

Endemic plants of tropical dry evergreen forest, Southern India

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Abstract. During the last two decades of intensive botanical survey of the tropical dry evergreen forest, a total of 82 endemic taxa were found out of 1142 species enumerated from 85 sites in the three Coromandel Coastal districts of the state Tamil Nadu: Cuddalore, Kancheepuram and Villupuram, and in the Pondicherry district. Of 82 species, 17 are trees, 11 shrubs, 9 climbers and 45 herbs. Distribution of these endemic species was analyzed and categorised as endemic to the country, peninsular India, southern India, Eastern and Western Ghats, and at the state and district level. Interestingly, the study found that some endemic species were disjunctly distributed between districts, states, ghats, climatic regimes and bioregions. Anthropogenic disturbance and species threat status were also studied and discussed.

Key words: Coromandel Coast, endemics, disjunct distribution, Pondicherry, Tamil Nadu, threat status, tropical dry evergreen forest

1. Introduction

India is one of 18 extremely diverse and top 10 species-rich countries of the world. Out of 18043 species, a total of 4381 taxa belonging to 1007 genera and 176 families, including 4303 angiosperms, 12 gymnosperms and 66 pteridophytes, have been confirmed as endemic to India (Singh & Dash 2014). Recently, among angiosperms, a total of 58 genera have been identified as endemic to India (Singh *et al.* 2015). Chatterjee (1939, 1962) was the first researcher who studied the endemism of the Indian flora and evaluated that 6850 species are unique to this region (61% of flowering plants), of which 3169 species are restricted to the Himalayas and 2045 to Peninsular India (PI). Blasco (1971) estimated that there are about 1268 dicotyledons endemic to South India; however, Nayar (1977) recorded 2100 flowering plants endemic to PI. Later, Nayar (1980a) reported 141 genera endemic to India; while Ahmedullah & Nayar (1986) found 55 genera endemic to PI of which 45 are monotypic (Nayar 1980a). Recently, Irwin & Narasimhan (2011) enumerated only 49 genera that are endemic to India, excluding several genera based

on nomenclatural changes and extended distribution. Nayar (1980b) categorised the endemic genera of India into 3 patterns based on the distribution, i.e., Himalayan endemic genera, Peninsular Indian endemic genera and Andaman & Nicobar Islands endemic genera.

In India, the Western Ghats (WG) has much more endemic taxa (2116 species) than the rest of India. In the state-wise analysis, Tamil Nadu ranks first with 410 species, followed by Kerala (357), and Maharashtra (278), while Andaman and Nicobar Islands together contribute 278 taxa (Singh *et al.* 2015).

A total of 166 endemic taxa, representing 117 genera and 43 families, are known to occur in the Eastern Ghats (EG), of which 129 are dicots and 46 monocots. Sudhakar Reddy & Raju (2008) recorded 400 endemic spermatophytes from the EGs of Andhra Pradesh and their adjacent coastal plains. The Flora of Tamil Nadu was published in 1983, 1987 and 1989 in 3 volumes, afterwards, Betty & Ramachandran (2014) added 192 taxa belonging to 130 genera and 61 families between the period of 1989 and 2013 based on published sources, unpublished thesis and research reports made by several botanists (Matthew 1999; Uma Maheshwari & Daniel

2001; Ramachandran *et al.* 2006; Manickam *et al.* 2008; Viswanathan & Manikandan 2008; Kabeer & Nair 2009; Yarrayya *et al.* 2015). Out of them, 87 taxa are new to science, as well as endemic to the state of Tamil Nadu. High concentration of endemic plants directly reflects the habitat stability, environmental quality, rich biodiversity and conservation values in a specific area. The main aim of this work is to explore the wealth of endemic plants diversity from the fragile tropical dry evergreen forests and to know the current threat status of these plant species.

2. Material and methods

The natural vegetation occurring along the east coast of Southern India, extending from Visakhapatnam in Andhra Pradesh in the North to Ramanathapuram in Tamil Nadu in the South, was described as tropical dry evergreen forest (TDEF) (Champion & Seth 1968). These forest types are found in 13 coastal districts out of 32 districts in Tamil Nadu. The state lies between 8° 5' to 13° 35' N latitude and 76° 15' to 80° 20' E longitude and is situated on the south eastern side of Indian

