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Dynamics of Biodiversity Behavior in Forest Landscape of Belagavi Division Karnataka, India

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Abstract

Belagavi district has an area of 13,415 square kilometers of the State's geographical area making it the largest district in Karnataka. In this project, the survey of forests conducted in 109 Beats of 9 Forest Ranges in Belagavi Forest Division (FD), resulted in identification of 578 species belonging to 100 families and 331 genera. The analysis revealed that Fabaceae is dominant family with 88 species followed by Rubiaceae (41). Among 331 genera, the dominant are identified as Ficus and Leucas with 11 species each and followed by Cassia with maximum of 10 species. Habit wise plants analysis of all 578 plant species comprises that tree dominant with 221 species (38.2 %), followed by Shrubs comprising of 198 species (34.2%) and herbs represented by 159 species forming 27.5 % of total plant population. Analysis revealed the presence of maximum 142 species like trees (72), shrubs (49) and 21 herbs from Chigule beat followed by Kakti beat by with 129 species includes 63 trees, 47 shrubs and 19 herbs, though there are many common species among them. These two beats may be declared as biodiversity conserve areas for protection of gene pool. Terminalia tomentosa of family Combretaceae is dominant species among trees, Catunaregam spinosa (*Rubiaceae*) is dominant species among shrubs and Elephantopus scaber (*Astraceae*) is dominant among herbs. Likewise, Spathodea campanulata of family Bignoniaceae is lowest with 154 plants among the trees and across all habits in the division [1]. It also shows that Rauvolfia serpentina of family Apocynaceae is lowest among the shrubs and Costus specious of family Costaceae is noted as fewer amongst the herbs. The survey has indicated 32 medicinal plants and identified as the RET species included in the IUCN Red list. Existing survey has also given note of some Medicinal plant species which are incorporated in the list of highly traded category of India as per National Medicinal Plant Board. Few selected plants are used as ingredients in Ayurveda, Homeopathy and Siddha medicines. Among them, several species are facing a threat due to their over exploitation by the pharmaceutical and therapeutical industries. In this regard, Belagavi Forest Division must take the resourcefulness to safeguard and rejuvenate these useful medicinal plants by maintaining a Field Gene Bank for the universal welfares of mankind.

The survey has also resulted in finding of 32 medicinal plants identified as the RET species included in the IUCN Red list. Some of the32 species listed under Red list include, Aegle marmelos, Andrographis paniculata, Artocarpus hirsutus, Boswellia serrate Calophyllum apetalum, Centella asiatica, Cryptolepis buchananii, Dioscorea bulbifera, Diospyros candolleana, Gnetum ula, Myristica malabarica, Madhuca longifolia, Limonia acidissima, Naringi crenulata, Pseudarthria viscid, Saraca asoca and Tylophora indica are Vulnerable. Abrus precatorius, Aristolochia tagala, Asparagus racemosus, Buchanania lanzan, Costus specious and Gardenia gummifera are listed under Threatened species. A significant finding of survey revealed that Smilax zeylanica has very large population of plants though it is listed as endangered in BSI flora, whereas Limonia acidissima has minimum number of plants is going to be critically endangered. Survey has also indicated that plant like Myristica malabarica, Calophyllum apetalum has poor population and in the verge of extinction. The regeneration of about 21tree species are found satisfactory but for other species it is poor to nil and require immediate attention [2,3].

Keywords: Biodiversity; Biodiversity hotspots Forest Division; Regeneration; Population; Western Ghats; Transact survey; Transact line

Abbreviations: FD: Forest Division; IUCN: International Union for Conservation of Nature and Natural Resources; NMPB: National Medicinal Plant Board; KAMPA: Karnataka State Medicinal Plants Authority; KFD: Karnataka Forest Department; WHO: World Health Organization

Introduction

India, a mega biodiversity country of 2.4% of the world's land area, harbor about 7-8% of the total species recorded so far. There are over 45,000 plant species and 91,000 animal species expectedly found in its territory. It is also amongst the few countries that have developed a biogeographic classification for conservation planning and has mapped biodiversity-rich areas in the country. Of the 34 globally acclaimed biodiversity hotspots, four are in India, represented by the Himalayas, the Western

Ghats (part of Western Ghats and Srilanka), the North-eastern India (part of Indo-Burma), and the Nicobar Islands (part of Sundar land). Considering the outstanding universal values and high level of endemism in the Western Ghats, 39 heritage sites are recognized by the International Union for Conservation of Nature and Natural Resources (IUCN) within the States of Kerala, Karnataka, Tamil Nadu and Maharashtra. With explosion of the human/cattle population, the forests are in receiving ends and no way to meet the increasing traditional and commercial needs is one of the main concern. Studies in the domain of forest ecological dynamics, especially on biodiversity status, regeneration and prevailing threat to the species require a holistic approach for assessment [4]. Assessing the ecological dynamic trends of medicinal plants in the forests is also of special interest in recent past epidemic/pandemic spreads. Though there are medicinal plants used since ancient times, new explorations for immune systems are bringing out the new powers of several species, so far unnoticed to the modern world. The current article is also focused to identify such uses of plants from the forests of the district. The present article is the part of study carried out in the project on "Assessment of Population Status and Removal of Bio-resources in Forests with Special Emphasis on Medicinal Plants in Karnataka" under the National Medicinal Plant Board (NMPB) scheme and implemented by the Karnataka Biodiversity Board in collaboration with Karnataka State Medicinal Plants Authority (KAMPA) and Karnataka Forest Department (KFD).

A line transect method is adopted for study by surveying an average of 0.5% areas in each beat, the basic unit of forests. The outcome of the study will help in conservation, planning, management, development of RET species, and sustainable use of medicinal plants across the forest division besides the specific objective in this article. Medicinal plants play an important role in supporting healthcare in India. Their importance is further increased in the past pandemic of Covid 19 in the country and world as a whole. According to the World Health Organization (WHO), 80% of the rural population in developing countries utilizes locally available medicinal plants for their primary healthcare needs. About 7200 species of medicinal plants are in current use by local communities all over India. About 90% of the country's medicinal plant species are found in forest habitats. Only 10% of them are distributed among other landscapes such as open grasslands, agricultural pastures, road sides, bunds of water bodies etc. So, there is an urgent need to conserve the wild populations of medicinal plant diversity in prioritized forest habitats of the country. India's rich medicinal plant heritage of 7200 species along with around 40,000 formulations spread among various health systems, if conserved and sustainably utilized, certainly has global relevance. For India's own health needs, conservation of her medicinal plants will contribute to self-reliance of millions on primary healthcare. The demand for medicinal plants is growing. In 2006, the annual turnover of the herbal industry was Rs. 2,000 million. According to some estimates, India supplies 12% of the world's requirements of medicinal plants. Today, 90% of the medicinal plants consumed domestically and exported globally are collected from the wild habitats. Only 70 out of around 900 species in the trade are obtained purely from cultivated sources [5].

Figure 1: Map of Belagavi District .

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Due to the increasing global demand for herbal remedies, the medicinal plants in the forests are facing threat for their survival. If the uncontrolled harvesting of bio-resources from the wild habitats has not been checked urgently, many of the valuable medicinal plants will be vanished from the forest along with their therapeutic knowledge, handed down through generations in traditional families. However, the distribution pattern and quantity of the medicinal plants in the forests are not estimated in any State of the country in wholistic manner hence present study. This article is the part of overall study of all forest land of Karnataka which was aimed to conduct botanical surveys through line transect method in all forest beats of Karnataka. To identify of medicinal plant species in the forests with precise locations. To make an assessment of population of trees, shrubs, climbers and herbs. To identify and categories the locally threatened plant species in each Forest of state. To estimate the population status of highly traded medicinal plants. To develop capacity of front line forest staff in identifying the traded plants resources. To identify bio-resources with emphasis on sustainable harvesting of medicinal plants. To develop guidelines for regulating the access and extraction of important bio-resources [6]. To generate bench mark data to the Government Departments on sustainable use of bio-resources etc (Figure 1).

Background

Over three-quarters of the world population relies mainly on plants and plant extracts for health care. More than 30% of the entire plant species, at one time or another, were used for medicinal purposes. It is estimated that the world market for plant derived drugs may account for about Rs.2, 00,000 crores. Presently, Indian contribution is less than Rs.2000 cr. Indian export of raw drugs has steadily grown at 26 % to Rs.165 crores in 1994-95 from Rs.130 crores in 1991-92. The annual production of medicinal and aromatic plant raw material is worth about Rs.200 crores. This is likely to touch US $1150 by the year 2000 and US $5 trillion by 2050. Of the 2, 50, 000 higher plant species on earth, more than 80,000 are medicinal. India is one of the world's 12 biodiversity centers with the presence of over 45000 different plant species. India's diversity is unmatched due to the presence of 16 different agro-climatic zones, 10 vegetation zones, 25 biotic provinces and 426 biomes (habitats of specific species). Of these, about 15000-20000 plants have good medicinal value. However, only 7000-7500 species are used for their medicinal values by traditional communities. In India, drugs of herbal origin have been used in traditional systems of medicines such as Unani and Ayurveda from ancient times [7]. The Ayurveda system of medicine uses about 700 species, Unani 700, Siddha 600, Amchi 600 and modern medicine around 30 species. The drugs are derived either from the whole plant or from different organs, like leaves, stem, bark, root, flower, seed, etc. Some drugs are prepared from plant product such as gum, resins and latex. Some important chemical intermediates needed for manufacturing the modern drugs are also obtained from plants (Eg. diosgenin, solasodine). Not only, that plant-derived drug offers a stable market worldwide, but also plants continue to be an important source for new drugs. Medicinal plants play an important role in supporting healthcare in India. According to the World Health Organization (WHO), 80 % of the rural population in developing countries utilizes locally available medicinal plants for their primary health care needs. About 7200 species of medicinal plants are in current use by local communities all over India. About 90 % of the country's medicinal plant species are found in forest habitats. Only 10 % of them are distributed among other landscapes such as open grasslands, agricultural pastures, roadsides, pounds of water bodies, etc. So, there is an urgent need to conserve the wild populations of medicinal plant diversity in prioritized forest habitats of the country [8].

India's rich medicinal plant heritage of 7200 species along with around 40,000 formulations spread among various health systems, if conserved and sustainably utilized, certainly has global relevance. For India's own health needs, conservation of her medicinal plants will contribute to self-reliance of millions on primary health care. The demand for medicinal plants is growing. Due to the increasing global demand for herbal remedies, medicinal plants in forests are facing threats to their survival. If the uncontrolled harvesting of bio-resources from wild habitats has not checked urgently many of the valuable medicinal plants will be vanished from the world along with their therapeutic knowledge, handed down through generations. However, the distribution pattern and quantity of the medicinal plants in forests are not estimated in any state of the country. In this background, the current program has been developed to conserve the plant sources in the forest and sustainable use by estimating their population and linking with location, as field gene banks for the future generations of the State. Considering the significant role of the several agencies involved in the project, perhaps the most unique in Indian forestry sector, it has decided by the KBB and KAMPA, to implement the project in all beats of all the Forest Divisions [9,10].

Methodology

Considering the significant role of the several agencies involved in the project, perhaps the most unique in Indian forestry sector, it has been decided to implement the project in all beats of all the Forest Divisions (FD) of the Karnataka state. Karnataka Forest Department has 39 Forest Divisions spread across 13 Circles. Each FD comprised of Sub Divisions, Ranges, Sections and beats which is the basic unit of forest. So, for the smooth implementation of the project, survey has been planned at the beat level in all the Ranges, for complete covering of all forests in a season or two, in collaboration with the front line staff of the Karnataka Forest Department. Considering the practical difficulties due to vast size, it has been decided to cover 0.5 % of the total forest areas per beat by line transect method. Transect lines of 10-meter width had been drawn across the beats in such a manner that all types of

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vegetations viz. natural forests, plantations, hill slopes, riversides, marshy lands and ponds etc. are covered proportionately. The transect lines are covered with GPS readings and drawn on topo sheets and then translate onto the field. All individuals of each of the tree species in the whole transect line have been recorded in the Proforma designed along with their four girth class measurements. For herbs, shrubs, and climbers, rectangular sub plots of 5mt x 5mt size have been demarcated along the transect line at an interval of every 200 meters alternately. If the subplot at the beginning of the transect line is fixed on the right side, it has to be on the left side, after 200 meters. Marking of the subplots alternately to the sides has to be followed for the entire transect line. The samples of subplots thus cover would be 0. 00625% of the beat area. All the identified herbs, shrubs, and climbers with medicinal value growing in the subplots have been counted and recorded in the Proforma assigned. GPS reading at the beginning, middle and at the end of the transect line and the GPS reading at the center of each subplot (5mt x 5mt) have been noted and recorded. Each transect survey team should comprise of two students of Botany/Forestry/Ayurveda, a Forester, a Forest Guard, a Forest Watcher or such other staff, and a Botanist/Ayurvedi Doctor/Plant Scientist. If the students themselves are trained, then combination may be a student (trained) two staff (Forester and Forest Guard), a local man known to vernacular names and a watcher as a helper [11].

Profile of the Belgaum Forest Division

Belagavi (earlier known as "Venugrama" or the "Bamboo Village") is one of the oldest, strong, prominent and well cultured historical place nestling high in the Western Ghats. The old town area with cotton and silk weavers stands gloriously besides the modern, bustling, tree-lined British Cantonment. Belagavi has an enviable heritage and offers much to be discovered. It lies in the zone of cultural transition between Karnataka, Maharashtra and Goa with a known antiquity clearly traceable up to 2nd Century A.D. Due to its proximity with the states of Maharashtra and Goa, Belagavi has acquired the cultural flavor of these states and blended it with the local Kannada culture to create a rich heritage, which is unique in its manifestation. It is also known as Malenadu or Rain Country and the vegetation here is verdant green throughout the year. Belagavi has now become one of the important districts in Karnataka state, marching with a tag of fast growing, redeveloping district. Belagavi is exactly at the center between Mumbai and Bangalore. Belgaum was once the capital of a dynasty of nine Kadamba kings. It appears that from the middle of 6th century was held by the Chalukyas, who were succeeded by Rastrakutas. After the break-up of Rashtrakuta dynasty a portion of it survived in Rattas (875-1250), who from 1210 onward made Venugrama their capital. The Kadambas of Goa succeeded in 12th century in acquiring and holding part of the district. Kittur in Belgaum district is a place of historical importance. Rani Chennamma of Kittur (1778–1829) is known for her resistance to British rule. Belagavi district has an area of 13,415 square kilometers of the State's geographical area making it the largest district in Karnataka. The district is bounded on west and north by Maharashtra state, on the northeast by Bijapur/Vijaypura district, on the east by Bagalkote district, on the southeast by Gadaga district, on the south by Dharawad and Uttara Kannada districts, and on the southwest by Goa state on the Western Ghats (50 km from the Goa state border). It is one of the oldest towns in the state, lying 502 km from Bangalore, 515 km from Hyderabad and 500 km from Mumbai. The district has been divided into 10 taluks. namely: Athani, Bailhongal, Belagavi, Chikkodi, Gokak, Hukkeri, Khanapur, Raibag, Ramdurg and Savadatti.

Forests in Belgaum district is divided into two forest divisions, namely Belgaum and Ghataprabha. Belgaum division covers the southwest of the district, and includes the forests of the Western Ghats. This division characterized by heavy rainfall, whereas Ghataprabha, to the northeast is much drier. Belagavi Forest Division comprises of nine ranges namely Belgaum, Golihalli, Gujanal, Kakti, Kanakumbi, Khanapur, Londa, Nagargali and Nesargi. In Belagavi district, forest area is more in Khanapur taluk, and very less in Chikkodi and Athani taluks and provides resources like gum, bees, beedi leaves, grass etc. Belgaum district is known as Sugar Bowl of Karnataka with 1.5 lakh hectares being used for commercial production and displaced Mandya district in sugar cane production over the last decade.The city of Belgaum is the district headquarters in North Karnataka. It houses the second legislative building, where the Karnataka Legislature will meet once a year. According to the 2011 Census of India, it has a population of 64.54 lakhs making it the second most populous district in Karnataka. Net sown area in the district is 839,242 hectares, which is 62% of the total geographical area of 1,344,382 hectares of the district. About 31.4% of the „Net sown" area i.e. 264,140 hectares is sown more than once. Major crops grown in the area are jowar, maize, paddy, wheat, bajra, grams, tur, groundnut, sunflower, sugarcane, cotton, tobacco etc.

Bhimgad Wildlife Sanctuary

Bhimgad Wildlife Sanctuary is a protected area in the Western Ghats, near Jamboti Village in Khanapur Taluk of Belgaum district, Karnataka state. This 19,042.58 ha (73.5238 sq mi) of tropical and subtropical moist broad leaf forest area was wild life sanctuary declared in December 2011. The sanctuary is also home to other rare species of flora and fauna. The area takes its name from the Bhimgad Fort (Figure 2) built and commanded by Shivaji in the 17th century. It is located in the heart of the forest valley, built by Shivaji to defend from the Portuguese troops who controlled Goa that time, rises 1800 ft near vertically above the plains. The fort occupied the summit of an extraordinary rock, with sides about 300 ft in perpendicular height. The defenses were almost entirely natural, requiring little additional construction. The ruins of the 380 ft high and 825 ft broad Bhimgad fort are located right in the heart of Mahadayi forest, and are of great historical significance. Bhimgad reserve forest, a protected area and a treasure of Western Ghats (Figure 2,3). The sanctuary is about 35 km southwest from Belgaum city. It is contiguous to the east of Mahedi Wildlife

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Sanctuary, north-west of the Bhagwan Mahaveer Sanctuary and Mollem National Park and north of Netravali Wildlife Sanctuary in Goa and Dandeli Wildlife Sanctuary in Karnataka. The western border areas encompass several geomorphological limestone formations with several caves. Bhimgad is a major destination for eco-tourism that comes in Khanapur taluk. Bhimgad forest of tropical and subtropical trees is also home to tigers, black panthers, leopards, gaurs, sloth bears, sambars, king cobras, elephants and some rare species of flora and fauna. The sanctuary, with beautiful mosaic of woodlands and grass lands, is rich in Medicinal plants. The application states: "This section of Bhimgad that lies in Karnataka reflects the bewildering complexity in plant, animal and bird life. It represents an area having a unique ecosystem that has significant biological and ecological importance. The region has numerous endemic plants and animals and also provides a critically important tiger corridor between Karnataka and Goa."

Figure 2: Bhimgad wildlife century in Belagavi Forest Division.

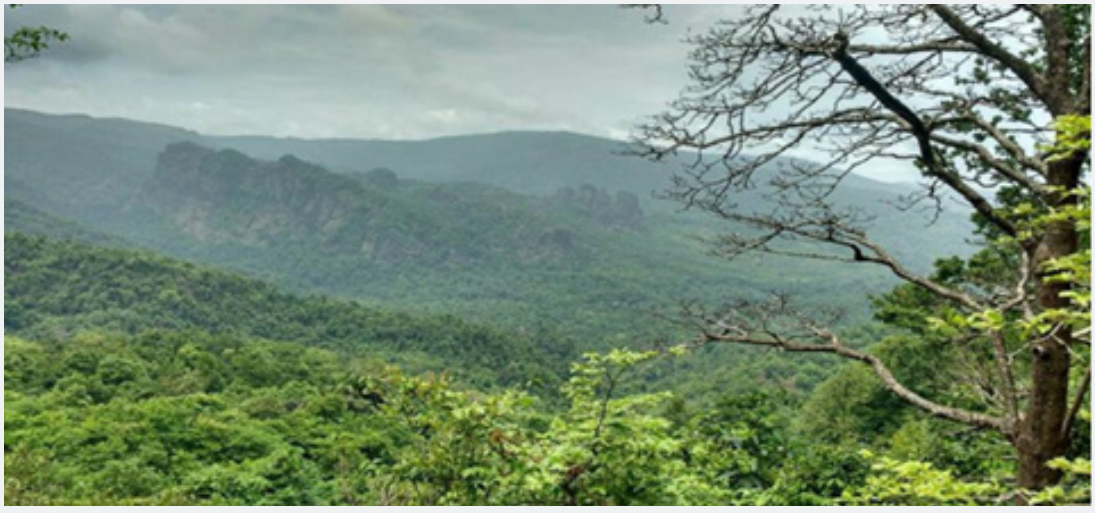

Figure 3: Bhimgad Forest in Belagavi Forest Division.

Khanapur forest range

Khanapur forest range (Figure 4) has some diverse flora and fauna; the forest department has not envisaged developing a Tree park at Koundal, Karambal villages, Khanapur range in the Western Ghats. The entire Khanapur forest range has rich

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presence of trees including animals and birds which might not be easy to spot while one is on a trek. Spread over 100 acres near Koundal, Karambal villages near to Goa-Karnataka state highway and Alanawar Road.

Figure 4: Khanapur forest range in Belagavi Forest Division.

Topography and Altitude

Belagavi district has an area of 13,415 square kilometers of the State's geographical area making it the largest district in Karnataka. The district is bounded on west and north by Maharashtra state, on the northeast by Bijapur district, on the east by Bagalkote district, on the southeast by Gadaga district, on the south by Dharawad and Uttara Kannada districts, and on the southwest by Goa state on the Western Ghats (50 km from the Goa state border). It is one of the oldest towns in the state, lying 502 km from Bangalore, 515 km from Hyderabad and 500 km from Mumbai. The district has been divided into 10 taluks namely: Athani, Bailhongal, Belagavi, Chikkodi, Gokak, Hukkeri, Khanapur, Raibag, Ramdurg and Savadatti. The topography of the district can be divided into four key zones:

a) On the western side, the district is covered with thick forests along the Western Ghat ranges. These western fringes are the most elevated area of the district, running along the Sahyadri Hills and stand at 450 to 900 metres above msl. The tops and upper slopes of these hills are almost bare and heavily degraded, but the lower slopes are fairly wooded with moist deciduous and evergreen species. This area receives high rainfall during the southwest monsoon.

b) The Northern belt of the district between the Ghataprabha and Krishna rivers makes a second zone. The west of this area is marked by plateaux of poor soil, further east there are rolling hills also of poor soil quality. In the northwest the land is also degraded and of low quality, but north of the Krishna River there is a belt of rich deep soil. Most of the forest areas of the district are concentrated in this zone.

c) The central zone of the district is defined by hills to the west and a succession of bare sandstone ranges to the east. The western end of the Ghataprabha valley is rugged with some forests on its slopes but these changes as the valley progresses eastwards near Daddi and passes through a black soil plain. The Gokak hills are flat-topped; their sides are terraced and covered in deciduous tree crops. Much of the rain comes from the northeast, leaving the south and west rather dry.

d) The lands are more open in the southern zone of the district; here arable crops occupy the majority of the land. To the far west and south of the district high rugged hills and forests break up the landscape, though in the extreme south the area becomes increasingly less wooded with larger outcrops of rock.

Belgaum is located at 15° 85' North latitude and 74°50' East longitude. The geographical location of the district is situated at an average elevation of 779 metres above mean sea level. Belgaum district is situated near the foothills of the Sahyadri mountain range (Western Ghats) 100 km from the Arabian Sea with the Markandeya river flowing nearby. Belgaum exhibits swift and kaleidoscopic changes in topography, vegetation and climate.

