

# Floristic Diversity, Vegetation Analysis and Threat Status of Plants in Various Forest Types in Dharmapuri Forest Division, Tamilnadu, Southern India

Umeshkumar L. TIWARI<sup>1\*</sup>, K. RAVIKUMAR<sup>2</sup>

<sup>1</sup>*Botanical Survey of India, Arunachal Pradesh Regional Centre, Senki View, Itanagar-791111, Arunachal Pradesh India; [tigerumesb11@gmail.com](mailto:tigerumesb11@gmail.com) (\*corresponding author)*

<sup>2</sup>*National Herbarium of Medicinal Plants and Repository of Raw Drug, Institute of Trans-disciplinary Health Sciences and Technology (ITD-HST) University; Foundation for Revitalisation of Local Health Traditions (FRLHT), No. 74/2, Jarakabande Kaval, Post Attur, Via - Yelahanka, Bangalore 560 106. [ravikumarfhlbt@gmail.com](mailto:ravikumarfhlbt@gmail.com)*

## Abstract

The present paper deals with the study conducted to know the floristic diversity assessment and vegetation composition analysis in various forest types of Dharmapuri Forest division situated in Eastern Ghats of Southern India in the state of Tamilnadu. A total of 352 species of 233 genera and belonging to 79 families were recorded. The quantitative features such as density and important value index (IVI) varied greatly among forest and different forest types. In the present study the diversity index of shrubs and herbs were found to be higher than the tree species. The presence of high number of higher girth class of tree species and low number of sapling and seedling indicates that the present forest is old and exhibiting the low regeneration.

**Keywords:** Dharmapuri Forest Division; floristic diversity; threatened status

## Introduction

Tropical forest constitutes the most diverse plant communities on earth and it covers 7% of the earth's land surface, but harbor more than half of the world's species (Wilson, 1988), and are currently vanishing at an overall rate of 0.8-2% per year (May and Stumpf, 2000; Sagar *et al.* 2003; Naidu and Kumar, 2015). The vanishing of tropical forests comes at a time when our data on their structure and dynamics is sadly not enough (Hubbell and Foster, 1992). Dependence on forest is inevitable in India, therefore, the pressure on forests by the ever-increasing population in logarithmic (Jayakumar *et al.*, 2002; Pragasan, 2010). Rapidly dwindling biodiversity levels have raised the concern that species loss could sooner or later lead to ecosystem collapse (Naeem and Wright, 2003); a decade of research has highlighted generally a positive relationship (Hooper *et al.*, 2005; Balvanera *et al.*, 2006). India is one of the 12 mega diversity countries in the world. Across the world, 25 hot-spots have been identified on the basis of the species endemism and degree of threat through habitat loss (Mayers *et al.*, 2000). Among the rich biodiversity hot spot areas in India are such as the Eastern and Western Ghats,

Western and Eastern Himalayas and Andaman islands. The present study site falls within the Eastern Ghats.

Hence, the conservation of biological diversity has become a major concern, for much of the society and many government agencies at all levels (Kaya and Raynal, 2001). Documenting basic patterns of biodiversity are fundamental for shows potential areas for conservation and management action (Villasenor *et al.*, 2007). The Eastern Ghats of India is a broken chain of hills that runs almost parallel to east coast of India covering four states viz. Odisha, Andhra Pradesh, Tamilnadu and Karnataka. Floristic diversity and phytosociological study of Dharmapuri forest Division is lacking. Therefore, the present study has been undertaken to assess the plant biodiversity and vegetation analysis in different forest types of Dharmapuri Forest Division.

## Materials and Methods

### Study area

The Dharmapuri Forest Division lies between 11° 53' and 12° 29' N and 77° 40' and 78° 17' E. It occupies the entire Dharmapuri, Pennagaram and Palacode Talukas. The total area of this division is 9,6407 ha. The headquarters of this division is at Dharmapuri. There are four territorial forest ranges (Pennagaram, Hogenakkal, Dharmapuri and Palakkodu) in this division.

The rainfall is low with annual average of only 846 mm and varies within the narrow limits from 736 to 1,054 mm.

The division covers a vast table land supported by hill ranges clothing its boundaries on the west, south and east. According to the revised survey of the forest types of India by Champion and Seth (1968), the forest division is represented by 12 different forest types (Fig. 1). The study area is dominated by Southern Tropical Dry Mixed Deciduous forest, *Hardwickia* subtype, Secondary Dry Deciduous Forest, Dry Deciduous Scrub, Dry Tropical Riverine Forest, Southern Thorn Forest, Southern Thorn Scrub Forest, Dry Bamboo Brake, Carnatic Umbrella Thorn Forest and Southern Euphorbia Scrub.

#### Survey, sampling, data compilation and analysis

Survey was conducted during 2013-2015 covering all aspects and different seasons. For the study of plant biodiversity the division is divided based on 10 different forest types. These forest types were further separated depend on topography and altitude. Intensive field survey adopting 0.1% of the total area of each forest types was carried out following quadrat technique. For the quantitative assessment, a plot of 31.62 × 31.62 m. (65 nos.) quadrats for trees, bamboos and lianas, all the individuals were measured at GBH in the sample plots; within which 5×5 m (130 nos.) quadrats for shrubs, saplings and climbers and 1×1 m (260 nos.) quadrats for herbs and seedlings. For the collection of data from these quadrats and analysis, standard ecological methods were followed. A species list of all the identified species was prepared with the help of flora guides (Hooker, 1872-1897; Gamble and Fischer, 1915-1932; Vajravelu and Radhakrishnan 1967-1968; Matthew, 1981-1984; Ahmedullah and Nayar, 1987; Henry *et al.*, 1987; Henry *et al.*, 1989; Sanjappa, 1992; Nayar, 1996; Jagtap and Singh, 1999; Singh, 2001; Balakrishnan and Chakrabarty, 2007; Ansari, 2008). Each sampled sites were marked with a Global Positioning System (GPS).

Quadrat data were used for computation of analytical features such as density, frequency, basal cover and Important Value Index (IVI), following standards phytosociological methods as given by Curtis and McIntosh (1950). Diameter at breast height of the trees with > 20 cm

circumference in each quadrat was measured and recorded for each species. The Important Value Index (IVI) for the tree species was determined as the sum of the relative density, relative frequency and relative dominance (Simpson, 1949; Curtis, 1959). The species diversity among forest types were determined by using Shannon Wiener information function (H') (Shannon and Wiener, 1963). Similarity index was determined by as per formula given by Sorenson (1948).

## Results and Discussion

#### Floristic diversity and threatened status

The study recorded 352 species of vascular plants of 233 genera belongs to 79 families i.e. Angiosperms (348 species), Pteridophytes (3 species) and Bryophytes (1 species) (Table 1 & 2). Of the total species 51 species were trees, 17 species of Lianas, 42 species of shrubs, 26 species of climbers, 185 species of herbs, sedges 4, grasses 23, ferns 2 species and 2 species of mosses. Among these recorded species based on Red data book of Indian Plant (Nayar and Sastry, 1987, 1988, 1990) (Table 2): Three (3) species are Endangered; Two (2) species as Vulnerable; Two (2) species as Near Threatened; Twelve (12) species are Endemic to Southern India. Twenty one (21) species found to be rare.

#### Compositional features

##### Southern tropical dry mixed deciduous forest

This is the most conspicuous type of deciduous forest in the division spreading over almost all the reserved forests of Palacode and Bevanurmalai of Pennagaram Range. Sandal and Bamboo, the two economically most valuable species are found exclusively in this forest. The species forming the upper and lower canopy are almost deciduous. Some of the predominant trees that are found to occur in this forest type are: *Albizia amara*, *Acacia planifrons*, *Anogeissus latifolia*, *Chloroxylon swietenia*, *Psydrax dicoccus*, *Cassia fistula*, *Holoptelea integrifolia*, *Phyllanthus emblica*, *Premna tomentosa*, *Vitex altissima*, *Cassine glauca*, *Diospyros ferrea*, *Strychnos nuxvomica*, *Shorea talura* and *Ficus* spp.. *Shorea talura* though occurs profusely in this sub type, but only in patches. The most common climbers/liana/straggler in this forest is: *Cissus quadrangularis*, *Cocculus hirsutus*, *Scutia myrtina*, *Cryptolepis grandiflora*, *Jasminum* spp., etc. The common herbs here are *Spermacoce ocyroides*, *Evolvulus alsinoides*, *Oplismenus compositus*, *Aristida setacea* etc.

**Tree layer:** In this forest type *Albizia amara* has highest density (179.9 ha<sup>-1</sup>) and IVI (32.2) was recorded followed by *Acacia planifrons* (D= 105.4 ha<sup>-1</sup> and IVI= 25.3) (Appendix 1).

**Sapling and seedlings:** In sapling (of tree species) stage *Acacia planifrons* was dominant among all other species present in this forest type followed by *Albizia amara*. **Shrub layer:** *Acalypha fruticosa* (D=1,820 ha<sup>-1</sup>, IVI=30.05), *Tarenna asiatica* (D=1,000 ha<sup>-1</sup>, IVI=18.80), *Solanum pubescens* (D=860 ha<sup>-1</sup>, IVI=17.29) and *Lantana camara* (D=860 ha<sup>-1</sup>, IVI=16.93). The highest frequency was recorded for *Coffea wightiana* (f=40%) followed by *Solanum pubescens* (f=35%). The frequency ranged from 5-40%.

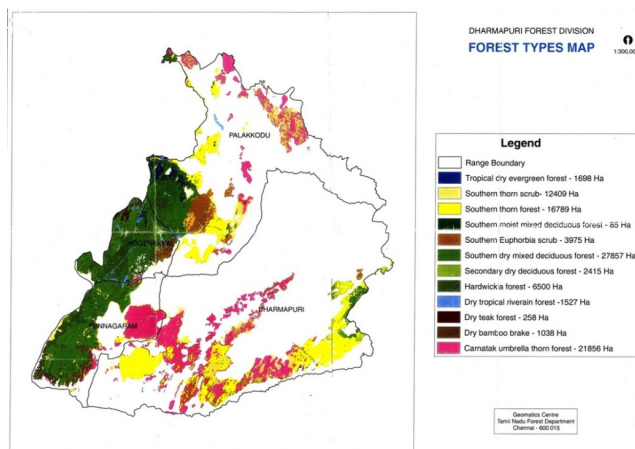


Fig. 1. The Dharmapuri Forest Division (Source: Tamil Nadu Forest Department)

Table 1. Floristic diversity in various forest types of Dharmapuri Forest (DFD)

Habits	CUTF	DDS	EuS	HwkF	RvF	SDDF	SDMDF	SDS	STF	STS	DFD
Trees	21	13	10	7	9	10	29	15	23	23	51
Liana	7	4	3	2	4	5	13	5	9	6	17
Shrubs	25	13	11	0	3	19	25	14	20	20	42
Climbers	16	7	7	1	0	9	12	9	12	13	26
Herbs	109	46	36	9	15	76	55	60	103	88	185
Grass	12	4	3	1	1	11	5	6	12	13	23
Sedges	2	2	1	0	0	1	3	1	3	3	4
Fern	3	2	0	0	0	1	1	2	3	0	3
Moss	1	1	0	0	0	1	1	0	0	1	1
Total species	196	92	71	20	32	133	144	112	185	167	352
Number Genera	134	81	63	20	32	101	119	90	140	126	233
Number of Family	58	41	37	17	23	49	52	43	51	50	79
EN	2	1	2	0	0	2	2	2	3	3	3
Endemic (SI or PI)	8	2	0	2	0	5	2	3	5	5	12
NT	0	1	1	1	1	0	1	0	0	0	2
Rare	8	1	1	0	0	4	5	1	10	3	21
VL	1	0	0	0	1	0	2	1	1	1	2

1. CUTF: Carnatic Umbrella Thorn Forest; 2. DDS: Dry Deciduous Scrub Forest; 3. EuS: Euphorbia Scrub Forest; 4. HwkF: Hardwickia Forest; 5. RvF: Riverain Forest; 6. SDDF: Southern Tropical Dry Deciduous Forest; 7. SDMDF: Southern Tropical Dry Moist Mixed Deciduous Forest; 8. SDS: Southern Scrub Forest; 9. STF: Southern Thorn Forest; 10. STS: Southern Thorn Scrub Forest; EN: Endangered; SI: Southern India or PI: Peninsular India; NT: Near Threatened; VN: Vulnerable.

