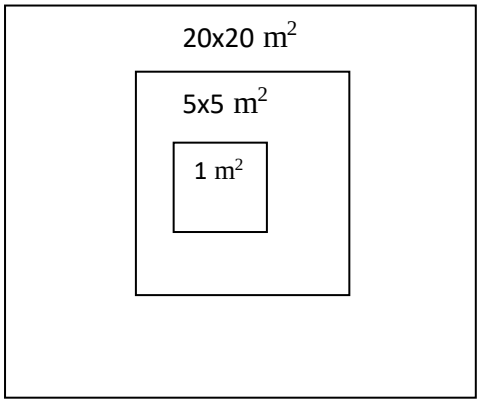
Field explorations will be conducted intensively covering all the seasons. All the plant taxa encountered in the sampled quadrates will be recorded and representative specimens of every taxon will be collected in quadruplicates, except in the case of rare plants and herbarium will be prepared according to methodology described by Santapau (1995), Jain and Rao (1977) and Forman and Bridson (1989). With the help of GPS all the geographical coordinates will be recorded at NE corner of the quadrate and the photographs will be taken. Identification of specimens will be following local, regional and national floras and further confirmed in certain cases, by comparing with the herbarium. A critical study will be made in confirmation of identification of endemic, threatened taxa.

QUANTITATIVE STUDIES

The field work plan to be carried out in Appanapally Reserved Forest of Telangana is provided in **Figure 1**. A total of 1 hectare area of Appanapally Reserved Forest of Telangana state will be sampled by lying of 25 quadrates in the study area. Each quadrate size is 20×20m. All the life forms of plants such as trees, shrubs, climbers, and herbs will be enumerated. All trees ≥ 30 cm girth at 1.37m height (gbh) will be enumerated in 20×20m quadrates, for multi stemmed trees girth will be measured separately, the regeneration for all trees will be inventoried in 5m×5m nested plot, shrubs and climbers in 5m×5m nested plot and herbs will be studied in nested 1m×1m plot. To enumerate the herbaceous vegetation the field work will be carried out in two seasons. Frequency, density, basal area and Importance

Value Index, demographic stability will be calculated for trees following by Curtis and McIntosh (1950). The Diversity Indices of plant species namely Shannon-Wiener index (Shannon and Weiner, 1962), Simpson index (Simpson, 1949) and Evenness Index (Pielou, 1969, 1975) will be calculated.

Figure1. Field work plan: 20X20 m^2 for trees, 10X10m^2 for tree saplings and seedlings, 5x5m^2 for shrubs, climbers and 1x1m^2 for herbs



The quantitative characters of the plant species like abundance (A), density (D), frequency (F) were calculated for each species following Curits and Cottom (1956), Mueller-Dombois and Ellenberg (1974).

$$\text{Abundance} = \frac{\text{Total number of individuals in all sampling units}}{\text{Total number of sampling units in which species occur}}$$

$$\text{Density} = \frac{\text{Total number of individuals in all sampling units}}{\text{Total number of sampling units studied}}$$

$$\text{Frequency} = \frac{\text{Number of sampling units in which species occur}}{\text{Total number of sampling units}} \times 100$$

Importance Value Index (IVI)

It is the sum of relative values of any three quantitative characters: relative abundance (RA), relative density (RD) and relative frequency (RF). These quantitative characters are calculated for each species following Curits and Cottom (1956). IVI was calculated to known the dominant species in a community. IVI was computed by using the following formulae;

IVI = Relative Abundance + Relative density + Relative frequency

$$RA = \frac{\text{Abundance of the individual species}}{\text{Sum of abundance value of all species}} \times 100$$

$$RD = \frac{\text{Density value of the individual species}}{\text{Sum of density value of all species}} \times 100$$

$$RF = \frac{\text{Frequency value of the individual species}}{\text{Sum of frequency value of all species}} \times 100$$

Only the top 50 high IVI taxa are presented in the form of table and top 10 taxa are graphically represented.

A/F ratio (Distribution Pattern)

The distribution pattern of the species is interpreted based on Curtis & Cottam (1956). The pattern is determined by calculating the abundance to frequency ratio (A/F). Accordingly, if the value is <0.025, the dispersion of the species is considered regular; 0.025 to 0.05 for random dispersion and >0.05 represents the contagious dispersion pattern.

