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Endemic Vascular Plants from the Coromandel Coast of Tamil Nadu, Southern India

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Abstract

Intensive botanical survey was done more than two decades on Tropical Dry Evergreen Forest from four coastal districts *viz.* Cuddalore, Kancheepurm, Nagai and Villupuram of Tamil Nadu and Union Territory of Pondicherry. A total of 87 protected (hillocks, reserve forest) and unprotected (sacred groves, unclassified vegetation) sites were regularly studied from five districts. From this study 82 endemic taxa were enumerated. In addition 25 endemic species were added for the analysis through literature screening and herbarium consultation from 10 Coromandel coastal districts of Tamil Nadu. In all 107 species were recorded, among them 19 are trees, 18 shrubs, 9 climbers and 61 herbs. Distribution of these endemic species were analysed and categorised into endemic to the country, peninsular India, southern India, Eastern and Western Ghats, state and district level. Interestingly the study found that some endemic species were disjunctly distributed in between districts, states, ghats, climatic regimes and bioregions. The disturbance, threat status and conservation measures of few endemic and IUCN red listed species were also studied and discussed.

Keywords: conservation, Coromandel Coast, disjunction, endemism, Pondicherry, Tamil Nadu, IUCN status, tropical dry Evergreen Forest

1. Introduction

India is one of the 18 extremely diverse and top 10 species-rich countries of the world, in which a total of 4381 taxa belonging to 1007 genera and 176 families, including 4303 angiosperms, 12 gymnosperms and 66 pteridophytes, out of 18,043 species have been confirmed as endemic to India [1]. Recently, in angiosperms a total of 58 genera have been identified as endemic to India, of which 49 are confined to Peninsular India [2]. Though the term 'endemism' coined during eighteenth century Chatterjee [3, 4] was the first who studied the endemism of the Indian flora. He was considered 6850 species that are unique to this region (61% of flowering plants), of which 3169 species are restricted to Himalayas and 2045 to Peninsular India (PI). Blasco [5] was estimated about 1268 endemic dicotyledons to south India; however Nayar [6] recorded 2100 flowering plants endemic to PI. Later, Nayar [7] reported 141 genera endemic to India; while Ahmedullah & Nayar

[7] found 55 genera endemic to PI of which 45 are monotypic [7]. Recently, Irwin & Narasimhan [9] enumerated only 49 genera which are endemics to India, excluding several genera based on nomenclatural changes and extended distribution. Nayar [10] categorised the endemic genera of India into 3 patterns based on the distribution *viz.* Himalayan Endemic Genera, Peninsular Indian Endemic genera and Andaman & Nicobar Islands Endemic genera. Meanwhile there are no families which are endemic to India [8].

In India, Western Ghats has much more endemic (2116 species) taxa than rest of India. State-wise analysis Tamil Nadu ranking first with 410 species, followed by Kerala (357), Maharashtra (278) and Andaman and Nicobar Islands together contributes with 278 taxa [2]. In Eastern Ghats (EG), a total of 166 endemic taxa, under 117 genera and 43 families are known to occur, of which 129 dicots and 46 are monocots. Sudhakar Reddy & Raju [11] recorded 400 endemic spermatophytes from the EGs of Andhra Pradesh and their adjacent coastal plains.

The Flora of Tamil Nadu published during 1983, 1987 and 1989 in 3 volumes, and the report after Betty & Ramachandran [12] was added 192 taxa belonging to 130 genera and 61 families between the period 1989 and 2013. These additions were compiled from research articles, unpublished thesis and research reports by several botanists [13–19]. Among them 87 taxa are new to the science as well as endemic to the state of Tamil Nadu. The high concentration of endemic plants once again proves that the southern India is one of the top ten mega biodiversity hotspot area. It directly reflects the habitat stability, environmental quality, and rich biodiversity and conservation values in a specific area. However the Coromandel Coast is another unique bioregion, as flood plain and a buffer zone between the hill range of Eastern Ghats and Bay of Bengal; and this was not studied or updated since Roxburgh [20]. The main aim of this work is to explore the wealth and threat status of endemic plants diversity from the Coromandel Coast and especially from the fragile ecosystem of Tropical Dry Evergreen Forests (TDEF), was classified by Champion and Seth [21].

2. Materials and methods

The geographical area of Tamil Nadu is 130,058 km² and has roughly rhomboidal shape in appearance. It lies between 8° 5'–13° 35' N latitude and 76° 15'–80° 20' E longitude. The state occupies 4.08% of the total area of the country. It has the coast line of 990 km at east and land boundary of 1200 km towards west. The state is divided into 38 districts of which 13 districts lies on the east coast. The natural land mass of the state was divided into the Eastern Ghats, Coastal Plains, Central plateau and Western Ghats. Most part of the 13 coastal districts considered as the Coromandel Coast of Tamil Nadu (**Figure 1**). The entire coast of Tamil Nadu, is chiefly sandy with outcrops of rocky headlands at Kancheepuram, Kanyakumari, Tirunelveli and Villupuram districts. The coastal vegetation had further subdivided into Strand, Estuarine and Coastal Tropical Dry Evergreen Forest types (Nair and Henry [22]).

2.1 Study area

The present study has included 13 coastal districts of Tamil Nadu; Karaikal and Puducherry regions from Union Territory (UT) of Pondicherry along the Coromandel Coast of south India. However, regular intensive survey was done since 1996 to till date on four coastal districts (Cuddalore, Kancheepuram, Nagai and Villupuram) and two regions (Puducherry and Karaikal) from the UT of Pondicherry. Forest cover of Cuddalore is 444 km² (11.98%) out of 3706 km², Kancheepuram 372 km² (8.31%) out of 4474 km² and Villupuram 1011 km²