**Herb layer:** The density ranged from 6.63/ m<sup>2</sup> to 0.03/m<sup>2</sup>, grasses exhibits 13.88% of each plots. Among grasses *Oropetium thomaeum* (D=2.5/m<sup>2</sup>), *Aristida setacea* (D=2.0/m<sup>2</sup>), *Eragrostirella* sp. (D=1.08/m<sup>2</sup>) followed by *Oplismenus composites* (D=1.0/m<sup>2</sup>). *Mitracarpus hirtus* exhibits the maximum density (D=6.43/m<sup>2</sup>) and F=47.50%, followed by *Spermacoce ocymoides* (D=4.75/ m<sup>2</sup> and F=55%), *Evolvulus alsinoides* (D=3.68/m<sup>2</sup> and F=72.50%) and *Spermacoce articularis* (D=3.50/m<sup>2</sup> and F=32.50%). The highest frequency was recorded for *Evolvulus alsinoides* (72.50%) and lowest for many species with 2.5%. **Hardwickia subtype:** Under Dry Deciduous forest, this sub types very distinct. This classification is based on the abundant presence of *Hardwickia binata*. This tree occurs gregariously and is often occupies the slopes that drain into the Cauvery, Chinnar and Anaibiddahalla on the west and Hosur valley in the east. Since this species is of evergreen nature, it stands out conspicuously in this sub type. Some of the other associated species are: *Boswellia serrata*, *Grewia flavescens*, *Solanum pubescens*, *Grewia tenax*, *Chloroxylon swietenia*, *Dichrostachys cinerea* and *Diospyros* spp. **Tree layer:** In this forest type the climax species is *Hardwickia binata* has highest density (138.86 ha<sup>-1</sup>) and IVI (120.89) was recorded followed by *Gyrocarpus americanus* (D= 69.43 ha<sup>-1</sup> and IVI= 54.63) and *Albizia amara* (D= 69.43 ha<sup>-1</sup> and IVI= 46.93) (Appendix 1). **Sapling and seedlings:** In sapling (of tree species) stage *Albizia amara* was dominant among all other species present in this forest type followed by *Holoptelea integrifolia* and *Hardwickia binata*. **Shrub layer:** *Acalypha fruticosa* (D=1,820 ha<sup>-1</sup>, IVI=30.05), *Tarenna asiatica* (D=1,000 ha<sup>-1</sup>, IVI=18.80), *Solanum pubescens* (D=860 ha<sup>-1</sup>, IVI=17.29) and *Lantana camara* (D=860 ha<sup>-1</sup>, IVI=16.93). The highest frequency was

recorded for *Coffea wightiana* (f=40%) followed by *Solanum pubescens* (f=35%). The frequency ranged from 5-40%.

**Herb layer:** The density ranged from 6.63/m<sup>2</sup> to 0.03/m<sup>2</sup>, grasses exhibits 13.88% of each plots. Among grasses *Oropetium thomaeum* (D=2.5/ m<sup>2</sup>), *Aristida setacea* (D=2.0/ m<sup>2</sup>), *Eragrostirella* sp. (D=1.08/ m<sup>2</sup>) followed by *Oplismenus composites* (D=1.0/ m<sup>2</sup>). *Mitracarpus hirtus* exhibits the maximum density (D=6.43/ m<sup>2</sup>) and F=47.50%, followed by *Spermacoce ocymoides* (D=4.75/m<sup>2</sup> and F=55%), *Evolvulus alsinoides* (D=3.68/m<sup>2</sup> and F=72.50%) and *Spermacoce articularis* (D=3.50/ m<sup>2</sup> and F=32.50%). The highest frequency was recorded for *Evolvulus alsinoides* (72.50%) and lowest for many species with 2.5%. **Secondary Dry Deciduous Forest:** Basically this is a mixed deciduous forest but due to continuous exploitation and biotic interferences it is converted in to secondary serial forest type. This forest is dominated by *Albizia amara* and other associate species are: *Acalypha fruticosa*, *Solanum pubescens*, *Gymnema sylvestre*, *Jasminum* spp. *Pachygone ovata*, *Gyrocarpus americanus*, *Cordia monoica*, *Fluggea leucopyrus*, *Ziziphus trinervia*, *Chloroxylon swietenia*, *Dichrostachys cinerea* and *Moringa concanensis*. In this forest type the climax species is *Albizia amara* has highest density (311 ha<sup>-1</sup>) and IVI (179) was recorded followed by *Pterolobium hexapetalum* (D= 31 ha<sup>-1</sup> and IVI= 12.3), *Chloroxylon swietenia* (D= 27 ha<sup>-1</sup> and IVI= 20.80) and *Euphorbia antiquorum* (D= 25 ha<sup>-1</sup> and IVI= 16.4) (Appendix 1). **Sapling and seedlings:** In sapling (of tree species) stage *Albizia amara* was dominant among all other species present in this forest type followed by *Chloroxylon swietenia* and *Fluggea leucopyrus*. **Shrub layer:** *Solanum pubescens* (D=4072.73 ha<sup>-1</sup>, IVI=45.33), *Acalypha fruticosa*

( $D=2654.55 \text{ ha}^{-1}$ ,  $IVI=31.41$ ), *Lantana camara* ( $D=1290.91 \text{ ha}^{-1}$ ,  $IVI=19.22$ ) and *Jatropha gossypifolia* ( $D=860 \text{ ha}^{-1}$ ,  $IVI=16.93$ ). The highest frequency was recorded for *Solanum pubescens* ( $F=72.73\%$ ) followed by *Acalypha fruticosa* and *Lantana camara* ( $f=40.91\%$ ). The frequency ranged from 4.5-72.73%. **Herb layer:** The density ranged from  $6.63/\text{m}^2$  to  $0.03/\text{m}^2$ , grasses exhibits 13.88% of each plots. Among the dominant species *Aristida adscensionis* ( $D=4.84/\text{m}^2$ ), *Abutilon crispum* ( $D=3.16/\text{m}^2$ ), *Blepharis molluginifolia* ( $D=2.66/\text{m}^2$ ) followed by *Sida cordifolia* ( $D=2.55/\text{m}^2$ ). *Blepharis molluginifolia* exhibits the maximum frequency= $75\%$ , followed by *Justicia glauca* ( $F=56.82\%$ ), *Justicia prostrata* ( $F=45.45\%$ ) and *Aristida adscensionis* ( $F=40.91\%$ ) and lowest frequency for many species with 2.27%.

**Dry Deciduous Scrub Forest:** Due to persistent felling and removal of useful species this forest type was subjected to a high degree of degradation over a prolonged period of time, by which all the tall trees eventually disappeared, resulting in to stunted growth of few scattered trees seen in open forest. Some of the common species composition are: *Albizia amara*, *Chloroxylon swietenia*, *Dichrostachys cinerea*, *Diospyros* spp., *Cipadessa baccifera*, *Atalantia monophylla*, *Annona squamosa*, *Butea monosperma*, *Wrightia tinctoria*, *Feronia elephantum*, *Dodonaea viscosa*, *Catunaregum spinosa*, *Pavetta indica*, *Lantana camara*, *Ziziphus mauritiana*, *Gymnema sylvestre*, *Cassia montana*, *Azadirachta indica*, *Hemidesmus indicus*, *Ichnocarpus frutescens*, etc. In this forest type the climax species is *Azadirachta indica* has highest density ( $139 \text{ ha}^{-1}$ ) and  $IVI$  (131.4) was recorded followed by *Toddalia asiatica* var. *gracilis* ( $D= 56.80 \text{ ha}^{-1}$  and  $IVI= 20.26$ ), *Chloroxylon swietenia* ( $D= 53.6 \text{ ha}^{-1}$  and  $IVI= 25.11$ ), *Albizia amara* ( $D= 47.33 \text{ ha}^{-1}$  and  $IVI= 22.5$ ) and *Erythroxylum monogynum* ( $D= 37.9 \text{ ha}^{-1}$  and  $IVI= 20.05$ ) (Appendix 1).

**Sapling and seedlings:** In sapling (of tree species) stage *Azadirachta indica* was dominant among all other species present in this forest type followed by *Wrightia tinctoria*, *Chloroxylon swietenia* and *Euphorbia antiquorum*. **Shrub layer:** *Dodonaea viscosa* ( $D= 7866.67 \text{ ha}^{-1}$ ,  $F= 83.33\%$ ,  $IVI= 45.67$ ), *Lantana camara* ( $D= 5,200 \text{ ha}^{-1}$ ,  $F= 66.67\%$ ,  $IVI= 33.41$ ), *Canthium coromandelicum* ( $D= 3,066.67 \text{ ha}^{-1}$ ,  $F= 50\%$ ,  $IVI= 22.78$ ), *Flueggea leucopyrus* ( $D= 3,000 \text{ ha}^{-1}$ ,  $F= 50\%$ ,  $IVI= 22.42$ ). The lowest density, frequency and  $IVI$  was recorded for *Annona squamosa*, *Aristolochia indica*, *Cocculus hirsutus* and *Cryptolepis grandiflora* ( $D= 66.67 \text{ ha}^{-1}$ ,  $F= 16.67\%$ ,  $IVI= 2.75$ ). The frequency ranged from 16.67-83.33%.

**Herb layer:** The density ranged from  $6.63/\text{m}^2$  to  $0.03/\text{m}^2$ , grasses exhibits 13.88% of each plots. *Brachiaria ramosa* ( $D=36.67/\text{m}^2$ ,  $F= 50\%$ ), *Spermacoce ocymoides* ( $D=27.67/\text{m}^2$ ,  $F= 25\%$ ), *Glossocardia bosvallia* ( $D=3.67/\text{m}^2$ ,  $F= 8.33\%$ ) followed by *Polygala chinensis* ( $D=2.50/\text{m}^2$ ,  $F= 25\%$ ).