Diversity Indices: Species diversity indices namely Shannon-Wiener index (Shannon and Weiner, 1962), Simpson index (Simpson, 1949) and Margalef Index (Margalef, 1980) were calculated.

Simpson index: It is a measure of dominance since it weighted towards the abundances of commonest species. It is estimated by using following formula:

$$\mathbf{D = \sum (ni/N)^2 or\ Pi^2}$$

Shannon-Wiener index: It is a measure of the average degree of 'uncertainty' in predicting to what species an individual chosen at random from a collection of S species and N individuals will belong. It is estimated by using following formula:

$$\mathbf{H' = -\sum (ni/N)\ ln\ (ni/N)}$$

Where, ni = number of individuals belonging to the ith species

N = Total number of individuals in the sample.

Margalef Index: Species richness S is the simplest measure of biodiversity and is simply a count of the number of different species in a given area. This measure is strongly dependent on sampling size and effort. The Margalef diversity index can easily be calculated by using the following formula:

$$d = (S - 1) / \ln N$$

Where **S** is the number of species, and **N** is the total number of individuals in the sample.

Girth Measurement

All tree species with ≥30cm girth at a height of 1.37m (gbh) from the ground were measured by using a measuring tape and their height was estimated by ocular estimates, while ≥10 to <30cm gbh stems were recorded. For multiple stemmed trees, bole girths were measured separately; basal area was calculated for each stem.

CONSERVATION STUDIES

The threat status of the quadrates will be assessed by using Cumulative Disturbance Index (CDI). Data will be collected on disturbance parameters like, lopping, cut stems, soil removal, grazing, weeds and incidence of fire, based on the observation during the field work. Cumulative Disturbance Index (CDI) (Boraiah, 2001) will be computed based on the disturbance scores (absent-0, low-1, medium-2, high-3) and the study area was grouped into three major categories, namely undisturbed (score 1-6), moderately disturbed (7-12) and highly disturbed (13-18) and diversity and structural parameters will be computed as mentioned above.

CHAPTER – V

RESULTS AND DISCUSSION

The quantification study of present work is done through the laying of 25 quadrats with 20×20m size all habitats in Appanapally reserved forest.

In the present study, a **total of 93 plant taxa were recorded** in the 25 sampled units, belonging to **82 genera** and **38 families**. The habit analysis revealed that trees are dominating with 32 species followed by herbs (31), shrubs (16) and climbers (14) species. All the recorded taxa are presented in **Table-1** alongwith their correct name, family, Total Number of Individuals (TNI) and occurred in number of sampling units (Q)**.**

Table 1: List of species encountered in sampling units

S.NO	Name of the Species	Family	Habit	Q	TNI
1	*Aegle marmelos*	Rutaceae	T	1	1
2	*Aerva lanata*	Amaranthaceae	H	4	6
3	*Alangium salvifolium*	Alangiaceae	T	7	15
4	*Albizia amara*	Fabaceae	T	24	75
5	*Albizia odoratissima*	Fabaceae	T	2	2
6	*Allmania nodiflora*	Amaranthaceae	H	3	3
7	*Alternanthera tenella*	Amaranthaceae	H	2	2
8	*Alysicarpus racemosus*	Fabaceae	H	2	3
9	*Andrographis paniculata*	Acanthaceae	H	1	1
10	*Annona squamosa*	Annonaceae	T	7	11
11	*Anogeissus latifolia*	Combretaceae	T	1	1
12	*Apluda mutica*	Poaceae	H	3	12
13	*Aristida funiculata*	Poaceae	H	4	12
14	*Asparagus racemosus*	Asparagaceae	C	2	4
15	*Atalantia monophylla*	Rutaceae	T	1	2
16	*Azadirachta indica*	Meliaceae	T	8	17
17	*Barleria montana*	Acanthaceae	H	4	6
18	*Barleria prionitis*	Acanthaceae	S	7	14
19	*Barleria strigosa*	Acanthaceae	S	2	3
20	*Bauhinia vahlii*	Fabaceae	C	1	1
21	*Blepharis maderaspatensis*	Acanthaceae	H	3	6
22	*Brachiaria ramosa*	Poaceae	H	3	3
23	*Bridelia retusa*	Euphorbiaceae	T	1	1
24	*Butea monosperma*	Fabaceae	T	21	43
25	*Byttneria herbacea*	Sterculiaceae	H	4	8
26	*Cadaba fruticosa*	Capparaceae	S	7	25
27	*Canavalia gladiata*	Fabaceae	C	2	4
28	*capparis decidua*	Capparaceae	S	1	5