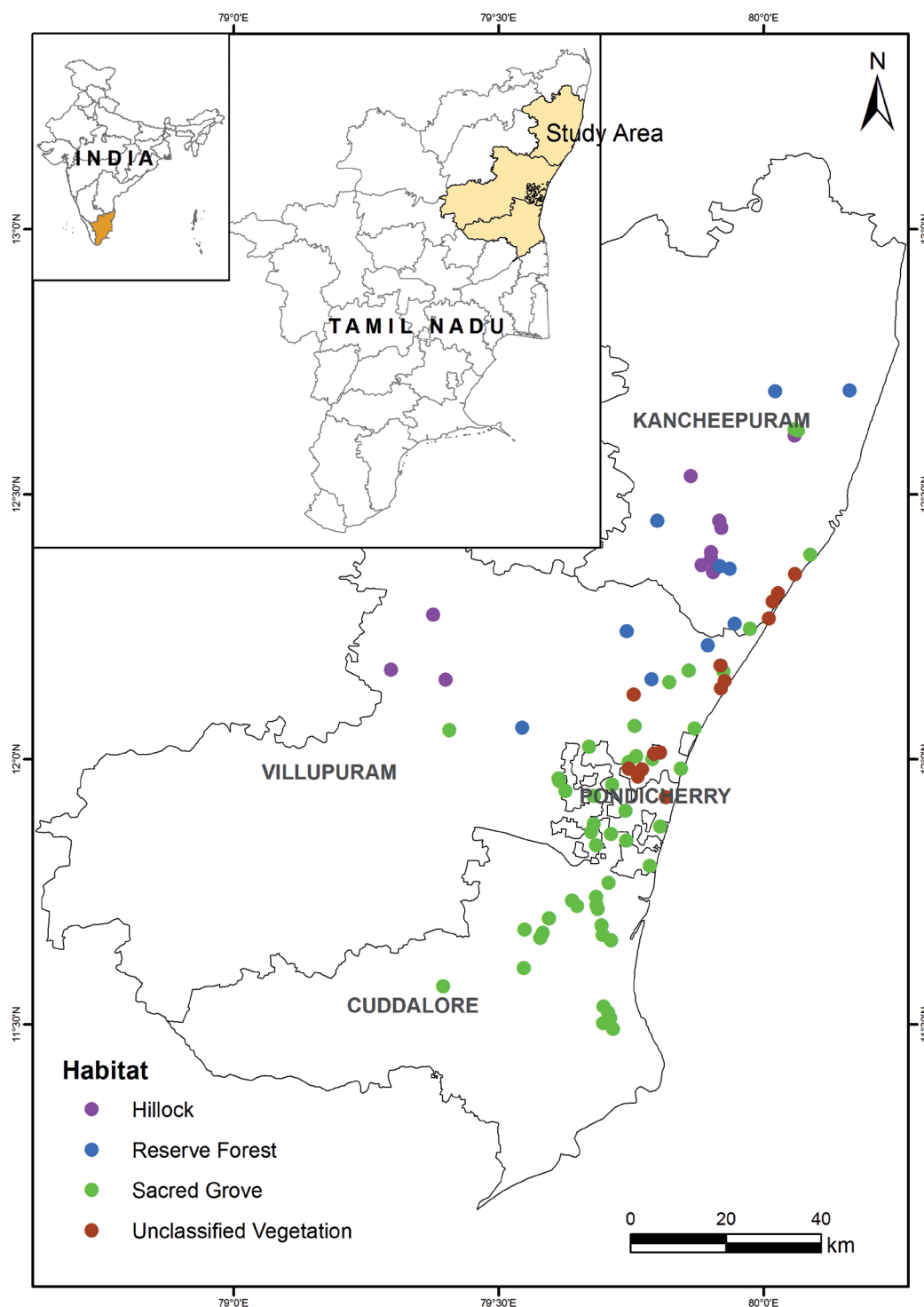


Fig. 1. Study area map

Peninsula. It has a coast line of 990 km in the east and a land boundary of 1200 km in the west.

2.1. Study area

Four districts were selected in the present study, including three Coromandel Coastal districts of Southern India, i.e., Kancheepuram, Villupuram and Cuddalore from the state Tamil Nadu, and the fourth district was Pondicherry (Fig. 1). In Cuddalore, forest cover is 444 km² (11.98%) out of 3706 km², in Kancheepuram 372 km² (8.31%) out of 4474 km² and in Villupuram 1011 km² (14.06%) out of 7190 km² of geographical area (Annamalai 2004). The forest cover at the Union Territory of Pondicherry is 50.06 km² (10.43%) out of 480 km² of area (Forest Survey of India, 2013).

Geologically, part of Cuddalore and Villupuram districts belonged to the formation of Cuddalore sandstone during Miocene period (Meher-Homji 1970). The soil along the coast is sandy loam or red ferralitic and in certain places covered with alluvial deposits and becoming clayey beneath (Meher-Homji 1974, 1984). The coastal plains are extending up to 40-60 km (Mani 1974) and are overlain by a thin soil layer supporting agriculture. The substratum erupted into hillocks and mounds in the Kancheepuram and Villupuram districts and into undulating terrain in the Cuddalore district. 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 (Marlange & Meher-Homji 1965).