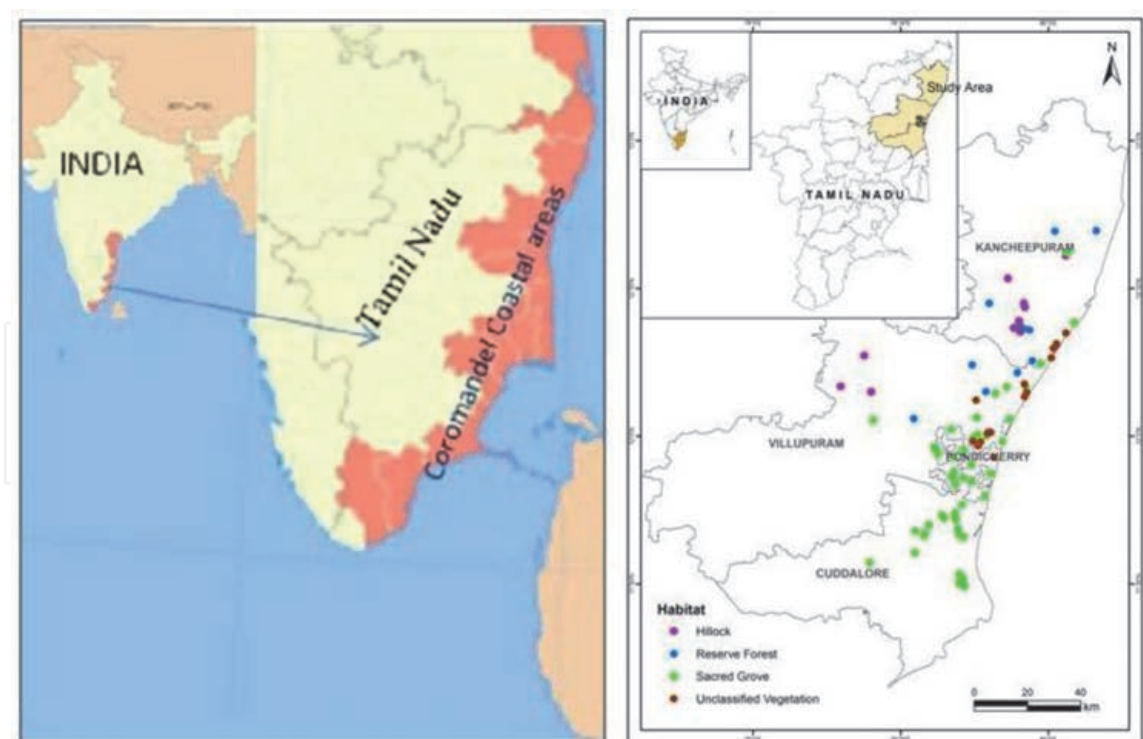


Figure 1.
 Study area - Coromandel Coast and detailed study at district level.

(14.06%) out of 7190 km² geographical area [23]. The forest cover at Union Territory of Pondicherry is 50.06 km² (10.43%) out of 480 km² area [24].

Geologically, part of Cuddalore and Villupuram districts belonged to the formation of Cuddalore sandstone during Miocene period [25]. The soil along the coast is sandy loam or red ferralitic and in certain places covered with alluvial deposits and becoming clayey at interior [26, 27]. The coastal plains are extending up to 40–60 km [28] and are overlain by a thin soil layer supporting agriculture. The substratum erupted into hillocks and mounds at Kancheepuram and Villupuram districts and into undulating terrain in Cuddalore districts. The scattered hillocks rise up to 450 m with interrupted vegetation among the charkonite or gneiss rocks. The natural vegetation is mostly found on less fertile and red ferralitic soil, whereas black clay and alluvial soils were brought under cultivation [29].

A typical maritime tropical climate with dissymmetric rainfall regime occurs in the study area. The mean annual rainfall recorded during 2007–2016 period was 1256 mm with mean rainy days of 56 per year. The minimum temperature 17.7°C is in January, maximum temperature 40.5°C in May and the mean is 28.5°C. The average relative humidity is 76% and the weather is generally cool during December to January with the late nights dewy. Dry weather prevails during April to June. Wind speed ranges from 5 to 9 km/h during July to September but extremely higher during the cyclonic days, during October to December [30].

2.2 Field survey

Four types of vegetation covers including micro and macro habitats *viz.*, Hillocks (HL), Reserve Forest (RF), Sacred Groves (SG) and Unclassified Vegetation (UC) were identified using Geological Survey of India (GSI) map, Google map and interview with people. The areas of HL vegetation are ranging from 680 to 2200, RFs from 100 to 350, SGs from one to 40 and UCs from 0.5 to 35 hectares (ha). The elevation of HL was found between 150 and 450, RFs 100 to 350, SGs sea level to 80 and UC sea level to 40 m a.s.l.

Botanical surveys were made extensively once in a week on 87 sites from five districts with a team of four members, visiting each and every site with an interval of 4–6 months and monitored pre-monsoon and post-monsoon changes from 1996 to 2019. These sites were geo-referenced with Garmin Global Positioning System (GPS), followed by intensive species enumerations including herbs, shrubs, trees and climbers; collection of voucher samples and photographed the key characters of the plants. A total of 15,316 herbarium sheets were prepared from the sample collections and deposited at AURO! Herbarium, Auroville, India. The nomenclature of all plant species recorded in this study was verified in www.plantsoftheworldonline.org. In addition, Endemic plants of Indian Region (Ahmedullah & Nayar [10]), The Flora of the Gulf of Mannar, Southern India [31], Endemic Vascular Plants of India [2], Plant Discoveries [32], research articles between 2013 and 2019 period and different herbarium such as Saint Joseph College (SJC) Tiruchirapalli, Madras Herbarium (MH!) Coimbatore, Foundation of Revitalization of Local HealthTraditions (FRLH) Bangalore, French Institute of Pondicherry (HIFP) Puducherry, and Sri ParamaKalyani Center for Ecological Studies (SPKCESH) Tirunelveli was referred and enriched the endemic species list to the study area.

2.3 Analyses

Based on phytogeographical distribution six groups of endemic regions were categorised, such as 1. the state Tamil Nadu, 2. Eastern Ghats (EG), 3. EG & Western Ghats (WG), 4. Southern India (SI), 5. Peninsular India (PI) and 6. Entire India except Himalayas. In addition, disjunct nature of distribution of these endemic species between or among the regions was also studied. Site disturbances such as browsing, cutting, lopping, and clear felling, encroachment for cultivation purposes, construction of big modern temple, construction and widening the metal road, digging irrigation channels and cementing the thrashing floor were studied and categorised into low, medium and high by following Venkateswaran & Parthasarathy [33]. High ranks signify high levels of anthropogenic disturbance in the forests. The disturbance codes were co-related with four life forms and threat status of all species was verified with www.iucnredlist.org (version 2020–2). Threat assessment and possible conservation measures were undertaken on few endemic and endangered species through Auroville greening and Botanical Garden Projects.