29	*Cardiospermum halicacabum*	Sapindaceae	C	1	1
30	*Cassia fistula*	Fabaceae	T	4	5
31	*Catunaregam spinosa*	Rubiaceae	S	1	2
32	*Chamaecrista absus*	Fabaceae	S	1	4
33	*Chloris barbata*	Poaceae	H	2	3
34	*Chloroxylon swietenia*	Rutaceae	T	15	48
35	*Cleome viscosa*	Capparaceae	H	4	7
36	*Cocculus hirsutus*	Menispermaceae	C	1	3
37	*Combretum albidum*	Combretaceae	C	1	2
38	*Dalbergia sissoo*	Fabaceae	T	1	1
39	*Dichanthium annulatum*	Poaceae	H	2	3
40	*Diospyros chloroxylon*	Ebenaceae	T	5	9
41	*Dodonaea viscosa*	Sapindaceae	S	4	8
42	*Erythroxylum monogynum*	Erythroxylaceae	T	1	2
43	*Flacourtia indica*	Flacourtiaceae	T	1	4
44	*Grewia flavescens*	Tiliaceae	C	3	5
45	*Grewia hirsuta*	Tiliaceae	S	4	10
46	*Grewia villosa*	Tiliaceae	S	1	2
47	*Gymnama sylnestre*	Asclepiadaceae	C	1	10
48	*Gyrocarpus americanus*	Hernandiaceae	T	3	4
49	*Helicteres isora*	Sterculiaceae	S	2	5
50	*Hemidesmus indicus*	Asclepiadaceae	C	3	5
51	*Heteropogon contortus*	Poaceae	H	6	14
52	*Holoptelea integrifolia*	Ulmaceae	T	6	9
53	*Hyptis suaveolens*	Lamiaceae	H	6	18
54	*Indigofera linnaei*	Fabaceae	H	2	4
55	*Indoneesiella echioides*	Acanthaceae	H	3	7
56	*Jacquemontia paniculata*	Convolvulaceae	C	1	2
57	*Lantana camara*	Verbenaceae	S	17	62
58	*Leucaena leococephala*	Fabaceae	T	2	2
59	*Madhuca indica*	Sapotaceae	T	1	1
60	*Merura oblongifolia*	Capparaceae	C	2	7
61	*Morinda pubescens*	Rubiaceae	T	2	3
62	*Mucuna pruriens*	Fabaceae	C	2	3
63	*Nyctanthes arbortristis*	Oleaceae	T	1	1
64	*Parthenium hysterophorus*	Asteraceae	H	3	5
65	*Pavonia zeylanica*	Malvaceae	H	3	6
66	*Perotis indica*	Poaceae	H	2	2
67	*Phoenix selvestris*	Arecaceae	T	1	1
68	*Phyllanthus amarus*	Euphorbiaceae	H	2	3
69	*Phyllanthus emblica*	Euphorbiaceae	T	1	1

70	*Phyllanthus maderaspatensis*	Euphorbiaceae	H	2	2
71	*Plumbago zeylanica*	Plumbaginaceae	H	2	4
72	*Pongamia pinnata*	Fabaceae	T	11	24
73	*Premna latifolia*	Lamiaceae	T	3	3
74	*Prosopis chilensis*	Mimosaceae	S	3	9
75	*Pupalia lappacea*	Amaranthaceae	H	2	5
76	*Senna ariculata*	Fabaceae	S	5	12
77	*Senna tora*	Fabaceae	H	4	8
78	*Sida acuta*	Malvaceae	H	3	5
79	*Sida cordifolia*	Malvaceae	H	5	7
80	*Solanum pubescens*	Solanaceae	S	1	1
81	*Strychnos nux-vomica*	Loganiaceae	T	1	1
82	*Strychnos potatorum*	Loganiaceae	T	1	1
83	*Tectona Grandis*	Lamiaceae	T	8	19
84	*Temarindus indica*	Fabaceae	T	1	1
85	*Tephrosia purpurea*	Fabaceae	H	3	5
86	*Ventilago denticulata*	Rhamnaceae	C	1	1
87	*Vernonia cinerea*	Asteraceae	H	4	8
88	*Waltheria indica*	Sterculiaceae	H	5	11
89	*Wrightia tinctoria*	Apocynaceae	T	4	5
90	*Xanthium indicum*	Asteraceae	S	1	2
91	*Ximenia americana*	Olacaceae	T	1	1
92	*Ziziphus mauritiana*	Rhamnaceae	S	1	4
93	*Ziziphus oenopolia*	Rhamnaceae	C	3	7