Forest Types

Forest has been of abundant reputation to mankind since prehistoric days. 60 % of the earth once covered with forest. With the expansion of civilization, large areas have been cleared to make way for farms, mines, towns and roads. Today about 30% of earth is still forested. The slopes of the Western Ghats and their foothills constitute majority of the reserved forests. There are few scattered and less dense reserved forests nearer to the

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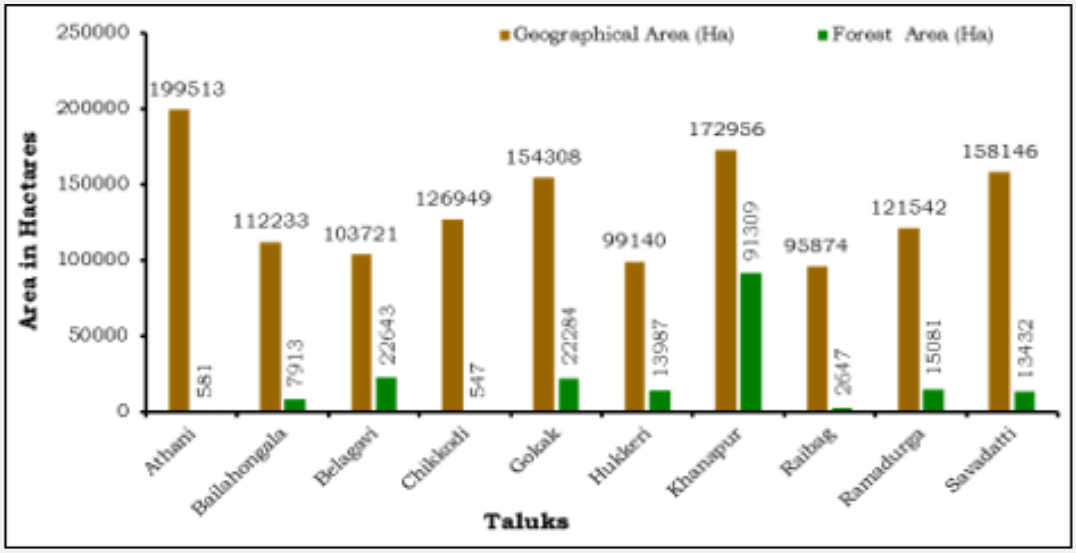
sea coast. The reserves near the coast are scattered, smaller in extent and are thinly wooded and mostly contain fuel wood species. The ghat and the foothill forests are situated about 16 to 30 kilometers away from the coast, about 19 to 24 kilometers breadth. The ghat forests, on their northern limits, sweep towards the coast. The ghat reserves and foothill portions are generally wooded and form extensive and continuous block, which form the catchment area for the principal rivers taking birth in the division. The diversity of species, their growth condition and other factors of the forests are governed by climatic, geographic and edaphic factors. Physiognomy, biomass, species composition, floristic stratification and phenology are the various significant aspects determining the structure of vegetation. The variation in altitudes, ruggedness of the terrain and the resultant differences in temperature and rainfall coupled with biotic and edaphic condition are responsible for the existence of many types of forests in this Division. Forests in Belgaum district is divided into two forest divisions, namely Belgaum and Ghataprabha. Belgaum division covers the southwest of the district, and includes the forests of the Western Ghats. This division characterized by heavy rainfall, whereas Ghataprabha, to the northeast is much drier. The northern forests have been severely degraded due to human activity, including over-grazing and agriculture, as well as due to fire and invasion by foreign species such as Opuntia and Lantana. The distribution of forests is generally scattered being found in smaller or bigger patches in most taluks.

The rainfall varies considerably from the western boundary of the district towards the east and there is a gradual change in the forest's composition. Better stocking in forests of the district can be seen in western part of the division adjoining to Western Ghats. The division has a fair representation of wildlife shelters including elephants, leopard, bear, wild dog, wild boar, spotted deer, wild boars, fox, jackal, porcupines, hares, mongoose, pangolin, etc. Belagavi division forests are classified under two sub groups namely 5A-Southern Tropical Dry Deciduous Forests and 6A-Southern Tropical Thorn Forests as per Sir Harry G.Champion and S.K.Seth classification (1968) in their "A revised survey of the forest types of India. Accordingly, the forest types are identified in Belagavi Forest Division. The forests can be presumed to have reached the climatic climax of the region; dry deciduous forests that are being declined to various stages of degradation. Belagavi Forest Division comprises of nine ranges namely Belgaum, Golihalli, Gujanal, Kakti, Kanakumbi, Khanapur, Londa, Nagargali and Nesargi. In Belagavi district, forest area is more in Khanapur taluk, and very less in Chikkodi and Athani taluks (Table 1, Graph 1) and provides resources like gum, bees, beedi leaves, grass etc.



Graph 1: Taluk-wise distribution of Geographical Area and Forest Area in Belagavi District.

Soil

Soil is one of the significant natural factors of environment and biodiversity. There is an association amongst soil and vegetation, soil and climate, soil and slope and climate and slope, but all these features co-operate in the fabrication of authentic soil. Soil is the resultant product of rock materials and climatic condition. It consists of mineral matter, decaying organic matters and micro-organisms. Millions of people and plant life depends on soil. It is one of the significant issues for the study of its varieties, properties and characteristics to planners to know the spatial variation in its distribution and contribution to the spatial development of the region. The soils of Belgaum district can broadly be classified into red soils and black soils. These soils

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vary in depth and texture, depending on the parent rock type, physiographic settings and climatic conditions. By and large, black soils predominates the Deccan Trap terrain and the red soils are found in the southwestern and southeastern part of the district in gneissic terrain. These soils in turn can be grouped into seven categories as given below, out of which the first five cover large tracks of land while the last two are local in nature.

Table 1: Taluk-wise Forest Area in Belagavi District.

Sl.No	Taluk	Geographical Area (Ha)	Total Forest Area (Ha)
1	Athani	199513	581
2	Bailahongala	112233	7913
3	Belagavi	103721	22643
4	Chikkodi	126949	547
5	Gokak	154308	22284
6	Hukkeri	99140	13987
7	Khanapur	172956	91309
8	Raibag	95874	2647
9	Ramadurga	121542	15081
10	Savadatti	158146	13432
District Total		1344382	190424

i. **Shallow black soils**: These soils occur in the Deccan trap region and to some extent are also developed in schist, shale and limestone terrains. They are greyish to dark greyish-brown in colour, with clayey texture. These soils have poor to moderate infiltration characteristics.

ii. **Medium black soils**: These soils are predominantly derived from Deccan traps and occupy large parts of the district. They are dark greyish- brown to very dark greyish-brown with clayey texture. These are derived from the weathered products of basalts and limestone and are darker in valleys than in high lands. Their texture varies from loam to clay, with low to moderate infiltration characteristics.

iii. **Deep to Very deep black soils**: These soils occupy large tracts in Deccan trap terrain along the Krishna River and in gneissic terrain. Soils are dark greyish-brown to very dark greyish-brown in colour and have clayey texture. Soils occur on plains or lands having gentle slopes and exhibit wide cracks in summers, derived from a wide variety of parent rock types like traps, schists, gneisses and sedimentary rocks. Soils generally transported and occur in valleys and depressions. Accumulation of lime, gypsum and soluble salts at varying depths in the profile often pose problems and has poor infiltration characteristics.

iv. **Mixed red and black soils**: These soils occur in northern parts of the district. Soils are dark reddish-brown to dark greyish-brown in colour with silty-clay to clayey-loam textures. Soils are derived from gneisses, schists and sedimentary rocks. Red soils having high infiltration characteristics are confined to uplands and black soils of poor to medium infiltration characteristics occur in valleys and low lands.

v. **Red loamy soils**: These soils occur as small strips in the valleys adjacent to Western Ghats. They are generally transported and are loamy to silty-loam in texture. They have moderate to good infiltration characteristics.

vi. **Lateritic soils**: Lateritic soils are red in colour and occur as pockets. They occur at high-levels as insitu in Deccan Trap terrain and at low- levels as transported in Malnad region. They are derived from Deccan traps as well as sedimentary rocks, Dharwarian Schists and peninsular gneisses. These soils have well to moderate infiltration characteristics.

vii. **Alluvial soils**: These soils are developed over the alluvium deposited by the Krishna River and its tributaries. They are very limited in extent and thickness and are local in nature. Soils have good infiltration characteristics, are composed of coarse sand, sandy-loam and loams.

Climate

Climate is one of the important factors through which the activities of mankind find their place on the earth surface. The climate of any region is not determined by a single factors/ element, but rather by the combinations of climatic elements and of weather types prevailing. The condition of a region also depends on the manmade features like industrial enterprises and the intensity of transportation system. Belgaum district has a tropical savannah climate (Koppen Climate Classification). It is known for its pleasant year-round climate. Belgaum is at its coldest in winter (lowest temperature in Karnataka is usually recorded in Belgaum) and it experiences almost continuous monsoon rains from June to September. Belgaum sometimes receives hail storms during April. The climate of the district as a whole can be termed

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as semi-arid. The variation in the maximum temperature during the year ranges from 27° C to 35.7° C and minimum from 14 °C to 20.6 °C. The district experiences pleasant winters and hot dry summers. The hot season extends from March to May, during which the daily maximum temperature often shoots up to 35.7 °C. Agro-climatologically the district can be divided into three zones i.e. high rainfall "Hilly zone", "Northern transitional zone" and "Northern dry zone" from southwest to northeast respectively.

Rainfall

Continuous movement of water between the earth and the atmosphere is the hydrological cycle. Water vapor from water and land surfaces and from living cells circulates through the atmosphere and falls as rain or snow. When it reaches the earth, water either flows into streams and then into the oceans or lakes, or it enters, or infiltrates the soil. Some water becomes soil moisture, which may evaporate directly or move up through the roots of plants and be released by the leaves. Some water percolates downward, accumulating in the so-called zone of saturation to form the groundwater reservoir, the upper surface of which is the water table. Under natural conditions, the water table rises in response to inflowing water and then declines as the water drains into natural outlets such as wells and springs. The hilly forested region of Belagavi district includes Kankumbi, Jamboti and Bhimgad receives torrential rains every year. Kankumbi hill range in fact, rivals Agumbe in Shivamogga district for the tag of being the Cherrapunji of the South. Several rivers including Mhadei, Malaprabha and Tillari and hundreds of perennial streams are running in the district. Mhadei originates in the Bhimgad forests with a cluster of 30 springs forming the river Mahadayi, which is joined by two other streams Marcidha nala and Pannera nala. Water flow down in the valley and over the 150 ft Vajrapoha falls. The evening sun falling on the veil gives a glittering touch thus the name vajra. The Mhadei river goes on to be the important Mandovi river in Goa. Forest department remarks that Kankumbi receives more rainfall than other places. However, in the last 3-5 years, it has come down a bit due to developmental activities. Zilla Panchayat reported that for four months life is very difficult in Kankumbi especially Amagaon which receives the highest rainfall. The average rainfall is around 4000 mm and during the monsoon months, they are cutoff from rest of the world. Amagaon has set the record of having received the highest rainfall of 10,068 mm in 2010.

The normal rainfall in the district decreases from more than 1859 mm in Khanapur taluk in southwest to less than 491 mm in Raibag taluk towards northeasterly direction. Those areas, that receive less than 750 mm annual rainfall are classified as semi-arid and drought prone. Hence, the entire district except, southwestern part is categorized as semi-arid and drought prone. Total normal rainy days vary from 90 in Khanapur to 37 in Athani. Eastern and northeastern parts of the district are prone to drought of mild nature. The average annual rainfall during the period 1971 to 2000 recorded in the district is 769.1 mm. The standard deviation and Coefficient variation of rainfall for the Belgaum district is 196.2 mm and 25.5% respectively. The highest mean annual rainfall recorded in the district was 1,064 mm in the year 1975 and the lowest rainfall 455 mm in the year 2003. An analysis of the seasonal variation of rainfall indicates that bulk of the rainfall is received during southwest monsoon period (June to Sept) that is nearly 71.6% of the annual. The contribution by the northeast monsoon or post monsoon (Oct to Dec) is nearly 17.3% and the rest 11.1% is the contribution of the dry weather and pre-monsoon period (Jan to May). The statistical analysis of the rainfall for the period 1971- 2000 indicate that the coefficient of variation for the district as a whole is around 25.5 %, for the south-western monsoon it is 32.5% and for the north-eastern monsoon it is 56.5%. Thus the southwest monsoon is more reliable as compared to the northeast monsoon. Although the district as a whole received normal rainfall during the year 2006 on an annual basis; it experienced 24% excess rainfall during monsoon and 53% deficient rainfall during post-monsoon period. The deficiency of rainfall during post-monsoon period was more than 60% in Bailhongal, Belgaum, Chikkodi, Gokak, Hukkeri and Khanapur taluks.

Implementation of the project

Survey in the Belagavi Forest Division was taken by the KBB along with KAMPA during the year 2017. Initial training (Figure 5 & 6) with orientation inputs of project to frontline staff like DCF, ACF, RFO"s, DyRFO"s, FG"s, FW"s, of department was organized at Belagavi headquarter to assess the population of medicinal plants, inventory with a sampling intensity of 0.5 % has been given. The distribution of plants across the forest corresponding to per hectare in various parameters, like number of trees, herbs and shrubs as well as species composition in have been recorded during the transect surveys. The present study shows how the issue of medicinal plant conservation fits into the Indian framework in which the NMPB operates. The field survey conducted in the FD primarily focused on the wild medicinal plants (Figures 7-22).

Study Area

The survey was conducted in 109 beats and 9 ranges of Belagavi division. Details of transect lines drawn for the project is provided in Table 2. It shows range name, beat name, area in hectares and length of the transect lines in kilometre.

Results and Discussion

Development of species-based data system

Current survey had steamed up in the establishment of a database for the medicinal plants/others of Karnataka linking all species with precise locations in the forests. The system will help to enter and process the data generated through transects surveys for assessing the population of medicinal plants/others at various levels. The system integrates data on the species such as botanical

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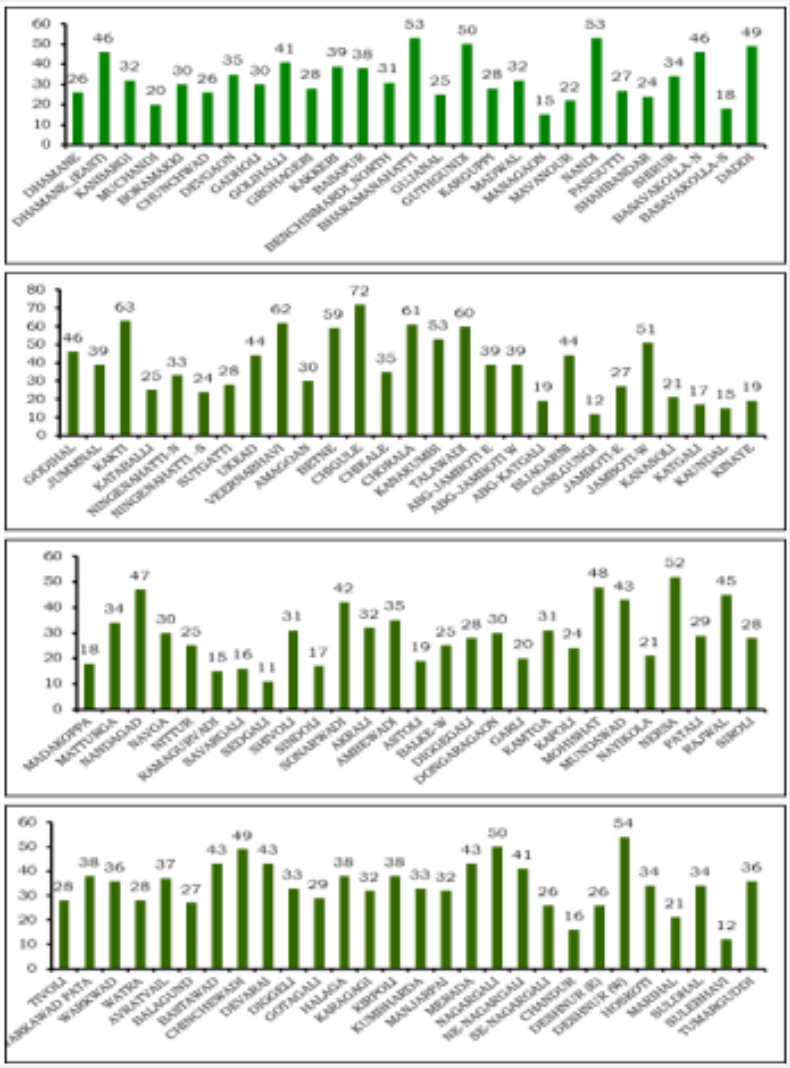
name, local name, family, number of individuals, girth, class of trees, regeneration, and location details of Beat, Range and FD obtained through the field survey as per the designed Formats. Advantages/characters of the user-friendly data managing system are as follows (Graph 2).



Graph 2: Trees across 109 Beats.

Table 2: Details on Transect Lines across the Beats.

Sl. No.	Range	Name of Beat	Beat Area (Hectare)	Transect Line in KM
1	Belgam	Dhamane	862.27	4.3
2		Dhamane_(East)	781.83	4.1
3		Kanbargi	1010.7	5
4		Muchandi	671.8	3.4
5	Golihalli	Boramakki	968.06	5
6		Chunchwad	593.95	3
7		Devgaon	964.29	5
8		Gadholi	852.05	4.3

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9		Golihalli	679.68	3.4
10		Grohageri	510.428	2.6
11		Kakkeri	1150.89	5.8
12	Gujanal	Basapur	1254.61	6.4
13		Benchinmardi_North	1953	10
14		Bharamanahatti	1246.22	6.4
15		Gujanal	1519.22	7.6
16		Guthgundi	1227.43	6.2
17		Karguppi	2014.07	10.1
18		Madwal	1850.14	9.4
19		Managaon	685.18	1.2
20		Mavanour	1497.99	7.5
21		Nandi	1620.26	7
22		Pangutti	989.67	5
23		Shahbandar	2441.63	11.9
24		Shirur	1328.33	6.8
25	Kakti	Basavakolla-N	689.34	3.66
26		Basavakolla-S	98.8	0.6
27		Daddi	2160.42	10.8
28		Godihal	1176.09	5.41
29		Jummnal	472.08	2.4
30		Kakti	1171.55	6
31		Kataballi	418.7	2.1
32		Ningenahatti-N	941.3	4.4
33		Ningenatti-S	407.52	2.1
34		Sutgatti	417.2	2.1
35		Ukkad	1240.13	6.2
36		Veernabhavi	1417.87	7.3
37	Kanakumbi	Amagoan	445.07	2.2
38		Betne	2684.37	13.1
39		Chigule	4239.3	20.8
40		Chikale	1571.89	7.4
41		Chorala	3127.91	15.2
42		Kanakumbi	2665.92	14
43		Talawadi	2268.03	11.4
44		Abg-Jamboti E	1932.2	9.6
45		Abg-Jamboti W	1571.2	7.1
46		Abg-Katgali	328.13	2
47		Bijagarni	1057.72	5.3
48		Garlgungi	109.76	0.8
49		Jamboti-E	1199.8	6
50		Jamboti-W	2591.19	15.2
51		Kanasoli	478.262	2.51
52		Katgali	336.46	2

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53	Khanapur	Kaundal	314.8	1.6
54		Kinaye	664.43	3.4
55		Madakoppa	478.88	2.4
56		Matturga	876.8	4.38
57		Nandagad	747.71	3.8
58		Navga	496.16	2.5
59		Nittur	184.32	1.2
60		Ramagurvadi	406.1	2.04
61		Savargali	455.6	2.4
62		Sedgali	139.2	0.7
63		Shivoli	494.62	2.5
64		Sindoli	406.1	2
65		Sonarwadi	1544.23	9
66	Londa	Akrali	960	4.8
67		Ambewadi	1580	7.8
68		Astoli	250	1.3
69		Balke-W	751	3.8
70		Diggegali	696.4	3.5
71		Dongaragaon	1418.8	7.1
72		Garli	465.9	2.4
73		Kamtga	960	4.8
74		Kapoli	894	4.5
75		Mohishat	1462	7.4
76		Mundawad	1234.8	6.2
77		Nayikola	360	1.8
78		Nersa	1482.91	7.42
79		Patali	600	3
80		Rajwal	1108.8	5.6
81		Siroli	1130	5.5
82		Tivoli	1050	5.2
83		Warkawad Pata	1343.6	6.8
84		Warkwad	1345	6.8
85		Watra	810	4.8
86		Avratvail	625.2	3.2
87		Balagund	630.46	3.2
88		Bastawad	779.54	3.8
89		Chinchewadi	1114.19	5.6
90		Devarai	670.44	3.4
91		Diggeli	832.18	4.2
92		Gotagali	650.08	4.8
93		Halaga	593.78	3
94		Karagagi	941.63	4.7

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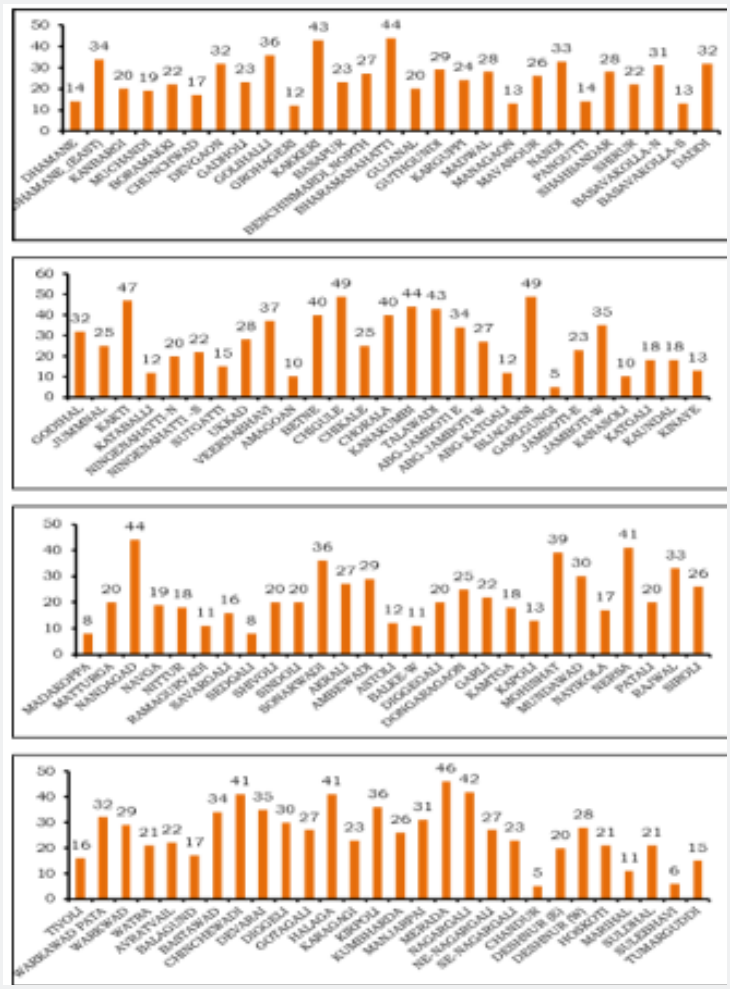
95	Nagargali	Kirpoli	856.5	4.3
96		Kumbharda	879.84	4.4
97		Manjarpai	1069.7	5.4
98		Merada	829.86	4.2
99		Nagargali	1248.8	6.3
100		Ne-Nagaragali	980.7	5
101		Se-Nagargali	882	4.4
102	Nesargi	Chandur	640.08	3.3
103		Deshnur (E)	1985.93	10.2
104		Deshnur (W)	2875.7	14.4
105		Hoskoti	1103.04	5.6
106		Marihal	901.9	4.5
107		Suldhal	2907.64	14.4
108		Sulebhavi	441.2	2.2
109		Tumarguddi	1733.94	8.7



Graph 3: Shrubs across Beats.

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a) Rapid and easy input or output of desired/required data and work as a multi-user system.

b) Collected information on the plants has entered into various levels, such as Division, Range, Section, and Beat along with scientific name, vernacular name, family, uses, and a number of individuals.

c) Scientific name, local name, and family of the plants are preloaded as a drop box for user friendly manner for adding the appropriate choice.

d) The database provides a recording of the GPS readings for each of subplots in the transect lines and the transit line itself.

e) The data can be merged and processed from Beat level up to the State level (Beats to Section to Range, Division to Circle, and to the State).

Results of the survey in the present project, around 578 plant species have been found. The resource assessment delivers quantification of these plants encompassing 578 species from 109 forests beats belonging to 9 ranges of Belagavi division as documented in (Table 3).

Table 3: Plant species recorded from Belagavi Forest Division.