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 of 17.7°C is in January, maximum temperature of 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 5-9 km/h during July to September, but it is extremely higher during the cyclonic days, during October to December.

2.2. Field survey

Four types of vegetation cover, including micro- and macro- habitats, i.e., 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.

Eighty five sites were selected in four districts and botanical surveys were made extensively once a week by a team of four members, visiting each and every site within an interval of 4-6 months. Pre-monsoon and post-monsoon changes were monitored from 1996 to 2016. These sites were geo-referenced with Garmin Global Positioning System (GPS), followed by intensive species inventory, including herbs, shrubs, trees and climbers; collection of voucher samples and photographic documentation of the key characters of the plants. A total of 12816 herbarium sheets were prepared from the sample collections and deposited at the AURO Herbarium, Auroville, India. The nomenclature of all plant species recorded in this study were verified with the site 'The Plant List' (<http://www.theplantlist.org/>).

2.3. Analyses

Phyto-geographical distribution of endemics was studied, with six areas of endemism categorised into endemic to: (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 areas was also studied. Site disturbances such as: browsing, cutting, lopping, and clear felling, encroachment for cultivation purposes, construction of a big modern temple, construction and widening of the metal road, digging irrigation channels and cementing the thrashing floor, were studied and categorised into low, medium and high, following Venkateswaran & Parthasarathy (2003). High ranks signify high levels of anthropogenic disturbance in the forests. The disturbance levels were correlated with four growth forms, threat status of species and their values.

3. Results

Among the 85 sites studied, 25 (SG) sites are from Cuddalore, 22 (8 HL, 6 RF, 4 SG, 4 UC) from Kancheepuram and 28 (3 HL, 4 RF, 13 SG, 8 UC) from Villupuram districts of Tamil Nadu, while 10 (8 SG, 2 UC) from Pondicherry. Altogether, 1,142 species from 125 families and 580 genera were listed, of which 191 species are trees, 105 shrubs, 161 climbers and 685 herbs. Analysis of the results showed that among trees the dominant family was Leguminosae (34 species), among shrubs Rubiaceae (12 species), for climbers Convolvulaceae (27 species) and for herbs Poaceae (132 species). *Ficus* (13) is the dominant genus among trees; among shrubs dominated five genera, i.e., *Capparis*, *Grewia*, *Jatropha*, *Polyalthia* and *Premna*, with 3 species each; *Ipomoea* (13) is the dominant genus of climbers and *Cyperus* (26) among herbs.

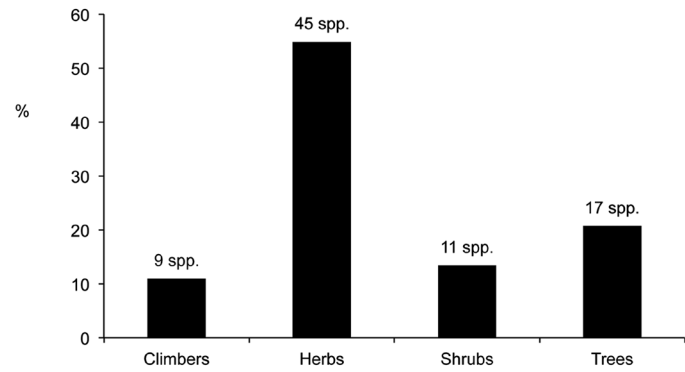


Fig. 2. The number of endemic plant species found in the studied tropical dry evergreen forest of the Coromandel Coast of Peninsular India according to different growth forms

In the presented work, we found 82 (7.18%) endemic species from the TDEF that were distributed along the Coromandel Coast of Peninsular India, of which 17 species were trees, 11 shrubs, 9 climbers and 45 herbs

(Appendix 1; Fig. 2). These endemic species were represented by 65 genera and 31 families, of which Leguminosae (10 species from 7 genera) was the dominant family, followed by Acanthaceae (9 species from