**Dry Tropical Riverain forests:** This forest type is particularly noticeable along Cauvery and Chinnar rivers near Hogenakkal. The most predominant and unique tree species of this type are *Terminalia arjuna* mixed with

*Syzygium cumini*, *Pongamia pinnata*, *Mangifera indica*, *Barringtonia acutangula*, *Alangium salvifolium*, *Ficus racemosa*, *Sapindus emarginatus* and *Tamarindus indica*. Other life forms such as *Crinum asiaticum*, *Homonaia retusa*, *Cyperus* sp. and *Citrullus colocynthis* are also seen in this forest type. In this forest type the climax species is *Prosopis juliflora* has highest density ( $104.14 \text{ ha}^{-1}$ ) and  $IVI$  (12.58) was recorded followed by *Albizia amara* ( $D= 47.34 \text{ ha}^{-1}$  and  $IVI= 47.12$ ), *Terminalia arjuna* ( $D= 28.40 \text{ ha}^{-1}$  and  $IVI= 19.92$ ), *Syzygium cumini* ( $D= 18.93 \text{ ha}^{-1}$  and  $IVI= 16.58$ ) and *Sapindus emarginatus* and *Pongamia glabra* ( $D= 18.93 \text{ ha}^{-1}$  and  $IVI= 19.80, 19.41$  respectively) (Appendix 1).

**Sapling and seedlings:** In sapling (of tree species) stage *Prosopis juliflora* was dominant among all other species present in this forest type followed by *Syzygium cumini*, *Terminalia arjuna* and *Pongamia glabra*. **Shrub layer:** *Barleria prionitis* ( $D= 1000 \text{ ha}^{-1}$ ,  $F= 100\%$ ,  $IVI= 76.1$ ), *Azima tetracantha* ( $D= 600 \text{ ha}^{-1}$ ,  $F= 100\%$ ,  $IVI= 53.6$ ), *Cocculus villosus* ( $D= 400 \text{ ha}^{-1}$ ,  $F= 50\%$ ,  $IVI= 41.5$ ), *Jatropha gossypifolia* ( $D= 200 \text{ ha}^{-1}$ ,  $F= 50\%$ ,  $IVI= 25.8$ ). **Herb layer:** The density ranged from  $13/\text{m}^2$  to  $0.75/\text{m}^2$ , grasses exhibits 2.50% of each plots. Maximum density was recorded for *Spilanthes clava* ( $D=18/\text{m}^2$ ,  $F= 50\%$ ), *Achyranthes aspera* ( $D=13/\text{m}^2$ ,  $F= 25\%$ ), *Sida acuta* ( $D=10.5/\text{m}^2$ ,  $F= 25\%$ ), *Crossandra linneari* ( $D=7.50/\text{m}^2$ ,  $F= 50\%$ ), *Leonotis nepetifolia* ( $D=6.25/\text{m}^2$ ,  $F= 25\%$ ) followed by *Aerva lanata* ( $D=5.0/\text{m}^2$ ,  $F= 25\%$ ).

**Southern Thorn Forests:** This type of forest occurs mostly in the southern western part of the division covering entire Dharmapuri range. Floristically it is dominated by *Albizia amara*, *Chloroxylon swietenia*, *Azadirachta indica*, *Psydrax dicoccus*, *Erythroxylum monogynum*, *Cassia montana*, *Flacourtia indica*, *Maytenus emarginatus*, *Naringi crenulata*, *Balanites aegyptiaca*, *Toddalia asiatica* var. *gracilis*, *Gymnema sylvestre*, *Acacia chundra*, *Acacia leucophloea*, *Acacia ferruginea*, *Ziziphus xylopyrus* and *Dichrostachys cinerea*. This forest type is dominated by *Albizia amara* ( $D= 77.63 \text{ ha}^{-1}$ ,  $F= 80\%$ ,  $IVI= 48.48$ ) followed by *Chloroxylon swietenia* ( $D= 53.96 \text{ ha}^{-1}$   $F= 60\%$ ,  $IVI= 31.28$ ), *Acacia planifrons* ( $D= 46.39 \text{ ha}^{-1}$   $F= 40\%$ ,  $IVI= 52.03$ ), *Acacia chundra* ( $D= 39.76 \text{ ha}^{-1}$ ,  $F= 40\%$ ,  $IVI= 26.11$ ), *Acacia leucophloea* ( $D= 31.24 \text{ ha}^{-1}$   $F= 50\%$ ,  $IVI= 22.97$ ) and *Pterolobium hexapetalum* ( $D= 22.72 \text{ ha}^{-1}$ ,  $F= 50\%$ ,  $IVI= 11.47$ ) (Appendix 1).

**Sapling and seedlings:** In sapling (of tree species) stage *Acacia planifrons* was dominant among all other species present in this forest type followed by *Pterolobium hexapetalum*, *Acacia chundra* and *Albizia amara*, *Euphorbia antiquorum* and *Euphorbia tortilis*. **Shrub layer:** *Lantana camara* ( $D= 2500 \text{ ha}^{-1}$ ,  $F= 50\%$ ,  $IVI= 24.22$ ), *Dodonaea viscosa* ( $D= 1880 \text{ ha}^{-1}$ ,  $F= 40\%$ ,  $IVI= 19.40$ ), *Cassia montana* ( $D= 1720 \text{ ha}^{-1}$ ,  $F= 35\%$ ,  $IVI= 18.13$ ), *Tarenna asiatica* ( $D= 1620 \text{ ha}^{-1}$ ,  $F= 65\%$ ,  $IVI= 19.02$ ) and *Flueggea leucopyrus* ( $D= 1080 \text{ ha}^{-1}$ ,  $F= 35\%$ ,  $IVI= 12.99$ ). Seven (07) species with lowest density, frequency and  $IVI$  ( $D= 20 \text{ ha}^{-1}$ ,  $F= 5\%$ ,  $IVI= 1.10$ ). The frequency ranged from 5-65%.

**Herb layer:** The density ranged from 7.88/m<sup>2</sup> to 0.05/m<sup>2</sup>, dominant species are *Aristida setacea* (D=7.88/m<sup>2</sup>, F= 50%), *Evolvulus alsinoides* (D=7.48/m<sup>2</sup>, F= 77.50%), *Glossocardia bosvallia* (D=6.25/m<sup>2</sup>, F= 12.50%), *Barleria buxifolia* (D=6.0/m<sup>2</sup>, F= 52.50%), *Aristida adscensionis* (D=5.25/m<sup>2</sup>, F= 87.5%) followed by *Fimbristylis ovata* (D=3.75/m<sup>2</sup>, F= 37.50%).

**Southern Thorn Scrub:** When the thorn forests are repeatedly hacked at higher intensity these forests are reduced to a mere scrub land consisting of thorny bushes and stunted tree growth averaging to 2 to 3 meters in height. Impenetrable thorny thickets also are commonly met within this type of forests. This forest is usually represented by species like *Albizia amara*, *Chloroxylon swietenia*, *Azadirachta indica*, *Psydrax dicoccus*, *Toddalia asiatica* var. *gracilis*, *Pterolobium hexapetalum*, *Erythroxylon monogynum*, *Dodonaea viscosa*, *Acacia caesia*, *Acacia chundra*, *Acacia ferruginea*, *Ziziphus xylopyrus*, *Dichrostachys cinerea*, *Lantana camera* and *Caralluma adscendens* var. *attenuata*. This forest type is dominated by *Chloroxylon swietenia* (D= 29.59 ha<sup>-1</sup>, F= 62.50%, IVI= 24.16) followed by *Pterolobium hexapetalum* (D= 29.59 ha<sup>-1</sup>, F= 62.50%, IVI= 22.90), *Acacia chundra* (D= 27.22 ha<sup>-1</sup>, F= 37.50%, IVI= 23.95), *Tamarindus indica* (D= 22.49 ha<sup>-1</sup> F= 12.50%, IVI= 99.41) and *Albizia amara* (D= 17.75 ha<sup>-1</sup>, F= 50%, IVI= 15.53) (Appendix 1).

**Sapling and seedlings:** In sapling (of tree species) stage *Chloroxylon swietenia*, *Acacia planifrons*, *Acacia chundra* was dominant among all other species present in this forest type followed by *Pterolobium hexapetalum*, *Albizia amara*, *Euphorbia antiquorum* and *Ziziphus oenoplia*. **Shrub layer:** *Lantana camara* (D= 3,825 ha<sup>-1</sup>, F= 75%, IVI= 29.05), *Dodonaea viscosa* (D= 3450 ha<sup>-1</sup>, F= 56.25%, IVI= 26.11), *Cassia montana* (D= 2,300 ha<sup>-1</sup>, F= 43.75%, IVI= 19.16), *Catunaregam spinosa* (D= 2,100 ha<sup>-1</sup>, F= 50%, IVI= 18.21), *Tarenna asiatica* (D= 1,250 ha<sup>-1</sup>, F= 37.5%, IVI= 12.49) and *Flueggea leucopyrus* (D= 1,825 ha<sup>-1</sup>, F= 62.50%, IVI= 17.54). Five (05) species with lowest density, frequency and IVI (D= 20 ha<sup>-1</sup>, F= 6.25%, IVI= 1.20). The frequency ranged from 6.25-75%.

**Herb layer:** The density ranged from 12.66/m<sup>2</sup> to 0.03/m<sup>2</sup>, dominant species are *Digitaria bicornis* (D=12.66/m<sup>2</sup>, F= 31.25%), *Brachiaria ramosa* (D=11.09/m<sup>2</sup>, F= 34.38%), *Evolvulus alsinoides* (D=7.75/m<sup>2</sup>, F= 21.88%), *Hedyotis puberula* (D=4.19/m<sup>2</sup>, F= 15.63%), *Spermacoce articularis* (D=2.72/m<sup>2</sup>, F= 12.50%) followed by *Digitaria ciliaris* (D=2.50/m<sup>2</sup>, F= 9.38%).

**Carnatic Umbrella Thorn Forest (CUTF):** This vegetation is of open thorny forests with scattered *Acacia planifrons* and *Albizia amara* that are characterized by umbrella-shaped crowns. Other floristic elements seen in this forest type are: *Acalypha fruticosa*, *Holoptelea integrifolia*, *Dodonaea viscosa*, *Solanum pubescens*, *Cocculus hirsutus*, *Cissus quadrangularis*, *Cryptolepis grandiflora*, *Abutilon crispum*, *Sarcostemma acidum*, *Sida* spp., *Dioscorea* spp., *Corallocarpus epigaeus*, *Cardiospermum canescens*, *Barleia longiflora*, *Gymnema sylvestre*, etc. In CUTF forest a total of 196 species were recorded.

**Tree layer:** In this forest type 21 tree species and 7 lianas were recorded, dominated species in this forest are *Acacia planifrons* (D=185.81 ha<sup>-1</sup>, F= 100%, IVI=126.24), *Albizia amara* (D=125.98 ha<sup>-1</sup>, F= 92.86%, IVI=57.97), *Pterolobium hexapetalum* (D= 35.84 ha<sup>-1</sup>, F=64.29%, IVI=15.91), *Flueggea leucopyrus* (D= 21.71 ha<sup>-1</sup>, F=14.29%, IVI=7.35), *Wrightia tinctoria* (D= 16.23 ha<sup>-1</sup>, F=50%, IVI=9.92), *Euphorbia antiquorum* (D= 13.71 ha<sup>-1</sup>, F=42.86%, IVI=8.49), *Chloroxylon swietenia* (D= 12.30 ha<sup>-1</sup>, F=28.57%, IVI=6.35) and *Annona squamosa* (D= 11.50 ha<sup>-1</sup>, F=28.57%, IVI=6.10).