Analysis of Families and Genera

Analysis at family the level revealed that Fabaceae is the largest family with 17 taxa, followed by Poaceae (7 taxa) and Acanthaceae (6 taxa). A total of 3 families are represented with Four species; 7 families are with 3 species; 5 families with 2 species; 20 families with 20 species. The list of familirs showed in Table-2:

Table 2: List of Families encountered in sampling units

S.NO	Name of the species	No. of Genera	No of Species
1	Acanthaceae	4	6
2	Alangiaceae	1	1
3	Amaranthaceae	4	4
4	Annonaceae	1	1
5	Apocynaceae	1	1
6	Arecaceae	1	1
7	Asclepiadaceae	2	2
8	Asparagaceae	1	1
9	Asteraceae	3	3
10	Capparaceae	4	4
11	Combretaceae	1	2
12	Convolvulaceae	1	1
13	Ebenaceae	1	1
14	Erythroxylaceae	1	1
15	Euphorbiaceae	2	4
16	Fabaceae	15	17
17	Flacourtiaceae	1	1
18	Hernandiaceae	1	1
19	Lamiaceae	3	3
20	Loganiaceae	1	2
21	Malvaceae	2	3
22	Meliaceae	1	1
23	Menispermaceae	1	1
24	Mimosaceae	1	1
25	Olacaceae	1	1
26	Oleaceae	1	1
27	Plumbaginaceae	1	1
28	Poaceae	7	7
29	Rhamnaceae	2	3
30	Rubiaceae	2	2
31	Rutaceae	3	3
32	Sapindaceae	2	2
33	Sapotaceae	1	1
34	Solanaceae	1	1
35	Sterculiaceae	3	3
36	Tiliaceae	1	3
37	Ulmaceae	1	1
38	Verbenaceae	1	1
	Grand Total	**81**	**93**

TREES

The total number of individuals (TNI), number of quadrates in which species occurred, and the quantitative characters like abundance (A), density (D), frequency (F), relative abundance (RA), relative density (RD), relative frequency (RF) and importance value index (IVI) of trees were showed in **Table-3** along with basal area.

Abundance: The total number of individuals (TNI) of trees in the study site was 319. The total abundance value for all the trees is 50.4. The highest abundance was recorded for *Albizia amara* (3.0) and the lowest abundance was recorded for 15 taxa with 1.0 (e.g. *Albizia odoratissima, Ximenia americana*).

Density: The total density of 32 trees is 12.56, with an average of 0.3. The highest density value was recorded for *Albizia amara* (3.0) and the lowest density was recorded for 12 taxa with 0.04 (e.g. *Anogeissus latifolia*).

Frequency: The total frequency for all the trees is 588, with an average of 18.37. The high- frequency was recorded for *Albizia amara* with 96 and least frequency was observed in 15 taxa with 4 (e.g. *Bridelia retusa*).

Importance Value Index (IVI): Importance Value Index of individual tree species encountered in the sampled quadrates was identified *Albizia amara* (46.41)as the most important species followed by *Butea monosperma* (32.04)and *Chloroxylon swietenia* (31.89). The lowest IVI value (2.98) was observed in 12 taxa (*Anogeissus latifolia, Strychnos nux-vomica*).

Diversity indices: The Simpson Index is 0.9133, Shannon-Wiener Index is 2.68, Margalef Index is 4.03 and the Evenness Index is 0.694.

Table 3: Phytosociological attributes of Trees of Nallamalais

S.NO	Name of the Species	Q	TNI	A	D	F	RA	RD	RF	IVI	A/F
1	*Aegle marmelos*	1	1	1.00	0.04	4	1.984	0.32	0.680	2.983	0.25
2	*Alangium salvifolium*	7	15	2.14	0.6	28	4.252	4.78	4.762	13.791	0.08
3	*Albizia amara*	24	75	3.13	3	96	6.200	23.89	16.327	46.412	0.03
4	*Albizia odoratissima*	2	2	1.00	0.08	8	1.984	0.64	1.361	3.982	0.13