Sl. No.	Species	Family	Habit
1	*Acanthospermum hispidum*	*Asteraceae*	Herb
2	*Achyranthes aspera*	*Amaranthaceae*	Herb
3	*Acmella paniculata*	*Asteraceae*	Herb
4	*Acmella radicans*	*Asteraceae*	Herb
5	*Adenostemma lavenia var.rugosum*	*Asteraceae*	Herb
6	*Allmania nodiflora var. dichotoma*	*Amaranthaceae*	Herb
7	*Alpinia malaccensis*	*Zingiberaceae*	Herb
8	*Alternanthera sessilis*	*Amaranthaceae*	Herb
9	*Alternanthera tenella*	*Amaranthaceae*	Herb
10	*Alysicarpus belgaumensis*	*Fabaceae*	Herb
11	*Alysicarpus bupleurifolius var. bulbeurifolius*	*Fabaceae*	Herb
12	*Alysicarpus bupleurifolius var. gracilis*	*Fabaceae*	Herb
13	*Alysicarpus hamosus*	*Fabaceae*	Herb
14	*Alysicarpus longifolius*	*Fabaceae*	Herb
15	*Alysicarpus nummularius*	*Fabaceae*	Herb
16	*Andrographis alata*	*Acanthaceae*	Herb
17	*Andrographis echioides*	*Acanthaceae*	Herb
18	*Andrographis paniculata*	*Acanthaceae*	Herb
19	*Anisochilus carnosus*	*Lamiaceae*	Herb
20	*Argemone mexicana*	*Papaveraceae*	Herb
21	*Asparagus racemosus*	*Asparagaceae*	Herb
22	*Biophytum sensitivum var.candolleanum*	*Oxilidaceae*	Herb
23	*Biophytum sensitivum*	*Oxilidaceae*	Herb
24	*Blechnum orientale*	*Blechnaceae*	Herb
25	*Blepharis asperrima*	*Acanthaceae*	Herb
26	*Blepharis integrifolia*	*Acanthaceae*	Herb
27	*Blepharis maderaspatensis*	*Acanthaceae*	Herb
28	*Blumea malcolmii*	*Asteraceae*	Herb
29	*Boerhavia repens*	*Nyctaginaceae*	Herb
30	*Borreria articularis*	*Rubiaceae*	Herb
31	*Borreria stricta*	*Rubiaceae*	Herb
32	*Buchchnera hispida*	*Enterobacteriaceae*	Herb

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33	*Buchnera hispida*	*Enterobacteriaceae*	Herb
34	*Canscora diffusa*	*Gentianeceae*	Herb
35	*Canscora diffusa*	*Gentianeceae*	Herb
36	*Caralluma adscendens var.attenuata*	*Apocynaceae*	Herb
37	*Cassia senna*	*Lauraceae*	Herb
38	*Cassia tora*	*Lauraceae*	Herb
39	*Centella asiatica*	*Apiaceae*	Herb
40	*Centranthera indica*	*Orobanchaceae*	Herb
41	*Corchorus aestuans*	*Malvaceae*	Herb
42	*Corchorus trilocularis*	*Malvaceae*	Herb
43	*Costus speciosus*	*Costaceae*	Herb
44	*Crassocephalum crepidioides*	*Asteraceae*	Herb
45	*Crotalaria acicularis*	*Fabaceae*	Herb
46	*Crotalaria calycina*	*Fabaceae*	Herb
47	*Crotalaria parviflora*	*Fabaceae*	Herb
48	*Curculigo orchioides*	*Hypoxidaceae*	Herb
49	*Cyanotis fasciculata*	*Commelinaceae*	Herb
50	*Cyanotis tuberosa var.adscendens*	*Commelinaceae*	Herb
51	*Cynoglossum zeylanicum*	*Boraginaceae*	Herb
52	*Desmodium alysicarpoides*	*Fabaceae*	Herb
53	*Desmodium gangeticum*	*Fabaceae*	Herb
54	*Desmodium triangulare var.congestum*	*Fabaceae*	Herb
55	*Desmodium triflorum*	*Fabaceae*	Herb
56	*Echinops echinatus*	*Asteraceae*	Herb
57	*Eleiotis monophylla*	*Fabaceae*	Herb
58	*Elephantopus scaber*	*Asteraceae*	Herb
59	*Emilia sonchifolia*	*Asteraceae*	Herb
60	*Euphorbia cristata*	*Euphorbiaceae*	Herb
61	*Euphorbia elegans*	*Euphorbiaceae*	Herb
62	*Euphorbia hirta*	*Euphorbiaceae*	Herb
63	*Evolvulus alsinoides*	*Convolvulaceae*	Herb
64	*Exacum atropurpureum Bedd.*	*Gentianeceae*	Herb
65	*Flemingia nilgheriensis*	*Fabaceae*	Herb
66	*Geophila repens*	*Rubiaceae*	Herb
67	*Hibiscus lobatus*	*Malvaceae*	Herb
68	*Indigofera aspalthoides*	*Fabaceae*	Herb
69	*Indigofera hirsuta*	*Fabaceae*	Herb
70	*Indigofera linifolia var.campbelli*	*Fabaceae*	Herb
71	*Indigofera linifolia*	*Fabaceae*	Herb
72	*Indigofera linifolia*	*Fabaceae*	Herb
73	*Indigofera linnaei*	*Fabaceae*	Herb
74	*Indigofera tinctoria*	*Fabaceae*	Herb
75	*Ipomoea pes-tigridis*	*Convolvulaceae*	Herb

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76	*Justicia procumbens*	*Acanthaceae*	Herb
77	*Justicia prostrata*	*Acanthaceae*	Herb
78	*Lavandula bipinnata*	*Lamiaceae*	Herb
79	*Leonotis nepetifolia*	*Lamiaceae*	Herb
80	*Lepidagathis incurva*	*Acanthaceae*	Herb
81	*Lepidagathis incurva var.lophostachyoides*	*Acanthaceae*	Herb
82	*Lepidagathis incurva var. mucronata*	*Acanthaceae*	Herb
83	*Leucas angustissima*	*Lamiaceae*	Herb
84	*Leucas aspera*	*Lamiaceae*	Herb
85	*Leucas cephalotes*	*Lamiaceae*	Herb
86	*Leucas eriostoma*	*Lamiaceae*	Herb
87	*Leucas indica*	*Lamiaceae*	Herb
88	*Leucas longifolia*	*Lamiaceae*	Herb
89	*Leucas marrubioides*	*Lamiaceae*	Herb
90	*Leucas stelligera*	*Lamiaceae*	Herb
91	*Leucas stricta*	*Lamiaceae*	Herb
92	*Limnophila chinensis*	*Plantaginaceae*	Herb
93	*Lobelia alsinoides*	*Campanulaceae*	Herb
94	*Lobelia nicotianifolia*	*Campanulaceae*	Herb
95	*Ludwigia perennis*	*Onagraceae*	Herb
96	*Merremia tridentata*	*Convolvulaceae*	Herb
97	*Merremia umbellata*	*Convolvulaceae*	Herb
98	*Mimosa pudica*	*Fabaceae*	Herb
99	*Mollugo nudicaulis*	*Molluginaceae*	Herb
100	*Naregamia alata*	*Meliaceae*	Herb
101	*Ocimum sanctum*	*Lamiaceae*	Herb
102	*Oldenlandia corymbosa*	*Rubiaceae*	Herb
103	*Oxalis corniculata*	*Oxalidaceae*	Herb
104	*Pavonia arabica*	*Malvaceae*	Herb
105	*Pentanema indicum*	*Asteraceae*	Herb
106	*Phaulopsis imbricata*	*Acanthaceae*	Herb
107	*Phyllanthus maderaspatensis*	*Phyllanthaceae*	Herb
108	*Phyllanthus niruri*	*Phyllanthaceae*	Herb
109	*Phyllanthus urinaria*	*Phyllanthaceae*	Herb
110	*Phyllanthus virgatus*	*Phyllanthaceae*	Herb
111	*Phyllocephalum scabridum*	*Asteraceae*	Herb
112	*Plumbago zeylanica*	*Plumbaginaceae*	Herb
113	*Polycarpaea corymbosa*	*Caryophyllaceae*	Herb
114	*Pulicaria angustifolia*	*Asteraceae*	Herb
115	*Pulicaria wightiana*	*Asteraceae*	Herb
116	*Rhynchosia minima .*	*Fabaceae*	Herb
117	*Rhynchostylis retusa*	*Orchidaceae*	Herb
118	*Rubia cordifolia*	*Rubiaceae*	Herb
119	*Rungia parviflora var. parviflora*	*Acanthaceae*	Herb

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120	*Rungia repens*	*Acanthaceae*	Herb
121	*Senecio tenuifolius*	*Asteraceae*	Herb
122	*Senna uniflora*	*Fabaceae*	Herb
123	*Sesamum indicum*	*Pedaliaceae*	Herb
124	*Sida alnifolia*	*Malvaceae*	Herb
125	*Sida cordata*	*Malvaceae*	Herb
126	*Sida cordifolia*	*Malvaceae*	Herb
127	*Sida mysorensis*	*Malvaceae*	Herb
128	*Sida rhombifolia ssp.retusa*	*Malvaceae*	Herb
129	*Sida rhombifolia*	*Malvaceae*	Herb
130	*Sida spinosa*	*Malvaceae*	Herb
131	*Solanum tuberosum*	*Solanaceae*	Herb
132	*Sonchus asper*	*Asteraceae*	Herb
133	*Sopubia delphinifolia*	*Serophulariaceae*	Herb
134	*Spermacoce articularis*	*Rubiaceae*	Herb
135	*Spermacoce hispida*	*Rubiaceae*	Herb
136	*Spermacoce ocymoides*	*Rubiaceae*	Herb
137	*Spermacoce pusilla*	*Rubiaceae*	Herb
138	*Spilanthes paniculata*	*Asteraceae*	Herb
139	*Stachyphrynium spicatum*	*Anacardiaceae*	Herb
140	*Stachytarpheta indica*	*Verbnaceae*	Herb
141	*Staurogyne glauca(*	*Acanthaceae*	Herb
142	*Strobilanthes parviflora*	*Acanthaceae*	Herb
143	*Stylosanthes guianensis*	*Fabaceae*	Herb
144	*Stylosanthes viscosa*	*Fabaceae*	Herb
145	*Synedrella nodiflora*	*Asteraceae*	Herb
146	*Tragia involucrata*	*Euphorbiaceae*	Herb
147	*Trianthema crystallina*	*Aizoaceae*	Herb
148	*Tribulus terrestris*	*Zygophyllaceae*	Herb
149	*Trichodesma inaequale*	*Boraginaceae*	Herb
150	*Tricholepis amplexicaulis*	*Asteraceae*	Herb
151	*Trichuriella monsoniae*	*Amaranthaceae*	Herb
152	*Trichurus monsoniae*	*Amaranthaceae*	Herb
153	*Tridax procumbens*	*Asteraceae*	Herb
154	*Vanda spathulata*	*Orchidaceae*	Herb
155	*Vernonia cinerea*	*Asteraceae*	Herb
156	*Vetiveria lawsonii*	*Poaceae*	Herb
157	*Vetiveria zizanioides*	*Poaceae*	Herb
158	*Vicoa indica*	*Asteraceae*	Herb
159	*Zornia gibbosa*	*Fabaceae*	Herb
160	*Abelmoschus angulosus*	*Malvaceae*	Shrub
161	*Abrus precatorius .*	*Fabaceae*	Shrub
162	*Abutilon indicum*	*Malvaceae*	Shrub

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163	*Acacia concinna*	*Fabaceae*	Shrub
164	*Acacia torta*	*Fabaceae*	Shrub
165	*Agave americana*	*Asparagaceae*	Shrub
166	*Allophylus cominia*	*Sapindaceae*	Shrub
167	*Allophylus concanicus*	*Sapindaceae*	Shrub
168	*Ampelocissus indica*	*Vitaceae*	Shrub
169	*Ancistrocladus heyneanus*	*Ancistrocladaceae*	Shrub
170	*Anisomeles malabarica*	*Lamiaceae*	Shrub
171	*Ardisia solanacea*	*Primulaceae*	Shrub
172	*Argyreia cuneata*	*Convolvulaceae*	Shrub
173	*Argyreia cymosa*	*Convolvulaceae*	Shrub
174	*Argyreia elliptica*	*Convolvulaceae*	Shrub
175	*Argyreia nervosa*	*Convolvulaceae*	Shrub
176	*Argyreia pilosa*	*Convolvulaceae*	Shrub
177	*Aristolochia indica*	*Aristolochiaceae*	Shrub
178	*Aristolochia tagala*	*Aristolochiaceae*	Shrub
179	*Asparagus racemosus var. javanicus*	*Asparagaceae*	Shrub
180	*Asparagus racemosus*	*Asparagaceae*	Shrub
181	*Atalantia wightii*	*Rutaceae*	Shrub
182	*Atylosia albicans*	*Fabaceae*	Shrub
183	*Atylosia scarabaeoides*	*Fabaceae*	Shrub
184	*Barleria cristata*	*Acanthaceae*	Shrub
185	*Breynia nivosa var. purpurea*	*Phyllanthaceae*	Shrub
186	*Breynia retusa*	*Phyllanthaceae*	Shrub
187	*Breynia vitis-idaea*	*Phyllanthaceae*	Shrub
188	*Bridelia scandens*	*Phyllanthaceae*	Shrub
189	*Bridelia stipularis*	*Phyllanthaceae*	Shrub
190	*Caesalpinia bonduc*	*Fabaceae*	Shrub
191	*Caesalpinia mimosoides*	*Fabaceae*	Shrub
192	*Calycopteris floribunda*	*Combretaceae*	Shrub
193	*Cansjera rheedei*	*Opiliaceae*	Shrub
194	*Canthium angustifolium*	*Rubiaceae*	Shrub
195	*Canthium coromandelicum*	*Rubiaceae*	Shrub
196	*Canthium indicum*	*Rubiaceae*	Shrub
197	*Canthium parviflorum*	*Rubiaceae*	Shrub
198	*Carissa carandas*	*Apocynaceae*	Shrub
199	*Carissa spinarum*	*Apocynaceae*	Shrub
200	*Cassia alata*	*Lauraceae*	Shrub
201	*Cassia auriculata*	*Lauraceae*	Shrub
202	*Cassia hirsuta*	*Lauraceae*	Shrub
203	*Cassia sericea*	*Lauraceae*	Shrub
204	*Cassia tomentosa*	*Lauraceae*	Shrub
205	*Catunaregam rugulosa*	*Rubiaceae*	Shrub

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206	*Catunaregam spinosa*	*Rubiaceae*	Shrub
207	*Celastrus paniculatus*	*Celastraceae*	Shrub
208	*Cipadessa baccifera*	*Meliaceae*	Shrub
209	*Cissampelos pareira var. hirsuta*	*Menispermaceae*	Shrub
210	*Cissus discolor*	*Vitaceae*	Shrub
211	*Cissus pallida*	*Vitaceae*	Shrub
212	*Cissus vitiginea*	*Vitaceae*	Shrub
213	*Clematis gouriana*	*Ranunculaceae*	Shrub
214	*Clematis hedysarifolia*	*Ranunculaceae*	Shrub
215	*Clematis triloba*	*Ranunculaceae*	Shrub
216	*Clerodendrum calamitosum*	*Lamiaceae*	Shrub
217	*Clerodendrum infortunatum*	*Lamiaceae*	Shrub
218	*Clerodendrum serratum var.dentatum*	*Lamiaceae*	Shrub
219	*Clerodendrum serratum*	*Lamiaceae*	Shrub
220	*Clerodendrum serratum*	*Lamiaceae*	Shrub
221	*Clerodendrum viscosum*	*Lamiaceae*	Shrub
222	*Coccinia grandis*	*Cucurbitaceae*	Shrub
223	*Cocculus hirsutus*	*Menispermaceae*	Shrub
224	*Colebrookea oppositifolia*	*Lamiaceae*	Shrub
225	*Connarus wightii*	*Connaraceae*	Shrub
226	*Coscinium fenestratum*	*Menispermaceae*	Shrub
227	*Crotalaria juncea*	*Fabaceae*	Shrub
228	*Crotalaria prostrata*	*Fabaceae*	Shrub
229	*Cryptolepis buchanani*	*Apocynaceae*	Shrub
230	*Cryptolepis grandiflora*	*Apocynaceae*	Shrub
231	*Cyclea peltata*	*Menispermaceae*	Shrub
232	*Dalbergia horrida*	*Fabaceae*	Shrub
233	*Desmodium pulchellum*	*Fabaceae*	Shrub
234	*Desmodium triquetrum*	*Fabaceae*	Shrub
235	*Desmodium umbellatum*	*Fabaceae*	Shrub
236	*Dicoma tomentosa*	*Asteraceae*	Shrub
237	*Dioscorea alata*	*Dioscoreaceae*	Shrub
238	*Dioscorea bulbifera*	*Dioscoreaceae*	Shrub
239	*Dioscorea oppositifolia*	*Dioscoreaceae*	Shrub
240	*Dioscorea pentaphylla*	*Dioscoreaceae*	Shrub
241	*Dioscorea pentaphylla*	*Dioscoreaceae*	Shrub
242	*Diploclisia glaucescens*	*Menispermaceae*	Shrub
243	*Dodonaea viscosa*	*Sapindaceae*	Shrub
244	*Dracaena terniflora*	*Asparagaceae*	Shrub
245	*Elaeagnus conferta*	*Elaeagnaceae*	Shrub
246	*Embelia basaal*	*Primulaceae*	Shrub
247	*Embelia tsjeriam-cottam*	*Primulaceae*	Shrub
248	*Endostemon viscosus*	*Lamiaceae*	Shrub
249	*Entada pusaetha*	*Fabaceae*	Shrub

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250	*Entada scandens*	*Fabaceae*	Shrub
251	*Eranthemum roseum*	*Acanthaceae*	Shrub
252	*Flacourtia indica*	*Saliceceae*	Shrub
253	*Flemingia bracteata*	*Fabaceae*	Shrub
254	*Flemingia macrophylla*	*Fabaceae*	Shrub
255	*Flemingia strobilifera*	*Fabaceae*	Shrub
256	*Glycine pentaphylla*	*Fabaceae*	Shrub
257	*Glycosmis pentaphylla*	*Rutaceae*	Shrub
258	*Gnetum ula*	*Gnetaceae*	Shrub
259	*Gnidia glauca*	*Thymelaeaceae*	Shrub
260	*Grewia abutilifolia*	*Malvaceae*	Shrub
261	*Grewia hirsuta*	*Malvaceae*	Shrub
262	*Grewia lawsoniana*	*Malvaceae*	Shrub
263	*Grewia microcos*	*Malvaceae*	Shrub
264	*Grewia tenax*	*Malvaceae*	Shrub
265	*Grewia tiliifolia var. leptopetala*	*Malvaceae*	Shrub
266	*Gymnema sylvestre*	*Apocynaceae*	Shrub
267	*Helicteres isora*	*Malvaceae*	Shrub
268	*Hemidesmus indicus var. pubescens*	*Apocynaceae*	Shrub
269	*Hemidesmus indicus*	*Apocynaceae*	Shrub
270	*Hibiscus furcatus*	*Malvaceae*	Shrub
271	*Ichnocarpus frutescens*	*Apocynaceae*	Shrub
272	*Indigofera cordifolia*	*Fabaceae*	Shrub
273	*Ipomoea alba*	*Convolvulaceae*	Shrub
274	*Ipomoea aquatica*	*Convolvulaceae*	Shrub
275	*Ipomoea hederifolia*	*Convolvulaceae*	Shrub
276	*Ipomoea nil*	*Convolvulaceae*	Shrub
277	*Ipomoea obscura*	*Convolvulaceae*	Shrub
278	*Ipomoea quamoclit L.*	*Convolvulaceae*	Shrub
279	*Ixora coccinea var.lutea*	*Rubiaceae*	Shrub
280	*Ixora nigricans*	*Rubiaceae*	Shrub
281	*Ixora polyantha*	*Rubiaceae*	Shrub
282	*Jasminum angustifolium*	*Oleaceae*	Shrub
283	*Jasminum flexile*	*Oleaceae*	Shrub
284	*Jasminum malabaricum*	*Oleaceae*	Shrub
285	*Jasminum rottlerianum*	*Oleaceae*	Shrub
286	*Jasminum roxburghianum*	*Oleaceae*	Shrub
287	*Jatropha curcas*	*Euphorbiaceae*	Shrub
288	*Jatropha gossypifolia*	*Euphorbiaceae*	Shrub
289	*Kirganelia reticulata*	*Euphorbiaceae*	Shrub
290	*Leea indica*	*Vitaceae*	Shrub
291	*Lepidagathis cristata*	*Acanthaceae*	Shrub
292	*Luvunga sarmentosa*	*Rutaceae*	Shrub
293	*Maerua oblongifolia*	*Capparaceae*	Shrub

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294	*Maytenus rothiana*	*Celastraceae*	Shrub
295	*Melastoma malabathricum*	*Melastomataceae*	Shrub
296	*Moullava spicata*	*Fabaceae*	Shrub
297	*Mucuna monosperma*	*Fabaceae*	Shrub
298	*Mucuna pruriens*	*Fabaceae*	Shrub
299	*Mundulea sericea*	*Fabaceae*	Shrub
300	*Mussaenda laxa*	*Rubiaceae*	Shrub
301	*Naravelia zeylanica*	*Ranunculaceae*	Shrub
302	*Nyctanthes arbor-tristis*	*Oleaceae*	Shrub
303	*Opuntia stricta var.dillenii*	*Cactaceae*	Shrub
304	*Passiflora foetida*	*Passifloraceae*	Shrub
305	*Pavetta tomentosa*	*Rubiaceae*	Shrub
306	*Pavonia odorata*	*Malvaceae*	Shrub
307	*Pavonia zeylanica*	*Malvaceae*	Shrub
308	*Pergularia daemia*	*Apocynaceae*	Shrub
309	*Piper longum*	*Piperaceae*	Shrub
310	*Piper nigrum .*	*Piperaceae*	Shrub
311	*Piper trioicum*	*Piperaceae*	Shrub
312	*Pogostemon speciosus*	*Lamiaceae*	Shrub
313	*Polygala chinensis*	*Polygalaceae*	Shrub
314	*Prosopis juliflora*	*Fabaceae*	Shrub
315	*Pseudarthria viscida*	*Fabaceae*	Shrub
316	*Psychotria flavida*	*Rubiaceae*	Shrub
317	*Randia rugulosa*	*Rubiaceae*	Shrub
318	*Rauvolfia serpentina*	*Apocynaceae*	Shrub
319	*Rhinacanthus nasutus*	*Acanthaceae*	Shrub
320	*Rhynchosia aurea*	*Fabaceae*	Shrub
321	*Rhynchosia minima var. laxiflora*	*Fabaceae*	Shrub
322	*Rivea hypocrateriformis*	*Convolvulaceae*	Shrub
323	*Scoparia dulcis*	*Plantaginaceae*	Shrub
324	*Scutia myrtina*	*Rhamnaceae*	Shrub
325	*Securinega leucopyrus*	*Phyllanthaceae*	Shrub
326	*Sida acuta*	*Malvaceae*	Shrub
327	*Smilax aspera*	*Smilacaceae*	Shrub
328	*Smilax zeylanica*	*Smilacaceae*	Shrub
329	*Solanum erianthum*	*Solanaceae*	Shrub
330	*Solanum torvum*	*Solanaceae*	Shrub
331	*Spatholobus parviflorus*	*Fabaceae*	Shrub
332	*Strobilanthes asperrimus*	*Acanthaceae*	Shrub
333	*Stylosanthes fruticosa*	*Fabaceae*	Shrub
334	*Tarenna asiatica*	*Rubiaceae*	Shrub
335	*Tephrosia purpurea .*	*Fabaceae*	Shrub
336	*Thespesia lampas*	*Malvaceae*	Shrub
337	*Toddalia asiatica*	*Rutaceae*	Shrub