3. Results

Through our regular field study on 87 sites, 25 (SG) sites are from Cuddalore, 22 (8 HL, 6 RF, 4 SG, 4 UC) from Kancheepuram, one site (1RF) from Nagai, 28 (3 HL, 4 RF, 13 SG, 8 UC) from Villupuram districts of Tamil Nadu, 10 (8 SG, 2 UC) from Puducherry region and entire Karaikal region, Union Territory of Pondicherry. Altogether, 1197 species were listed from 127 families and 584 genera, of which 196 species are trees, 113 shrubs, 172 climbers and 716 herbs. Through literature screening and referring the herbarium 25 endemics were added. Finally a total of 107 endemic species were compiled for the Coromandel Coast of Peninsular India and analysed. Of which 19 species are trees, 18 shrubs, 9 climbers and 61 herbs (**Figure 2**). These endemic species were represented by 74 genera and 33 families, of which Leguminosae (17 species from 10 genera) is the dominant family followed by Acanthaceae (13 species from 5 genera), Euphorbiaceae (10 species from 5 genera) and Poaceae (9 from 9 genera). The other dominant families are Apocynaceae and Rubiaceae, had 4 species each (**Figure 3**).

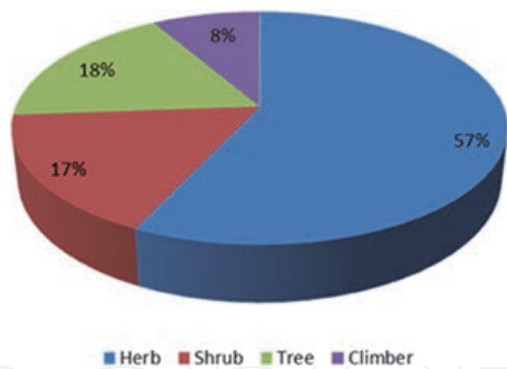


Figure 2.
Endemic plants of CC and their habits representation.

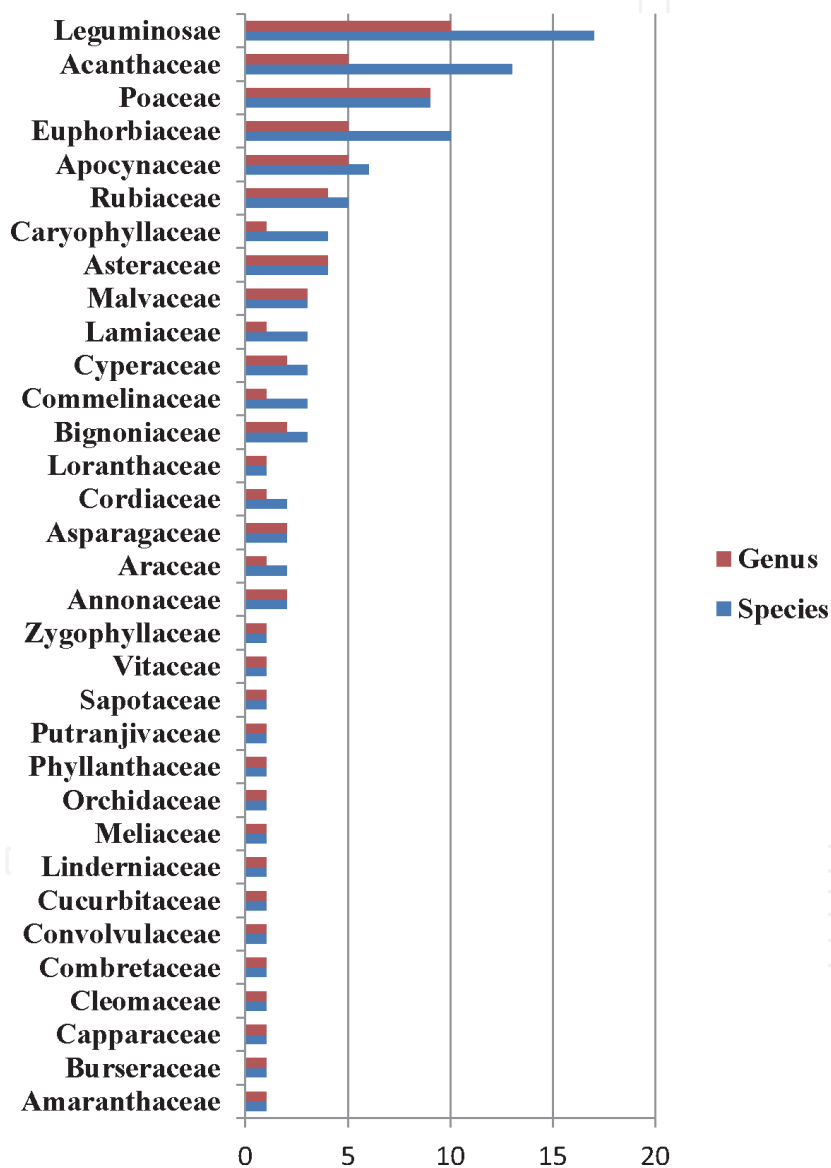


Figure 3.
Detail of endemic plant families, genera and species.

3.1 Disturbance

Qualitatively, classified disturbances were noted from four vegetation types (Table 1; Figure 4). These disturbance codes were correlated with life form, threat status and ethno-botanical values of endemic species. In general, from 50 to 65% of

species were represented in disturbed category. Maximum numbers of species are encountered at medium level of disturbance, followed by undisturbed, low and high level of disturbance. Reasons for the threat are: root of *Decalepis hamiltonii* and fruit of *Phyllanthus indo-fischeri* were extensively collected for their medicinal properties; *Justicia beddomei*, *Leucas wightiana* and *Lindernia minima* are endangered due to narrow and disjunct distribution; *Derris ovalifolia*, *Drypetes porteri*, and *Koilolepas calycinum* are facing habitat loss; *Pterocarpus santalinus* was threatened due to illegal logging; *Sterculia populifolia* living with rocky outskirts; and the herbs are generally facing pressure by grazing.