**Shrub layer:** In this forest type 25 species of shrubs and 16 species of climbers and lianas were recorded, among these dominant species are *Acalypha fruticosa* (D=4173.33 ha<sup>-1</sup>, F=40%, IVI=34.2), *Lantana camera* (D=1800 ha<sup>-1</sup>, F=60%, IVI=19.6), *Solanum pubescens* (D=1413.33 ha<sup>-1</sup>, F=53.33%, IVI=16.45), *Jatropha gossypifolia* (D=1106.67 ha<sup>-1</sup>, F=40%, IVI=13.1), *Flueggea leucopyrus* (D=1040 ha<sup>-1</sup>, F=40%, IVI=12.7), *Tarenna asiatica* (D=880 ha<sup>-1</sup>, F=26.67%, IVI=10.5), *Jasminum angustifolium* (D=613.33 ha<sup>-1</sup>, F=33.33%, IVI=9.02) and *Opuntia dillenii* (D=600 ha<sup>-1</sup>, F=16.67%, IVI=7.88).

**Herb layer:** Among herbaceous species grasses are dominant in ground cover in this forest type. *Aristida adscensionis* (D=6.35 ha<sup>-1</sup>, F=46.67%), *Evolvulus alsinoides* (D=5.43 ha<sup>-1</sup>, F=53.33%), *Oropetium thomaeum* (D=5.28 ha<sup>-1</sup>, F=33.33%), *Brachiaria ramosa* (D=4.78 ha<sup>-1</sup>, F=23.33%), *Spermacoce ocymoides* (D=4.33 ha<sup>-1</sup>, F=30%), *Indigofera linnaei* (D=4.17 ha<sup>-1</sup>, F=46.67%), *Spermacoce stricta* (D=4.0 ha<sup>-1</sup>, F=33.33%), *Hibiscus lobatus* (D=3.92 ha<sup>-1</sup>, F=43.33%), *Spermacoce articularis* (D=3.52 ha<sup>-1</sup>, F=18.33%) and *Sida cordifolia* (D=2.97 ha<sup>-1</sup>, F=53.33%).

**Southern Euphorbia Scrub:** This is an extremely degraded type of forest seen in pockets along the fringes of the Carnatic Umbrella Thorn Forests. No noteworthy tree growths are seen here. The vegetation comprises mostly *Euphorbia antiquorum*, *Euphorbia tortilis* with *Albizia amara*, *Azadirachta indica* and *Annona squamosa*. Some of the worthy species to be mentioned in this forest type are: *Coccinea indica*, *Caralluma* spp., *Rhynchosia minima*, *Sida* spp., *Commiphora berryi*, *Dioscorea* spp., *Cardiospermum halicacabum*, *Barleria buxifolia*, etc.

**Tree layer:** This forest is dominated by *Acacia planifrons* (D=138.86 ha<sup>-1</sup>, F= 100%, IVI=84.80), *Euphorbia antiquorum* (D=88.36 ha<sup>-1</sup>, F= 100%, IVI=48.65), *Annona squamosa* (D= 82.05 ha<sup>-1</sup>, F=33.33%, IVI=45.97), *Albizia amara* (D= 41.03 ha<sup>-1</sup>, F=33.33%, IVI=29.06), *Commiphora berryi* (D= 25.25 ha<sup>-1</sup>, F=66.67%, IVI=15.36), *Dichrostachys cinerea* (D= 22.09 ha<sup>-1</sup>, F=33.33%, IVI=10.08), *Capparis sepiaria* (D= 12.62 ha<sup>-1</sup>, F=33.33%, IVI=7.63), *Flacourtia indica* (D= 12.62 ha<sup>-1</sup>, F=33.33%, IVI=7.46) and *Toddalia asiatica* var. *gracilis* (D= 12.62 ha<sup>-1</sup>, F=33.33%, IVI=7.60).

**Shrub layer:** Among these dominant species are *Opuntia dillenii* (D=2,600 ha<sup>-1</sup>, F=50%, IVI=31.23), *Acalypha fruticosa* (D=1,866.67 ha<sup>-1</sup>, F=33.33%, IVI=25.52), *Lantana camera* (D=1800 ha<sup>-1</sup>, F=66.67%, IVI=23.90), *Flueggea leucopyrus* (D=1333.33 ha<sup>-1</sup>, F=50%, IVI=19.0),

*Barleria glabra* (D=1,066.67 ha<sup>-1</sup>, F=50%, IVI=16.42), *Canthium coromandelicum* (D=1066.67 ha<sup>-1</sup>, F=33.33%, IVI=16.33), *Coffea wightiana* (D=933.33 ha<sup>-1</sup>, F=33.33%, IVI=14.80), *Catunaregam spinosa* (D=800 ha<sup>-1</sup>, F=16.67%, IVI=15.62) and *Tarenna asiatica* (D=800 ha<sup>-1</sup>, F=33.33%, IVI=13.27).

**Herb layer:** This forest type grasses are dominant, and ground cover is represented by *Aristida adscensionis* (D=14.83 ha<sup>-1</sup>, F=83.33%), *Evolvulus alsinoides* (D=12.75 ha<sup>-1</sup>, F=75%), *Justicia procumbens* (D=11.75 ha<sup>-1</sup>, F=83.33%), *Brachiaria ramosa* (D=10.42 ha<sup>-1</sup>, F=16.67%), *Dipteracanthus patulus* (D=6.42ha<sup>-1</sup>, F=91.67%), *Dipteracanthus prostratus* (D=4.0 ha<sup>-1</sup>, F=66.67%), *Sida cordifolia* (D=3.75 ha<sup>-1</sup>, F=41.67%), *Oropetium thomaicum* (D=3.33 ha<sup>-1</sup>, F=8.33%), *Aristida setacea* (D=2.42 ha<sup>-1</sup>, F=33.33%) and *Plectranthus caninus* (D=1.83 ha<sup>-1</sup>, F=25%).

*Species diversity and concentration of dominance*

The species diversity, concentration of dominance of different forest types are depicted (Table 2). The highest concentration of dominance was recorded for HwkF (0.05) followed by RvF (0.03) and for all other 8 forest types is 0.01. The species diversity (H) was recorded highest for CUTF (5.28) followed by STF (5.22) and the lowest for HwkF (3.00).

*Native, rarity and endemic species*

Of the recorded species Twelve (12) species are endemic to peninsular India (Nayar and Sastry, 1990; Ravikumar and Ved, 2000); remaining species are non natives and Twenty one (21) species were rare for Peninsular India. Among threatened and near threatened category Three (03) species are Endangered (EN), Two (02) species are Rare and Two (02) species are Vulnerable. CUTF and STF forest represents maximum numbers (19 each) of threatened species viz. Endemic, Endangered, Rare and Vulnerable. Other forest types signify less number of threatened species.

The biodiversity on earth provides a large number of services to humankind. Biodiversity not only helps in the regulations of soil, water but it also provides food and shelter for survival. Due to increase in human population, has resulted in demand of more and more biological resources (Daily, 1995; Singh, 2002). These resources are limited and for the sustainable exploitation of these resources we have to formulate some strategies. Such activities are impairing and destroying ecosystems. For conservation and management of these species in wild an attempt have been made to assess and identify the status of diversity in Junction of Eastern and Western Ghats. The assessment was done by using the quantitative and

qualitative attributes. Tree density significantly contributes to the forest functional diversity, ecological processes and ecosystem services (Puttookame *et al.*, 2015). Tree species richness in Bannerghata forests ranged from 9-41species (Verma *et al.*, 2009). In Mudumalai Forest in India has 63 tree species (Condit *et al.*, 2000) and in present study area 51 species which is less then Mudumalai but higher then Bannerghata Forests . The five most abundant families in DFD were Fabaceae (34 nos.), Acanthaceae (24 nos.), Poaceae (22 nos.), Euphorbiaceae (17 nos.) and Rubiaceae (16 nos.), while Panda *et al.* (2013) found Euphorbiaceae and Moraceae to be the most dominant families in the northern portion of Eastern ghats, in southern portion of Eastern ghats in Bannerghata Forests is dominant by families Fabaceae, Caesalpiniaceae and Rubiaceae (Puttookame *et al.*, 2015; Gopalkrishna *et al.*, 2015), Mimosaceae, Rubiaceae, Apocynaceae were the most dominant families in Piranmalai Forest (Pitchairamu *et al.*, 2008), Euphorbiaceae and Rubiaceae were most dominant in Shervarayan hill (Kadavul and Parthasarthy, 1999).

**Conclusions**

Economic well being of human is directly connected to its surrounding biodiversity and is an essential ingredient of ecosystem function and its stability. The floristic diversity of Dharmapuri forests will help forest department to develop management plan for these tropical dry forests of Eastern Ghats. The quantitative biodiversity data of Eastern Ghats will be useful in forest management and conservation. In view of this study it shows the tree density in forests along with the rare and endemic species of the forest division. During our study period we have observed that all the forested area of this division was subjected to continuous biotic pressure resulting into rapid degradation. With the help of JFM concept these areas can slowly be restored for recouping the vegetation. Due to perpetual grazing as observed in many areas, the new seedlings and saplings of important species like bamboo, medicinal plants and other NTFP species are often subjected to continuous damage. Management of grazing is very important for the conservation of natural vegetation. This will help to increase in availability of biomass for fodder, fuelwood in forest areas. With the help of this studies it has been identified the specific localities of each of CR/EN/VL species for this division and these localities can be further monitored to know their population dynamics and based on this a special conservation plan can be made and it should also be included in the working plan for their conservation in its respective habitats. To accomplish the success, a nursery can be raised close to the well identified forest area and these CR/EN/VL plants can be grown there and shall later be transferred to the specific natural habitats.

Table 2. Species diversity in different forest types

	CUTF	DDS	EuS	HwkF	RvF	SDDF	SDMDF	SDS	STF	STS
Individuals	196	92	71	20	34	133	142	112	185	167
Dominance 'D'	0.01	0.01	0.01	0.05	0.03	0.01	0.01	0.01	0.01	0.01
Shannon 'H'	5.28	4.52	4.26	3.00	3.53	4.89	4.96	4.72	5.22	5.12
Simpson 'D'	0.99	0.99	0.99	0.95	0.97	0.99	0.99	0.99	0.99	0.99

CUTF: Carnatic umbrella thorn forest; DDS: Dry deciduous scrub forest; EuS: Euphorbia scrub forest; HwkF: Hardwickia forest; RvF: Riverain forest; SDDF: Southern tropical dry deciduous forest; SDMDF: Southern tropical dry moist mixed deciduous forest; SDS: Southern scrub forest; STF: Deccan thorn forest and STS: Deccan thorn scrub forest.

## Acknowledgements

Authors are thankful to Forest Department of Tamilnadu for funding the project “Status and Survey of Selected CR/EN/DD Taxa in Wild Dharmapuri Forest Division, Tamilnadu”, under Tamilnadu Biodiversity and Greening Project (TBGP) scheme activity component 1.1.3.1. Authors are also grateful to Director FRLHT Bangaluru for his support and guidance. We are thankful to our colleagues S. Gokul and N. Dhatchanamoorthy who provided skill and support during data collection and also assisted in data entry. We are also grateful to N. Begum and N. Balachandran for providing their help during in the office. We have to express our appreciation to the Mr.Sanjay K. Srivastava, Project Director & Adl. PCCF; DFO, Dharmapuri and Forest staff for sharing their pearls of wisdom with us during the course of this research. We are also immensely grateful to Dr Manoj Kumar Sarkar, IFS, Adl. PCCF for his comments and support during the course of study.