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338	*Trachyspermum roxburghianum*	*Apiaceae*	Shrub
339	*Triumfetta rhomboidea*	*Asteraceae*	Shrub
340	*Tylophora asthmatica*	*Apocynaceae*	Shrub
341	*Tylophora indica var.glabra*	*Apocynaceae*	Shrub
342	*Tylophora indica*	*Apocynaceae*	Shrub
343	*Urena lobata*	*Malvaceae*	Shrub
344	*Urena lobata ssp.lobata*	*Malvaceae*	Shrub
345	*Urena lobata*	*Malvaceae*	Shrub
346	*Uvaria narum*	*Annonaceae*	Shrub
347	*Ventilago madraspatana*	*Rhamnaceae*	Shrub
348	*Vernonia cinerascens*	*Asteraceae*	Shrub
349	*Vitex negundo*	*Lamiaceae*	Shrub
350	*Waltheria indica*	*Malvaceae*	Shrub
351	*Wattakaka volubilis*	*Apocynaceae*	Shrub
352	*Wendlandia thyrsoidea*	*Rubiaceae*	Shrub
353	*Woodfordia fruticosa*	*Lythraceae*	Shrub
354	*Zanthoxylum ovalifolium*	*Rutaceae*	Shrub
355	*Ziziphus glaberrima*	*Rhamnaceae*	Shrub
356	*Ziziphus oenoplia*	*Rhamnaceae*	Shrub
357	*Ziziphus rugosa*	*Rhamnaceae*	Shrub
358	*Acacia auriculiformis*	*Fabaceae*	Tree
359	*Acacia catechu*	*Fabaceae*	Tree
360	*Acacia chundra*	*Fabaceae*	Tree
361	*Acacia ferruginea*	*Fabaceae*	Tree
362	*Acacia intsia*	*Fabaceae*	Tree
363	*Acacia nilotica ssp.indica*	*Fabaceae*	Tree
364	*Acrocarpus fraxinifolius*	*Fabaceae*	Tree
365	*Actinodaphne angustifolia*	*Lauraceae*	Tree
366	*Adina cordifolia*	*Rubiaceae*	Tree
367	*Aegle marmelos*	*Rutaceae*	Tree
368	*Aglaia elaeagnoidea*	*Meliaceae*	Tree
369	*Ailanthus excelsa*	*Simaroupaceae*	Tree
370	*Alangium salvifolium*	*Cornaceae*	Tree
371	*Albizia amara*	*Fabaceae*	Tree
372	*Albizia lebbeck*	*Fabaceae*	Tree
373	*Albizia odoratissima*	*Fabaceae*	Tree
374	*Albizia procera*	*Fabaceae*	Tree
375	*Allophylus cobbe*	*Sapindaceae*	Tree
376	*Alseodaphne semecarpifolia var. angustifolia*	*Lauraceae*	Tree
377	*Alseodaphne semecarpifolia var. semecarpifolia*	*Lauraceae*	Tree
378	*Alstonia scholaris*	*Apocynaceae*	Tree
379	*Anacardium occidentale*	*Anacardiaceae*	Tree
380	*Annona squamosa*	*Annonaceae*	Tree
381	*Anogeissus latifolia*	*Combretaceae*	Tree

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382	*Aporosa lindleyana*	*Phyllanthaceae*	Tree
383	*Artocarpus hirsutus*	*Moraceae*	Tree
384	*Artocarpus integer*	*Moraceae*	Tree
385	*Artocarpus lacucha*	*Moraceae*	Tree
386	*Atalantia racemosa*	*Rutaceae*	Tree
387	*Azadirachta indica*	*Meliaceae*	Tree
388	*Bauhinia malabarica*	*Fabaceae*	Tree
389	*Bauhinia racemosa*	*Fabaceae*	Tree
390	*Bauhinia variegata*	*Fabaceae*	Tree
391	*Bombax ceiba*	*Bombacaceae*	Tree
392	*Boswellia serrata*	*Burseraceae*	Tree
393	*Bridelia retusa*	*Phyllanthaceae*	Tree
394	*Buchanania axillaris*	*Anacardiaceae*	Tree
395	*Buchanania lanzan*	*Anacardiaceae*	Tree
396	*Butea monosperma*	*Fabaceae*	Tree
397	*Callicarpa tomentosa*	*Lamiaceae*	Tree
398	*Calophyllum apetalum*	*Calophyllaceae*	Tree
399	*Calophyllum tomentosum*	*Calophyllaceae*	Tree
400	*Canthium dicoccum*	*Rubiaceae*	Tree
401	*Carallia brachiata*	*Rhizophoraceae*	Tree
402	*Careya arborea*	*Lecythidaceae*	Tree
403	*Caryota urens*	*Arecaceae*	Tree
404	*Casearia tomentosa*	*Saliceceae*	Tree
405	*Cassia fistula*	*Lauraceae*	Tree
406	*Cassia siamea*	*Lauraceae*	Tree
407	*Cassia timorensis*	*Lauraceae*	Tree
408	*Cassine glauca*	*Celastraceae*	Tree
409	*Cassine paniculata*	*Celastraceae*	Tree
410	*Ceiba pentandra*	*Bombacaceae*	Tree
411	*Chionanthus mala-elengi*	*Oleaceae*	Tree
412	*Chloroxylon swietenia*	*Rutaceae*	Tree
413	*Chukrasia tabularis*	*Meliaceae*	Tree
414	*Cinnamomum malabatrum*	*Lauraceae*	Tree
415	*Cordia wallichii*	*Boraginaceae*	Tree
416	*Dalbergia lanceolaria*	*Fabaceae*	Tree
417	*Dalbergia latifolia*	*Fabaceae*	Tree
418	*Dalbergia paniculata*	*Fabaceae*	Tree
419	*Dalbergia sissoides*	*Fabaceae*	Tree
420	*Dalbergia sissoo*	*Fabaceae*	Tree
421	*Dillenia indica*	*Dilleniaceae*	Tree
422	*Dillenia pentagyna*	*Dilleniaceae*	Tree
423	*Diospyros affinis*	*Ebenaceae*	Tree
424	*Diospyros angustifolia*	*Ebenaceae*	Tree
425	*Diospyros candolleana*	*Ebenaceae*	Tree

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426	*Diospyros ebenum*	*Ebenaceae*	Tree
427	*Diospyros melanoxylon*	*Ebenaceae*	Tree
428	*Diospyros montana*	*Ebenaceae*	Tree
429	*Diospyros saldanhae*	*Ebenaceae*	Tree
430	*Dolichandrone atrovirens*	*Bignoniaceae*	Tree
431	*Dolichandrone falcata*	*Bignoniaceae*	Tree
432	*Elaeocarpus serratus*	*Elaeocarpaceae*	Tree
433	*Elaeocarpus tuberculatus*	*Elaeocarpaceae*	Tree
434	*Erythrina stricta*	*Fabaceae*	Tree
435	*Erythrina variegata var. orientalis*	*Fabaceae*	Tree
436	*Euodia lunu-akenda*	*Rutaceae*	Tree
437	*Ficus amplissima J.E.Smith*	*Moraceae*	Tree
438	*Ficus arnottiana (Miq.) Miq.*	*Moraceae*	Tree
439	*Ficus benghalensis L.*	*Moraceae*	Tree
440	*Ficus hispida L.f.*	*Moraceae*	Tree
441	*Ficus microcarpa L.f.*	*Moraceae*	Tree
442	*Ficus racemosa L.*	*Moraceae*	Tree
443	*Ficus religiosa L.*	*Moraceae*	Tree
444	*Ficus tinctoria ssp. parasitica*	*Moraceae*	Tree
445	*Ficus tsjahela*	*Moraceae*	Tree
446	*Flacourtia latifolia*	*Saliceceae*	Tree
447	*Flacourtia montana*	*Saliceceae*	Tree
448	*Garcinia gummi-gutta*	*Clusiaceae*	Tree
449	*Garcinia indica*	*Clusiaceae*	Tree
450	*Garcinia morella*	*Clusiaceae*	Tree
451	*Garcinia talbotii*	*Clusiaceae*	Tree
452	*Gardenia gummifera*	*Rubiaceae*	Tree
453	*Gardenia latifolia*	*Rubiaceae*	Tree
454	*Glochidion ellipticum*	*Phyllanthaceae*	Tree
455	*Glochidion johnstonei*	*Phyllanthaceae*	Tree
456	*Gmelina arborea*	*Lamiaceae*	Tree
457	*Grewia tiliifolia var. tiliifolia*	*Malvaceae*	Tree
458	*Grewia tiliifolia*	*Malvaceae*	Tree
459	*Haldina cordifolia*	*Rubiaceae*	Tree
460	*Hardwickia binata*	*Fabaceae*	Tree
461	*Holarrhena antidysenterica*	*Apocynaceae*	Tree
462	*Holarrhena pubescens*	*Apocynaceae*	Tree
463	*Holigarna arnottiana*	*Anacardiaceae*	Tree
464	*Holigarna grahamii*	*Anacardiaceae*	Tree
465	*Holoptelea integrifolia*	*Ulmaceae*	Tree
466	*Hopea ponga var. cauveriana*	*Dipterocarpaceae*	Tree
467	*Hydnocarpus pentandrus*	*Achariaceae*	Tree
468	*Hymenodictyon obovatum*	*Rubiaceae*	Tree
469	*Ixora arborea*	*Rubiaceae*	Tree

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470	*Ixora brachiata*	*Rubiaceae*	Tree
471	*Ixora parviflora*	*Rubiaceae*	Tree
472	*Ixora pavetta*	*Rubiaceae*	Tree
473	*Kingiodendron pinnatum*	*Fabaceae*	Tree
474	*Kydia calycina*	*Malvaceae*	Tree
475	*Lagerstroemia lanceolata*	*Lythraceae*	Tree
476	*Lagerstroemia parviflora*	*Lythraceae*	Tree
477	*Lannea coromandelica*	*Anacardiaceae*	Tree
478	*Limonia acidissima*	*Rutaceae*	Tree
479	*Limonia crenulata*	*Rutaceae*	Tree
480	*Litsea deccanensis*	*Lauraceae*	Tree
481	*Litsea ghatica*	*Lauraceae*	Tree
482	*Lophopetalum wightianum*	*Celastraceae*	Tree
483	*Macaranga indica*	*Euphorbiaceae*	Tree
484	*Macaranga peltata*	*Euphorbiaceae*	Tree
485	*Madhuca insignis*	*Sapotaceae*	Tree
486	*Madhuca longifolia var.latifolia*	*Sapotaceae*	Tree
487	*Madhuca longifolia*	*Sapotaceae*	Tree
488	*Madhuca longifolia*	*Sapotaceae*	Tree
489	*Madhuca neriifolia*	*Sapotaceae*	Tree
490	*Maesa indica*	*Myrsinaceae*	Tree
491	*Mallotus philippensis*	*Euphorbiaceae*	Tree
492	*Mallotus philippensis*	*Euphorbiaceae*	Tree
493	*Mammea suriga*	*Calophyllaceae*	Tree
494	*Mangifera indica*	*Anacardiaceae*	Tree
495	*Maytenus emarginata*	*Anacardiaceae*	Tree
496	*Melia azedarach*	*Meliaceae*	Tree
497	*Melia dubia*	*Meliaceae*	Tree
498	*Memecylon umbellatum*	*Melastomataceae*	Tree
499	*Mimusops elengi*	*Sapotaceae*	Tree
500	*Mitragyna parviflora*	*Rubiaceae*	Tree
501	*Morinda citrifolia*	*Rubiaceae*	Tree
502	*Morinda tomentosa*	*Rubiaceae*	Tree
503	*Murraya koenigii*	*Rutaceae*	Tree
504	*Murraya paniculata*	*Rutaceae*	Tree
505	*Myristica malabarica*	*Myristicaceae*	Tree
506	*Naringi crenulata*	*Rutaceae*	Tree
507	*Neolitsea zeylanica*	*Lauraceae*	Tree
508	*Nothapodytes nimmoniana*	*Icacinaceae*	Tree
509	*Nothopegia beddomei*	*Anacardiaceae*	Tree
510	*Nothopegia racemosa*	*Anacardiaceae*	Tree
511	*Nothopegia travancorica*	*Anacardiaceae*	Tree
512	*Olea dioica*	*Oleaceae*	Tree
513	*Pavetta indica*	*Rubiaceae*	Tree

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514	*Persea macrantha*	*Lauraceae*	Tree
515	*Phoenix sylvestris*	*Arecaceae*	Tree
516	*Phyllanthus emblica*	*Phyllanthaceae*	Tree
517	*Polyalthia longifolia*	*Annonaceae*	Tree
518	*Pongamia pinnata*	*Fabaceae*	Tree
519	*Psidium guajava*	*Myrtaceae*	Tree
520	*Psydrax dicoccos*	*Rubiaceae*	Tree
521	*Pterocarpus marsupium*	*Fabaceae*	Tree
522	*Pterospermum acerifolium*	*Malvaceae*	Tree
523	*Pterospermum heyneanum*	*Malvaceae*	Tree
524	*Pterospermum xylocaprum*	*Malvaceae*	Tree
525	*Radermachera xylocarpa*	*Bignoniaceae*	Tree
526	*Randia candolleana*	*Rubiaceae*	Tree
527	*Sabal blackburniana*	*Arecaceae*	Tree
528	*Santalum album*	*Santalaceae*	Tree
529	*Sapindus emarginatus*	*Sapindaceae*	Tree
530	*Saraca asoca*	*Fabaceae*	Tree
531	*Schefflera actinophylla*	*Araliaceae*	Tree
532	*Schefflera wallichiana*	*Araliaceae*	Tree
533	*Schleichera oleosa*	*Sapindaceae*	Tree
534	*Semecarpus anacardium*	*Anacardiaceae*	Tree
535	*Simarouba amara*	*Simaroubaceae*	Tree
536	*Simarouba glauca*	*Simaroubaceae*	Tree
537	*Soymida febrifuga*	*Meliaceae*	Tree
538	*Spathodea campanulata*	*Bignoniaceae*	Tree
539	*Spondias pinnata*	*Anacardiaceae*	Tree
540	*Sterculia campanulata*	*Malvaceae*	Tree
541	*Sterculia guttata*	*Malvaceae*	Tree
542	*Sterculia urens*	*Malvaceae*	Tree
543	*Stereospermum chelonoides*	*Bignoniaceae*	Tree
544	*Streblus asper*	*Moraceae*	Tree
545	*Strychnos nux-vomica*	*Loganiaceae*	Tree
546	*Strychnos potatorum*	*Loganiaceae*	Tree
547	*Swietenia mahogoni*	*Meliaceae*	Tree
548	*Symplocos racemosa*	*Symplocaceae*	Tree
549	*Syzygium caryophyllatum*	*Myrtaceae*	Tree
550	*Syzygium cumini*	*Myrtaceae*	Tree
551	*Syzygium salicifolium*	*Myrtaceae*	Tree
552	*Tabernaemontana alternifolia*	*Apocynaceae*	Tree
553	*Tabernaemontana dichotoma*	*Apocynaceae*	Tree
554	*Tamarindus indica*	*Fabaceae*	Tree
555	*Tamilnadia uliginosa*	*Rubiaceae*	Tree
556	*Tectona grandis*	*Lamiaceae*	Tree
557	*Terminalia alata*	*Combretaceae*	Tree

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558	*Terminalia arjuna*	*Combretaceae*	Tree
559	*Terminalia bellirica*	*Combretaceae*	Tree
560	*Terminalia chebula*	*Combretaceae*	Tree
561	*Terminalia pallida*	*Combretaceae*	Tree
562	*Terminalia paniculata*	*Combretaceae*	Tree
563	*Terminalia tomentosa*	*Combretaceae*	Tree
564	*Toona ciliata*	*Meliaceae*	Tree
565	*Trema orientalis*	*Cannabaceae*	Tree
566	*Vateria indica*	*Dipterocarpaceae*	Tree
567	*Vitex altissima*	*Lamiaceae*	Tree
568	*Wrightia arborea*	*Apocynaceae*	Tree
569	*Wrightia tinctoria var. rothii*	*Apocynaceae*	Tree
570	*Wrightia tinctoria*	*Apocynaceae*	Tree
571	*Wrightia tinctoria*	*Apocynaceae*	Tree
572	*Xantolis tomentosa*	*Sapotaceae*	Tree
573	*Ximenia americana*	*Olacaceae*	Tree
574	*Xylia xylocarpa*	*Fabaceae*	Tree
575	*Ziziphus horrida*	*Rhamnaceae*	Tree
576	*Ziziphus jujuba*	*Rhamnaceae*	Tree
577	*Ziziphus mauritiana*	*Rhamnaceae*	Tree
578	*Ziziphus mauritiana*	*Rhamnaceae*	Tree

Development of species-based data system

Current survey had steamed up in the establishment of a database for the medicinal plants/others of Karnataka linking all species with precise locations in the forests. The system will help to enter and process the data generated through transects surveys for assessing the population of medicinal plants/others at various levels. The system integrates data on the species such as botanical name, local name, family, number of individuals, girth, class of trees, regeneration, and location details of Beat, Range and FD obtained through the field survey as per the designed Formats. Advantages/characters of the user-friendly data managing system are as follows.

a) Rapid and easy input or output of desired/required data and work as a multi-user system.

b) Collected information on the plants has entered into various levels, such as Division, Range, Section, and Beat along with scientific name, vernacular name, family, uses, and a number of individuals.

c) Scientific name, local name, and family of the plants are preloaded as a drop box for user friendly manner for adding the appropriate choice.

d) The database provides a recording of the GPS readings for each of subplots in the transect lines and the transit line itself.

e) The data can be merged and processed from Beat level up to the State level (Beats to Section to Range, Division to Circle, and to the State).

Estimation of Population of Tree Species

Analysis has resulted in the assessment of a number of specific species belong to 578 plants. Plants are accessible according to their habit. An estimation of 221 tree species is provided in (Table 4-6).

Enumeration of species across Beats.

The location wise distribution of species is also projected through survey of 109 beats of Belagavi FD. Number of plants documented from each beat is presented according to their habit as shown in (Table 7). This will help in beatwise management of biodiversity. There are common species found in the beats.

Assessment of species in Beats.

According to survey of plants in 109 beats belongs to 9 ranges of Belagavi Forest Division, a total of 7691 plants were recorded and the data comprised of 3688 trees, 2741 shrubs and 1262 herbs. Analysis revealed the presence of maximum 142 plants like trees (72), shrubs (49) and 21 herbs from Chigule beat followed Kakti beat by with 129 species includes 63 trees, 47 shrubs and 19 herbs. Veernabhavi beat reported the presence of 117 plants which includes 62 trees, 37 shrubs and 18 herbs followed by Talawadi (60 trees, 43 shrubs and 12 herbs) and Nagargali beat (50 trees, 42 shrubs and 23 herbs) with 115 plants includes. Bharamanahatti beat was recorded with 114 plants including 53 trees, 44 shrubs and 17 herbs, followed by beat with 113 plants (50

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trees, 40 shrubs and 14 herbs) and Chorala beat with 112 plants (61 trees, 40 shrubs and 11 herbs). Bijagarni and Nandagad beat revealed the presence of 111 species including 44 trees, 49 shrubs and 18 herbs and 47 trees, 44 shrubs and 20 herbs respectively, whereas Kakkeri beat consists of 110 species having 39 trees, 43 shrubs and 28 herbs closely followed by Merada beat consists of 108 species having 43 trees, 46 shrubs and 19 herbs and also Nandi beat reported 107 plants among which 53 trees, 33 shrubs and 21 herbs (Graphs 3-5). Kanakumbi beat consists of 106 plants includes 53 trees, 44 shrubs and 9 herbs immediately followed by Daddi beat (49 trees, 32 shrubs and 42 herbs) recorded 105 plants. Deshnur (W) beat (104) consists 54 trees, shrubs and 22 herbs and Guthgundi beat (103) reported with 50 trees, shrubs and 24 herbs. Nersa beat comprises of 101 plants, including 52 trees, 41 shrubs and 8 herbs, Chinchewadi beat (49 trees, 41 shrubs and 10 herbs) with 100 plants. Jamboti-W beat (51 trees, 35 shrubs and 12 herbs) comprises of 98 plants, whereas Godihal beat comprised of 96 plants (46 trees, 32 shrubs and 18 herbs). Mohishat and Halaga beat consists of 93 plants each and Dhamane_(East), Ukkad and Devarai recorded with 92 plants each. The beats Golihalli and Sonarwadi compresed of 90 plants each followed by Kirpoli beat found with 89 plants (38 trees, 36 shrubs and 15 herbs).

Table 4: Estimated Population of Tree Species.

Sl. No.	Species	Habit	Percentage (%)
1	*Acacia auriculiformis*	Tree	0.215
2	*Acacia catechu*	Tree	0.002
3	*Acacia chundra*	Tree	0.313
4	*Acacia ferruginea*	Tree	0.001
5	*Acacia intsia*	Tree	0
6	*Acacia nilotica ssp. indica*	Tree	0.008
7	*Acrocarpus fraxinifolius*	Tree	0.008
8	*Actinodaphne angustifolia*	Tree	0.002
9	*Adina cordifolia*	Tree	0.113
10	*Aegle marmelos*	Tree	0.169
11	*Aglaia elaeagnoidea*	Tree	0.092
12	*Ailanthus excelsa*	Tree	0.009
13	*Alangium salviifolium ssp. salviifolium*	Tree	0.046
14	*Albizia amara*	Tree	0.32
15	*Albizia lebbeck*	Tree	0.036
16	*Albizia odoratissima*	Tree	0.037
17	*Albizia procera*	Tree	0.211
18	*Allophylus cobbe.*	Tree	0.246
19	*Alseodaphne semecarpifolia var. angustifolia*	Tree	0.326
20	*Alseodaphne semecarpifolia var. semecarpifolia*	Tree	0.004
21	*Alstonia scholaris*	Tree	0.005
22	*Anacardium occidentale*	Tree	0.027
23	*Annona squamosa*	Tree	0.08
24	*Anogeissus latifolia*	Tree	6.39
25	*Aporosa lindleyana*	Tree	1.63
26	*Artocarpus hirsutus*	Tree	0.005
27	*Artocarpus integer*	Tree	0.009
28	*Artocarpus lacucha*	Tree	0.003
29	*Atalantia racemosa*	Tree	0.002
30	*Azadirachta indica*	Tree	0.224
31	*Bauhinia malabarica*	Tree	0.143

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32	*Bauhinia racemosa*	Tree	0.036
33	*Bauhinia variegata*	Tree	0.047
34	*Bombax ceiba*	Tree	0.119
35	*Boswellia serrata*	Tree	0.046
36	*Bridelia retusa*	Tree	0.593
37	*Buchanania axillaris*	Tree	0.025
38	*Buchanania lanzan*	Tree	1.858
39	*Butea monosperma*	Tree	1.221
40	*Callicarpa tomentosa*	Tree	0.028
41	*Calophyllum apetalum*	Tree	0.005
42	*Calophyllum tomentosum*	Tree	0.004
43	*Canthium dicoccum var. dicoccum*	Tree	0.58
44	*Carallia brachiata*	Tree	0.297
45	*Careya arborea*	Tree	5.019
46	*Caryota urens*	Tree	0.107
47	*Casearia tomentosa*	Tree	0.16
48	*Cassia fistula*	Tree	0.845
49	*Cassia siamea*	Tree	0.189
50	*Cassia timorensis*	Tree	0.006
51	*Cassine glauca*	Tree	0.049
52	*Cassine paniculata*	Tree	0.111
53	*Ceiba pentandra*	Tree	0.004
54	*Chionanthus mala-elengi*	Tree	0.028
55	*Chloroxylon swietenia*	Tree	5.935
56	*Chukrasia tabularis var. tabularis*	Tree	0.01
57	*Cinnamomum malabatrum*	Tree	0.001
58	*Cordia wallichii*	Tree	0.025
59	*Dalbergia lanceolaria*	Tree	0.051
60	*Dalbergia latifolia*	Tree	1.168
61	*Dalbergia paniculata*	Tree	0.779
62	*Dalbergia sissoides*	Tree	0.02
63	*Dalbergia sissoo*	Tree	0
64	*Dillenia indica*	Tree	0.003
65	*Dillenia pentagyna*	Tree	0.937
66	*Diospyros affinis*	Tree	0.042
67	*Diospyros angustifolia*	Tree	0.478
68	*Diospyros candolleana*	Tree	0.692
69	*Diospyros ebenum*	Tree	0.001
70	*Diospyros melanoxylon*	Tree	2.476
71	*Diospyros montana*	Tree	0.832
72	*Diospyros saldanhae*	Tree	0.082
73	*Dolichandrone atrovirens*	Tree	0.683
74	*Dolichandrone falcata*	Tree	0.033
75	*Elaeocarpus serratus*	Tree	0.059