3.2 Distribution

For an understanding based on geographical distribution the 107 endemic species that recorded from the CC plains were divided into eight groups and their representations are: 1. India (excluding Himalayas & north east) (6 species), 2. Peninsular India (22 species), 3. Southern India (28 species), 4. Southern India with one or two states of north India (11species), 5. Eastern and Western Ghats (5 species), 6. Eastern Ghats (5 species), 7. Tamil Nadu (27 species) and 8. Dispersed in different states (3 species) (**Figure 5**). The distribution of six species across the country is *Crotalaria pusilla*, *Dolichandrone falcata* and *Hardwickia binata*, *Iseilema anthephoroides*, *Lophopogon tridentatus* and *Scleria stocksiana* (**Figure 6**). *Crotalaria willdenowiana*, *Deccania pubescens* var. *candolleana*, *Polycarpaea corymbosa*, *Pterocarpus santalinus* and *Sterculia populifolia* were spotted only in EGs of Andhra Pradesh, Karnataka and Tamil Nadu (**Figure 7**). Five species viz. *Derris ovalifolia*, *Mallotus resinusus* var. *muricatus*, *Mussaenda glabrata*, *Rhynchosia courtallensis* and *Tetrastigma tamilnadense* was found both in EG and WG (**Figure 7**). At regional

Details		Undisturbed	Disturbed		
			Low	Medium	High
Life form	Herbs (61)	16	12	24	9
	Shrubs (18)	5	6	3	4
	Trees (19)	7	3	4	5
	Climbers (9)	4	1	3	1
Threat status	IUCN categorised (7)	3	1	2	1
	From publications (10)	3	3	3	1
	Not evaluated (90)	27	19	29	15

Table 1. Correlation of endemic plants life form and threat status with disturbance gradience.

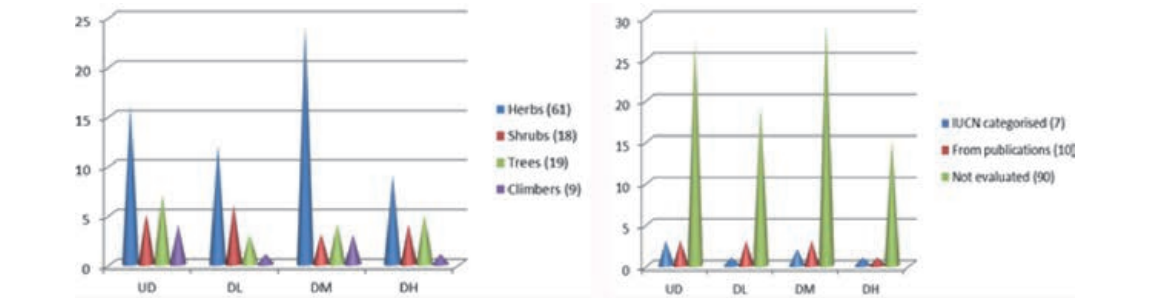


Figure 4. Disturbance index with life-form and threat status.

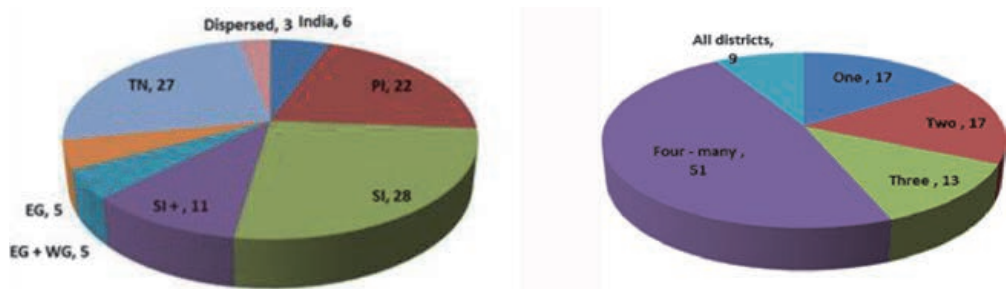


Figure 5.
Geographical representation of endemics at regional and district level of Tamil Nadu.