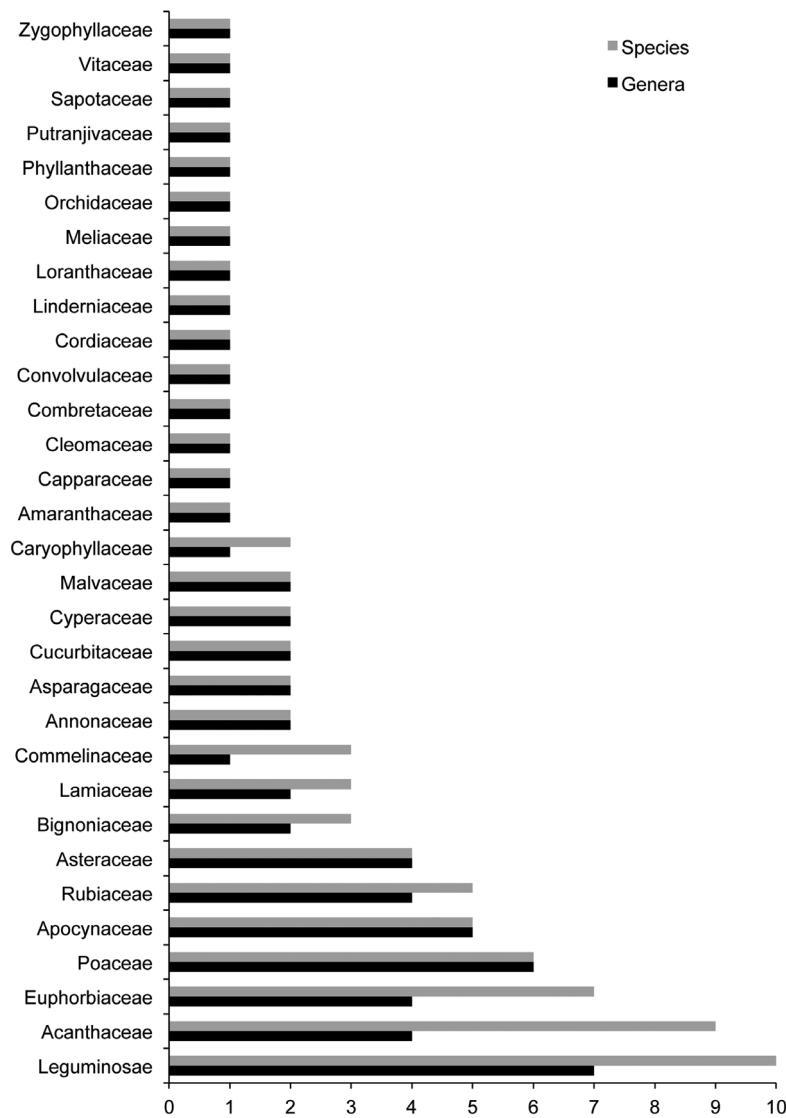


Fig. 3. Distribution of endemic plant species and genera of the studied tropical dry evergreen forest of the Coromandel Coast of Peninsular India within families

Table 1. The number of endemic plant species of the studied tropical dry evergreen forest of the Coromandel Coast of Peninsular India found in the habitats of different level of disturbance, according to plant growth forms, threat status and medicinal and economic values

Endemic species characteristics		Total number of species	Undisturbed habitats	Disturbed habitats		
				Low	Medium	High
Growth form	Herbs	45	11	9	20	5
	Shrubs	11	3	6	1	1
	Trees	17	6	2	4	5
	Climbers	9	4	1	3	1
Threat status	IUCN category	6	3	0	2	1
	Based on published resources	10	3	3	3	1
	Not evaluated	66	18	15	23	10
Values	Medicinal & economic	41	10	8	14	9
	None	41	14	10	14	3

4 genera), Euphorbiaceae (7 species from 4 genera) and Poaceae (6 from 6 genera). The other dominant families were Apocynaceae, Rubiaceae and Asteraceae (Fig. 3).

3.1. Habitats

Four levels of disturbance of habitats were determined in the studied area based on qualitative assessment – undisturbed, low, medium and high (Table 1). These levels were correlated with the number of endemic species representing different growth forms, threat status and ethno-botanical values. In general, from 50 to 65% of species were represented in the disturbed category. Maximum number of species was found for the medium level of disturbance, followed by undisturbed, low and high level of disturbance.

3.2. Distribution

Based on geographical distribution, the endemic species from TDEF were divided into six groups. Among them, *Deccania pubescens* var. *candolleana*, *Pterocarpus santalinus* and *Sterculia populifolia* were spotted only in EG of Andhra Pradesh and Tamil Nadu. Four species i.e., *Derris ovalifolia*, *Mallotus resinus* var. *muricatus*, *Mussaenda glabrata* and *Rhynchosia courtallensis* were found both in EG and WG (Appendix 2). Twenty four species were distributed across the four southern states of India and another 24 species in PI. Three species, i.e., *Crotalaria pusilla*, *Dolichandrone falcata* and *Hardwickia binata*, were found across the country, except Himalayas (Appendix 3). The remaining 15 species were distributed unregularly without any regional limitations.

3.3. Narrow endemics

Nine species, such as: *Carissa salicina*, *Cordia ramanujamii*, *Derris ovalifolia*, *Dipcadi montanum* var. *madrasicum*, *Drypetes porteri*, *Huberantha senjiana*, *Lindernia minima*, *Mussaenda tomentosa* and

Tetrastigma tamilnadense, were endemic to the state Tamil Nadu, while *C. ramanujamii*, *H. senjiana* and *T. tamilnadense* are neo-endemic. The first two neo-endemic species are restricted to the area of 50 km² of Gingee hills. *D. porteri* and *M. tomentosa* were disjunctly distributed between Tirunelveli and Gingee hills (Appendix 4).