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76	*Elaeocarpus tuberculatus*	Tree	0.004
77	*Erythrina stricta*	Tree	0.022
78	*Erythrina variegata var. orientalis*	Tree	0.021
79	*Euodia lunu-akenda*	Tree	0.02
80	*Ficus amplissima*	Tree	0.047
81	*Ficus arnottiana*	Tree	0.021
82	*Ficus benghalensis*	Tree	0.009
83	*Ficus hispida*	Tree	0.044
84	*Ficus microcarpa*	Tree	0.004
85	*Ficus racemosa*	Tree	0.184
86	*Ficus religiosa*	Tree	0.002
87	*Ficus tinctoria ssp. parasitica*	Tree	0.001
88	*Ficus tsjahela*	Tree	0.021
89	*Flacourtia latifolia*	Tree	0.011
90	*Flacourtia montana*	Tree	0.187
91	*Garcinia gummi-gutta*	Tree	0.099
92	*Garcinia indica*	Tree	0.037
93	*Garcinia morella*	Tree	0.005
94	*Garcinia talbotii*	Tree	0.003
95	*Gardenia gummifera*	Tree	1.325
96	*Gardenia latifolia*	Tree	1.05
97	*Glochidion ellipticum*	Tree	0.326
98	*Glochidion johnstonei*	Tree	0.009
99	*Gmelina arborea*	Tree	0.075
100	*Grewia tiliifolia var. tiliifolia*	Tree	0.767
101	*Grewia tiliifolia Vahl*	Tree	0.498
102	*Haldina cordifolia*	Tree	0.009
103	*Hardwickia binata*	Tree	0.115
104	*Holarrhena antidysenterica*	Tree	2.457
105	*Holarrhena pubescens*	Tree	0.006
106	*Holigarna arnottiana*	Tree	0.122
107	*Holigarna grahamii*	Tree	0.671
108	*Holoptelea integrifolia*	Tree	0.288
109	*Hopea ponga var. cauveriana*	Tree	0.007
110	*Hydnocarpus pentandrus*	Tree	0.002
111	*Hymenodictyon obovatum*	Tree	0.045
112	*Ixora arborea*	Tree	0.686
113	*Ixora brachiata*	Tree	0.262
114	*Ixora parviflora*	Tree	0.004
115	*Ixora pavetta*	Tree	0
116	*Kingiodendron pinnatum*	Tree	0.004
117	*Kydia calycina*	Tree	0.135
118	*Lagerstroemia lanceolata*	Tree	2.499

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119	*Lagerstroemia parviflora*	Tree	2.536
120	*Lannea coromandelica*	Tree	0.176
121	*Limonia acidissima*	Tree	0.001
122	*Limonia crenulata*	Tree	0.001
123	*Litsea deccanensis*	Tree	0.01
124	*Litsea ghatica*	Tree	0.325
125	*Lophopetalum wightianum*	Tree	0.003
126	*Macaranga indica*	Tree	0.006
127	*Macaranga peltata*	Tree	1.592
128	*Madhuca insignis*	Tree	0.06
129	*Madhuca longifolia var. latifolia*	Tree	0.217
130	*Madhuca longifolia var. longifolia*	Tree	0.085
131	*Madhuca longifolia*	Tree	0.048
132	*Madhuca neriifolia*	Tree	0.006
133	*Maesa indica*	Tree	0.047
134	*Mallotus philippensis var. philippensis*	Tree	1.942
135	*Mallotus philippensis*	Tree	0.188
136	*Mammea suriga*	Tree	0
137	*Mangifera indica*	Tree	0.344
138	*Maytenus emarginata*	Tree	1.323
139	*Melia azedarach*	Tree	0.012
140	*Melia dubia*	Tree	0.004
141	*Memecylon umbellatum*	Tree	1.735
142	*Mimusops elengi*	Tree	0.14
143	*Mitragyna parviflora*	Tree	0.192
144	*Morinda citrifolia*	Tree	0.222
145	*Morinda tomentosa*	Tree	0.13
146	*Murraya koenigii*	Tree	0.252
147	*Murraya paniculata*	Tree	0.142
148	*Myristica malabarica*	Tree	0.005
149	*Naringi crenulata*	Tree	0.022
150	*Neolitsea zeylanica*	Tree	0.337
151	*Nothapodytes nimmoniana*	Tree	0.332
152	*Nothopegia beddomei*	Tree	0.003
153	*Nothopegia racemosa*	Tree	0.571
154	*Nothopegia travancorica*	Tree	0.095
155	*Olea dioica*	Tree	2.167
156	*Pavetta indica*	Tree	0.013
157	*Persea macrantha*	Tree	0.095
158	*Phoenix sylvestris*	Tree	0.036
159	*Phyllanthus emblica*	Tree	1.214
160	*Polyalthia longifolia*	Tree	0.001
161	*Pongamia pinnata*	Tree	0.39
162	*Psidium guajava*	Tree	0.002

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163	*Psydrax dicoccos*	Tree	0.008
164	*Pterocarpus marsupium*	Tree	0.603
165	*Pterospermum acerifolium*	Tree	0.007
166	*Pterospermum heyneanum*	Tree	0.01
167	*Pterospermum xylocaprum*	Tree	0.004
168	*Radermachera xylocarpa*	Tree	0.014
169	*Randia candolleana*	Tree	0.354
170	*Sabal blackburniana*	Tree	0.003
171	*Santalum album*	Tree	0.048
172	*Sapindus emarginatus*	Tree	0.026
173	*Saraca asoca*	Tree	0.007
174	*Schefflera actinophylla*	Tree	0.025
175	*Schefflera wallichiana*	Tree	0.005
176	*Schleichera oleosa*	Tree	0.49
177	*Semecarpus anacardium*	Tree	0.176
178	*Simarouba amara*	Tree	0.005
179	*Simarouba glauca*	Tree	0.171
180	*Soymida febrifuga*	Tree	0.454
181	*Spathodea campanulata*	Tree	0
182	*Spondias pinnata*	Tree	0.021
183	*Sterculia campanulata*	Tree	0.002
184	*Sterculia guttata*	Tree	0.072
185	*Sterculia urens*	Tree	0.021
186	*Stereospermum chelonoides*	Tree	0.485
187	*Streblus asper*	Tree	0
188	*Strychnos nux-vomica*	Tree	0.005
189	*Strychnos potatorum*	Tree	0.653
190	*Swietenia mahogoni*	Tree	0.016
191	*Symplocos racemosa*	Tree	1.47
192	*Syzygium caryophyllatum*	Tree	0.018
193	*Syzygium cumini*	Tree	2.693
194	*Syzygium salicifolium*	Tree	0.048
195	*Tabernaemontana alternifolia*	Tree	0.498
196	*Tabernaemontana dichotoma*	Tree	0.011
197	*Tamarindus indica*	Tree	0.045
198	*Tamilnadia uliginosa*	Tree	0.002
199	*Tectona grandis*	Tree	0.074
200	*Terminalia alata*	Tree	0.008
201	*Terminalia arjuna*	Tree	0.002
202	*Terminalia bellirica*	Tree	0.882
203	*Terminalia chebula*	Tree	0.436
204	*Terminalia pallida*	Tree	0.037
205	*Terminalia paniculata*	Tree	8.882
206	*Terminalia tomentosa*	Tree	9.476

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207	*Toona ciliata*	Tree	0.008
208	*Trema orientalis*	Tree	0.02
209	*Vateria indica*	Tree	0.001
210	*Vitex altissima var. altissima*	Tree	0.102
211	*Wrightia arborea*	Tree	0.038
212	*Wrightia tinctoria var. rothii*	Tree	0.234
213	*Wrightia tinctoria var. tinctoria*	Tree	0.177
214	*Wrightia tinctoria*	Tree	0.175
215	*Xantolis tomentosa*	Tree	0.001
216	*Ximenia americana*	Tree	0.243
217	*Xylia xylocarpa*	Tree	5.17
218	*Ziziphus horrida*	Tree	0.036
219	*Ziziphus jujuba*	Tree	0.021
220	*Ziziphus mauritiana var. muratiana*	Tree	0.018
221	*Ziziphus mauritiana*	Tree	0.002

Table 5: Estimated Population of Shrub Species.

Sl. No.	Species	Habit	Percentage (%)
1	*Abelmoschus angulosus*	Shrub	0.001
2	*Abrus precatorius*	Shrub	0.005
3	*Abutilon indicum*	Shrub	0.006
4	*Acacia concinna*	Shrub	0.001
5	*Acacia torta*	Shrub	2.439
6	*Agave americana*	Shrub	0.073
7	*Allophylus cominia*	Shrub	0.23
8	*Allophylus concanicus*	Shrub	0.008
9	*Ampelocissus indica*	Shrub	0.012
10	*Ancistrocladus heyneanus*	Shrub	0.097
11	*Anisomeles malabarica*	Shrub	0.012
12	*Ardisia solanacea*	Shrub	0.195
13	*Argyreia cuneata*	Shrub	0.127
14	*Argyreia cymosa*	Shrub	0.002
15	*Argyreia elliptica*	Shrub	0.109
16	*Argyreia nervosa*	Shrub	0.191
17	*Argyreia pilosa*	Shrub	0.077
18	*Aristolochia indica*	Shrub	0.168
19	*Aristolochia tagala*	Shrub	0.013
20	*Asparagus racemosus var. javanicus*	Shrub	0.243
21	*Asparagus racemosus var. racemosus*	Shrub	0.108
22	*Atalantia wightii*	Shrub	0.012
23	*Atylosia albicans*	Shrub	0.039
24	*Atylosia scarabaeoides*	Shrub	0.075
25	*Barleria cristata*	Shrub	0.002
26	*Breynia nivosa var. purpurea*	Shrub	0.004

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27	*Breynia retusa*	Shrub	0.108
28	*Breynia vitis-idaea*	Shrub	1.063
29	*Bridelia scandens*	Shrub	0.13
30	*Bridelia stipularis*	Shrub	0.856
31	*Caesalpinia bonduc*	Shrub	0.122
32	*Caesalpinia mimosoides*	Shrub	0.254
33	*Calycopteris floribunda*	Shrub	0.483
34	*Cansjera rheedei*	Shrub	0.008
35	*Canthium angustifolium*	Shrub	0.421
36	*Canthium coromandelicum*	Shrub	0.084
37	*Canthium indicum*	Shrub	0.062
38	*Canthium parviflorum*	Shrub	5.127
39	*Carissa carandas*	Shrub	3.414
40	*Carissa spinarum*	Shrub	0.022
41	*Cassia alata*	Shrub	0.013
42	*Cassia auriculata*	Shrub	0.679
43	*Cassia hirsuta*	Shrub	0.001
44	*Cassia sericea*	Shrub	0.096
45	*Cassia tomentosa*	Shrub	0.017
46	*Catunaregam rugulosa*	Shrub	1.379
47	*Catunaregam spinosa*	Shrub	9.218
48	*Celastrus paniculatus*	Shrub	0.443
49	*Cipadessa baccifera*	Shrub	1.133
50	*Cissampelos pareira var. hirsuta*	Shrub	0.004
51	*Cissus discolor*	Shrub	0.023
52	*Cissus pallida*	Shrub	0.049
53	*Cissus vitiginea*	Shrub	0.008
54	*Clematis gouriana*	Shrub	0.017
55	*Clematis hedysarifolia*	Shrub	0.191
56	*Clematis triloba*	Shrub	0.021
57	*Clerodendrum calamitosum*	Shrub	0.101
58	*Clerodendrum infortunatum*	Shrub	1.093
59	*Clerodendrum serratum var. dentatum*	Shrub	0.095
60	*Clerodendrum serratum var. serratum*	Shrub	0.809
61	*Clerodendrum serratum*	Shrub	0.003
62	*Clerodendrum viscosum*	Shrub	5.851
63	*Coccinia grandis*	Shrub	0.01
64	*Cocculus hirsutus*	Shrub	0.62
65	*Colebrookea oppositifolia*	Shrub	0.076
66	*Connarus wightii*	Shrub	0.014
67	*Coscinium fenestratum*	Shrub	0.01
68	*Crotalaria juncea*	Shrub	0.041
69	*Crotalaria prostrata*	Shrub	0.117

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70	*Cryptolepis buchananii*	Shrub	0.27
71	*Cryptolepis grandiflora*	Shrub	0.001
72	*Cyclea peltata*	Shrub	2.884
73	*Dalbergia horrida*	Shrub	0.173
74	*Desmodium pulchellum*	Shrub	0.284
75	*Desmodium triquetrum*	Shrub	0.193
76	*Desmodium umbellatum*	Shrub	0.109
77	*Dicoma tomentosa*	Shrub	0.567
78	*Dioscorea alata*	Shrub	0.08
79	*Dioscorea bulbifera*	Shrub	0.009
80	*Dioscorea oppositifolia*	Shrub	0.551
81	*Dioscorea pentaphylla var. pentaphylla*	Shrub	0.312
82	*Dioscorea pentaphylla*	Shrub	0.02
83	*Diploclisia glaucescens*	Shrub	0.746
84	*Dodonaea viscosa*	Shrub	3.274
85	*Dracaena terniflora*	Shrub	0.056
86	*Elaeagnus conferta*	Shrub	0.171
87	*Embelia basaal*	Shrub	0.009
88	*Embelia tsjeriam-cottam*	Shrub	2.243
89	*Endostemon viscosus*	Shrub	0.032
90	*Entada pusaetha*	Shrub	0.005
91	*Entada scandens*	Shrub	0.03
92	*Eranthemum roseum*	Shrub	1.686
93	*Flacourtia indica*	Shrub	0.19
94	*Flemingia bracteata*	Shrub	0.023
95	*Flemingia macrophylla*	Shrub	0.23
96	*Flemingia strobilifera*	Shrub	4.283
97	*Glycine pentaphylla*	Shrub	0.012
98	*Glycosmis pentaphylla*	Shrub	1.402
99	*Gnetum ula*	Shrub	0.219
100	*Gnidia glauca*	Shrub	3.285
101	*Grewia abutilifolia*	Shrub	0.056
102	*Grewia hirsuta*	Shrub	0.191
103	*Grewia lawsoniana*	Shrub	0.002
104	*Grewia microcos*	Shrub	2.645
105	*Grewia tenax*	Shrub	0.056
106	*Grewia tiliifolia var. leptopetala*	Shrub	0.038
107	*Gymnema sylvestre*	Shrub	0.151
108	*Helicteres isora*	Shrub	0.758
109	*Hemidesmus indicus var. pubescens*	Shrub	4.898
110	*Hemidesmus indicus*	Shrub	0.034
111	*Hibiscus furcatus*	Shrub	0.043
112	*Ichnocarpus frutescens*	Shrub	0.709

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113	*Indigofera cordifolia*	Shrub	0.028
114	*Ipomoea alba*	Shrub	0.006
115	*Ipomoea aquatica*	Shrub	0.008
116	*Ipomoea hederifolia*	Shrub	0.004
117	*Ipomoea nil*	Shrub	0.006
118	*Ipomoea obscura*	Shrub	0.006
119	*Ipomoea quamoclit*	Shrub	0.005
120	*Ixora coccinea var. lutea*	Shrub	0.014
121	*Ixora nigricans*	Shrub	0.357
122	*Ixora polyantha*	Shrub	0.007
123	*Jasminum angustifolium*	Shrub	0.005
124	*Jasminum flexile*	Shrub	0.008
125	*Jasminum malabaricum*	Shrub	1.307
126	*Jasminum rottlerianum*	Shrub	0.009
127	*Jasminum roxburghianum*	Shrub	1.189
128	*Jatropha curcas*	Shrub	0.004
129	*Jatropha gossypifolia*	Shrub	0.11
130	*Kirganelia reticulata*	Shrub	0.011
131	*Leea indica*	Shrub	4.137
132	*Lepidagathis cristata*	Shrub	1.275
133	*Luvunga sarmentosa*	Shrub	0.057
134	*Maerua oblongifolia*	Shrub	0.002
135	*Maytenus rothiana*	Shrub	0.449
136	*Melastoma malabathricum*	Shrub	0.064
137	*Moullava spicata*	Shrub	0.757
138	*Mucuna monosperma*	Shrub	0.021
139	*Mucuna pruriens*	Shrub	0.02
140	*Mundulea sericea*	Shrub	0.196
141	*Mussaenda laxa*	Shrub	0.038
142	*Naravelia zeylanica*	Shrub	0.295
143	*Nyctanthes arbor-tristis*	Shrub	0.012
144	*Opuntia stricta var. dillenii*	Shrub	0.083
145	*Passiflora foetida*	Shrub	0.009
146	*Pavetta tomentosa*	Shrub	0.151
147	*Pavonia odorata*	Shrub	0.228
148	*Pavonia zeylanica*	Shrub	0.02
149	*Pergularia daemia*	Shrub	0.021
150	*Piper longum*	Shrub	0.003
151	*Piper nigrum*	Shrub	0.107
152	*Piper trioicum*	Shrub	2.027
153	*Pogostemon speciosus*	Shrub	0.022
154	*Polygala chinensis*	Shrub	0.001
155	*Prosopis juliflora*	Shrub	0.013

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156	*Pseudarthria viscida*	Shrub	0.763
157	*Psychotria flavida*	Shrub	0.142
158	*Randia rugulosa*	Shrub	0.151
159	*Rauvolfia serpentina*	Shrub	0.001
160	*Rhinacanthus nasutus*	Shrub	0.514
161	*Rhynchosia aurea*	Shrub	0.003
162	*Rhynchosia minima var. laxiflora*	Shrub	0.008
163	*Rivea hypocrateriformis*	Shrub	0.008
164	*Scoparia dulcis*	Shrub	0.012
165	*Scutia myrtina*	Shrub	0.598
166	*Securinega leucopyrus*	Shrub	0.741
167	*Sida acuta*	Shrub	0.329
168	*Smilax aspera*	Shrub	0.011
169	*Smilax zeylanica*	Shrub	3.541
170	*Solanum erianthum*	Shrub	0.035
171	*Solanum torvum*	Shrub	0.065
172	*Spatholobus parviflorus*	Shrub	0.018
173	*Strobilanthes asperrimus*	Shrub	0.024
174	*Stylosanthes fruticosa*	Shrub	0.773
175	*Tarenna asiatica*	Shrub	0.004
176	*Tephrosia purpurea*	Shrub	0.166
177	*Thespesia lampas*	Shrub	0.055
178	*Toddalia asiatica var. asiatica*	Shrub	0.146
179	*Trachyspermum roxburghianum*	Shrub	0.011
180	*Triumfetta rhomboidea*	Shrub	1.184
181	*Tylophora asthmatica*	Shrub	0.034
182	*Tylophora indica var. glabra*	Shrub	0.03
183	*Tylophora indica*	Shrub	0.002
184	*Urena lobata ssp. lobata var.*	Shrub	0.49
185	*Urena lobata ssp. lobata*	Shrub	0.147
186	*Urena lobata*	Shrub	0.442
187	*Uvaria narum*	Shrub	0.087
188	*Ventilago madraspatana*	Shrub	0.506
189	*Vernonia cinerascens*	Shrub	0.006
190	*Vitex negundo*	Shrub	0.008
191	*Waltheria indica*	Shrub	0.093
192	*Wattakaka volubilis*	Shrub	0.032
193	*Wendlandia thyrsoidea*	Shrub	0.182
194	*Woodfordia fruticosa*	Shrub	0.142
195	*Zanthoxylum ovalifolium*	Shrub	0.179
196	*Ziziphus glaberrima*	Shrub	0.002
197	*Ziziphus oenoplia*	Shrub	2.402
198	*Ziziphus rugosa*	Shrub	1.362

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Table 6: Estimated Population of Herb Species.

Sl. No.	Species	Habit	Percentage (%)
1	*Acanthospermum hispidum*	Herb	0.102
2	*Achyranthes aspera var. aspera*	Herb	0.194
3	*Acmella paniculata*	Herb	0.022
4	*Acmella radicans*	Herb	0.206
5	*Adenostemma lavenia var. rugosum*	Herb	0.005
6	*Allmania nodiflora var. dichotoma*	Herb	0.011
7	*Alpinia malaccensis*	Herb	0.274
8	*Alternanthera sessilis*	Herb	0.272
9	*Alternanthera tenella*	Herb	1.324
10	*Alysicarpus belgaumensis*	Herb	0.019
11	*Alysicarpus bupleurifolius var. bupleurifolius*	Herb	0.573
12	*Alysicarpus bupleurifolius var. gracilis*	Herb	0.056
13	*Alysicarpus hamosus*	Herb	0.03
14	*Alysicarpus longifolius*	Herb	0.004
15	*Alysicarpus nummularius*	Herb	0.322
16	*Andrographis alata*	Herb	0.026
17	*Andrographis echioides*	Herb	0.108
18	*Andrographis paniculata*	Herb	2.639
19	*Anisochilus carnosus*	Herb	0.201
20	*Argemone mexicana*	Herb	0.011
21	*Asparagus racemosus*	Herb	0.053
22	*Biophytum sensitivum var. candolleanum*	Herb	0.435
23	*Biophytum sensitivum var. sensitivum*	Herb	0.135
24	*Blechnum orientale*	Herb	0.072
25	*Blepharis asperrima*	Herb	0.421
26	*Blepharis integrifolia*	Herb	0.021
27	*Blepharis maderaspatensis*	Herb	0.147
28	*Blumea malcolmii*	Herb	0.016
29	*Boerhavia repens*	Herb	0.005
30	*Borreria articularis*	Herb	0.032
31	*Borreria stricta*	Herb	8.367
32	*Buchchnera hispida*	Herb	0.007
33	*Buchnera hispida*	Herb	0.688
34	*Canscora diffusa*	Herb	0.181
35	*Canscora diffusa*	Herb	1.641
36	*Caralluma adscendens var. attenuata*	Herb	0.124
37	*Cassia senna*	Herb	0.073
38	*Cassia tora*	Herb	0.127
39	*Centella asiatica*	Herb	0.431
40	*Centranthera indica*	Herb	0.006
41	*Corchorus aestuans*	Herb	0.012

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42	*Corchorus trilocularis*	Herb	0.01
43	*Costus speciosus*	Herb	0.002
44	*Crassocephalum crepidioides*	Herb	0.019
45	*Crotalaria acicularis*	Herb	0.008
46	*Crotalaria calycina*	Herb	0.028
47	*Crotalaria parviflora*	Herb	0.012
48	*Curculigo orchioides*	Herb	0.844
49	*Cyanotis fasciculata*	Herb	0.013
50	*Cyanotis tuberosa var. adscendens*	Herb	0.008
51	*Cynoglossum zeylanicum*	Herb	0.049
52	*Desmodium alysicarpoides*	Herb	0.003
53	*Desmodium gangeticum*	Herb	0.512
54	*Desmodium triangulare var. congestum*	Herb	0.03
55	*Desmodium triflorum*	Herb	5.251
56	*Echinops echinatus*	Herb	0.01
57	*Eleiotis monophylla*	Herb	0.027
58	*Elephantopus scaber*	Herb	11.728
59	*Emilia sonchifolia*	Herb	0.047
60	*Euphorbia cristata*	Herb	0.005
61	*Euphorbia elegans*	Herb	0.517
62	*Euphorbia hirta*	Herb	0.238
63	*Evolvulus alsinoides*	Herb	5.084
64	*Exacum atropurpureum*	Herb	0.036
65	*Flemingia nilgheriensis*	Herb	0.015
66	*Geophila repens*	Herb	0.089
67	*Hibiscus lobatus*	Herb	0.164
68	*Indigofera aspalthoides*	Herb	0.026
69	*Indigofera hirsuta*	Herb	0.03
70	*Indigofera linifolia var. campbelli*	Herb	0.054
71	*Indigofera linifolia var. linifolia*	Herb	0.007
72	*Indigofera linifolia*	Herb	0.028
73	*Indigofera linnaei*	Herb	0.253
74	*Indigofera tinctoria*	Herb	0.005
75	*Ipomoea pes-tigridis*	Herb	0.016
76	*Justicia procumbens*	Herb	5.642
77	*Justicia prostrata*	Herb	0.031
78	*Lavandula bipinnata*	Herb	0.009
79	*Leonotis nepetifolia*	Herb	0.006
80	*Lepidagathis incurva var. incurva*	Herb	0.126
81	*Lepidagathis incurva var. lophostachyoides*	Herb	0.006
82	*Lepidagathis incurva var. mucronata*	Herb	0.013
83	*Leucas angustissima*	Herb	0.059
84	*Leucas aspera*	Herb	0.501
85	*Leucas cephalotes*	Herb	0.006

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86	*Leucas eriostoma*	Herb	2.951
87	*Leucas indica*	Herb	0.453
88	*Leucas longifolia*	Herb	0.074
89	*Leucas marrubioides*	Herb	0.006
90	*Leucas stelligera*	Herb	1.478
91	*Leucas stricta*	Herb	0.033
92	*Limnophila chinensis*	Herb	0.022
93	*Lobelia alsinoides*	Herb	0.023
94	*Lobelia nicotianifolia*	Herb	0.032
95	*Ludwigia perennis*	Herb	0.052
96	*Merremia tridentata*	Herb	0.011
97	*Merremia umbellata*	Herb	0.149
98	*Mimosa pudica*	Herb	0.826
99	*Mollugo nudicaulis*	Herb	0.028
100	*Naregamia alata*	Herb	0.017
101	*Ocimum sanctum*	Herb	0.099
102	*Oldenlandia corymbosa*	Herb	0.058
103	*Oxalis corniculata*	Herb	2.81
104	*Pavonia arabica*	Herb	0.011
105	*Pentanema indicum*	Herb	0.133
106	*Phaulopsis imbricata*	Herb	0.041
107	*Phyllanthus maderaspatensis*	Herb	0.053
108	*Phyllanthus niruri*	Herb	0.013
109	*Phyllanthus urinaria*	Herb	0.024
110	*Phyllanthus virgatus*	Herb	0.389
111	*Phyllocephalum scabridum*	Herb	0.038
112	*Plumbago zeylanica*	Herb	0.013
113	*Polycarpaea corymbosa*	Herb	0.899
114	*Pulicaria angustifolia*	Herb	0.009
115	*Pulicaria wightiana*	Herb	0.047
116	*Rhynchosia minima*	Herb	0.128
117	*Rhynchostylis retusa*	Herb	0.007
118	*Rubia cordifolia*	Herb	0.477
119	*Rungia parviflora var. parviflora*	Herb	4.68
120	*Rungia repens*	Herb	2.981
121	*Senecio tenuifolius*	Herb	0.094
122	*Senna uniflora*	Herb	0.446
123	*Sesamum indicum*	Herb	0.079
124	*Sida alnifolia*	Herb	0.006
125	*Sida cordata*	Herb	1.407
126	*Sida cordifolia*	Herb	0.284
127	*Sida mysorensis*	Herb	0.009
128	*Sida rhombifolia ssp. retusa*	Herb	1.808
129	*Sida rhombifolia ssp. rhombifolia*	Herb	0.322

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130	*Sida spinosa*	Herb	0.866
131	*Solanum tuberosum*	Herb	0.003
132	*Sonchus asper*	Herb	0.183
133	*Sopubia delphinifolia var. delphinifolia*	Herb	1.657
134	*Spermacoce articularis*	Herb	5.395
135	*Spermacoce hispida*	Herb	2.364
136	*Spermacoce ocymoides*	Herb	0.045
137	*Spermacoce pusilla*	Herb	3.951
138	*Spilanthes paniculata*	Herb	0.007
139	*Stachyphrynium spicatum*	Herb	0.755
140	*Stachytarpheta indica*	Herb	0.483
141	*Staurogyne glauca*	Herb	0.094
142	*Strobilanthes parviflora*	Herb	0.007
143	*Stylosanthes guianensis*	Herb	0.098
144	*Stylosanthes viscosa*	Herb	0.48
145	*Synedrella nodiflora*	Herb	0.506
146	*Tragia involucrata*	Herb	0.035
147	*Trianthema crystallina*	Herb	0.015
148	*Tribulus terrestris*	Herb	0.031
149	*Trichodesma inaequale*	Herb	0.013
150	*Tricholepis amplexicaulis*	Herb	0.142
151	*Trichuriella monsoniae*	Herb	0.026
152	*Trichurus monsoniae*	Herb	0.104
153	*Tridax procumbens*	Herb	5.707
154	*Vanda spathulata*	Herb	0.016
155	*Vernonia cinerea*	Herb	2.443
156	*Vetiveria lawsonii*	Herb	0.013
157	*Vetiveria zizanioides*	Herb	0.003
158	*Vicoa indica*	Herb	0.02
159	*Zornia gibbosa*	Herb	0.057

Table 7: Distribution of Plant species across Beats.