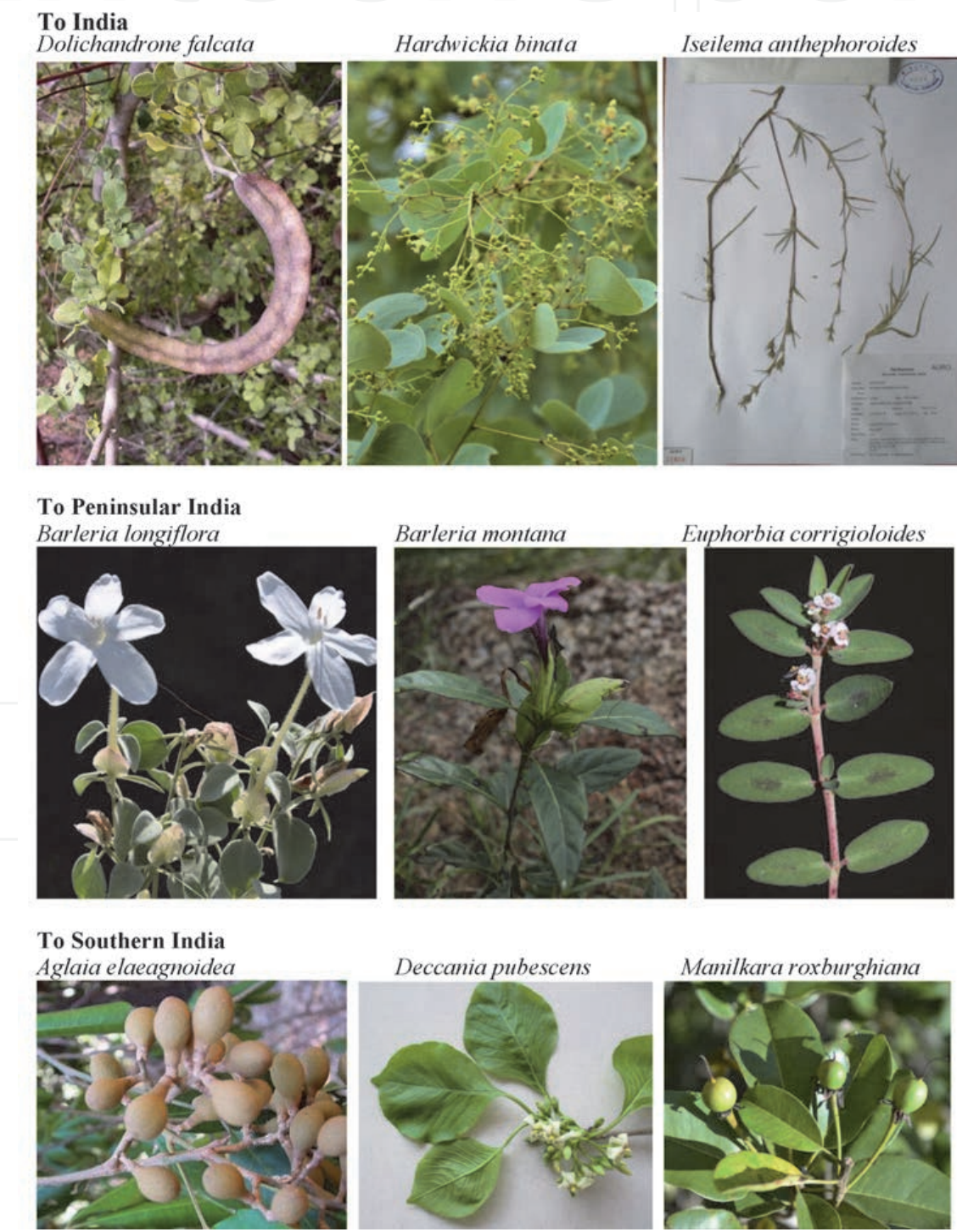


Figure 6.
Representation of endemic plants distributed at national and regional level.

level south India has 28 species followed by 27 species restricted to Tamil Nadu and 22 taxa represented from peninsular India (**Figure 5**).

The representations of species at different districts of Tamil Nadu are analysed, and the study shows that the species found in only one (17 species), two (17 species), three (13), four – many (51 species) and in all districts (9) were recorded (**Figure 5**).

3.3 Narrow or steno endemics

Thirteen species were showed very narrow distribution, found in only one district. They are *Acrachne henrardiana* of Poaceae (Pudukkottai district), *Barleria*

To EG & WG

Tetrastigma tamilnadense



Mallotus resinousus



Rhynchosia courtallensis



To Tamil Nadu

Carissa salicina



Derris ovalifolia



Lepidagathis pungens



RET Endemics

Drypetes porteri



Pterocarpus santalinus



Sterculia populifolia



Figure 7.
Representation of endemic plants distributed at state level and RET endemics.

durairajii of Acanthaceae (Thoothukudi), *Caralluma adscendens* var. *gracilis* of Apocynaceae (Pudukkottai), *Cordia ramanujamii* of Cordiaceae (Villupuram), *Deris gamblei* of Leguminosae (Pudukkottai), *Huberantha senjiana* of Annonaceae (Villupuram), *Jatropha villosa* var. *ramnadensis* of Euphorbiaceae (Ramanathapuram), *Lepidagathis pungens* of Acanthaceae (Tirunelveli), *Leucas anandaraoana* of Lamiaceae (Ramanathapuram), *Polycarpaea diffusa* and *Polycarpaea majumdariana* of Caryophyllaceae (Thoothukudi and Tirunelveli), *Sporobolus hajrae* of Poaceae (Pudukkottai) and *Theriophonum sivaganganum* of Araceae (Ramanathapuram); of which *C. ramanujamii* and *H. senjiana* are recently described neo-endemics (**Figure 8**).

3.4 Disjunct distribution

The analysis shows interesting disjunctions between: 1. The districts of Tamil Nadu, 2. SI and north-east and 3. SI and north-west, and 4. SI and trans-Himalaya (**Figure 9**). *Garnotia elata* of Poaceae and *Glossocardia bosvallia* of Asteraceae are sharing their region between SI and Uttar Pradesh; *Indigofera mysorensis* of Leguminosae and *Jatropha tanjorensis* of Euphorbiaceae between SI and West Bengal; *Manisuris myurus* of Poaceae between SI & Manipur; *Oldenlandia attenuata* of Rubiaceae between EG and Uttar Pradesh; *Leucas diffusa* between SI and Delhi;