5	*Annona squamosa*	7	11	1.57	0.44	28	3.118	3.50	4.762	11.383	0.06
6	*Anogeissus latifolia*	1	1	1.00	0.04	4	1.984	0.32	0.680	2.983	0.25
7	*Atalantia monophylla*	1	2	2.00	0.08	4	3.968	0.64	0.680	5.285	0.50
8	*Azadirachta indica*	8	17	2.13	0.68	32	4.216	5.41	5.442	15.072	0.07
9	*Bridelia retusa*	1	1	1.00	0.04	4	1.984	0.32	0.680	2.983	0.25
10	*Butea monosperma*	21	43	2.05	1.72	84	4.063	13.69	14.286	32.043	0.02
11	*Cassia fistula*	4	5	1.25	0.2	16	2.480	1.59	2.721	6.794	0.08
12	*Chloroxylon swietenia*	15	48	3.20	1.92	60	6.349	15.29	10.204	31.840	0.05
13	*Dalbergia sissoo*	1	1	1.00	0.04	4	1.984	0.32	0.680	2.983	0.25
14	*Diospyros chloroxylon*	5	9	1.80	0.36	20	3.571	2.87	3.401	9.839	0.09
15	*Erythroxylum monogynum*	1	2	2.00	0.08	4	3.968	0.64	0.680	5.285	0.50
16	*Flacourtia indica*	1	4	4.00	0.16	4	7.937	1.27	0.68	9.89	1.00
17	*Gyrocarpus americanus*	3	4	1.33	0.16	12	2.646	1.27	2.04	5.96	0.11
18	*Holoptelea integrifolia*	6	9	1.50	0.36	24	2.976	2.87	4.08	9.92	0.06
19	*Leucaena leococephala*	2	2	1.00	0.08	8	1.984	0.64	1.36	3.98	0.13
20	*Madhuca indica*	1	1	1.00	0.04	4	1.984	0.32	0.68	2.98	0.25
21	*Morinda pubescens*	2	3	1.50	0.12	8	2.976	0.96	1.36	5.29	0.19
22	*Nyctanthes arbortristis*	1	1	1.00	0.04	4	1.984	0.32	0.68	2.98	0.25
23	*Phoenix selvestris*	1	1	1.00	0.04	4	1.984	0.32	0.68	2.98	0.25
24	*Phyllanthus emblica*	1	1	1.00	0.04	4	1.984	0.32	0.68	2.98	0.25
25	*Pongamia pinnata*	11	24	2.18	0.96	44	4.329	7.64	7.48	19.46	0.05
26	*Premna latifolia*	3	3	1.00	0.12	12	1.984	0.96	2.04	4.98	0.08
27	*Strychnos potatorum*	1	1	1.00	0.04	4	1.984	0.32	0.68	2.98	0.25
28	*Strychnos nux-vomica*	1	1	1.00	0.04	4	1.984	0.32	0.68	2.98	0.25
29	*Tectona Grandis*	8	19	2.38	0.76	32	4.712	6.05	5.44	16.21	0.07
30	*Temarindus indica*	1	1	1.00	0.04	4	1.984	0.32	0.68	2.98	0.25
31	*Wrightia tinctoria*	4	5	1.25	0.2	16	2.480	1.59	2.72	6.79	0.08
32	*Ximenia americana*	1	1	1.00	0.04	4	1.984	0.32	0.68	2.98	0.25
			319	50	12.6	588	100.000	100.00	100.00	300.00	0.09

SHRUBS

The total number of individuals (TNI), number of quadrates in which species occurred, and the quantitative characters like abundance (A), density (D), frequency (F), relative abundance (RA), relative density (RD), relative frequency (RF) and importance value index (IVI) of shrubs are given in **Table-4**.

Abundance: The total number of individuals (TNI) of shrubs in the study site was 168. The total abundance value for all the 16 shrubs is 43.1, with an average of 2.6. The highest abundance was recorded for *Capparis decidua* (5) and the lowest abundance was recorded for *Solanum pubescens* (1).

Density: The total density of 16 taxa is 6.7, with an average of 0.4. The highest density value was recorded for *Lantana camara* (2.5), followed by *Cadaba fruticosa* (1), *Barleria prionitis* (0.6) and the lowest density was recorded for *Solanum pubescens* (0.04).

Frequency: The total frequency for all the shrubs is 232, with an average of 14.5. The high-frequency value was recorded for *Lantana camara* with 68, followed by *Cadaba fruticosa* (28), *Barleria prionitis* (28) and least frequency was observed in with 4 in 7 taxa.