Sl.No.	Beats	Trees species	Shrubs species	Herbs species	Total species
1	Dhamane	26	14	4	44
2	Dhamane_(East)	46	34	12	92
3	Kanbargi	32	20	17	69
4	Muchandi	20	19	6	45
5	Boramakki	30	22	15	67
6	Chunchwad	26	17	13	56
7	Devgaon	35	32	19	86
8	Gadholi	30	23	15	68
9	Golihalli	41	36	13	90
10	Grohageri	28	12	14	54
11	Kakkeri	39	43	28	110

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12	Basapur	38	23	24	85
13	Benchinmardi_North	31	27	23	81
14	Bharamanahatti	53	44	17	114
15	Gujanal	25	20	12	57
16	Guthgundi	50	29	24	103
17	Karguppi	28	24	27	79
18	Madwal	32	28	20	80
19	Managaon	15	13	17	45
20	Mavanour	22	26	25	73
21	Nandi	53	33	21	107
22	Pangutti	27	14	10	51
23	Shahbandar	24	28	18	70
24	Shirur	34	22	10	66
25	Basavakolla-N	46	31	9	86
26	Basavakolla-S	18	13	5	36
27	Daddi	49	32	24	105
28	Godihal	46	32	18	96
29	Jummnal	39	25	12	76
30	Kakti	63	47	19	129
31	Kataballi	25	12	13	50
32	Ningenahatti-N	33	20	8	61
33	Ningenahatti-S	24	22	6	52
34	Sutgatti	28	15	12	55
35	Ukkad	44	28	20	92
36	Veernabhavi	62	37	18	117
37	Amagoan	30	10	5	45
38	Betne	59	40	14	113
39	Chigule	72	49	21	142
40	Chikale	35	25	6	66
41	Chorala	61	40	11	112
42	Kanakumbi	53	44	9	106
43	Talawadi	60	43	12	115
44	Abg-Jamboti E	39	34	9	82
45	Abg-Jamboti W	39	27	7	73
46	Abg-Katgali	19	12	5	36
47	Bijagarni	44	49	18	111
48	Garlgungi	12	5	4	21
49	Jamboti-E	27	23	6	56
50	Jamboti-W	51	35	12	98
51	Kanasoli	21	10	5	36
52	Katgali	17	18	2	37
53	Kaundal	15	18	9	42
54	Kinaye	19	13	3	35

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55	Madakoppa	18	8	2	28
56	Matturga	34	20	5	59
57	Nandagad	47	44	20	111
58	Navga	30	19	9	58
59	Nittur	25	18	6	49
60	Ramagurvadi	15	11	3	29
61	Savargali	16	16	4	36
62	Sedgali	11	8	3	22
63	Shivoli	31	20	8	59
64	Sindoli	17	20	4	41
65	Sonarwadi	42	36	12	90
66	Akrali	32	27	8	67
67	Ambewadi	35	29	6	70
68	Astoli	19	12	10	41
69	Balke-W	25	11	4	40
70	Diggegali	28	20	10	58
71	Dongaragaon	30	25	8	63
72	Garli	20	22	5	47
73	Kamtga	31	18	3	52
74	Kapoli	24	13	4	41
75	Mohishat	48	39	6	93
76	Mundawad	43	30	9	82
77	Nayikola	21	17	5	43
78	Nersa	52	41	8	101
79	Patali	29	20	9	58
80	Rajwal	45	33	8	86
81	Siroli	28	26	6	60
82	Tivoli	28	16	4	48
83	Warkawad Pata	38	32	5	75
84	Warkwad	36	29	5	70
85	Watra	28	21	7	56
86	Avratvail	37	22	8	67
87	Balagund	27	17	18	62
88	Bastawad	43	34	6	83
89	Chinchewadi	49	41	10	100
90	Devarai	43	35	14	92
91	Diggeli	33	30	9	72
92	Gotagali	29	27	9	65
93	Halaga	38	41	14	93
94	Karagagi	32	23	18	73
95	Kirpoli	38	36	15	89
96	Kumbharda	33	26	10	69
97	Manjarpai	32	31	20	83

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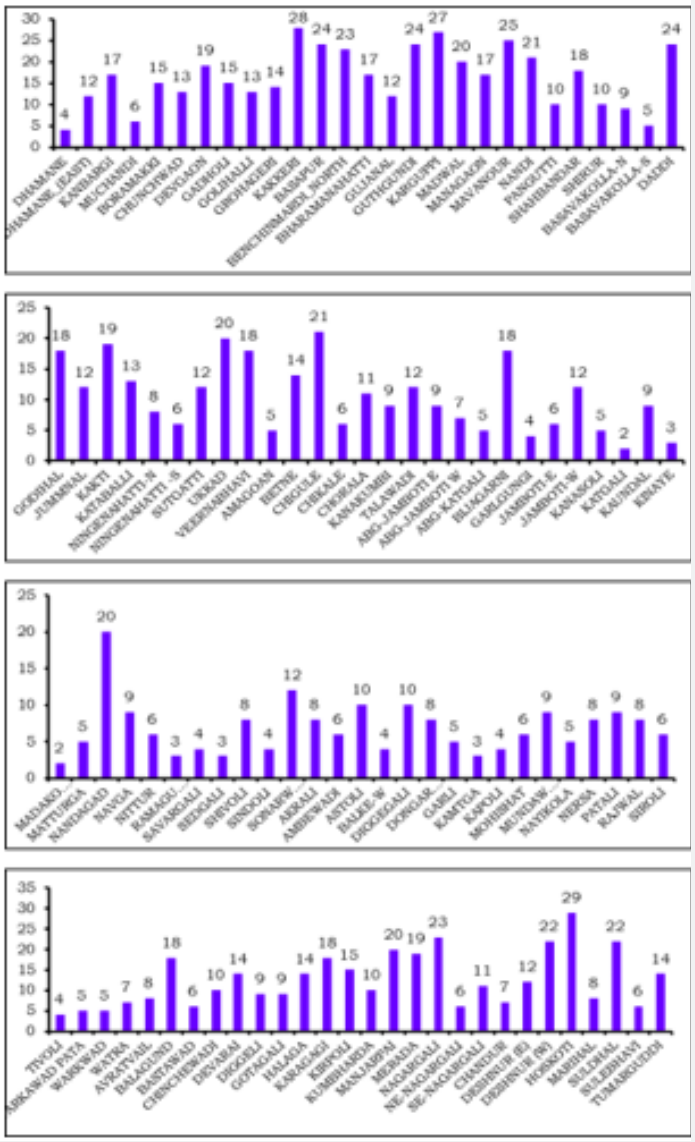
98	Merada	43	46	19	108
99	Nagargali	50	42	23	115
100	Ne-Nagargali	41	27	6	74
101	Se-Nagargali	26	23	11	60
102	Chandur	16	5	7	28
103	Deshnur (E)	26	20	12	58
104	Deshnur (W)	54	28	22	104
105	Hoskoti	34	21	29	84
106	Marihal	21	11	8	40
107	Suldhal	34	21	22	77
108	Sulebhavi	12	6	6	24
109	Tumarguddi	36	15	14	65



Graph 4: Herbs across Beats.

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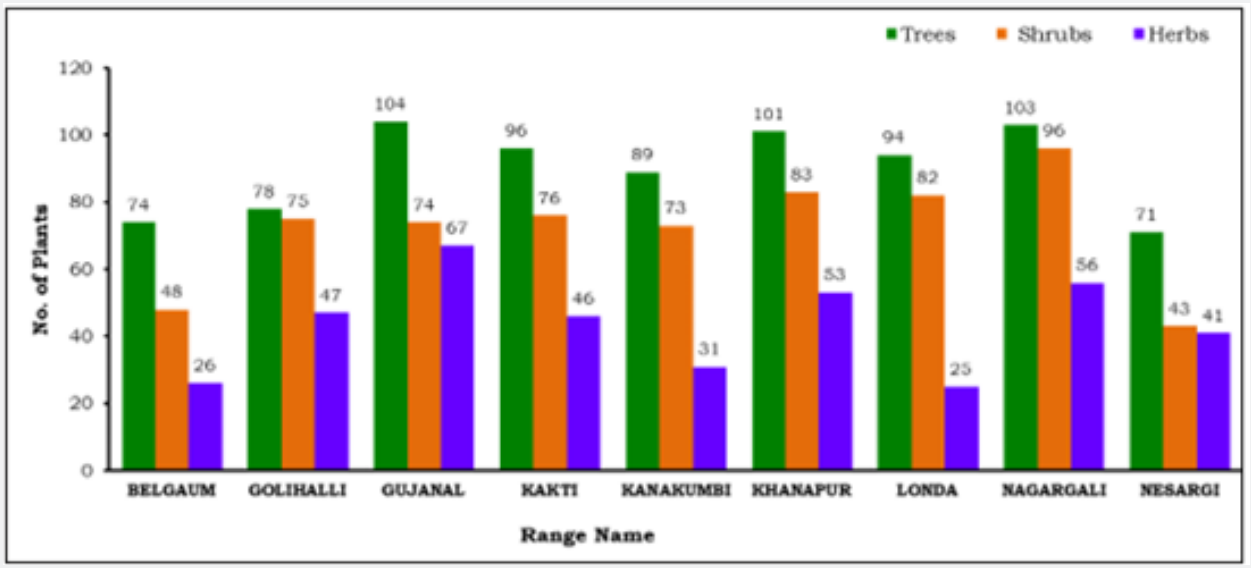

Graph 5: Distribution of species across Ranges.

The 3 beats such as Devgaon, Basavakolla-N and Rajwal were comprised of 86 plants each. Nearly 85 plants have recorded in Basapur beat followed by Hoskoti beat with 84 plants. Bastawad and Manjarpai beat consists of 83 plants each followed by Abg-Jamboti E and Mundawad beat with 82 plants each. Benchinmardi_North beat having 81 species and Madwal beat consists of 80 plants. Karguppi, Suldhal, Jummnal, Warkawad Pata and Ne-Nagargali beats displayed 79, 77, 76, 75 and 74 plants respectively, which is closely followed by Mavanour, Abg-Jamboti and W Karagagi beats with 73 species each. Diggeli beat with 72 plants and Shahbandar, Ambewadi and Warkwad beats consists of 70 plants each. Kanbargi and Kumbharda beats recorded with 69 plants each, followed by Gadholi beat with 68 plants. The 3 beats like Boramakki, Akrali and Avratvail beat comprised of 67 species each, whereas Shirur and Chikale beats were found with 66 species each. Gotagali and Tumarguddi beats recorded with 65 species each and Dongaragaon, Balagund and Ningenahatti-N beats were identified with 63,62, and 61 plants respectively. Siroli and Se-Nagargali beats comprised of 60 plants. Matturga and Shivoli beats consists of 59 plants and Navga, Diggegali, Patali and Deshnur (E) comprised of 58 species each followed by Gujanal beat with 57 plants. The beats including Chunchwad, Jamboti-E and Watra beats were found with 56 plants each, likewise Sutgatti and Grohageri beats were found with 55 and 54 plants. Ningenahatti–S and Kamtga beats with 52 species, Pangutti and Kataballi beats recorded with 51 and 50 plants each. Nittur, Tivoli and Garli beats were found with 49, 48 and 47 plants respectively, followed by Muchandi, Managaon and Amagoan beats with 45 plants each. Dhamane, Nayikola and Kaundal beats comprised of 44, 43 and 42 species each, whereas Sindoli, Astoli and Kapoli beats has 41 plants each. The beats like Balke- W and Marihal have 40 species followed by Katgali beat with 37 plants. The 4 beats such as Basavakolla-S, Abg-Katgali, Kanasoli and Savargali have 36 plants each. Kinaye beat consists of 35 plants followed by Ramagurvadi beat with 29 plants, Madakoppa and Chandur beats with 28 plants each. The minimum number of plants like 24, 22 and 21plants were found in beats like Sulebhavi, Sedgali and Garlgungi.

Enumeration of species across Ranges.

(Table 8 & Graph-6) describes the number of species identified in 9 Ranges of Belagavi division during the survey. It is noted that there are several common species that are also recorded across the Ranges. This will help in range wise management of biodiversity. The data mentioned in (Table 8-10) reveals that, Nagargali range consists of maximum number of trees species 103, shrubs 96 and herbs 56 followed by Gujanal range in the division. Nesargi range (155) has recorded very poor taxa of all the three types like trees (71), shrubs (43) and herbs (41) and Belgum with 148 plants compare to other ranges. The distribution pattern of plant habit, obtained after a survey of 9 ranges in Belagavi Forest division is represented graphically (Graph 6-6d). Among the 9 ranges, Nagargali range has been recorded with maximum species of 255, including 103 trees, 96 shrubs and 56 herbs followed by Gujanal range having a total of 245 species, among them 104 trees, 74 shrubs and 67 herbs. The moderate number of plants has been recorded with 237 and 218 species in Khanapur and Kakti range respectively, whereas Londa, Golihalli and Kanakumbi range comprised of 201, 200 and 193 species respectively. The minimum plants were recorded in Nesargi (155) and Belgaum (148) range.

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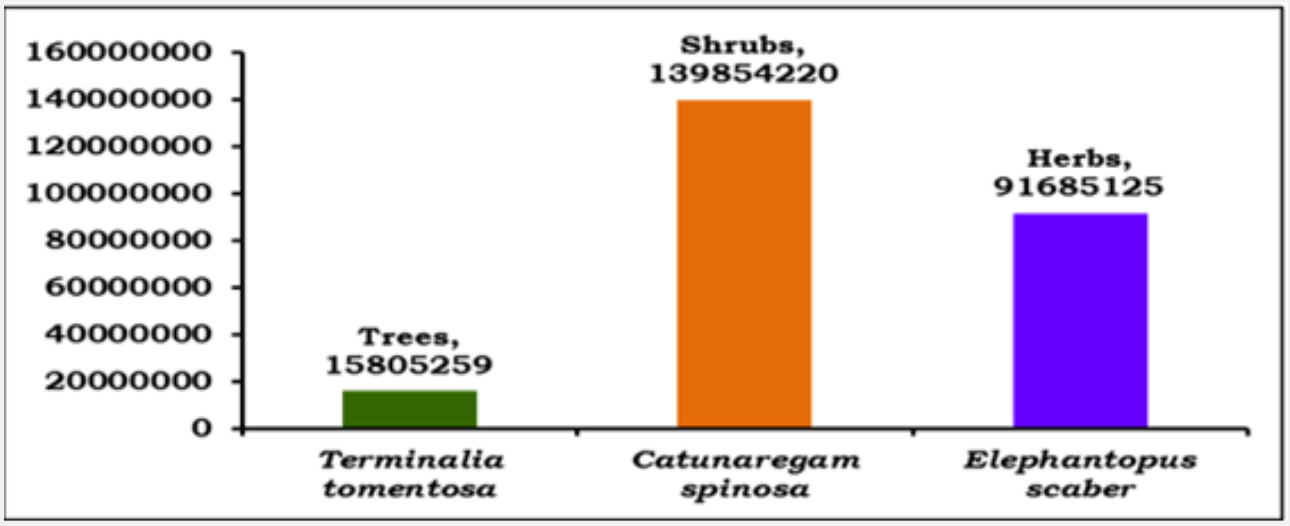

Graph 6: Highest Number of Plants among all the Habits.

Table 8: Distribution of species across Ranges.

Sl.No.	Range	Trees species	Shrubs species	Herbs species
1	Belgaum	74	48	26
2	Golihalli	78	75	47
3	Gujanal	104	74	67
4	Kakti	96	76	46
5	Kanakumbi	89	73	31
6	Khanapur	101	83	53
7	Londa	94	82	25
8	Nagargali	103	96	56
9	Nesargi	71	43	41

Dominant Plant Species of the Division.

The survey assessed across 109 beats of 9 ranges in the division has helped to identify dominant plant species among the different habits like Trees, Shrubs and Herbs and are listed in (Table 11). Based on the survey study, Terminalia tomentosa of the family Combretaceae is the dominant tree species with the projected percentage of 9.476 % in the ecosystem. Shrub Catunaregam spinosa of family Rubiaceae and herb Elephantopus scaber of family Asteraceae were found in 9.218% and 11.728% respectively considered as dominant species in their respective habits. (Graph 7,7a).

Lowest Plant plants in the division.

The assessment of plant population in 109 beats from 9 ranges in division has also helped to find out the lowest projected number of species. Among them, tree species, Spathodea campanulate(tree); Rauvolfia serpentina(shrub) and Costus speciosus (herb) are found in lesser numbers. The results are represented in (Table 12 & Graph 8).

Distribution of species according to Habit in the Division

Habit wise plants analysis of all 578 species comprises that treess are dominant with 221 species (38 %) followed by Shrubs comprising of 198 species (34 %) and herbs with 159 species (28 %). Trees have been represented by 221 species forming 38 % of total plants as depicted in Pie Graph 8.

Distribution of Plants according to Genera

Genus wise arrangement of 578 plants revealed that the plants belong to 331 genera. The dominant genera among them are identified as Cassia with maximum of 10 species followed by Ficus and Leucas with 11 species each. Acacia, Grewia, Indigofera and Sida comprised of 8 species followed by Desmodium, Diospyros,

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Ipomoea, Ixora, Terminalia and Zanthoxylum with 7 species each. The genera like Alysicarpus, Clerodendrum and Dalbergia comprised of 6 species each whereas, Argyreia, Canthium, Crotalaria, Dioscorea, Jasminum, Madhuca and Phyllanthus were found with 5 species each. Albizia, Buchaniaia, Flemingia, Garcinia, Lepidagathis, Spermacoce and Wrightia were documented with 4 species each. The 22 genera such as Allophylus, Andrographis, Artocarpus, Asparagus, Bauhinia, Blepharis, Breynia, Bridelia, Cissus, Euphorbia, Flacoutrtia, Nothopegia, Pavonia, Piper, Pterospermum, Rhynchosia, Solanum, Stercularia, Stylosanthes, Syzygium, Tylophora and Urena were comprised of 3 species each. The analysis indicated that 55 genera are represented with 2 species each and majority of 224 (38.7 %) genera among the total 578 plants have been represented by 1 species each.

Table 9: Dominant Plant Species among the three Habits.

Highest No. of plants found		
Habit	**Name of the plant**	**Projected No**
Tree	Terminalia tomentosa	9.48%
Shrub	Catunaregam spinosa	9.22%
Herb	Elephantopus scaber	11.73%

Table 10: Lowest Plant Species among the three Habits.

Lowest No. of Plants found		
Habit	**Name of the plant**	**Projected No**
Tree	Spathodea campanulata	insignificant
Shrub	Rauvolfia serpentina	0.00%
Herb	Costus speciosus	0.00%

Table 11: Proportionate Number of Matured Trees in the Ecosystem.

Sl. No.	Botanical Name of the Tree	Percentage (%)
1	*Acacia auriculiformis*	0.036
2	*Acrocarpus fraxinifolius*	0.07
3	*Adina cordifolia*	0.4
4	*Aglaia elaeagnoidea*	0.163
5	*Alangium salviifolium ssp. salviifolium*	0.114
6	*Albizia lebbeck*	0.062
7	*Albizia odoratissima*	0.04
8	*Albizia procera*	0.312
9	*Alseodaphne semecarpifolia var.*	0.38
10	*Alstonia scholaris*	0.021
11	*Anacardium occidentale*	0.004
12	*Anogeissus latifolia*	1.187
13	*Aporosa lindleyana*	1.731
14	*Artocarpus integer*	0.004
15	*Azadirachta indica*	0.028
16	*Bauhinia malabarica*	0.281
17	*Bauhinia racemosa*	0.022
18	*Bauhinia variegata*	0.075
19	*Bombax ceiba*	0.577
20	*Bridelia retusa*	0.015
21	*Buchanania lanzan*	0.58
22	*Butea monosperma*	1.442
23	*Calophyllum apetalum*	0.028

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24	*Canthium dicoccum var. dicoccum*	0.477
25	*Carallia brachiata*	0.889
26	*Careya arborea*	3.741
27	*Caryota urens*	0.052
28	*Cassia fistula*	0.25
29	*Cassia siamea*	0.022
30	*Cassine paniculata*	0.003
31	*Ceiba pentandra*	0.008
32	*Chloroxylon swietenia*	0.052
33	*Cordia wallichii*	0.02
34	*Dalbergia latifolia*	1.478
35	*Dalbergia paniculata*	0.208
36	*Dillenia indica*	0.017
37	*Dillenia pentagyna*	3.107
38	*Diospyros angustifolia*	0.067
39	*Diospyros melanoxylon*	0.025
40	*Diospyros montana*	0.469
41	*Diospyros saldanhae*	0.088
42	*Elaeocarpus serratus*	0.246
43	*Erythrina variegata var. orientalis*	0.075
44	*Ficus amplissima*	0.217
45	*Ficus arnottiana*	0.028
46	*Ficus benghalensis*	0.074
47	*Ficus hispida*	0.004
48	*Ficus racemosa*	0.489
49	*Ficus religiosa*	0.003
50	*Ficus tinctoria ssp. parasitica*	0.008
51	*Ficus tsjahela*	0.176
52	*Flacourtia montana*	0.021
53	*Garcinia indica*	0.048
54	*Glochidion ellipticum*	0.216
55	*Gmelina arborea*	0.211
56	*Grewia tiliifolia var. tiliifolia*	1.248
57	*Grewia tiliifolia*	0.964
58	*Haldina cordifolia*	0.05
59	*Holigarna arnottiana*	0.042
60	*Holigarna grahamii*	2.772
61	*Holoptelea integrifolia*	0.003
62	*Hopea ponga var. cauveriana*	0.012
63	*Hymenodictyon obovatum*	0.178
64	*Ixora arborea*	0.005
65	*Kydia calycina*	0.056
66	*Lagerstroemia lanceolata*	8.018

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67	*Lagerstroemia parviflora*	0.088
68	*Lannea coromandelica*	0.491
69	*Litsea ghatica*	0.332
70	*Lophopetalum wightianum*	0.034
71	*Macaranga indica*	0.013
72	*Macaranga peltata*	1.292
73	*Madhuca longifolia var. latifolia*	0.043
74	*Madhuca longifolia var. longifolia*	0.035
75	*Mallotus philippensis var. philippensis*	0.061
76	*Mallotus philippensis*	0.003
77	*Mangifera indica*	0.667
78	*Maytenus emarginata*	0.055
79	*Memecylon umbellatum*	4.302
80	*Mimusops elengi*	0.239
81	*Mitragyna parviflora*	0.403
82	*Murraya koenigii*	0.024
83	*Myristica malabarica*	0.012
84	*Nothapodytes nimmoniana*	0.066
85	*Nothopegia racemosa*	1.051
86	*Nothopegia travancorica*	0.048
87	*Olea dioica*	5.414
88	*Persea macrantha*	0.176
89	*Pongamia pinnata*	0.26
90	*Pterocarpus marsupium*	0.662
91	*Pterospermum xylocaprum*	0.007
92	*Radermachera xylocarpa*	0.007
93	*Sapindus emarginatus*	0.031
94	*Schleichera oleosa*	0.269
95	*Semecarpus anacardium*	0.017
96	*Spondias pinnata*	0.045
97	*Sterculia guttata*	0.04
98	*Sterculia urens*	0.001
99	*Stereospermum chelonoides*	0.491
100	*Swietenia mahogoni*	0.014
101	*Symplocos racemosa*	1.582
102	*Syzygium caryophyllatum*	0.025
103	*Syzygium cumini*	6.775
104	*Syzygium salicifolium*	0.151
105	*Tabernaemontana alternifolia*	0.006
106	*Tamarindus indica*	0.016
107	*Tectona grandis*	0.033
108	*Terminalia alata*	0.015
109	*Terminalia bellirica*	2.604
110	*Terminalia chebula*	0.795

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111	*Terminalia paniculata*	11.215
112	*Terminalia tomentosa*	17.425
113	*Vitex altissima var. altissima*	0.045
114	*Wrightia tinctoria var. rothii*	0.025
115	*Wrightia tinctoria var. tinctoria*	0.012
116	*Wrightia tinctoria*	0.021
117	*Xantolis tomentosa*	0.008
118	*Xylia xylocarpa*	8.831
119	*Ziziphus horrida*	0.009

Table 12: Proportionate Regeneration Status of Tree Species in the Ecosystem.