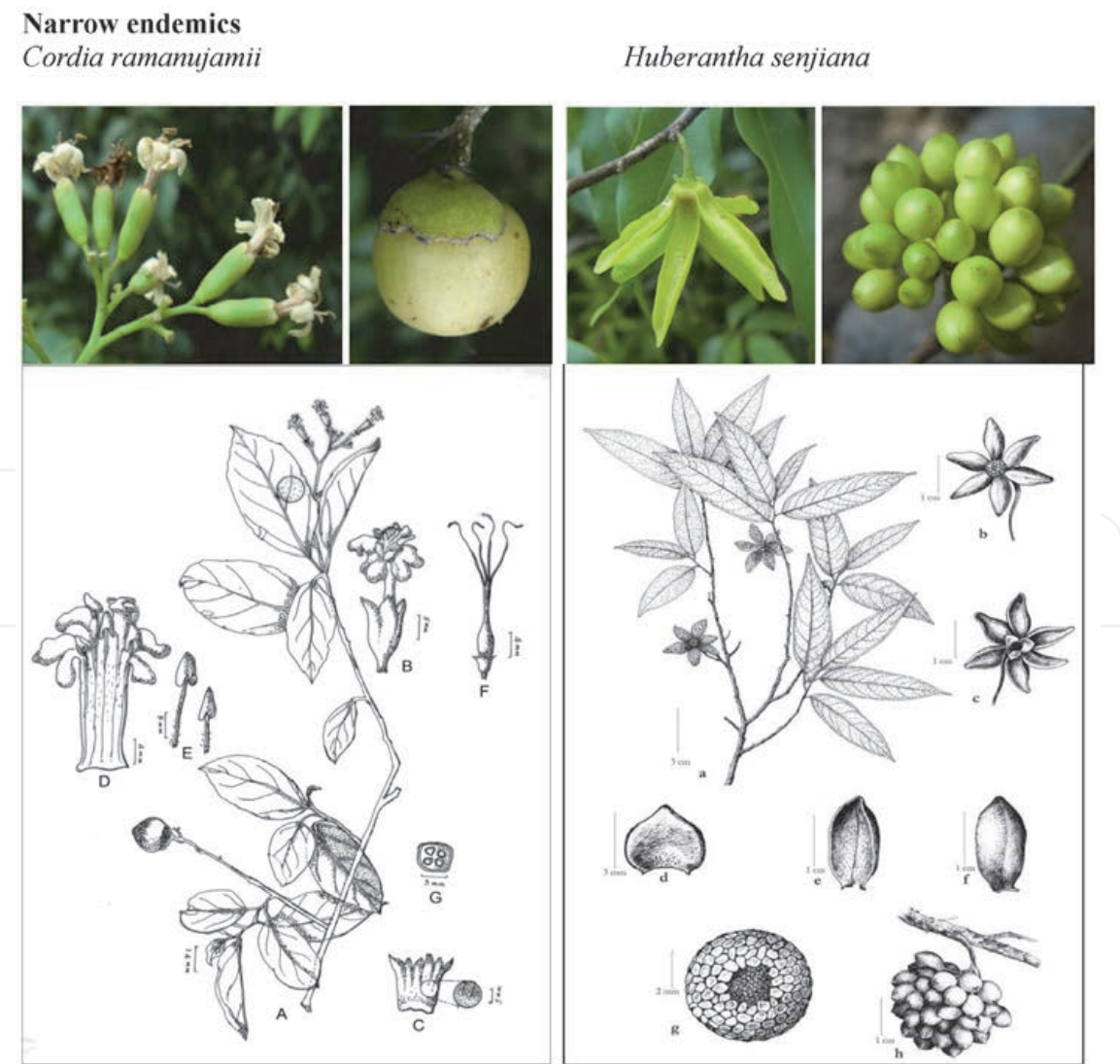


Figure 8.
Recently described endemic species.

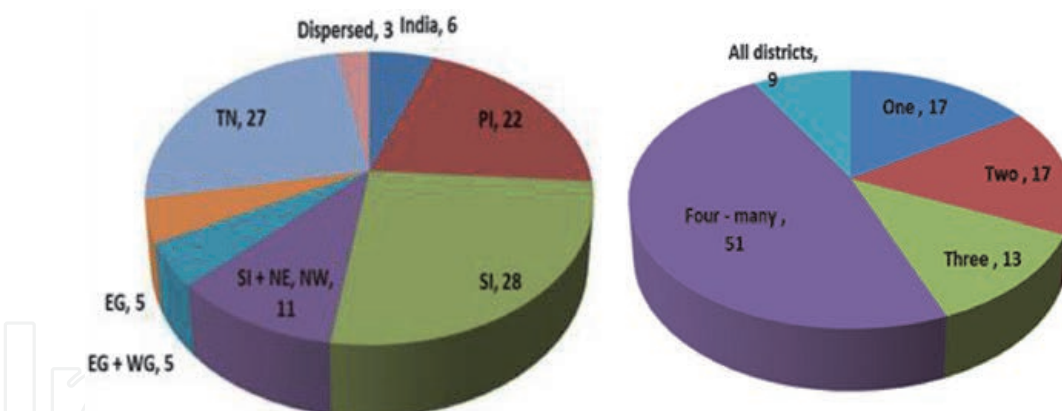


Figure 9.
Representation of state and district level distribution of endemics.

L. wightiana and *Senna montana* between SI and Gujarat; and *Tricholepis radicans* between SI and Rajasthan are some important disjunct distributions between two major geographical regions (**Figure 10**).

In Tamil Nadu at district level analysis (**Figure 9**) found that *Blumea eriantha* of Asteraceae (Coimbatore-Villupuram), *Chlorophytum malabaricum* of Asparagaceae (Nilgiri-Villupuram), *Cordia diffusa* of Cordiaceae (Coimbatore-Kancheepuram), *Drypetes porteri* of Euphorbiaceae (Theni-Villupuram), *Justicia beddomei* of Acanthaceae (Tirunelveli-Villupuram), *Melothria angulata* of Cucurbitaceae (Dindigul-Villupuram), *Mussaenda tomentosa* of Rubiaceae (Tirunelveli-Villupuram), *Rhynchosia courtallensis* of Leguminosae (Tirunelveli-Villupuram), *Tetrastigma tamilnadense* of Vitaceae (Tirunelveli-Villupuram) and *Trachys narasimhanii* of Poaceae (Chennai-Ramanathapuram) are showing great disjunction between the north and south district (**Figure 10**).

3.5 Doubtful endemics

There are six species viz. *Ceropegia mannanarana* of Apocynaceae, *Leucas nepetifolia* of Lamiaceae, *Mariscus clarkii* of Cyperaceae, *Stenosiphonium parviflorum* of Acanthaceae *Sehima sulcatum* and *Zenkeria elegans* of Poaceae are considered as doubtful endemics because Singh et al. [2], Krishnamurthy et al. [34], Henry et al. [35] and Ahmedullah & Nayar [10] treated them as endemic whereas the www.plantsoftheworldonline.org for the former four species and Kabeer & Nair [13] for the latter two Poaceae members had marked them as non-endemic. Meanwhile, Krishnamurthy et al. [34] was included the two latter species under “endangered” list.