Importance Value Index (IVI): Importance Value Index of individual shrubs are *Lantana camara* (74.68) is the most important species followed by *Cadaba fruticosa* (35.24), *Barleria prionitis* (25.04). The lowest IVI value 4.64 was observed for *Solanum pubescens.*

Diversity indices: The Simpson Index is 0.874, Shannon-Wiener Index is 2.196, Margalef Index is 2.051 and the Evenness Index is 0.817.

Table. 4. Phytosociological attributes of Shrubs

S.No	Name of the Species	Q	TNI	A	D	F	RA	RD	RF	IVI
1	*Barleria prionitis*	7	14	2.0	0.56	28	4.64	8.33	12.1	25.04
2	*Barleria strigosa*	2	3	1.5	0.12	8	3.48	1.79	3.4	8.71
3	*Cadaba fruticosa*	7	25	3.6	1	28	8.29	14.88	12.1	35.24
4	*Capparis decidua*	1	5	5.0	0.2	4	11.60	2.98	1.7	16.30
5	*Catunaregam spinosa*	1	2	2.0	0.08	4	4.64	1.19	1.7	7.55
6	*Chamaecrista absus*	1	4	4.0	0.16	4	9.28	2.38	1.7	13.39

7	*Dodonaea viscosa*	4	8	2.0	0.32	16	4.64	4.76	6.9	16.30
8	*Grewia hirsuta*	4	10	2.5	0.4	16	5.80	5.95	6.9	18.65
9	*Grewia villosa*	1	2	2.0	0.08	4	4.64	1.19	1.7	7.55
10	*Helicteres isora*	2	5	2.5	0.2	8	5.80	2.98	3.4	12.22
11	*Lantana camara*	17	62	3.6	2.48	68	8.46	36.90	29.3	74.68
12	*Prosopis chilensis*	3	9	3.0	0.36	12	6.96	5.36	5.2	17.49
13	*Senna ariculata*	5	12	2.4	0.48	20	5.57	7.14	8.6	21.33
14	*Solanum pubescens*	1	1	1.0	0.04	4	2.32	0.60	1.7	4.64
15	*Xanthium indicum*	1	2	2.0	0.08	4	4.64	1.19	1.7	7.55
16	*Ziziphus mauritiana*	1	4	4.0	0.16	4	9.28	2.38	1.7	13.39
			168	43.1	6.72	232	100.04	100.00	100.0	300.04

CLIMBERS

The total number of individuals (TNI), number of quadrates in which species occurred, and the quantitative characters like abundance (A), density (D), frequency (F), relative abundance (RA), relative density (RD), relative frequency (RF) and importance value index (IVI) for climbers were presented in **Table-5.**

Abundance: The total number of individuals (TNI) of climbers in the study site was 55. The total abundance value for climbers is about 34.7, with an average of 2.4. *Gymnama sylnestre* (10) was recorded as the high abundant species and the lowest abundance was recorded for *Bauhinia vahlii* , *Ventilago denticulata* and *Cardiospermum halicacabum* with 1.0.

Density: The total density of 14 climbers is 2.20, with an average of 0.15. The highest density value was recorded for *Gymnama sylnestre* (0.40) and the lowest density was recorded for *Bauhinia vahlii* , *Ventilago denticulata* and *Cardiospermum halicacabum* with (0.04).

Frequency: The total frequency for all the climbers is 96, with an average of 6.8. The high-frequency value was recorded for *Grewia flavescens, Hemidesmus indicus* and *Ziziphus oenopolia* with 12 and least frequency was observed in 7 taxa with 4.

Importance Value Index (IVI): Importance Value Index of individual climbers encountered in the sampled quadrates was identified *Gymnama sylnestre* (51.17)as the most important species

followed by *Ziziphus oenopolia* (31.95) and *Merura oblongifolia* (31.15). The lowest IVI value (8.87) was observed in 3 taxa. The top 10 dominant IVI climbers are presented in **Fig.7.**

Diversity indices: The Simpson Index is 0.895, Shannon-Wiener Index is 2.552, Margalef Index is 3.358 and Evenness Index is 0.713.