Sl. No.	Name of the tree species	Percentage (%)
1	*Acacia auriculiformis*	0.18
2	*Acacia catechu*	0.003
3	*Acacia chundra*	0.461
4	*Acacia ferruginea*	0.001
5	*Acacia intsia*	0
6	*Acacia nilotica ssp. indica*	0.012
7	*Actinodaphne angustifolia*	0.004
8	*Adina cordifolia*	0.097
9	*Aegle marmelos*	0.269
10	*Aglaia elaeagnoidea*	0.139
11	*Ailanthus excelsa*	0.006
12	*Alangium salviifolium ssp. salviifolium*	0.065
13	*Albizia amara*	0.46
14	*Albizia lebbeck*	0.02
15	*Albizia odoratissima*	0.015
16	*Albizia procera*	0.096
17	*Allophylus cobbe*	0.567
18	*Alseodaphne semecarpifolia var.*	0.499
19	*Alseodaphne semecarpifolia var.*	0.003
20	*Alstonia scholaris*	0.001
21	*Anacardium occidentale*	0.012
22	*Annona squamosa*	0.128
23	*Anogeissus latifolia*	7.301
24	*Aporosa lindleyana*	1.713
25	*Artocarpus hirsutus*	0.008
26	*Artocarpus integer*	0.001
27	*Atalantia racemosa*	0.004
28	*Azadirachta indica*	0.285
29	*Bauhinia malabarica*	0.107
30	*Bauhinia racemosa*	0.013
31	*Bauhinia variegata*	0.046

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32	*Bombax ceiba*	0.035
33	*Boswellia serrata*	0.054
34	*Bridelia retusa*	0.778
35	*Buchanania axillaris*	0.026
36	*Buchanania lanzan*	1.558
37	*Butea monosperma*	0.857
38	*Callicarpa tomentosa*	0.046
39	*Calophyllum apetalum*	0.003
40	*Calophyllum tomentosum*	0.005
41	*Canthium dicoccum var. dicoccum*	0.669
42	*Carallia brachiata*	0.198
43	*Careya arborea*	4.118
44	*Caryota urens*	0.185
45	*Casearia tomentosa*	0.21
46	*Cassia fistula*	0.894
47	*Cassia siamea*	0.216
48	*Cassia timorensis*	0.009
49	*Cassine glauca*	0.041
50	*Cassine paniculata*	0.11
51	*Ceiba pentandra*	0.004
52	*Chionanthus mala-elengi*	0.064
53	*Chloroxylon swietenia*	6.884
54	*Chukrasia tabularis var. tabularis*	0.014
55	*Cinnamomum malabatrum*	0.002
56	*Cordia wallichii*	0.03
57	*Dalbergia lanceolaria*	0.063
58	*Dalbergia latifolia*	0.993
59	*Dalbergia paniculata*	1.04
60	*Dalbergia sissoides*	0.04
61	*Dalbergia sissoo*	0.001
62	*Dillenia indica*	0.004
63	*Dillenia pentagyna*	0.81
64	*Diospyros affinis*	0.052
65	*Diospyros angustifolia*	0.802
66	*Diospyros candolleana*	0.998
67	*Diospyros ebenum*	0.002
68	*Diospyros melanoxylon*	2.363
69	*Diospyros montana*	1.283
70	*Diospyros saldanhae*	0.058
71	*Dolichandrone atrovirens*	0.928
72	*Dolichandrone falcata*	0.04
73	*Elaeocarpus serratus*	0.021
74	*Elaeocarpus tuberculatus*	0.009
75	*Erythrina stricta*	0.003

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76	*Erythrina variegata var. orientalis*	0.025
77	*Euodia lunu-akenda*	0.029
78	*Ficus amplissima*	0.009
79	*Ficus arnottiana*	0.015
80	*Ficus benghalensis*	0.003
81	*Ficus hispida*	0.067
82	*Ficus microcarpa*	0.001
83	*Ficus racemosa*	0.149
84	*Ficus tinctoria ssp. parasitica*	0.001
85	*Flacourtia latifolia*	0.015
86	*Flacourtia montana*	0.286
87	*Garcinia gummi-gutta*	0.172
88	*Garcinia indica*	0.032
89	*Garcinia morella*	0.005
90	*Garcinia talbotii*	0.008
91	*Gardenia gummifera*	2.235
92	*Gardenia latifolia*	0.927
93	*Glochidion ellipticum*	0.253
94	*Glochidion johnstonei*	0.021
95	*Gmelina arborea*	0.067
96	*Grewia tiliifolia var. tiliifolia*	0.6
97	*Grewia tiliifolia*	0.409
98	*Haldina cordifolia*	0.006
99	*Hardwickia binata*	0.142
100	*Holarrhena antidysenterica*	4.268
101	*Holarrhena pubescens*	0.013
102	*Holigarna arnottiana*	0.175
103	*Holigarna grahamii*	0.397
104	*Holoptelea integrifolia*	0.417
105	*Hopea ponga var. cauveriana*	0.005
106	*Hydnocarpus pentandrus*	0.002
107	*Hymenodictyon obovatum*	0.02
108	*Ixora arborea*	1.158
109	*Ixora brachiata*	0.422
110	*Ixora parviflora*	0.008
111	*Ixora pavetta*	0
112	*Kingiodendron pinnatum*	0.01
113	*Kydia calycina*	0.071
114	*Lagerstroemia lanceolata*	1.297
115	*Lagerstroemia parviflora*	1.945
116	*Lannea coromandelica*	0.079
117	*Limonia crenulata*	0.001
118	*Litsea deccanensis*	0.022
119	*Litsea ghatica*	0.531

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120	*Macaranga indica*	0.007
121	*Macaranga peltata*	1.839
122	*Madhuca insignis*	0.057
123	*Madhuca longifolia var. latifolia*	0.27
124	*Madhuca longifolia var. longifolia*	0.1
125	*Madhuca longifolia*	0.074
126	*Madhuca neriifolia*	0.007
127	*Maesa indica*	0.068
128	*Mallotus philippensis var. philippensis*	2.409
129	*Mallotus philippensis*	0.405
130	*Mangifera indica*	0.325
131	*Maytenus emarginata*	3.032
132	*Melia azedarach*	0.018
133	*Melia dubia*	0.008
134	*Memecylon umbellatum*	1.426
135	*Mimusops elengi*	0.199
136	*Mitragyna parviflora*	0.178
137	*Morinda citrifolia*	0.204
138	*Morinda tomentosa*	0.251
139	*Murraya koenigii*	0.516
140	*Murraya paniculata*	0.316
141	*Myristica malabarica*	0.004
142	*Naringi crenulata*	0.019
143	*Neolitsea zeylanica*	0.437
144	*Nothapodytes nimmoniana*	0.491
145	*Nothopegia beddomei*	0.008
146	*Nothopegia racemosa*	0.813
147	*Nothopegia travancorica*	0.178
148	*Olea dioica*	1.756
149	*Pavetta indica*	0.029
150	*Persea macrantha*	0.145
151	*Phoenix sylvestris*	0.059
152	*Phyllanthus emblica*	1.13
153	*Polyalthia longifolia*	0.002
154	*Pongamia pinnata*	0.436
155	*Psidium guajava*	0.005
156	*Psydrax dicoccos*	0.006
157	*Pterocarpus marsupium*	0.634
158	*Pterospermum acerifolium*	0.011
159	*Pterospermum heyneanum*	0.017
160	*Pterospermum xylocaprum*	0.004
161	*Radermachera xylocarpa*	0.017
162	*Randia candolleana*	0.814
163	*Santalum album*	0.061

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164	*Sapindus emarginatus*	0.028
165	*Saraca asoca*	0.012
166	*Schefflera actinophylla*	0.032
167	*Schefflera wallichiana*	0.002
168	*Schleichera oleosa*	0.575
169	*Semecarpus anacardium*	0.156
170	*Simarouba glauca*	0.187
171	*Soymida febrifuga*	0.629
172	*Spondias pinnata*	0.004
173	*Sterculia campanulata*	0.006
174	*Sterculia guttata*	0.137
175	*Sterculia urens*	0.011
176	*Stereospermum chelonoides*	0.689
177	*Strychnos nux-vomica*	0.007
178	*Strychnos potatorum*	0.801
179	*Swietenia mahogoni*	0.02
180	*Symplocos racemosa*	1.565
181	*Syzygium caryophyllatum*	0.016
182	*Syzygium cumini*	2.636
183	*Syzygium salicifolium*	0.058
184	*Tabernaemontana alternifolia*	0.743
185	*Tabernaemontana dichotoma*	0.016
186	*Tamarindus indica*	0.046
187	*Tectona grandis*	0.009
188	*Terminalia alata*	0.005
189	*Terminalia arjuna*	0.005
190	*Terminalia bellirica*	0.552
191	*Terminalia chebula*	0.162
192	*Terminalia pallida*	0.061
193	*Terminalia paniculata*	5.582
194	*Terminalia tomentosa*	5.203
195	*Toona ciliata*	0.011
196	*Trema orientalis*	0.015
197	*Vitex altissima var. altissima*	0.115
198	*Wrightia arborea*	0.056
199	*Wrightia tinctoria var. rothii*	0.23
200	*Wrightia tinctoria var. tinctoria*	0.275
201	*Wrightia tinctoria*	0.223
202	*Ximenia americana*	0.502
203	*Xylia xylocarpa*	4.368
204	*Ziziphus horrida*	0.048
205	*Ziziphus jujuba*	0.048
206	*Ziziphus mauritiana var. muratiana*	0.014

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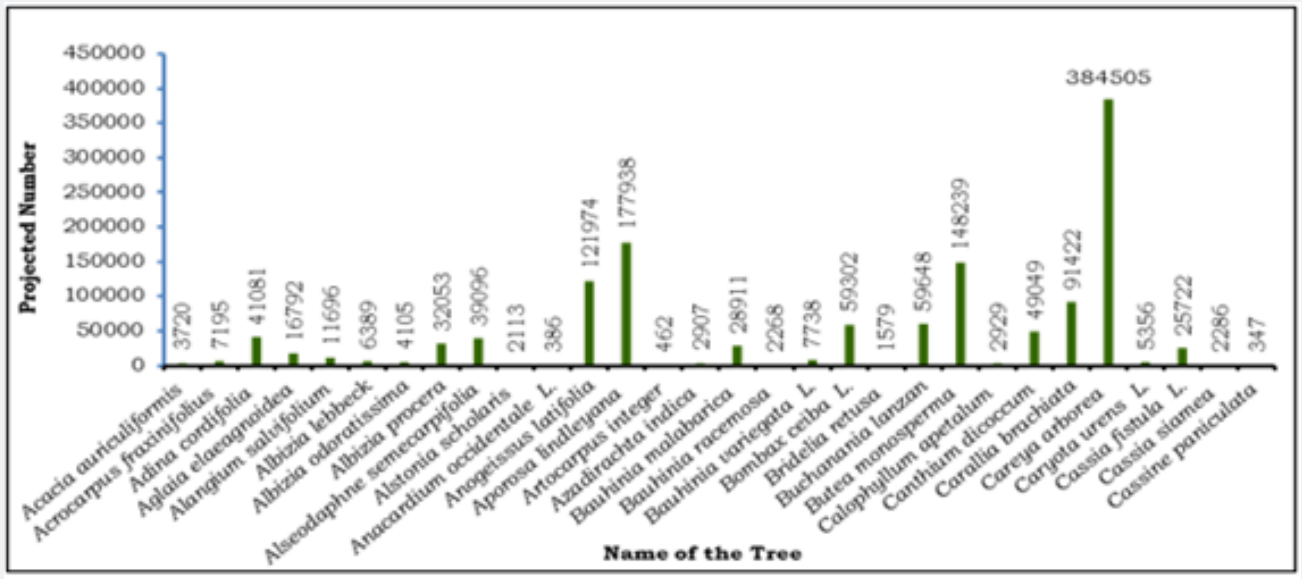
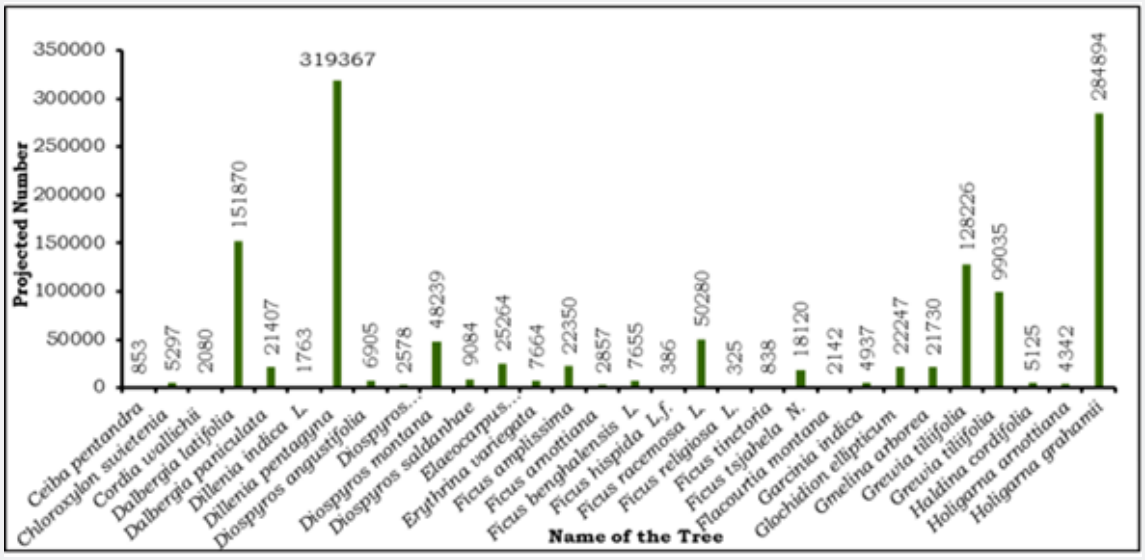


Graph 6a: Estimated Number of Matured Trees.



Graph 6b: Estimated Number of Matured Trees.

Distribution of Plants Across the Families.

According to the family wise distribution, among all 578 plants assessed during the survey shows that, plants belong to 100 families, where Fabaceae was identified as a major family with 88 species. The second dominated family was Rubiaceae (41), followed by Malvaceae (38), Lamiaceae (28), Apocynaceae (24), Asteraceae (23) and Acanthaceae (21). The family Laurace comprised of 17 species, closely followed by Convolvulaceae (16), Phyllanthaceae (15), Anacardiaceae (14), Rutaceae (14), Euphorbiaceae (11), Moraceae (13) and Meliaceae (10). Combretaceae and Rhamnaceae were recorded with 9 species each, whereas Olaceae was found with 8 species. Ebenaceae and Sapotaceae were recorded with 7 species each. The families such as Amaranthaceae and Sapandaceae comprised of 6 species each and 6 families like Asparagaceae, Bignoniaceae, Celastraceae, Dioscoraceae, Minispermaceae and Vitaceae were recorded with 5

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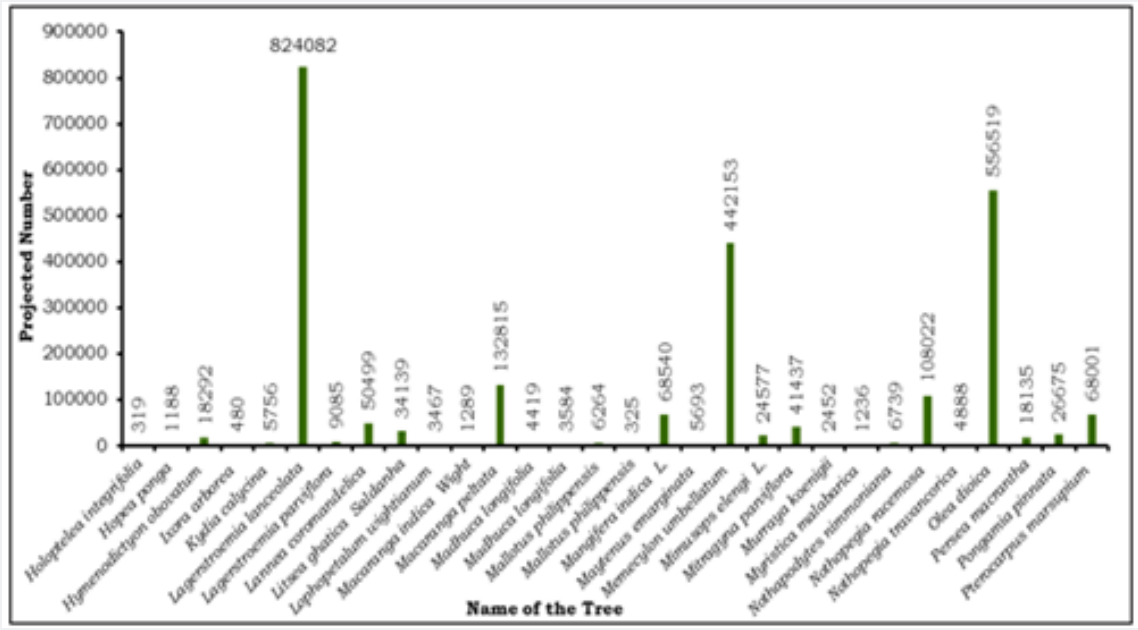
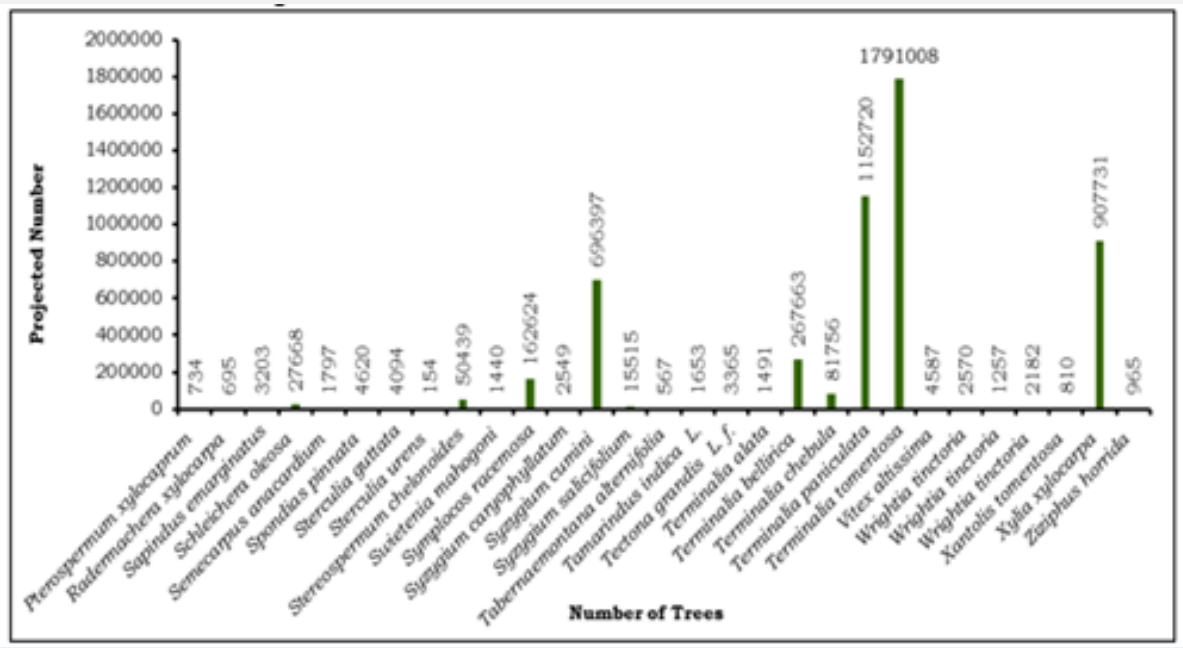
species each. Families like Clusiaceae, Myrtaceae, Ranunculaceae and Salicaceae were found with 4 species each, likewise 13 families including Annonaceae, Arecaceae, Boraginaceae, Callophyllaceae, Gentiaceae, Lamiaceae, Lythraceae, Piperaceae, Plantaginaceae, Primulaceae, Simarubaceae, and Solanaceae were found with 3 species each. Two species were recorded in 15 families nearly 7.4 % of the total plants comprised of 42 families with a single species.



Graph 6c: Estimated Number of Matured Trees.



Graph 6d: Estimated Number of Matured Trees.

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Estimation of Mature Trees.

The main objective of the project is to assess the plant species population, trees species being dominanted in forest etc. But an effort was made to evaluate the number of mature trees having girth of more than 100 cm in the ecosystem. Analysis has led to the projection of 119 mature tree species in the Belagavi Forest Division as shown in (Table 12). The table also indicate of percentage of that species out of the total mature trees available in the division. Terminalia tomentosa and Terminalia paniculata are having larger mature trees in the division. According to the survey, 119 species were reported in Belagavi division ,revealed the dominance ofTerminalia tomentosafollowed byTerminaliapaniculataXylia xylocarpa Lagerstroemia lanceolata Syzygium cumini Olea dioica Memecylon umbellatum Careya arborea,Dillenia pentagyna,Holigarna grahamii, Terminalia bellirica, Aporosa lindleyana, Symplocos racemosa and Dalbergia latifolia. The trees such as Ziziphus horrida, Ceiba pentandra, Ficus tinctoria, Xantolis tomentosa, Pterospermum xylocaprum, Radermachera xylocarpa, Tabernaemontana alternifolia, Ixora arborea, Artocarpus integer, Anacardium occidentale, Ficus hispida, Cassine paniculata, Ficus religiosa, Mallotus philippensis, Holoptelea integrifolia and Sterculia urens were found in minimum numbers. Matured trees with more than 100 cm GBH are reported in (Table 9) and represented in (Graphs 7a, 7b, 7c & 7d).