3.6 Threat status

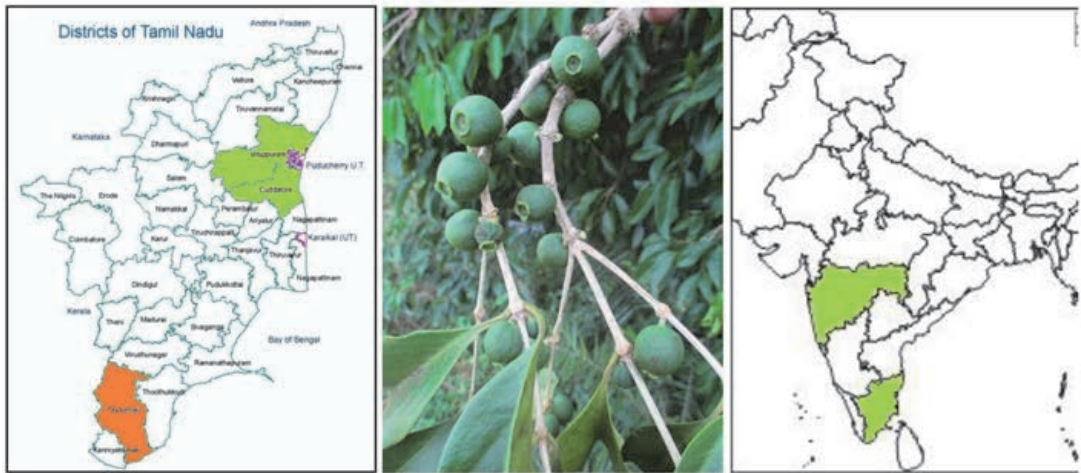
According to IUCN [36], a total of 90 (84.11%) out of 107 endemic species were listed as “not evaluated” and their population status in the wild habitats is also unknown. So far, only seven species viz., *Aglaia elaeagnoidea* (LC [37]), *Decalepis hamiltonii* (EN-A2cd, [38]), *Drypetes porteri* (EN-B1 + 2c, [39]), *Koilocypselus calycinum* (EN B1 + 2c, [39]), *Lindernia minima* (EN-B1ab + 2ab, [40]), *Pterocarpus santalinus* (EN-B1 + 2de, [41]), and *Sterculia populifolia* (CRD, [39]) are assessed according to IUCN criteria (**Figure 7**). From the published information found that 10 species such as, *Chrysopogon verticillatus* [13], *Crotalaria willdenowiana* [34], *Derris ovalifolia* [34, 42, 43], *Dipcadi montanum* var. *madrasicum* [10, 44], *Discospermum sphaerocarpum* [45], *Justicia beddomei* [10], *Leucas wightiana* [10],

Between the districts – *Justicia beddomei* and *Mussaenda tomentosa*



Between the States

Within the state and in PI - *Discospermum sphaerocarpum*



Between the two bio-regions – *Leucas wightiana* & *Manisuris myurus*



Figure 10.
Disjunct distribution of endemics.

Melothria angulata [22], *Rhynchosia courtallensis* [34] and *Sarcostemma intermedium* [34] were came to known as rare or endangered or threatened endemic species.

3.7 Threat assessment and conservation measures

Rapid Assessment Workshop on Conservation of Tropical Dry Evergreen Forest was conducted by Auroville Green Group, Auroville in collaboration with Foundation for Revitalization of Local Health Traditions, Bengaluru held between 5 and 7 March, 2002. A team of 32 field botanist and experts involved and assessed 48

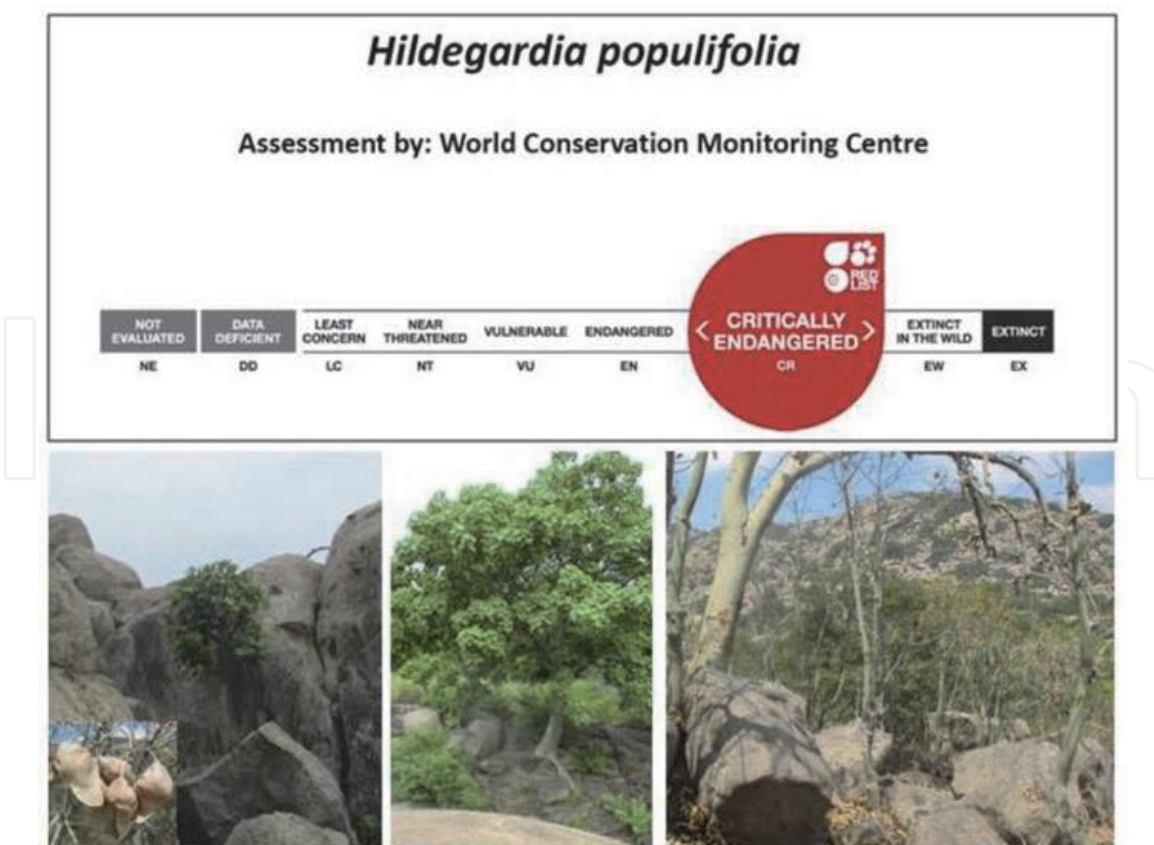


Figure 11.
Conservation status of *Hildegardia populifolia* and its habitat.

species but not published, in which 11 species such as *Acrachne henrandiana*, *Aglaia elaeagnoidea*, *Cadaba trifoliata*, *Caralluma indica*, *Carissa salicina*, *Ceropegia juncea*, *Derris ovalifolia*, *Discospermum sphaerocarpum* (syn. *Tricalysia sphaerocarpa*), *Habenaria roxburghii*, *Manisuris myurus*, and *Pterospermum xylocarpum* are endemic.