3.4. Species with disjunct distribution

Thirteen species, i.e.: *Carissa salicina*, *Crotalaria willdenowiana*, *Derris ovalifolia*, *Dipcadi montanum* var. *madrasicum*, *Drypetes porteri*, *Justicia beddomei*, *Lindernia minima*, *Mallotus resinus* var. *muricatus*, *Melothria angulata*, *Mussaenda glabrata*, *M. tomentosa*, *Polycarpaea corymbosa* var. *longipetala*, and *Rhynchosia courtallensis*, have very scattered distribution between EG and WG of Tamil Nadu, while *M. glabrata* showed extended distribution from WG to EG. The distribution is disjunct for: *Discospermum sphaerocarpum* and *Cyanotis papilionacea* between Tamil Nadu and Maharashtra, *Garnotia elata* and *Glossocardia bosvallia* between SI and Uttar Pradesh, *Indigofera mysorensis* between SI and West Bengal, *Leucas diffusa* between SI and Delhi, *L. wightiana* between SI and Gujarat, *Manisuris myurus* between SI & Manipur, *Oldenlandia attenuata* between EG and Uttar Pradesh, *Senna montana* between SI and Gujarat and *Tricholepis radicans* between SI and Rajasthan (Appendix 4). The remaining 24 species were very scattered within SI.

3.5. Doubtful endemics

Two species, i.e., *Sehima sulcatum* and *Zenkeria elegans* of Poaceae are considered as doubtful endemics because Singh *et al.* (2015), Krishnamurthy *et al.* (2014), Henry *et al.* (1989) and Ahmedullah & Nayar (1986) treated them as endemic, whereas Kabeer & Nair (2009) determined as non-endemic. Meanwhile, Krishnamurthy *et al.* (2014) included the later species on the 'endangered' species list.

3.6. Threat status

According to IUCN (2017), a total of 66 (80.48 %) out of 82 endemic species were listed as ‘not evaluated’ and their population status in the wild habitats is also unknown. So far, only six species, i.e., *Aglaia elaeagnoides* (LC, Pannell 1998), *Decalepis hamiltonii* (EN-A2cd, Ved *et al.* 2015), *Drypetes porteri* (EN-B1+2c, WCMC 1998), *Lindernia minima* (EN-B1ab+2ab, Rehel 2011), *Pterocarpus santalinus* (EN-B1+2de, CAMP 1998), and *Sterculia populifolia* (CR, WCMC 1998, Rao *et al.* 2011) are assessed according to IUCN criteria. Based on the published resources, 10 species, such as: *Chrysopogon verticillatus* (Kabeer & Nair 2009), *Crotalaria willdenowiana* (Krishnamurthy *et al.* 2014), *Derris ovalifolia* (Thothathri 1982; Balachandran & Rajendiran 2014; Krishnamurthy *et al.* 2014), *Dipcadi montanum* var. *madrasicum* (Ahmedullah & Nayar 1986; Prabhu Kumar *et al.* 2013), *Discospermum sphaerocarpum* (Henry *et al.* 1987), *Justicia beddomei* (Ahmedullah & Nayar 1986), *Leucas wightiana* (Ahmedullah & Nayar 1986), *Melothria angulata* (Nair & Henry 1983), *Rhynchosia courtallensis* (Krishnamurthy *et al.* 2014) and *Sarcostemma intermedium* (Krishnamurthy *et al.* 2014), are known as rare or endangered or threatened.

4. Discussion

The dominant families, i.e., Leguminosae (10 spp.), Acanthaceae (9), Euphorbiaceae (7), Poaceae (6), Apocynaceae (5) and Rubiaceae (5) determined in the present study coincide with local (Ramanujam *et al.* 2007), regional (Nayar 1996) and national (Singh & Dash 2014; Singh *et al.* 2015) analyses. Compared to the reports of Meher-Homji (1974), Balasubramanian (1987), Ramanujam & Kadamban (1999), Parthasarathy *et al.* (2008), Praveen Kumar (2011) and Balachandran (2016), in this study, 9 out of 82 endemic species are restricted to the state Tamil Nadu, 3 to EG, 4 to EG & WG, 24 to SI, 24 to PI, 3 to entire India and 15 elsewhere. These data show the richness of plant diversity and the abundance of endemics found in TDEF.

The International Union for Conservation of Nature and Natural Resources (Walter & Gillett 1998) assessed the global threat status of 33,418 species of Angiosperms, of which 1,215 species are reported from India, with 690 (55.8%) species evaluated as Indeterminate (I). In this study, 80% of endemic species were in ‘not evaluated’ category. According to Isik (2011), three-quarters of narrow endemic species of plants and animals are known to become extinct due to habitat loss or fragmentation. Thus, Nair (1991) 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 population status assessment for such species should be conducted repetitively.