Figure 7: Anisochilus carnosus
Plant Name: Anisochilus carnosus
Kannada Common Name: Karaveru
Family: Lamiaceae
Range: Belgaum
Beat Name : Kanbargi
GPS Reading:
Latitude 15o 54" 27.2'
Longitude 74o 34" 19.3'
Elevation 837m

Regeneration Status of Tree Species.

This is an important parameter to know the health of ecosystem. Regeneration of individual plants belonged to 206 species has been estimated during the survey in division. The assessment of tree regeneration was recorded by counting the individuals of less than 10 cm girth. Data indicate the changing dominance of various species across the population of forest beats and provided in Table 13. Percentage indicates the frequency of regeneration of that species in the ecosystem. Anogeissus latifolia, Careya arborea, Chloroxylon swietenia, Holarrhena antidysenterica, Mallotus philippensis var. philippensis, Syzygium cumini, Terminalia paniculate, Terminalia tomentosa are some species repeted to have good regeneration.

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Figure 8: Asparagus racemosus
Plant Name: Asparagus racemosus
Kannada Common Name: Aheruballi
Family: Liliaceae
Range: Golihalli
Beat Name : Devgaon
GPS Reading:
Latitude 15o 33" 21.7'
Longitude 74o 45" 40.3'
Elevation 778m

Figure 9: Blepharis asperrima
Plant Name: Blepharis asperrima
Family: Acanthaceae
Range: Khanapur
Beat Name : ABG-Jambotie
GPS Reading:
Latitude 15o 38" 29.2'
Longitude 74o 22" 55.3'
Elevation 693m

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Figure 10: clerodendrum infortunatum
Plant Name: clerodendrum infortunatum
Family: Verbenaceae
Range: Londa
Beat Name : Watra
GPS Reading:
Latitude 15o 28" 43.7'
Longitude 74o 29" 31.0'
Elevation 658m

Figure 11: Dioscorea oppositifolia
Plant Name: Dioscorea oppositifolia
Kannada Common Name: Eomsra
Family: Dioscoreaceae
Range: Londa
Beat Name : Nersa
GPS Reading:
Latitude 15o 35" 40.0'
Longitude 74o 25" 24.7'
Elevation 715m

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Figure 12: Ipomoea nil
Plant Name: Ipomoea nil
Kannada Common Name: Kaamanaaballi
Family: Convolvulaceae
Range Name: Golihalli
Beat Name: Golihalli
GPS reading:
Latitude 15° 32" 35.1'
Longitude 74° 38" 51.6'
Elevation 704 m

Figure 13: Moullava spicata
Plant Name: Moullava spicata
Kannada Common Name: Wagathi
Family: Fabaceae
Range Name: Kakti
Beat Name: Basavakolla-N
GPS reading:
Latitude 15° 57" 42.6
Longitude 74° 33" 8.9'
Elevation 829 m

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Figure 14: Rauvolfia serpentina
Plant Name: Rauvolfia serpentina
Kannada Common Name: Sarpagandhi
Family: Apocynaceae
Range Name: Golithalli
Beat Name: Chunchwad
GPS reading:
Latitude 15° 27” 54”
Longitude 74° 40” 49.2”
Elevation 600 m

Figure 15: Evolvulus alsinoides
Plant Name: Evolvulus alsinoides
Kannada Common Name: Vishnu kranthi
Family: Convolvulaceae
Range Name: Nesargi
Beat Name: Deshnur (E)
GPS reading:
Latitude 15° 55” 27.3’
Longitude 74° 45” 58.7”
Elevation 830 m

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Figure 16: Smilax zeylanica
Plant Name: Smilax zeylanica
Kannada Common Name: Kaaduhambutavare
Family: Smilacaceae
Range Name: Nesargi
Beat Name: Tumarguddi
GPS reading:
Latitude 15° 56" 14.3'
Longitude 74° 39" 46.6'
Elevation 726 m

Figure 17: Pseudarthria viscida
Plant Name: Pseudarthria viscida
Family: Fabaceae
Range Name: Kakti
Beat Name: Jummnal
GPS reading:
Latitude 15° 57" 57.7"
| Longitude 74° 31" 25.8'
Elevation 755 m

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Figure 18: Bombax ceiba
Plant Name: Bombax ceiba
Kannada Common Name: Kempu buruga
Family: Bombacaceae
Range Name: Khanapur
Beat Name: Navga
GPS reading:
Latitude 15° 35" 02.6'
Longitude 74° 32" 58.3"
Elevation 738 m

Figure 19: Elephantopus scaber
Plant Name: Elephantopus scaber
Kannada Common Name: Hakkarike
Family: Asteraceae
Range Name: Nagargali
Beat Name: Manjarpai
GPS reading:
Latitude 15° 25" 25.8'

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Figure 20: Gardenia latifolia
Plant Name: Gardenia latifolia
Family: Rubiaceae
Range Name: Nagargali
Beat Name: Halaga
GPS reading:
Latitude 15° 29" 43.5'
Longitude 74° 39" 4.9'
Elevation 654 m

Figure 21: Ipomoea hederifolia
Plant Name: Ipomoea hederifolia
Family: Convolvulaceae
Range Name: Golihalli
Beat Name: Kakkeri
GPS reading:
Latitude 15° 29" 38.8'
Longitude 74° 44" 31.2'
Elevation 652 m

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Figure 22: Leucas marrubioides
Plant Name: Leucas marrubioides
Family: Lamiaceae
Range Name: Khanapur
Beat Name: Katgali
GPS reading:
Latitude 15° 43" 17'
Longitude 74° 28" 19'
Elevation 708 m

Table 13: Estimation of Threatened Medicinal plant species.

Sl. No.	Botanical Name	Family	Habit	Threat Status
1	*Abrus precatorius*	*Fabaceae*	Shrub	Threatened
2	*Aegle marmelos*	*Rutaceae*	Tree	Vulnerable
3	*Andrographis paniculata*	*Acanthaceae*	Herb	Vulnerable
4	*Aristolochia tagala*	*Aristolochiaceae*	Shrub	Threatened
5	*Artocarpus hirsutus*	*Moraceae*	Tree	Vulnerable
6	*Asparagus racemosus*	*Asparagaceae*	Shrub	Threatened
7	*Boswellia serrata*	*Burseraceae*	Tree	Vulnerable
8	*Buchanania lanzan*	*Anacardiaceae*	Tree	Threatened
9	*Butea monosperma*	*Fabaceae*	Tree	Endangered
10	*Calophyllum apetalum*	*Calophyllaceae*	Tree	Vulnerable
11	*Centella asiatica*	*Apiaceae*	Herb	Vulnerable
12	*Clerodendrum serratum*	*Lamiaceae*	Shrub	Endangered
13	*Costus speciosus*	*Costaceae*	Herb	Threatened
14	*Cryptolepis buchananii*	*Apocynaceae*	Shrub	Vulnerable
15	*Dillenia pentagyna*	*Dilleniaceae*	Tree	Endangered
16	*Dioscorea bulbifera*	*Dioscoreaceae*	Shrub	Vulnerable
17	*Diospyros candolleana*	*Ebenaceae*	Tree	Vulnerable
18	*Embelia tsjeriam-cottam*	*Primulaceae*	Shrub	Endangered
19	*Gardenia gummifera*	*Rubiaceae*	Tree	Threatened
20	*Gnetum ula*	*Gnetaceae*	Shrub	Vulnerable

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21	*Limonia acidissima*	*Rutaceae*	Tree	Vulnerable
22	*Hardwickia binata*	*Fabaceae*	Tree	Endangered
23	*Madhuca longifolia*	*Sapotaceae*	Tree	Vulnerable
24	*Myristica malabarica*	*Myristicaceae*	Tree	Vulnerable
25	*Naringi crenulata*	*Rutaceae*	Tree	Vulnerable
26	*Persea macrantha*	*Lauraceae*	Tree	Endangered
27	*Pseudarthria viscida*	*Fabaceae*	Shrub	Vulnerable
28	*Saraca asoca*	*Fabaceae*	Tree	Vulnerable
29	*Smilax zeylanica*	*Smilacaceae*	Shrub	Endangered
30	*Terminalia pallida*	*Combretaceae*	Tree	Endangered
31	*Toona ciliata*	*Meliaceae*	Tree	Endangered
32	*Tylophora indica*	*Apocynaceae*	Shrub	Vulnerable

The Proportionate regeneration data of 206 tree species in the ecosystem of division has been projected in Table 13. It has been estimated by taking sample count of saplings with less than 10 cm girth of that species and then projected for the total area. (Graph 6a, 6b, 6c & 6d). Survey revealed that, among them Anogeissus latifolia has been noted as highest regeneration capacity followed by Chloroxylon swietenia, Terminalia paniculata, Terminalia tomentosa, Xylia xylocarpa , Holarrhena antidysenterica, Careya arborea, Maytenus emarginata, Syzygium cumini, Mallotus philippensis, Diospyros melanoxylon, Gardenia gummifera , Lagerstroemia parviflora, Macaranga peltata, Olea dioica, Aporosa lindleyana, Symplocos racemosa, Buchanania lanzan, Memecylon umbellatum and Lagerstroemia lanceolata. Lower regeneration capacity of trees was observed as indicated in (Table 10) of some of the species like Artocarpus integer, Ficus tinctoria, Ficus microcarpa , Alstonia scholaris, Acacia ferruginea, Dalbergia sissoo, Limonia crenulata, Ixora pavetta and Acacia intsia have been reported with the lowest number of trees. It may be due to the adverse effect of existing conditions for their growth. Augmentation of these plants mentioned above should be the priority of Belagavi Forest Division. For the quick ocular assessment the figures obtained through is presented through Graphs 6d.

Assessment of Threatened Medicinal Plants

From the survey, 32 medicinal plants have been identified as the RET species included in the IUCN Red list as shown in (Table 14). About 32 species have listed under Red list, among them Aegle marmelos, Andrographis paniculata, Artocarpus hirsutus, Boswellia serrata, Calophyllum apetalum, Centella asiatica, Cryptolepis buchananii, Dioscorea bulbifera, Diospyros candolleana, Gnetum ula, Myristica malabarica, Madhuca longifolia, Limonia acidissima, Naringi crenulata, Pseudarthria viscid, Saraca asoca and Tylophora indica are Vulnerable. Abrus precatorius, Aristolochia tagala, Asparagus racemosus, Buchanania lanzan, Costus speciosus and Gardenia gummifera are listed under Threatened species. Remaining 9 species such as Butea monosperma, Clerodendrum serratum, Dillenia pentagyna, Embelia tsjeriam-cottam, Hardwickia binata, Persea macrantha, Smilax zeylanica, Terminalia pallid and Toona ciliate are listed under endangered species. Belagavi Forest Division would predict and take measures to increase their population. The survey of plant population in Belagavi Forest Division revealed that Smilax zeylanica has maximum plants (53725561) though it is endangered, whereas Limonia acidissima has minimum number of plants (1944) is going to be critically endangered. The survey reported that plant like Myristica malabarica (7826) Calophyllum apetalum and (9168) has been projected with poor population and in the verge of extinction.

Therapeutic Significance and Medicinally Potential Plants of Belagavi Forest Division

Plants as an ingredient in many popular drugs belonged to the Ayurveda system of medicine got identified and assessed during the survey. Among the ingredients of the drug „Chavanaprasha" some of the plants like Asparagus racemosus (Satavari), Phyllanthus emblica (Amla), Santalum album (Sandal wood), Terminalia chebula (Chebilic myrobalan) and Sida cordifolia (Country mallow) have been incorporated in the database with location details and estimated population. Asparagus racemosus used in the preparation of some tailas like Shatavari taila, Naraine taila and Shatmulyadi taila. Andrographis alata is one ingradient in the preparation of Ayurvdic and Homeopathy medicines. Santalum album is used in the preparations of Siddha medicines - Arakkut tailam, Cintil Ney, Cukut tailam, Naciroka Nacat tailam, Nilavembu Kutineer, Vallarai Ney. Other plants recognized as authentic ingredients in different Ayurvedic preparations according to Ayurvedic Pharmacopoea of India (API) are Albizia lebbeck used in Dasangaleppa, Ocimum sanctum used in the preparation of manaasamitra Vataka. Pterocarpus marsupium bark is used in the preparation of Nyagrodhdi churna and Asanavilvdi taila and Terminalia bellirica bark is an important ingredient of Triphala churna and Triphaladi taila.The details of species found in division and their uses are given in (Table 15).

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Table 14: Assessment of Economically and Medicinally Potential species.

Sl.No.	Botanical Name	Family	Part Used	Therapeutical Property
1	*Abelmoschus crinitus*	*Malvaceae*	Seed, Bark	Seeds are valued medicinally for their diuretic, demulcent properties; they are stimulant, antiseptic, cooling, tonic, carminative and aphrodisiac. Bark paste is applied to cuts, wounds and sprains.
2	*Abrus precatorius*	*Fabaceae*	Roots, Leaves Seeds	Leaves used to cure fever, cold and cough. Roots are used to treat jaundice, abdominal pains, haemoglobinuric bile, tumors and abortion. Dry seeds used to cure worms infection.
3	*Acacia catechu*	*Mimosaceae*	Bark, Seeds, Gum	Gum used for treating cough and sore throat. Bark used against dysentery, diarrhoea and wound healing. Seeds have an antibacterial action.
4	*Acacia nilotica*	*Mimosaceae*	Bark, Leaves	Bark used for diarrhea, dysentery and leprosy. Leaves poulticed onto ulcers.
5	*Acacia auriculiformis*	*Fabaceae*	Root	A decoction of the root is used to treat aches and pains and sore eyes; an infusion of the bark treated rheumatism Plant is useful in Hemorrhoids, indigestion,
6	*Achyranthes aspera*	*Amaranthaceae*	Whole plant	cough, asthma, anemia, jaundice and snake bite. Root powder is sprinkled over the lesion in skin diseases.
7	*Albizia amara*	*Mimosaceae*	Leaves Root Bark, Seed	Leaf Paste and rootbark is used to cure skin diseases and poisonous bites. Seeds are used in the treatment of piles, diarrhea and gonorrhea.
8	*Asparagus racemosus*	*Liliaceae*	Whole plant	Plant used for stomach upset, constipation, stomach spasms and stomach ulcers. Also used for fluid retention, pain, cancer, anxiety, diarrhea, bronchitis, tuberculosis, dementia and diabetes
9	*Azadirachta indica*	*Meliaceae*	Leaves	Leaves used in medicinal treatment like skin diseases, healthy hair, improve liver function, detoxify the blood, fever reduction, dental treatments, cough, asthma, ulcers, piles, intestinal worms, urinary diseases.
10	*Barleria cristata*	*Acanthaceae*	Stem Leaf Root	Stem used to treat fever, toothache, respiratory diseases, joint pains. A mouthwash made from root tissue is used to relieve toothache and treat bleeding gums. Leaves are used to healing the wounds and to relieve joint pains.
11	*Cassia alata*	*Caesalpinaceae*	Seeds	Seeds have a bitter, bad taste and having diuretic, cathartic and useful in liver and kidney diseases.
12	*Cordia wallichii*	*Boraginaceae*	Fruits	Fruits are edible, slimy and heavy to digest. They are given in colic pain, disorders of blood, seminal weakness, and sexual disorders.
13	*Dioscorea oppositifolia*	*Dioscoraceae*	Whole plant	The whole plant extract is used for secondary syphilis and Psorasis.
14	*Dodonaea viscosa*	*Sapindaceae*	Stem, root, Leaves	Stem or leaf infusions are used to treat sore throats; root infusions treat colds.
15	*Elephantopus scaber*	*Asteraceae*	Leaves	Leaves used as an astringent agent, cardiac tonic and diuretic. Used for eczema, rheumatism, fever, bladder stones
16	*Euphorbia hirta*	*Euphorbiaceae*	Whole plant	Used for female disorders, respiratory ailments (cough, coryza, bronchitis and asthma), worm infestations in children, dysentery, jaundice, pimples, gonorrhea, digestive problems.
17	*Ficus benghalensis*	*Moraceae*	Leaves	Leaves used for wounds, skin diseases, eye diseases, leucorrhea, diabetes and diarrhea.
18	*Ficus religiosa*	*Moraceae*	Leaves	Used in traditional medicine, including asthma, diabetes, diarrhea, epilepsy, gastric problems, inflammatory disorders, infectious and sexual disorders.
19	*Gardenia gummifera*	*Rubiaceae*	Leaves	Used for fever treatment, wounds, indigestion, skin diseases and abdomen pain due to intestinal worm or constipation.
20	*Gymnema sylvestre*	*Asclepiadaceae*	Leaves	Leaf extract used to treat eye diseases, allergies, constipation, cough, dental caries, obesity, stomach ailments, and viral infections.
21	*Hemidesmus indicus*	*Asclepiadaceae*	Roots	Root is demulcent, alterative, astringent, diaphoretic, diuretic, tonic, anti-pyretic, and blood purifier. Used in leprosy, skin diseases, fever, asthma, bronchitis, syphilis and pruritus, other urinary diseases, chronic rheumatism and leucorrhoea.

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22	*Hibiscus lobatus*	*Malvaceae*		Leaves are antifungal agents have been used for treatment of fungal infections. Root bark used as an antifungal agent.
23	*Justicia prostrata*	*Acanthaceae*	Whole plant	Used in the treatment of fever, pain, inflammation, diabetes diarrhea and liver diseases. Also possess anti-tumoral, antiviral, analgesic, anti-inflammatory activities.
24	*Limonia crenulata*	*Rutaceae*	Root	Root extract is used for vomiting, dysentery and colic disorders. Fruit decoction is used as an antidote to insect poison
25	*Morinda tomentosa*	*Rubiaceae*	Fruit	Fruit is used to treat high blood pressure, arthritis, ulcers, depression, sprains, menstrual cramps, pain relief, inflammation, burns, fever, food poisoning, intestinal worms and joint problems.
26	*Ocimum sanctum*	*Lamiaceae*	Whole plant, Seed	Whole plant is used as stomachic and in treating sunstroke, headache and influenza. Seeds have laxative properties and are prescribed against gonorrhoea.
27	*Phoenix sylvestris*	*Arecaceae*	Root	The root of the plant is useful to treat toothache, nervous debility and helminthiasis.
28	*Phyllanthus emblica*	*Euphorbiaceae*	Fruit	Used for the treatment of diarrhea, jaundice, and inflammation.
29	*Santalum album*	*Santalaceae*	Wood	Used in folk medicine for treatment of common colds, bronchitis, skin disorders, heart ailments, fever, general weakness, urinary tract infection, mouth and pharynx inflammation, gallbladder and liver complaints
30	*Solanum erianthum*	*Solanaceae*	Seed	Seeds are used for treating toothache by burning them and inhaling the fumes.
31	*Tephrosia purpurea*	*Fabaceae*	Leaf	Leaf juice is used to treat dropsy and diabetes
32	*Urena lobata*	*Malvaceae*	Root, Leaf	Leaves and roots are used in the treatment of colic, malaria, fever, toothache, rheumatism and lumbago
33	*Vernonia cinerea*	*Asteraceae*	Whole plant	Used as remedy for asthma, cough, fever, gonorrhea leprosy, and phthisis
34	*Waltheria indica L.*	*Malvaceae*	Root, Stem, Leaf	Root, stem and leaf have antibacterial, antifungal, anti- inflammatory and anti-oxidant properties

Table 15: Highly Traded Medicinal Plants.

No	Botanical Name	Family	Trade Name	Part used
1	*Abrus precatorius*	*Fabaceae*	Gulagangi	Root,seed, Leaves
2	*Abutilon indicum*	*Malvaceae*	Baralu kaddi	Roots, Leaves
3	*Acacia catechu*	*Fabaceae*	Cachu, Kaachu,	Bark
4	*Acacia chundra*	*Fabaceae*	Kempu Jaali, Kempu Kaggali	Bark
5	*Achyranthes aspera*	*Amaranthaceae*	Apamarg	Root, Seed Leaves
6	*Ailanthus excels*	*Simaroubaceae*	Bende, Dodabevu,	Bark
7	*Albizia amara*	*Fabaceae*	Balukamb Beelkambi	Leaf
8	*Albizia lebbeck*	*Fabaceae*	Baage mara	Bark
9	*Asparagus racemosus*	*Asparagaceae*	Aashaadi baeru	Root
10	*Barleria cristata*	*Acanthaceae*	Jhante	Leaf
11	*Bauhinia malabarica*	*Fabaceae*	Basavanapaada	Leaf
12	*Boerhavia repens*	*Nyctaginaceae*	Adaka puttana gida	Whole Plant
13	*Butea monosperma*	*Fabaceae*	Gond-chunya, kamarkas	Gum, Wood
14	*Cassia alata*	*Fabaceae*	Bee chaksu, Kadu huliga	Seda, Roots
15	*Cassia fistula*	*Fabaceae*	Amaltas dana, Amaltas guda, KonnatholiKakke gida	Seeds, fruits, Flower, Bark
16	*Desmodium triflorum*	*Fabaceae*	Cherupulladi, Nilamparanda	Leaf

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17	*Evolvulus alsinoides*	*Convolvulaceae*	Shankhavali	Leaf
18	*Ficus amplissima*	*Moraceae*	Kallaaltholi	Bark
19	*Gymnema sylvestre*	*Apocynaceae*	Gudmaar,	Leaf
20	*Jatropha curcas L.*	*Euphorbiaceae*	Nepalam seed	Seed
21	*Leucas aspera*	*Lamiaceae*	Dronpushp	Leaf, Flower,
22	*Madhuca longifolia*	*Sapotaceae*	Hippe hoo, Mohwa seed	Flower, Seed
23	*Melia dubia*	*Meliaceae*	Bakayan phal,	Bark
24	*Naringi crenulata*	*Rutaceae*	Naidile gadde	Leaf
25	*Ocimum sanctum*	*Lamiaceae*	Kaarttuthulasi pacha	Leaf
26	*Oxalis corniculata*	*Oxalidaceae*	Puliyaarila,	Whole plant
27	*Phyllanthus emblica*	*Phyllanthaceae*	Nelli	Fruit
28	*Phyllanthus virgatus*	*Phyllanthaceae*	Kaadu nelli	Fruit
29	*Pterocarpus marsupium*	*Fabaceae*	Beeja patta	Seed, Gum, Heart wood
30	*Santalum album*	*Santalaceae*	Chandan chhilka	Heart wood
31	*Sapindus emarginatus*	*Sapindaceae*	Reetha, rita, soapnut	Fruit
32	*Solanum erianthum*	*Solanaceae*	Kandan, Kathiri	Whole plant
33	*Spermacoce hispida*	*Rubiaceae*	Nathai soori	Whole plant
34	*Tamarindus indica*	*Fabaceae*	Tamarind	Fruit
35	*Terminalia paniculata*	*Combretaceae*	Venmaruth	Bark
36	*Toona ciliata*	*Meliaceae*	Thooniyaankam	Leaf
37	*Tribulus terrestris*	*Zygophyllaceae*	Bhakara,Gokhru	Whole plant
38	*Vernonia cinerea*	*Asteraceae*	Kattu,cheeragam	Seed
39	*Vitex negundo*	*Lamiaceae*	Karinocci	Whole plant
40	*Wrightia tinctoria*	*Apocynaceae*	Beppale mara	Seed
41	*Ziziphus jujuba*	*Rhamnaceae*	Onav	Fruit

Medicinal Plants with High Trade Potential.

Survey of plants in Belagavi Forest Division resulted in the identification of 57 species with high trade value as per the study of NMPB are provided in (Table 15). The above 41 species are listed as highly traded plants, according to the study carried out by National Medicinal Plant Board Delhi. The forest beats should conserve these highly traded plants as Field Gene bank considering the demand in Medicine. The above listed plants include family name, trade name and parts used to trade in Indian market, belonged to 37 genera and 25 families. As per the analysis, Fabaceae is a dominant family with 12 species followed by Lamiaceae with 3 species. Apocynaceae, Meliaceae and Phyllanthaceae with 2 species each and 20 families comprised of single species each. Existing survey has brought about the documentation of some Medicinal plant species which are incorporated in the list of highly traded category of India according to National Medicinal Plant Board. Few selected plants from the list (Table 14 ,15) are used as ingredients in Ayurveda, Homeopathy and Siddha medicines. Among them, several plants are facing a threat due to their over exploitation by the pharmaceutical and therapeutical prospective. In this regard, Belagavi Forest Division must take the resourcefulness to safeguard and rejuvenate these useful medicinal plants by maintaining a Field Gene Bank for the universal welfares of mankind.

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