Table 5: Phytosociological attributes of climbers

S.NO	Name of the Species	Q	TNI	A	D	F	RA	RD	RF	IVI
1	*Asparagus racemosus*	2	4	2.0	0.16	8	5.76	7.27	8.33	21.37
2	*Bauhinia vahlii*	1	1	1.0	0.04	4	2.88	1.82	4.17	8.87
3	*Canavalia gladiata*	2	4	2.0	0.16	8	5.76	7.27	8.33	21.37
4	*Cardiospermum halicacabum*	1	1	1.0	0.04	4	2.88	1.82	4.17	8.87
5	*Cocculus hirsutus*	1	3	3.0	0.12	4	8.65	5.45	4.17	18.27
6	*Combretum albidum*	1	2	2.0	0.08	4	5.76	3.64	4.17	13.57
7	*Grewia flavescens*	3	5	1.7	0.20	12	4.80	9.09	12.50	26.39
8	*Gymnama sylnestre*	1	10	10.0	0.40	4	28.82	18.18	4.17	51.17
9	*Hemidesmus indicus*	3	5	1.7	0.20	12	4.80	9.09	12.50	26.39
10	*Jacquemontia paniculata*	1	2	2.0	0.08	4	5.76	3.64	4.17	13.57
11	*Merura oblongifolia*	2	7	3.5	0.28	8	10.09	12.73	8.33	31.15
12	*Mucuna pruriens*	2	3	1.5	0.12	8	4.32	5.45	8.33	18.11
13	*Ventilago denticulata*	1	1	1.0	0.04	4	2.88	1.82	4.17	8.87
14	*Ziziphus oenopolia*	3	7	2.3	0.28	12	6.72	12.73	12.50	31.95
			55	34.7	2.20	96	99.90	100.00	100.00	299.90

HERBS

The total number of individuals (TNI), number of quadrates in which species is recorded, and the quantitative characters like abundance (A), density (D), frequency (F), relative abundance (RA), relative density (RD), relative frequency (RF) and importance value index (IVI) of herbaceous plants are shown in **Table-6.**

Abundance: The total number of individuals (TNI) of herbaceous plants in the study site was 189. The total abundance value for all the 31 taxa is 56.5, with an average of 1.82. The highest abundance was recorded for *Apluda mutica* (4) and the lowest was recorded for 6 taxa with 1.0.

Density: The total density of 31 taxa is 7.56, with an average of 0.24. The highest density value was shown by *Hyptis suaveolens* (0.72) and the lowest was recorded for *Andrographis paniculata* taxa with 0.04. The lowest density shows the low population of the species which leads to rarity.

Frequency: The total frequency of the herbaceous taxa is 392, with an average of 12.6. The high-frequency value was recorded for *Hyptis suaveolens and Heteropogon contortus* with 24 and the least frequency was observed in Andrographis paniculata with 4.

Importance Value Index (IVI): Importance Value Index of individual herbaceous taxa encountered in the sampled quadrates reviled that, *Hyptis suaveolens* (20.96) is the most important species followed by *Heteropogon contortus* (17.66) and *Apluda mutica* (16.49). The lowest IVI value (3.32) was observed in *Andrographis paniculata*.

Diversity indices: The Sipmpson Index is 0.986, Shannon-Wiener Index is 4.56,Margalef Index is 18.53and Evenness Index is 0.6867 for herbaceous taxa in the study area.

Table 6. Phytoscoiological attributes of herbaceous plants.

S.No	Name of the species	Q	TNI	A	D	F	RA	RD	RF	IVI
1	*Aerva lanata*	4	6	1.5	0.24	16	2.65	3.17	4.08	9.91
2	*Allmania nodiflora*	3	3	1.0	0.12	12	1.77	1.59	3.06	6.42
3	*Alternanthera tenella*	2	2	1.0	0.08	8	1.77	1.06	2.04	4.87
4	*Alysicarpus racemosus*	2	3	1.5	0.12	8	2.65	1.59	2.04	6.28
5	*Andrographis paniculata*	1	1	1.0	0.04	4	1.77	0.53	1.02	3.32
6	*Apluda mutica*	3	12	4.0	0.48	12	7.08	6.35	3.06	16.49
7	*Aristida funiculata*	4	12	3.0	0.48	16	5.31	6.35	4.08	15.74
8	*Barleria montana*	4	6	1.5	0.24	16	2.65	3.17	4.08	9.91
9	*Blepharis maderaspatensis*	3	6	2.0	0.24	12	3.54	3.17	3.06	9.78
10	*Brachiaria ramosa*	3	3	1.0	0.12	12	1.77	1.59	3.06	6.42