## References

- Ahmedullah M, Nayar MP (1987). Endemic plants of Indian region. Botanical Survey of India, Calcutta.
- Ansari AA (2008). *Crotalaria* L. in India. Bishen Singh Mahendra Pal Singh, Dehra Dun.
- Balakrishnan, NP, Chakrabarty T (2007). The family Euphorbiaceae in India. Bishen Singh Mahendra Pal Singh, Dehra Dun.
- Balvanera P, Pfisterer BA, Buchmann N, He JS, Nakashizuka T, Raffaelli D, Schmid B (2006). Quantifying the evidence for biodiversity effects on ecosystem functioning and services. *Ecology Letters* 9:1146-1156.
- Champion HG, Seth SK (1968). A revised survey of forest types of India. Government of India Press, Delhi, India.
- Condit R, Ashton PS, Baker P, Bunyavejehewin S, Gunatilleke S, Gunatilleke N, Hubbell SP, Foster RB, Itoh A, LaFrankie JV, Lee HS, Losos E, Manokaran N, Sukumar R, Yamakura T (2000). Spatial patterns in the distribution of tropical tree species. *Science* 288:1414-1418.
- Curtis JT, McIntosh RP (1950). The interrelations of certain analytic and synthetic phytosociological characters. *Ecology* 31:434-455.
- Curtis JT (1959). The Vegetation of Wisconsin, an Ordination of Plant Communities. University Wisconsin Press, Madison, Wisconsin.
- Daily CG (1995). Restoring value to the world's degraded lands. *Science* 269:350-354.
- Gamble JS, Fischer ECE (1915-1939). Flora of the presidency of Madras. Adlard and Son Ltd., London.
- Gopalakrishna SP, Kaonga ML, Somashekar RK, Suresh HS, Suresh R (2015). Tree diversity in the tropical dry forest of Bannerghatta National Park in Eastern Ghats, Southern India. *European Journal of Ecology* 1(2):12-27.
- Henry AN, Kumari GR, Chithra V (1987). Flora of Tamil Nadu, India Series 1: Analysis, Volume 2. Botanical Survey of India, Coimbatore.
- Henry AN, Chithra V, Balakrishana NP (1989). Flora of Tamil Nadu, India Series 1: Analysis, Volume 3. Botanical Survey of India, Coimbatore.
- Hooker, JD (1872-1897). Flora of British India, Volumes 1-7. L. Reeve and Company, Ashford, Kent, U.K.
- Hooper DU, Chapin FS, Ewvel JJ, Hector A, Inchausti P, Lavorel S, ... Wardle DA (2005). Effects of biodiversity on ecosystem functioning: A consensus of current knowledge. *Ecological Monographs* 75(1):3-35.
- Hubbell SP, Foster RB (1992). Short-term dynamics of a neotropical forest: why ecological research matters to tropical conservation and management. *Oikos* 63:48-61.
- Jagtap AP, Singh NP (1999). Fascicles of flora of India. Botanical Survey of India, Calcutta.
- Jayakumar S, Soosairaj S, Samy DIA, Britto JS (2002). Similarity analysis in two tropical dry evergreen forests in the Eastern Ghats of Tamil Nadu. *Journal of Hill Research* 15:4-11.
- Kadavul K, Parthasarathy N (1999). Plant biodiversity and conservation of tropical semi-evergreen in the Shervarayan hills of Eastern Ghats, India. *Biodiversity Conservation* 8:421-439.
- Kaya Z, Raynal DJ (2001). Biodiversity and conservation of Turkish forests. *Biological Conservation* 97(2):131-141.
- Matthew KM (1981-1984). The flora of the Tamil Nadu Carnatic, Volumes I-III. The Rapinat Herbarium, St. Joseph's College, Tiruchirappalli.
- May RM, Stumpf MPH (2000). Species-area relationships in tropical forests. *Science* 290:2084-2086.
- Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GA, Kent J (2000). Biodiversity hotspots for conservation priorities. *Nature* 403:853-858.
- Naeem S, Wright JP (2003). Disentangling biodiversity effects on ecosystem functioning: deriving solutions to a seemingly insurmountable problem. *Ecology Letters* 6:567-579.
- Naidu MT, Kumar OA (2015). Tree species diversity in the Eastern Ghats of northern Andhra Pradesh, India. *Journal of Threatened Taxa* 7(8):7443-7459.
- Nayar MP, Sastry ARK (eds.) (1987-1990). Red data book of Indian Plants, Volume I-III. Botanical Survey of India, Calcutta.
- Nayar MP (1996). “Hot spots” of endemic plants of India, Nepal and Bhutan. Tropical Botanical Garden and Research Institute, Palode, Thiruvananthapuram.
- Panda PC, Mahapatra AK, Acharya PK, Debata AK (2013) Plant diversity in tropical deciduous forests of Eastern Ghats, India: A landscape assessment. *International Journal of Biodiversity Conservation* 5(10), 625-639.
- Pitchairamu C, Muthuchelian K, Siva (2008). Floristic inventory and quantitative vegetation analysis of tropical dry deciduous forest in Piranmalai forest, Eastern Ghats, Tamil Nadu, India. *Ethnobotanical Leaflets* 12:204-216.
- Pragasam A, Parthasarathy N (2010). Landscape-level tree diversity assessment in tropical forests of southern Eastern Ghats, India. *Flora* 205(11):728-737.
- Puttakame GS, Kaonga ML, Somashekar RK, Suresh HS, Suresh R (2015). Tree diversity in the tropical dry forest of Bannerghatta National Park in Eastern Ghats, Southern India. *European Journal of Ecology* 1(2):12-27.
- Ravikumar K, Ved DK (2000). 100 Red-list medicinal plants of conservation concern in Southern India. Foundation for Revitalisation of Local Health Traditions, Bangalore.
- Sagar R, Raghubanshi AS, Singh JS (2003). Tree species composition,

- dispersion and diversity along a disturbance gradient in a dry tropical forest region of India. *Forest Ecology and Management* 186:61-71.
- Sanjappa M (1992). *Legumes of India*. Bishen Singh Mahendra Pal Singh, Dehra Dun.
- Shannon CE, Wiener W (1963). *The mathematical theory of communication*. University of Illinois Press, Urbana.
- Simpson EH (1949). Measurement of diversity. *Nature* 163(4148):688.
- Singh SP (2002). Balancing the approaches of environmental conservation by considering ecosystem services as well as biodiversity. *Current Science* 82(11):1331-1335.
- Sorensen T (1948). A method of establishing groups of equal amplitude in plant sociology based on similarity of species content. *Dent Kong Dansk Vindensk (Copenhegen)* 5:1-34.
- Vajravelu E, Rathakrishnan NC (1967-1968). A contribution to the flora of Dharmapuri district, Madras State. *Botanical Survey of India* 9:31-48.
- Varma S, Anand VD, Avinash KG, Nishant MS (2009). Ecology, conservation and management of the Asian elephant in Bannerghatta National Park, Southern India. A Rocha India/ANCF: Asian Elephant Ecology and Conservation Reference Series No.1. A Rocha India and Asian Nature Conservation Foundation, Bangalore.
- Villaseñor JL, Maeda P, Rosell JA, Ortiz E (2007). Plant families as predictors of plant biodiversity in Mexico. *Diversity and Distributions* 13:871-876.
- Wilson EO (1988). The current state of biological diversity. In: Wilson EO and Peter FM (Eds). *Biodiversity*. National Academy Press, Washington DC, pp 3-18.



xx

Appendix 1. Diversity of plants in the sample quadrats for various forest types in Dharmapuri forest division with reference to their threat status

List of species recapitulation in forest types of Dharmapuri Forest Division.