Since 1996, extensive effort was employed by Auroville Green Group to conserve on Tropical Dry Evergreen Forest, is an endangered forest type in India. More than one lakh seedlings from 250 native species produced every year planted and developed 'Green Ring' in 2000 hectares at Auroville. Basically they attempted to conserve all the TDEF species; in addition they were concentrated on endemic, endangered and rare Indo-Sri Lankan elements too. Few such endemic species are *Commiphora berryii*, *Deccania pubescens*, *Derris ovalifolia*, *Discospermum sphaerocarpum*, *Dolichandrone atrovirens*, *Dolichandrone falcata*, *Drypetes porteri*, *Hardwickia binata*, *Justicia beddomei*, *Manilkara roxburghiana*, *Miliusa eriocarpa*, *Pterocarpus santalinus*, *Pterospermum xylocarpum*, *Sterculia populifolia* and so on. They are standardised the germination through different techniques for most species but they are not successful in *Terminalia paniculata* of Combretaceae and two non-endemic native species viz. *Anogeissus latifolia* of Combretaceae and *Hugonia mystax* of Linaceae.

3.7.1 *Sterculia populifolia*, threat assessment: a status survey

The conservation status of *Hildegardia populifolia* (syn of *Sterculia populifolia*) was kept in different category by the experts of India. This species was assessed first as 'Critically Endangered' by The World Conservation Monitoring Center WCMC [13] (**Figure 11**) and there are no update to till date. Literature screening showed with other categories as viz. 'Endangered' by Krishnamurthy et al. [34], Walter and

Gillet [46]; 'Vulnerable' by Reddy et al. [47]; 'Very Rare' by Rao and Pullaiah [48]. Whereas Sarcar and Sarcar [49] studied the population, propagation and conservation of the species and recommended the species as critically endangered. Madhavachetty et al. [50] was reported this species occurrence from Ankalamma Konda in Chittoor district. Recently Jaikrishnan [51] was made intensive population survey, counted all mature individual and assessed the new recruits at Gingee hills of Villupuram District, Tamil Nadu and finally concluded this species as 'critically endangered'. The taxa which are under threatened status since 1997 categorised by IUCN and Botanical Survey of India was published Red data books in three volumes during 1987–1990, in which *Hildegardia populifolia* was also treated as endangered.

4. Discussion

The floral diversity in any state or country or world the dominant families are Leguminosae, Poaceae, Orchidaceae, Acanthaceae, Euphorbiaceae, Asteraceae, Apocynaceae, and Rubiaceae so on. This present endemic study was more intrinsically matching with, regional [52] and national [1, 2] studies/analysis. Also, the study reports from the coastal plains [26, 53–58] favoured the present study. Out of 107 endemics 27 species are restricted to the state Tamil Nadu, 5 to EG, 5 to EG & WG, 28 to SI, 11 species sharing between SI with different states of north India, 22 to PI, to entire India, and 3 to elsewhere. These data were enlightened the richness of plant diversity at the Coromandel coast, especially from the TDEF of Tamil Nadu and supporting the 'coastal zone' as one of the endemic centres of India.

The International Union for Conservation of Nature and Natural Resources [46] assessed the global threat status of 33,418 species of Angiosperms, of which 1215 species are reported from India, of which 690 (55.8%) species were evaluated as Indeterminate (I). From this study 80% of endemic species were in 'not evaluated' category. According to Isik [59] three-quarters of narrow endemic species of plants and animals are known to have become extinct due to habitat loss or fragmentation. So as Nair [60] statement "it is very essential that rare, threatened and presumed extinct taxa should be repeatedly searched for in their type localities", should be strictly followed and need to do their population assessment status from time to time. Narrow range and regional level assessments are making ambiguous with the IUCN category, so the WCMC should follow these publications and update them to the relevant species.

Majority of endemic species are isolated due to geographical, ecological, edaphic and climatic barriers and these fragmented patches of vegetation were more pronounced in EG for the point of conservation [61, 62]. This condition was more privileged to the narrow endemic species like *Cordia ramanujamii*, *Huberantha senjiana* and *Mussaenda tomentosa* at Pakkam Malai reserve forest; Gingee hills of EG [53]. Meanwhile, the disjunctly distributed species like *Blumea eriantha*, *Cyanotis tuberosa*, *Drypetes porteri*, *Derris ovalifolia*, *Discospermum sphaerocarpum*, *Indigofera mysorensis*, *Justicia beddomei*, *Leucas wightiana*, *Manisuris myuros*, *Melothria angulata* between the two Ghats/bioregion have to be considered as crucial for the conservation actions.

It was estimated that 2–25% of plant species will become extinct or committed to extinction in tropical forest approximately in next years [63]. It is also opined that 22–47% of species might have already become threatened [64]. In India TDEF occupies about 2482.52 km² (1.61% of the country territory), in which Tamil Nadu has only 41.08 km² (0.1%) [65]. According to Krishnamurthy et al. [34] the TDEF found along the Coromandel Coast is an 'endangered forest' type. The degree of threat and richness of endemism is one of the major aspects in prioritising the areas

for conservation. In this paradigm, Jain & Rao [66] statement “if endemic species are eliminated from our country it will mean that they will be annihilated from the whole world, will be loss to science, will be struck off the roles of biological resources of this earth” should be profoundly considered. In all, highly fragmented form of TDEF ecosystem, indeterminate IUCN status of narrow endemics and their disjunct distribution with different bioregions of India should be considered as high priority for the assessment and conservation programs at national, regional and state level in regular intervals.

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