Majority of endemic species populations are isolated due to geographical, ecological, edaphic and climatic barriers and such fragmented patches of vegetation were more pronounced in EG, which is important from the viewpoint of conservation (Nayar *et al.* 1984; Gopalan & Henry 2000). This situation is more favourable to the narrow endemic species, like: *Cordia ramanujamii*, *Huberantha senjiana* and *Mussaenda tomentosa* in the Pakkam Malai reserve forest, Gingee hills of EG (Balachandran 2016). The other disjunctly distributed species, like: *Blumea eriantha*, *Cyanotis tuberosa*, *Drypetes porteri*, *Derris ovalifolia*, *Discospermum sphaerocarpum*, *Indigofera mysorensis*, *Leucas wightiana*, *Manisuris myuros*, and *Melothria angulata*, distributed between the two Ghats/bioregions have to be considered as crucial for conservation management.

It was estimated that 2-25% of plant species will become extinct or threatened with extinction in tropical forest in the nearest future (UNEP 1995). It is also estimated that 22-47% of species might have already become threatened with extinction (Pitman & Jørgensen 2002). In India, TDEF occupies about 2,482.52 km² (1.61% of the country territory), of which only 41.08 km² (0.1%) occurs in Tamil Nadu (Areendran & Rao 2006). According to Krishnamurthy *et al.* (2014), the TDEF found along the Coromandel Coast is an ‘endangered forest’ type. In this paradigm, Jain & Rao (1983) 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. Thus, a highly fragmented form of TDEF ecosystem, indeterminate IUCN status of narrow endemics and their disjunct distribution within different bioregions of India should be considered a high priority indication for the vegetation assessment at regular intervals and conservation programs.

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Appendix 1. Endemic plants of the Coromandel Coast of north Tamil Nadu with their distribution and threat status, including two doubtful endemic taxa (*)

No.	Species name	Family name	Growth form	Distribution	Threat status
1	<i>Acalypha alnifolia</i> Klein ex Willd.	Euphorbiaceae	H	SI	NE
2	<i>Acalypha malabarica</i> Müll. Arg.	Euphorbiaceae	H	PI	NE
3	<i>Aglaia elaeagnoidea</i> (A. Juss.) Benth.	Meliaceae	T	SI	NT
4	<i>Andrographis affinis</i> Nees	Acanthaceae	H	SI	NE
5	<i>Andrographis serpyllifolia</i> (Vahl) Wight	Acanthaceae	H	SI	NE
6	<i>Apocopsis courtallumensis</i> (Steud.) Henrard	Poaceae	H	PI	NE
7	<i>Argyreia kleiniana</i> Raizada	Convolvulaceae	C	PI	NE
8	<i>Barleria cuspidata</i> F. Heyne ex Nees	Acanthaceae	H	PI	NE
9	<i>Barleria longiflora</i> L.f.	Acanthaceae	H	PI	NE
10	<i>Barleria montana</i> Nees	Acanthaceae	H	PI	NE
11	<i>Blumea eriantha</i> DC.	Asteraceae	H	SI	NE
12	<i>Cadaba trifoliata</i> Wight & Arn.	Capparaceae	S	SI	NE
13	<i>Caralluma indica</i> (Wight & Arn.) N. E. Br.	Apocynaceae	H	SI	NE
14	<i>Carissa salicina</i> Lam.	Apocynaceae	S	Tamil Nadu	NE
15	<i>Chlorophytum malabaricum</i> Baker	Asparagaceae	H	PI	NE
16	<i>Chrysopogon verticillatus</i> (Roxb.) Trin. ex Steud.	Poaceae	H	PI	NT
17	<i>Cleome felina</i> L.f.	Cleomaceae	H	PI	NE
18	<i>Cordia ramanujamii</i> N. Balach. & K. Rajendiran	Cordiaceae	T	Tamil Nadu	NE
19	<i>Crotalaria pulchra</i> Andrews	Leguminosae	S	SI	NE
20	<i>Crotalaria pusilla</i> DC.	Leguminosae	H	India	NE
21	<i>Crotalaria willdenowiana</i> DC.	Leguminosae	H	EG & WG	NT
22	<i>Cryptolepis grandiflora</i> Wight	Apocynaceae	C	SI & AN Islands	NE
23	<i>Cyanotis arcotensis</i> R. S. Rao	Commelinaceae	H	PI	NE
24	<i>Cyanotis papilionacea</i> (Burm.f.) Schult. & Schult.f.	Commelinaceae	H	Maharashtra, Tamil Nadu	NE
25	<i>Cyanotis tuberosa</i> (Roxb.) Schult. & Schult.f.	Commelinaceae	H	PI	NE
26	<i>Decalepis hamiltonii</i> Wight & Arn.	Apocynaceae	C	SI	EN
27	<i>Deccania pubescens</i> (Roth) Tirveng. var. <i>candolleana</i> (Wight & Arn.) Tirveng.	Rubiaceae	T	EG	NE
28	<i>Derris ovalifolia</i> (Wight et Arn.) Benth.	Leguminosae	C	Tamil Nadu	NT
29	<i>Dicliptera cuneata</i> Nees	Acanthaceae	H	SI	NE
30	<i>Dipcadi montanum</i> (Dalzell) Baker var. <i>madrasicum</i> (E. Barnes & C. E. C. Fisch.) Deb & S. Dasgupta	Asparagaceae	H	Tamil Nadu	NT
31	<i>Discospermum sphaerocarpum</i> Dalzell ex Hook.f.	Rubiaceae	T	Maharashtra, Tamil Nadu	NT
32	<i>Dolichandrone atrovirens</i> (Roth) K. Schum.	Bignoniaceae	T	SI	NE
33	<i>Dolichandrone falcata</i> (Wall. ex DC.) Seem.	Bignoniaceae	T	India	NE
34	<i>Drypetes porteri</i> (Gamble) Pax & K.Hoffm.	Putranjivaceae	T	Tamil Nadu	EN
35	<i>Emilia scabra</i> DC.	Asteraceae	H	SI	NE
36	<i>Euphorbia corrigioloides</i> Boiss.	Euphorbiaceae	H	PI	NE
37	<i>Euphorbia elegans</i> Spreng.	Euphorbiaceae	H	PI	NE
38	<i>Fimbristylis woodrowii</i> C. B. Clarke	Cyperaceae	H	SI	NE
39	<i>Garnotia elata</i> (Arn. ex Miq.) Janowski	Poaceae	H	SI & Uttar Pradesh	NE
40	<i>Glossocardia bosvallia</i> (L.f.) DC.	Asteraceae	H	SI & Uttar Pradesh	NE
41	<i>Habenaria roxburghii</i> Nicolson	Orchidaceae	H	PI	NE
42	<i>Hardwickia binata</i> Roxb.	Leguminosae	T	India	NE
43	<i>Heterophragma quadriloculare</i> (Roxb.) K. Schum.	Bignoniaceae	T	PI	NE
44	<i>Huberantha senjiana</i> (R. Muralidharan, Naras. & N. Balach.) R. Muralidharan, Naras. & N. Balach.	Annonaceae	S	Tamil Nadu	NE
45	<i>Indigofera mysorensis</i> DC.	Leguminosae	H	SI & West Bengal	NE