Sr. no.	Species Name	Habit	Families	Status	Presens of species in forest types				
1	<i>Abrus precatorius</i> L.	C	Fabaceae		7				
2	<i>Abutilon crispum</i> (L.) Medik.	H	Malvaceae		1,6,7				
3	<i>Abutilon indicum</i> (L.) Sweet	H	Malvaceae		1				
4	<i>Acacia caesia</i> (L.) Willd.	L	Mimosaceae		5,7				
5	<i>Acacia chundra</i> (Rottler) Willd.	T	Mimosaceae		1,9,10				
6	<i>Acacia leucophloea</i> (Roxb.) Willd.	T	Mimosaceae		1,2,7,9,10				
7	<i>Acacia pinnata</i> Link	S	Mimosaceae		1,7,9,10				
8	<i>Acacia planifrons</i> Wight & Arn.	T	Mimosaceae		1,2,3,6,7,8,9,10				
9	<i>Acalypha alnifolia</i> Klein ex Willd.	H	Euphorbiaceae	Endemic	1,10				
10	<i>Acalypha fruticosa</i> Forssk.	H	Euphorbiaceae		1,2,3,6,7,8,9,10				
11	<i>Acalypha indica</i> L.	H	Euphorbiaceae		1,6				
12	<i>Acanthospermum hispidum</i> DC.	H	Asteraceae		10				
13	<i>Achyranthes aspera</i> L.	H	Amaranthaceae		1,2,4,5,6,7,8				
14	<i>Actinopteris radiata</i> (Sw.) Link	Ferns	Pteridaceae		1,2,6,9				
15	<i>Adiantum lunulatum</i> Burm.f.	Ferns	Pteridaceae		1,2,8,9				
16	<i>Aerva lanata</i> (L.) Juss.	H	Amaranthaceae		1,4,5,6				
17	<i>Ageratum conyzoides</i> (L.) L.	H	Asteraceae		7				
18	<i>Alangium salviifolium</i> (L.f.) Wangerin	T	Alangiaceae		3,9,10				
19	<i>Albizia amara</i> (Roxb.) B.Boivin	T	Mimosaceae		1,2,3,4,5,6,7,8,9,10				
20	<i>Alloterris cimicina</i> (L.) Stapf	Grass	Poaceae		1,9,10				
21	<i>Alysicarpus monilifer</i> (L.) DC.	H	Fabaceae		3,8,9,10				
22	<i>Alysicarpus vaginalis</i> (L.) DC.	H	Fabaceae		1,2,6,8,9,10				
23	<i>Ammannia baccifera</i> L.	H	Lythraceae		5				
24	<i>Andrographis echioides</i> (L.) Nees	H	Acanthaceae		1,6,8,9,10				
25	<i>Andrographis lineata</i> Nees	H	Acanthaceae		9,10				
26	<i>Andrographis longipedunculata</i> (Sreem) L. H. Cramer	H	Acanthaceae	Rare	1				
27	<i>Andrographis serpyllifolia</i> (Vahl) Wight	H	Acanthaceae		3,7,9,10				
28	<i>Anisochilus carnosus</i> (L.f.) Wall.	H	Lamiaceae		3,9				
29	<i>Anisomeles indica</i> (L.) Kuntze	H	Lamiaceae		5				
30	<i>Annona squamosa</i> L.	UT	Annonaceae		1,3,6,10				
31	<i>Apluda mutica</i> L.	Grass	Poaceae		1,10				
32	<i>Argyrea elliptica</i> Arn. ex Choisy	C	Convolvulaceae	Rare	7				
33	<i>Aristida adscensionis</i> L.	Grass	Poaceae		1,6,9,10				
34	<i>Aristida setacea</i> Retz.	Grass	Poaceae		1,2,3,7,9,10				
35	<i>Aristolochia indica</i> L.	C	Aristolochiaceae		2,10				
36	<i>Asparagus racemosus</i> Willd.	H	Liliaceae		1,2,7,8,9				
37	<i>Atalantia monophylla</i> DC.	T	Rutaceae		7				
38	<i>Azadirachta indica</i> A.Juss.	T	Meliaceae		1,2,3,4,5,6,7,8,9,10				
39	<i>Azima tetracantha</i> Lam.	S	Salvadoraceae		5,6				
40	<i>Barleria buxifolia</i> L.	H	Acanthaceae		1,2,3,6,8,9				
41	<i>Barleria glabra</i> Noronha	H	Acanthaceae		3				
42	<i>Barleria longiflora</i> L.f.	H	Acanthaceae	Endemic	1,3,4,6,7,8,9				
43	<i>Barleria mysorensis</i> B.Heyne ex Roth	H	Acanthaceae		1,9				
44	<i>Barleria nitida</i> Nees	H	Acanthaceae		1				
45	<i>Barleria noctiflora</i> L.f.	H	Acanthaceae		6,9				
46	<i>Barleria prionitis</i> L.	H	Acanthaceae		5,7				
47	<i>Barleria montana</i> Nees	H	Acanthaceae	Rare	7				
48	<i>Bauhinia racemosa</i> Lam.	T	Caesalpinaceae		7				
49	<i>Benkara malabarica</i> (Lam.) Tirveng.	S	Rubiaceae		6				
50	<i>Bidens pilosa</i> L.	H	Asteraceae		9,10				
51	<i>Blepharis maderaspatensis</i> (L.) B.Heyne ex Roth	H	Acanthaceae		1,2,6,8,9,10				
52	<i>Blepharis repens</i> (Vahl) Roth	H	Acanthaceae		1,6,7,8,9				
53	<i>Boerhavia diffusa</i> L.	H	Nyctaginaceae		1,2,6,8,9,10				
54	<i>Borassus flabellifer</i> L.	P	Caesalpinaceae		7				
55	<i>Brachiaria ramosa</i> (L.) Stapf	Grass	Poaceae		1,2,3,6,8,9,10				
56	<i>Brachiaria remota</i> (Retz.) Haines	Grass	Poaceae		1,8,9				
57	<i>Bulbostylis barbata</i> (Rottb.) C.B.Clarke	Sedges	Poaceae		2,6,9,10				
58	<i>Butea monosperma</i> (Lam.) Taub.	T	Fabaceae		2				
59	<i>Cadaba fruticosa</i> (L.) Druce	S	Capparaceae		1,7,10				
60	<i>Cajanus scarabaeoides</i> (L.) Thouars	H	Fabaceae		7,10				
61	<i>Cansjera rheedii</i> Blanco	L	Opiliaceae		7				
62	<i>Canthium coromandelicum</i> (Burm.f.) Alston	S	Rubiaceae		2,3,6,7,8,9,10				
63	<i>Capparis divaricata</i> Lam.	S	Capparaceae	EN	9,10				
64	<i>Capparis grandis</i> L.f.	T	Capparaceae	Rare	7				
65	<i>Capparis septaria</i> L.	S	Capparaceae		1,3,6,7,9,10				
66	<i>Capparis zeylanica</i> L.	L	Capparaceae		1,5,6,7,9,10				
67	<i>Caralluma adscendens</i> var. <i>attenuata</i> (Wight) Grav. & Mayur.	H	Asclepiadaceae		6,9,10				
68	<i>Caralluma adscendens</i> var. <i>fimbriata</i> (Wall.) Gravely & Mayur.	H	Asclepiadaceae	Endemic	6				
69	<i>Caralluma umbellata</i> Haw.	H	Asclepiadaceae		8				
70	<i>Cardiospermum canescens</i> Wall.	C	Sapindaceae		1,2,3,6,7,8,10				
71	<i>Carissa carandas</i> L.	S	Apocynaceae		7				
72	<i>Carissa spinarum</i> L.	S	Apocynaceae		7				
73	<i>Cassia absus</i> L.	H	Caesalpinaceae		1,8,9				
74	<i>Cassia auriculata</i> L.	S	Caesalpinaceae		1,2,6,7,8,9,10				
75	<i>Cassia fistula</i> L.	T	Caesalpinaceae		1,8,9,10				
76	<i>Cassia glauca</i> Lam.	S	Caesalpinaceae		1,10				
77	<i>Cassia italica</i> (Mill.) F.W.Andrews	H	Caesalpinaceae		1,9				

xx

78	<i>Cassia montana</i> Naves & Villar	S	Caesalpiniaceae	Endemic	1,2,6,9,10
79	<i>Cassia occidentalis</i> L.	H	Caesalpiniaceae		1,7,10
80	<i>Cassia pumila</i> Lam.	H	Caesalpiniaceae		8,10
81	<i>Cassia siamea</i> Lam.	T	Caesalpiniaceae		8,9,10
82	<i>Cassia tora</i> L.	H	Caesalpiniaceae		9,10
83	<i>Cassine balae</i> Kosterm.	T	Celstraceae		7
84	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	S	Rubiaceae		1,2,3,6,7,8,9,10
85	<i>Celastrus paniculatus</i> Willd.	L	Celstraceae		7
86	<i>Celosia polygonoides</i> Retz.	H	Amaranthaceae		1,4,6,9
87	<i>Celtis philippensis</i> var. <i>wightii</i> (Planch.) Socpadmo	T	Ulmaceae		4
88	<i>Chlorophytum malabaricum</i> Baker	H	Liliaceae	Rare	9
89	<i>Chlorophytum</i> sp.	H	Liliaceae		2,6,7,8,9,10
90	<i>Chloroxylon swietenia</i> DC.	T	Flindersiaceae	EN	1,2,6,7,8,9,10
91	<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	H	Asteraceae		1,2,3,9,10
92	<i>Chrysopogon fulvus</i> (Spreng.) Chiov.	Grass	Poaceae		7
93	<i>Cipadessa baccifera</i> (Roth) Miq.	S	Meliaceae		2,10
94	<i>Cissampelos pareira</i> var. <i>hirsuta</i> (Buch.-Ham. ex DC.) Forman	C	Menispermaceae		9
95	<i>Cissus quadrangularis</i> L.	L	Vitaceae		1,2,3,4,6,7,8,9,10
96	<i>Cleistanthus collinus</i> (Roxb.) Benth. ex Hook.f.	T	Euphorbiaceae		2,7,8,9
97	<i>Cleome aspera</i> J.Koenig ex DC.	H	Cleomaceae		1,2,7,9,10
98	<i>Cleome felina</i> L.f.	H	Cleomaceae	Endemic	1
99	<i>Cleome monophylla</i> L.	H	Cleomaceae		9
100	<i>Cleome viscosa</i> L.	H	Cleomaceae		6,8,9
101	<i>Coccinia grandis</i> (L.) Voigt	C	Cucurbitaceae		1,6
102	<i>Cocculus hirsutus</i> (L.) W.Theob.	L	Menispermaceae		1,2,3,4,5,6,7,8
103	<i>Coffea wightiana</i> Wall. ex Wight & Arn.	S	Rubiaceae		1,3,6,7,8,10
104	<i>Combretum albidum</i> G. Don	L	Combretaceae		1
105	<i>Commelina attenuata</i> K.D.Koenig ex Vahl	H	Commelinaceae		7
106	<i>Commelina benghalensis</i> L.	H	Commelinaceae		1,6,7,8,9,10
107	<i>Commelina diffusa</i> Burm.f.	H	Commelinaceae		1,6,9,10
108	<i>Commelina paleata</i> Hassk.	H	Commelinaceae		1
109	<i>Commiphora berryi</i> (Arn.) Engl.	S	Bursaceae	Endemic	1,3
110	<i>Commiphora caudata</i> (Wight & Arn.) Engl.	S	Bursaceae		7
111	<i>Corallocarpus epigaeus</i> (Rottler) Hook.f.	C	Cucurbitaceae		1,3,6,8,10
112	<i>Corbichonia decumbens</i> (Forssk.) Exell	H	Molluginaceae		1,6,7,8,10
113	<i>Corchorus aestuans</i> L.	H	Tiliaceae		1,3
114	<i>Corchorus tridens</i> L.	H	Tiliaceae		1
115	<i>Corchorus trilocularis</i> L.	H	Tiliaceae		1,10
116	<i>Cordia monoica</i> Roxb.	S	Boraginaceae	Rare	6,7
117	<i>Crateva religiosa</i> G.Forst.	T	Capparaceae		5
118	<i>Crotalaria calycina</i> Schrank	H	Fabaceae	Rare	
119	<i>Crotalaria bebecarpa</i> (DC.) Rudd	H	Fabaceae	Rare	1,3,8,9
120	<i>Crotalaria medicaginea</i> Lam.	H	Fabaceae		1,6,7,8,9,10
121	<i>Croton bonplandianus</i> Baill.	H	Euphorbiaceae		1,9
122	<i>Cryptolepis grandiflora</i> Wight	C	Asclepiadaceae		1,2,7,9
123	<i>Curculigo orchoides</i> Gaertn.	H	Hypoxidaceae		3,6,7,9,10
124	<i>Cyanotis cristata</i> (L.) D.Don	H	Commelinaceae		1,2,6,7,9,10
125	<i>Cyanotis tuberosa</i> (Roxb.) Schult. & Schult.f.	H	Commelinaceae		1,2,3,6,7,8,9,10
126	<i>Cymbopogon flexuosus</i> (Nees ex Steud.) W.Watson	Grass	Poaceae		1,9,10
127	<i>Cynodon dactylon</i> (L.) Pers.	Grass	Poaceae		1,3
128	<i>Dactyloctenium aegyptium</i> (L.) Willd.	Grass	Poaceae		6,10
129	<i>Dalbergia paniculata</i> Roxb.	T	Fabaceae		7,10
130	<i>Dendrophthoe falcata</i> (L.f.) Ettingsh.	Grass	Loranthaceae		8
131	<i>Desmodium gangeticum</i> (L.) DC.	H	Fabaceae		1
132	<i>Desmodium triflorum</i> (L.) DC.	Grass	Fabaceae		7,9,10
133	<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	UT	Mimosaceae		3,7,10
134	<i>Digitaria bicornis</i> (Lam.) Roem. & Schult.	Grass	Fabaceae		6,7,8,9,10
135	<i>Digitaria ciliaris</i> (Retz.) Koeler	Grass	Fabaceae		1,2,6,9,10
136	<i>Dioscorea oppositifolia</i> L.	C	Dioscoreaceae		4
137	<i>Dioscorea pentaphylla</i> L.	C	Dioscoreaceae		1,7
138	<i>Diospyros ferrea</i> (Willd.) Bakh.	T	Ebenaceae		7
139	<i>Diospyros malabarica</i> (Dest.) Kostel.	T	Ebenaceae		9
140	<i>Diospyros montana</i> Roxb.	T	Ebenaceae		1,3,6,7,8,9,10
141	<i>Dipcadi madrasicum</i> E.Barnes & C.E.C.Fisch.	H	Liliaceae		9,10
142	<i>Diplocyclos palmatus</i> (L.) C.Jeffrey	H	Liliaceae		6,8,
143	<i>Dipteracanthus patulus</i> (Jacq.) Nees	H	Acanthaceae		1,2,3,6,7,9
144	<i>Dipteracanthus prostratus</i> (Poir.) Nees	H	Acanthaceae		1,2,3,6,8,9,10
145	<i>Dodonaea viscosa</i> (L.) Jacq.	S	Sapindaceae		1,2,6,7,8,9,10
146	<i>Dregea volubilis</i> (L.f.) Benth. ex Hook.f.	C	Asclepiadaceae		7,9,10
147	<i>Drypetes septaria</i> (Wight & Arn.) Pax & K.Hoffm.	T	Euphorbiaceae		7,9
148	<i>Ehretia microphylla</i> Lam.	S	Boraginaceae		3,7,9
149	<i>Elytraria acaulis</i> (L.f.) Lindau	H	Acanthaceae		6,9,10
150	<i>Emilia sonchifolia</i> (L.) DC. ex DC.	H	Asteraceae		9
151	<i>Endostemon viscosus</i> (Roth) M.R.Ashby	H	Lamiaceae		9,10