11	*Byttneria herbacea*	4	8	2.0	0.32	16	3.54	4.23	4.08	11.85
12	*Chloris barbata*	2	3	1.5	0.12	8	2.65	1.59	2.04	6.28
13	*Cleome viscosa*	4	7	1.8	0.28	16	3.10	3.70	4.08	10.88
14	*Dichanthium annulatum*	2	3	1.5	0.12	8	2.65	1.59	2.04	6.28
15	*Heteropogon contortus*	6	14	2.3	0.56	24	4.13	7.41	6.12	17.66
16	*Hyptis suaveolens*	6	18	3.0	0.72	24	5.31	9.52	6.12	20.96
17	*Indigofera linnaei*	2	4	2.0	0.16	8	3.54	2.12	2.04	7.70
18	*Indoneesiella echioides*	3	7	2.3	0.28	12	4.13	3.70	3.06	10.89
19	*Parthenium hysterophorus*	3	5	1.7	0.2	12	2.95	2.65	3.06	8.66
20	*Pavonia zeylanica*	3	6	2.0	0.24	12	3.54	3.17	3.06	9.78
21	*Perotis indica*	2	2	1.0	0.08	8	1.77	1.06	2.04	4.87
22	*Phyllanthus amarus*	2	3	1.5	0.12	8	2.65	1.59	2.04	6.28
23	*Phyllanthus maderaspatensis*	2	2	1.0	0.08	8	1.77	1.06	2.04	4.87
24	*Plumbago zeylanica*	2	4	2.0	0.16	8	3.54	2.12	2.04	7.70
25	*Pupalia lappacea*	2	5	2.5	0.2	8	4.42	2.65	2.04	9.11
26	*Senna tora*	4	8	2.0	0.32	16	3.54	4.23	4.08	11.85
27	*Sida acuta*	3	5	1.7	0.2	12	2.95	2.65	3.06	8.66
28	*Sida cordifolia*	5	7	1.4	0.28	20	2.48	3.70	5.10	11.28
29	*Tephrosia purpurea*	3	5	1.7	0.2	12	2.95	2.65	3.06	8.66
30	*Vernonia cinerea*	4	8	2.0	0.32	16	3.54	4.23	4.08	11.85
31	*Waltheria indica*	5	11	2.2	0.44	20	3.89	5.82	5.10	14.82
			189	56.5	7.56	392	100.03	100.00	100.00	300.03

CHAPTER – VI

CONCLUSIONS AND FURTHER SCOPE TO STUDY

The field observations have strengthened that the herbs are habitat specific. Quadrates possessing high diversity in trees have registered greater diversity of herbaceous taxa along with diverse conditions of mechanisms to survive and disperse. Forests that are relatively undisturbed seem to possess these varied habitat conditions more. More upon certain specific areas should be with limited human and grazing animal's disturbance to conserve these taxa.

Ex-situ maintenance is one of the strategies to conserving the plants. This is mainly in gardens, germ-plasm banks. In the present investigation a total of 80 wild plants are

conserving in Botanical garden of our college. A special care is being taken for maintenance of Orchid species. The following key strategies are proposed for effective conservation of plant resources in Appanapally reserved forest of Mahabubnagar based on the present work sampling inventory.

1. State Forest department and GCC should ensure sustainable harvesting of medicinal plants. Towards this, intensive training programmes to be organized for tribal and other communities by governmental and non-governmental agencies for promoting awareness.
2. Focus immediate attention on the threatened plants identified as critically endangered by the forestry sector. The information in this regard will be communicated to Botanical Survey of India and IUCN by the investigator team.
3. *Ex situ* conservation of identified threatened species of Appanapally reserved forest of Mahabubnagar should be maintained in Biodiversity Park near to Mahabubnagar and other botanical gardens of the state.
4. Regular monitoring of plant resources of the study area.
5. A highly coordinated action-oriented multi-disciplinary approach on plant resources conservation integrating the forest department, Non-Governmental Organizations, scientific bodies at universities and research institutions with the co-operation of local communities should be implemented.

Further Scope

There is a need of indepth study of Disturbance factors that affecting the diversity of Appanapally reserved forest of Mahabubnagar, regeneration capacity of trees, above ground biomass studies for trees, leaf litter composition, soil organic carbon, plant- animal interaction, ethnobotanical studies are reccomendable for the study area.

CHAPTER – VII
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