No.	Species name	Family name	Growth form	Distribution	Threat status
46	<i>Indigofera prostrata</i> Willd.	Leguminosae	H	PI	NE
47	<i>Iseilema antheophoroides</i> Hack.	Poaceae	H	PI & Gujarat	NE
48	<i>Jatropha heynei</i> N. P. Balakr.	Euphorbiaceae	H	PI	NE
49	<i>Jatropha tanjorensis</i> J. L. Ellis & Saroja	Euphorbiaceae	S	PI	NE
50	<i>Justicia beddomei</i> (C. B. Clarke) Bennet	Acanthaceae	S	SI	NT
51	<i>Justicia glauca</i> Rottler	Acanthaceae	H	PI	NE
52	<i>Justicia neesii</i> Ramamoorthy	Acanthaceae	H	SI	NE
53	<i>Leucas diffusa</i> Benth.	Lamiaceae	H	SI & Delhi	NE
54	<i>Leucas wightiana</i> Wall. ex Benth.	Lamiaceae	H	SI & Gujarat	NT
55	<i>Lindernia minima</i> (Benth.) Mukerjee	Linderniaceae	H	Tamil Nadu	EN
56	<i>Lophopogon tridentatus</i> (Roxb.) Hack.	Poaceae	H	PI & Gujarat	NE
57	<i>Mallotus resinous</i> (Blanco) Merr.	Euphorbiaceae	T	WG & EG	NE
58	<i>Manilkara roxburghiana</i> (Wight) Dubard	Sapotaceae	T	SI	NE
59	<i>Manisuris myurus</i> L.	Poaceae	H	SI & Manipur	NE
60	<i>Melothria angulata</i> Chakrav.	Cucurbitaceae	C	SI	NT
61	<i>Miliusa eriocarpa</i> Dunn	Annonaceae	S	SI	NE
62	<i>Mussaenda glabrata</i> (Hook.f.) Hutch. ex Gamble	Rubiaceae	S	WG & EG	NE
63	<i>Mussaenda tomentosa</i> Wall. ex G. Don	Rubiaceae	S	Tamil Nadu	NE
64	<i>Oldenlandia attenuata</i> (Willd.) M. R. Almeida	Rubiaceae	H	EG & Uttar Pradesh	NE
65	<i>Phyllanthus indofischeri</i> Bennet	Phyllanthaceae	T	SI	NE
66	<i>Polycarpaea aurea</i> Wight & Arn.	Caryophyllaceae	H	PI	NE
67	<i>Polycarpaea corymbosa</i> (L.) Lam. var. <i>longipetala</i> S. R. Sriniv. & D. Naras.	Caryophyllaceae	H	EG & WG	NE
68	<i>Psilotrichum nudum</i> Wight	Amaranthaceae	H	SI	NE
69	<i>Pterocarpus santalinus</i> L.f.	Leguminosae	T	EG	EN
70	<i>Pterospermum xylocarpum</i> (Gaertn.) Santapau & Wagh	Malvaceae	T	PI	NE
71	<i>Rhynchosia courtallensis</i> Maesen	Leguminosae	C	SI	NT
72	<i>Sarcostemma intermedium</i> Decne.	Apocynaceae	C	PI	NE
73	<i>Scleria stocksiana</i> Boeckeler	Cyperaceae	H	India	NE
74	<i>Senna montana</i> (Roth) V. Singh	Leguminosae	S	SI & Gujarat	NE
75	<i>Solena amplexicaulis</i> (Lam.) Gandhi	Cucurbitaceae	C	SI	NE
76	<i>Sterculia populifolia</i> DC.	Malvaceae	T	EG	CR
77	<i>Taxillus heyneanus</i> Danser	Loranthaceae	S	SI	NE
78	<i>Terminalia paniculata</i> Roth	Combretaceae	T	PI	NE
79	<i>Tetrastigma tamilnadense</i> N. Balach. & K. Ravik.	Vitaceae	C	Tamil Nadu	NE
80	<i>Tribulus subramanyamii</i> P. Singh, G. S. Giri & V. Singh	Zygophyllaceae	H	PI	NE
81	<i>Tricholepis radicans</i> (Roxb.) DC.	Asteraceae	H	SI & Rajasthan	NE
82	<i>Vitex negundo</i> L. var. <i>purpurascens</i> Sivar. & Moldenke	Lamiaceae	T	SI	NE
83	<i>Sehima sulcatum</i> (Hack.) A. Camus*	Poaceae	H	India	NE
84	<i>Zenkeria elegans</i> Trin.*	Poaceae	H	SI	EN