xx

152	<i>Eragrostiella bifaria</i> (Vahl) Bor	Grass	Poaceae		1,5,6,8,10
153	<i>Eragrostis gangetica</i> (Roxb.) Steud.	Grass	Poaceae		9
154	<i>Eragrostis tenella</i> (L.) P.Beauv. ex Roem. & Schult.	Grass	Poaceae		7
155	<i>Erythroxylum monogynum</i> Roxb.	UT	Erythroxylaceae		1,2,5,7,9,10
156	<i>Euphorbia antiquorum</i> L.	UT	Euphorbiaceae		1,2,3,6,7,8,9,10
157	<i>Euphorbia hirta</i> L.	H	Euphorbiaceae		1,2,6,9,10
158	<i>Euphorbia tortilis</i> Rottler ex Ainslie	UT	Euphorbiaceae		1,9
159	<i>Evolvulus alsinoides</i> (L.) L.	H	Convolvulaceae		1,2,3,6,7,8,9,10
160	<i>Ficus mollis</i> Vahl	T	Moraceae		1
161	<i>Fimbristylis dichotoma</i> (L.) Vahl	Sedges	Cyperaceae		7,10
162	<i>Fimbristylis ovata</i> (Burm.f.) J.Kern	Sedges	Cyperaceae		1,2,3,7,8,9,10
163	<i>Flacourtia indica</i> (Burm.f.) Merr.	S	Flacourtiaceae		1,2,6,8,9,10
164	<i>Flueggea leucopyrus</i> Willd.	S	Euphorbiaceae		1,2,3,5,6,7,8,9,10
165	<i>Galactia tenuiflora</i> (Willd.) Wight & Arn.	H	Fabaceae		2,7
166	<i>Gardenia resinifera</i> Roth	S	Rubiaceae	Rare	9
167	<i>Gisekia pharnaceoides</i> L.	H	Molluginaceae		6
168	<i>Gloriosa superba</i> L.	H	Liliaceae	EN	1,6,7,8,9,10
169	<i>Glossocardia bosvallia</i> (L.f.) DC.	H	Asteraceae		1,2,8,9,10
170	<i>Gmelina asiatica</i> L.	S	Verbenaceae		1,7,8,9,10
171	<i>Grewia bracteata</i> Roth	S	Tiliaceae	Rare	9
172	<i>Grewia flavescens</i> Juss.	S	Tiliaceae		1,7
173	<i>Grewia hirsuta</i> Vahl	S	Tiliaceae		1
174	<i>Grewia orientalis</i> L.	S	Tiliaceae		1,2,6,8,9,10
175	<i>Grewia rhamnifolia</i> Burret	S	Tiliaceae		1
176	<i>Grewia tenax</i> (Forssk.) Fiori	S	Tiliaceae	Rare	1,6,7
177	<i>Grewia villosa</i> Willd.	S	Tiliaceae		8
178	<i>Gynmema sylvestre</i> (Retz.) R.Br. ex Sm.	C	Asclepiadaceae		1,7,8,9,10
179	<i>Gymnosporia ovata</i> Wall. ex M. Lawson	S	Celstraceae		7
180	<i>Gyrocarpus americanus</i> Jacq.	T	Hernandiaceae		1,4,7
181	<i>Hardwickia binata</i> Roxb.	T	Caesalpinaceae	Endemic	4
182	<i>Hedyotis corymbosa</i> (L.) Lam.	H	Rubiaceae		6,10
183	<i>Hedyotis puberula</i> (G.Don) R.Br. ex Arn.	H	Boraginaceae		1,3,6,8,9,10
184	<i>Heliotropium bracteatum</i> R.Br.	H	Boraginaceae		1
185	<i>Heliotropium marifolium</i> J.Koenig ex Retz.	H	Boraginaceae		6,8,9,10
186	<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult.	C	Asclepiadaceae		1,2,7,8,10
187	<i>Heteropogon contortus</i> (L.) P.Beauv. ex Roem. & Schult.	H	Poaceae		1,9,10
188	<i>Hibiscus birtus</i> L.	H	Malvaceae		1
189	<i>Hibiscus lobatus</i> (Murray) Kuntze	H	Malvaceae		1,3,9,10
190	<i>Hibiscus micranthus</i> L.f.	H	Malvaceae		1,2,6,8,9,10
191	<i>Holoptelea integrifolia</i> Planch.	T	Ulmaceae		1,3,4,6,7,9,10
192	<i>Hybanthus enneaspermus</i> (L.) F.Muell.	H	Violaceae		3,6,7
193	<i>Hyptis suaveolens</i> (L.) Poit.	H	Lamiaceae		10
194	<i>Ichnocarpus frutescens</i> (L.) W.T.Aiton	C	Apocynaceae		2,9
195	<i>Indigofera colutea</i> (Burm.f.) Merr.	H	Fabaceae		1
196	<i>Indigofera glabra</i> L.	H	Fabaceae	Rare	1
197	<i>Indigofera limnaii</i> Ali	H	Fabaceae		1,2,7,8,9,10
198	<i>Indigofera tinctoria</i> L.	H	Fabaceae		6,9
199	<i>Indigofera trifoliata</i> L.	H	Fabaceae	Endemic	1,6,8,9,10
200	<i>Indigofera trita</i> subsp. <i>scabra</i> (Roth) De Kort & G.Thijssse	H	Fabaceae	Rare	1
201	<i>Ipomoea obscura</i> (L.) Ker Gawl.	H	Convolvulaceae		1,7
202	<i>Ipomoea sepiaria</i> Koenig ex Roxb.	C	Convolvulaceae		1,6
203	<i>Ipomoea staphylina</i> Roem. & Schult.	C	Convolvulaceae		1,2,3,6,8,9,10
204	<i>Jasminum angustifolium</i> (L.) Willd.	C	Oleaceae		1,2,6,7,8,9,10
205	<i>Jasminum auriculatum</i> Vahl	C	Oleaceae		1,7,10
206	<i>Jatropha gossypifolia</i> L.	S	Euphorbiaceae		1,2,3,5,6,7,8,9,10
207	<i>Justicia glauca</i> Rottler	H	Acanthaceae		1,2,6,7,8,9,10
208	<i>Justicia procumbens</i> L.	H	Acanthaceae		1,2,3,6,8,9,10
209	<i>Justicia prostrata</i> Gamble	H	Acanthaceae		1,3,6,8,9,10
210	<i>Justicia tranquebariensis</i> L.f.	H	Acanthaceae		1,6,9,10
211	<i>Kobautia aspera</i> (B.Heyne ex Roth) Bremek.	H	Rubiaceae		1
212	<i>Kyllinga monocephala</i> Rottb.	H	Cyperaceae		1
213	<i>Kyllinga triceps</i> Sw.	H	Cyperaceae		1,6,9,10
214	<i>Lantana camara</i> L.	S	Verbenaceae		1,2,3,6,7,8,9,10
215	<i>Lantana veronicifolia</i> Hayek	S	Verbenaceae		1,6
216	<i>Leonotis nepetifolia</i> (L.) R.Br.	H	Lamiaceae		5,6
217	<i>Lepidagathis cristata</i> Willd.	H	Acanthaceae		9
218	<i>Leucas aspera</i> (Willd.) Link	H	Lamiaceae		1,6,10
219	<i>Leucas biflora</i> (Vahl) Sm.	H	Lamiaceae		10
220	<i>Leucas indica</i> (L.) Sm.	H	Lamiaceae		9,10
221	<i>Limonia acidissima</i> Groff	T	Rutaceae		7
222	<i>Maerua oblongifolia</i> (Forssk.) A.Rich.	L	Capparaceae	Rare	9
223	<i>Mariscus clarkei</i> Turrill ex Craib	H	Cyperaceae	Endemic	1,2,9,10
224	<i>Martynia annua</i> L.	H	Martyniaceae		2
225	<i>Medicago sativa</i> L.	H	Fabaceae		9
226	<i>Melhania incana</i> B.Heyne ex Wall.	H	Sterculiaceae		1,2,6
227	<i>Merremia tridentata</i> (L.) Hallier f.	H	Convolvulaceae		3,9,10
228	<i>Mimosa pudica</i> L.	H	Mimosaceae		8,9,10
229	<i>Mitracarpus birtus</i> (L.) DC.	H	Rubiaceae		1,7,9,10
230	<i>Mollugo cerviana</i> (L.) Ser.	H	Molluginaceae		6
231	<i>Mollugo nudicaulis</i> Lam.	H	Molluginaceae		2,3,6,7,8,9,10
232	<i>Mollugo oppositifolia</i> L.	H	Molluginaceae		2,8,10

xx

233	<i>Mollugo pentaphylla</i> L.	H	Molluginaceae	1,2,3,5,6,9,10
234	<i>Morinda coreia</i> Buch.-Ham.	T	Rubiaceae	2,9
235	<i>Ocimum americanum</i> L.	H	Lamiaceae	1,6,8,9
236	<i>Ocimum tenuiflorum</i> L.	H	Lamiaceae	1,2,6,8,9
237	<i>Oplismenus compositus</i> (L.) P.Beauv.	H	Poaceae	1,7
238	<i>Opuntia dillenii</i> (Ker Gawl.) Haw.	S	Cactaceae	1,2,3,6,7,9
239	<i>Oropetium thbmaeum</i> (L.f.) Trin.	Grass	Poaceae	1,2,6,9,10
240	<i>Orthosiphon glabratus</i> Benth.	H	Lamiaceae	1,6,7,8,9,10
241	<i>Orthosiphon thymiflorus</i> (Roth) Sleesen	H	Lamiaceae	7,8
242	<i>Oxalis corniculata</i> L.	H	Oxalidaceae	1,10
243	<i>Pachygone ovata</i> (Poir.) Diels	L	Menispermaceae	1,7,8,9
244	<i>Panicum</i> sp.	Grass	Poaceae	6
245	<i>Parthenium hysterophorus</i> L.	H	Asteraceae	1
246	<i>Passiflora foetida</i> L.	C	Passifloraceae	1,6,8,9,10
247	<i>Pavetta indica</i> L.	S	Rubiaceae	1,7
248	<i>Pavonia odorata</i> Willd.	H	Malvaceae	1,2,6,7,8,9,10
249	<i>Pavonia procumbens</i> (Wight & Arn.) Walp.	H	Malvaceae	1
250	<i>Pavonia zeylanica</i> (L.) Cav.	H	Malvaceae	1,2,6,9
251	<i>Pedaliium murex</i> L.	H	Pedaliaceae	6
252	<i>Pergularia daemia</i> (Forssk.) Chiov.	C	Asclepiadaceae	1,8,10
253	<i>Peristrophe bicalyculata</i> (Retz.) Nees	H	Acanthaceae	1
254	<i>Phoenix pusilla</i> Gaertn.	S	Areaceae	8,9,10
255	<i>Phoenix sylvestris</i> (L.) Roxb.	P	Areaceae	9
256	<i>Phyllanthus amarus</i> Schumach. & Thonn.	H	Euphorbiaceae	1,2,3,2,6,7,8,9,10
257	<i>Phyllanthus maderaspatensis</i> L.	H	Euphorbiaceae	1,6,8,9,10
258	<i>Phyllanthus polyphyllus</i> Willd.	S	Euphorbiaceae	7
259	<i>Phyllanthus virgatus</i> G.Forst.	H	Euphorbiaceae	1,2,3,2,7,8,9,10
260	<i>Physalis angulata</i> L.	H	Solanaceae	8
261	<i>Plectranthus caninus</i> Roth.	H	Lamiaceae	1,9
262	<i>Plumbago zeylanica</i> L.	H	Plumbaginaceae	1
263	<i>Polyalthia cerasoides</i> (Roxb.) Bedd.	T	Annonaceae	8
264	<i>Polycarpaea corymbosa</i> (L.) Lam.	H	Caryophyllaceae	6,8,9
265	<i>Polycarpaea corymbosa</i> (L.) Lam. var. <i>longipetala</i> S.R. Sriniv. & Narasimh.	H	Caryophyllaceae	Endemic 6
266	<i>Polygala chinensis</i> L.	H	Polygalaceae	1,2,3,5,6,7,8,9,10
267	<i>Polygala javana</i> DC.	H	Polygalaceae	10
268	<i>Polygala sibirica</i> L.	H	Polygalaceae	Rare 1,9
269	<i>Pongamia pinnata</i> (L.) Pierre	T	Fabaceae	1,4,5,7,8,9,10
270	<i>Portulaca tuberosa</i> Roxb.	H	Portulacaceae	1,6,7
271	<i>Premna latifolia</i> Roxb.	S	Verbenaceae	3,7
272	<i>Premna tomentosa</i> Willd.	T	Verbenaceae	2,9
273	<i>Prosopis juliflora</i> (Sw.) DC.	T	Mimosaceae	1,5
274	<i>Pseudarthria viscida</i> (L.) Wight & Arn.	H	Fabaceae	NT 2,3,2,7
275	<i>Psilotrichum nudum</i> Wight	H	Amaranthaceae	1,7,9
276	<i>Psydrax dicoccos</i> Gaertn.	UT	Rubiaceae	VN 1,7,8,9,10
277	<i>Pterolobium hexapetalum</i> (Roth) Santapau & Wagh	L	Caesalpiniaceae	1,2,5,6,7,8,9,10
278	<i>Pupalia lappacea</i> (L.) Juss.	H	Amaranthaceae	1
279	<i>Pupalia lappacea</i> var. <i>velutina</i> (Moq.) Hook.f.	H	Amaranthaceae	Rare 1,6,9,10
280	<i>Rhus mysurensis</i> B. Heyne ex Wight & Arn.	L	Anacardiaceae	7,9
281	<i>Rhynchosia aurea</i> (Willd.) DC.	H	Fabaceae	Rare 9,10
282	<i>Rhynchosia cana</i> (Willd.) DC.	H	Fabaceae	9
283	<i>Rhynchosia minima</i> (L.) DC.	H	Fabaceae	3,9
284	<i>Riccia</i> sp.	Moss	Ricciaceae	1,2,6,7,10
285	<i>Richardia scabra</i> L.	H	Rubiaceae	10
286	<i>Rivea hypocrateriformis</i> Choisy	C	Convolvulaceae	10
287	<i>Rottboellia cochinchinensis</i> (Lour.) Clayton	Grass	Poaceae	1
288	<i>Sageretia parviflora</i> G.Don	L	Rhamnaceae	10
289	<i>Sansevieria roxburghiana</i> Schult. & Schult.f.	H	Agavaceae	7,9
290	<i>Santalum album</i> L.	T	Santalaceae	10
291	<i>Sapindus emarginatus</i> Vahl	T	Sapindaceae	VN 4,5,7
292	<i>Sarcostemma acidum</i> (Roxb.) Voigt	C	Asclepiadaceae	1,7,10
293	<i>Sarcostemma secamone</i> (L.) Bennett	C	Asclepiadaceae	9
294	<i>Scilla hyacinthina</i> (Roth) J.F.Macbr.	H	Liliaceae	1,2,3,2,6,7,8,9,10
295	<i>Scleria lithosperma</i> (L.) Sw.	Sedges	Cyperaceae	1,7,9
296	<i>Scutia myrtina</i> (Burm.f.) Kurz	L	Rhamnaceae	7,9
297	<i>Sebastiania chamaelea</i> (L.) Müll.Arg.	H	Euphorbiaceae	10
298	<i>Secamone emetica</i> (Retz.) R. Br. ex Schult.	C	Asclepiadaceae	1,3,6,7,8,9
299	<i>Selaginella delicatula</i> (Desv. ex Poir.) Alston.	Fern	Selaginellaceae	1,7,8,9
300	<i>Sida acuta</i> Burm.f.	H	Malvaceae	1,5,6,7,8,10
301	<i>Sida cordata</i> (Burm.f.) Borss.Waalk.	H	Malvaceae	1,3,4,7,9,10
302	<i>Sida cordifolia</i> L.	H	Malvaceae	1,2,3,6,7,8,9,10
303	<i>Sida mysorensis</i> Wight & Arn.	H	Malvaceae	6,
304	<i>Sida retusa</i> L.	H	Malvaceae	1,3,
305	<i>Solanum pubescens</i> Willd.	H	Solanaceae	1,2,3,4,6,7,8,9,10
306	<i>Spermacoce articularis</i> L.f.	H	Rubiaceae	1,5,6,7,8,9,10
307	<i>Spermacoce ocyroides</i> Burm.f.	H	Rubiaceae	1,2,5,6,7,8,9,10
308	<i>Spermacoce stricta</i> L.f.	H	Rubiaceae	1,5
309	<i>Spilanthes calva</i> DC.	H	Asteraceae	5
310	<i>Sporobolus coromandelianus</i> (Retz.) Kunth	Grass	Poaceae	4
311	<i>Sporobolus diandrus</i> (Retz.) P.Beauv.	Grass	Poaceae	6
312	<i>Stemodia viscosa</i> Roxb.	H	Scrophulariaceae	5
313	<i>Stenosiphonium russellianum</i> Nees	H	Acanthaceae	7
314	<i>Sireblus asper</i> Lour.	T	Moraceae	7

xx

315	<i>Strychnos nux-vomica</i> L.	T	Loganiaceae		1,2,7,8,10
316	<i>Strychnos potatorum</i> L.f.	T	Loganiaceae		1,7,8,10
317	<i>Stylosanthes fruticosa</i> (Retz.) Alston	H	Fabaceae		9
318	<i>Syzygium cumini</i> (L.) Skeels	T	Myrtaceae		5
319	<i>Tamarindus indica</i> L.	T	Caesalpiniaceae		5,6,10
320	<i>Tarenna asiatica</i> (L.) Kuntze ex K.Schum.	S	Rubiaceae		1,2,3,6,7,8,9,10
321	<i>Tecoma stans</i> (L.) Juss. ex Kunth	S	Bignoniaceae		1
322	<i>Tectona grandis</i> L.f.	T	Verbenaceae		2
323	<i>Tephrosia pumila</i> (Lam.) Pers.	H	Fabaceae		1,3,6,7,8,9,10
324	<i>Tephrosia purpurea</i> (L.) Pers.	H	Fabaceae		1,2,6,8,9,10
325	<i>Tephrosia tinctoria</i> Pers.	H	Fabaceae		1,2,6
326	<i>Tephrosia uniflora</i> Pers.	H	Fabaceae	Rare	2
327	<i>Tephrosia villosa</i> (L.) Pers.	H	Fabaceae		8
328	<i>Teramnus mollis</i> Benth.	H	Fabaceae		2
329	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	T	Combretaceae	NT	5
330	<i>Theriophonum minutum</i> (Willd.) Baill.	H	Araceae	Rare	1
331	<i>Tinospora cordifolia</i> (Willd.) Miers	L	Menispermaceae		3
332	<i>Toddalia asiatica</i> var. <i>gracilis</i> Gamble	L	Rutaceae		2,3,7,8,9,10
333	<i>Tragia involucrata</i> L.	C	Euphorbiaceae		3,9
334	<i>Tragus roxburghii</i> Panigrahi	Grass	Poaceae		6,8,9,10
335	<i>Tribulus lanuginosus</i> L.	H	Zygophyllaceae	Endemi c	1,7,10
336	<i>Tribulus subramaniamii</i> P.Singh, G.S.Giri & V.Singh	H	Zygophyllaceae	Endemi c	8,9
337	<i>Tribulus terrestris</i> L.	H	Zygophyllaceae		1,2,9,10
338	<i>Trichodesma zeylanicum</i> (Burm.f.) R.Br.	H	Boraginaceae		9
339	<i>Tridax procumbens</i> (L.) L.	H	Asteraceae		1,3,8,10
340	<i>Triumfetta rhomboidea</i> Jacq.	H	Tiliaceae		1,10
341	<i>Triumfetta rotundifolia</i> Lam.	H	Tiliaceae	Rare	9
342	<i>Tylophora indica</i> (Burm. f.) Merr.	C	Asclepiadaceae		1,6,9
343	<i>Urginea indica</i> (Roxb.) Kuntz	H	Liliaceae		7,9,10
344	<i>Ventilago maderaspatana</i> Gaertn.	L	Rhamnaceae		7
345	<i>Vernonia cinerea</i> (L.) Less.	H	Asteraceae		1,6,8,9,10
346	<i>Vicoa indica</i> (L.) DC.	H	Asteraceae		1,4
347	<i>Viscum orientale</i> Willd.	H	Viscaceae		1
348	<i>Waltheria indica</i> L.	H	Sterculiaceae	Rare	6,9,10
349	<i>Wrightia tinctoria</i> R.Br	T	Apocynaceae		1,2,3,4,6,7,9,10
350	<i>Ziziphus oenopolia</i> (L.) Mill.	L	Rhamnaceae		1,6,7,9,10
351	<i>Ziziphus trinervia</i> Roth	T	Rhamnaceae		3,6,7,9
352	<i>Zornia diphylla</i> (L.) Pers.	H	Fabaceae		2,8,9,10

1. CUTF: Carnatic umbrella thorn forest; 2. DDS: Dry deciduous scrub forest; 3. EuS: Euphorbia scrub forest; 4. HwkF: Hardwickia forest; 5. RvF: Riverain forest; 6. SDDF: Southern tropical dry deciduous forest; 7. SD MDF: Southern tropical dry moist mixed deciduous forest; 8. SDS: Southern scrub forest; 9. STF: Deccan thorn forest; 10. STS: Deccan thorn scrub forest.