Explanations: H – Herb, S – Shrub, T – Tree, C – Climber; SI – Southern India, PI – Peninsular India, EG – Eastern Ghats, WG – Western Ghats, AN – Andaman & Nicobar Islands; NE – Not Evaluated; NT – Near Threatened; EN – Endangered; CR – Critically Endangered

Appendix 2. Endemic plants from the Coromandel Coast of north Tamil Nadu endemic to: a – Tamil Nadu, b – Eastern Ghats, c – Eastern Ghats & Western Ghats

a



Cordia ramanujamii



Drypetes porteri

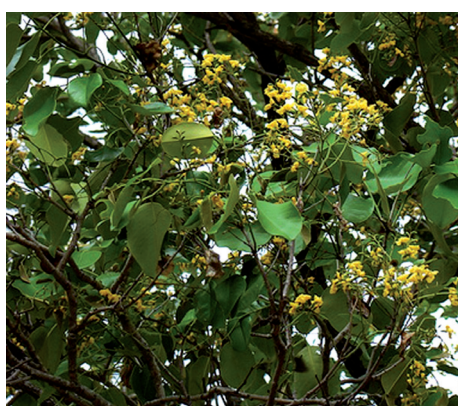


Huberantha senjiana

b



Deccania pubescens



Pterocarpus santalinus



Sterculia polpulifolia

c



Derris ovalifolia



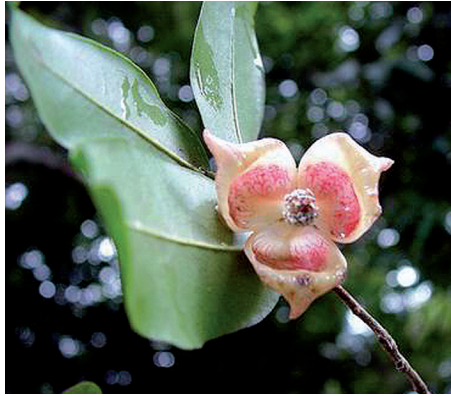
Mallotus resinous var. *muricatus*



Rhynchosia courtallensis

Appendix 3. Endemic plants from the Coromandel Coast of north Tamil Nadu endemic to: a – Southern India, b – Peninsular India, c – Entire India

a

*Aglaia elaeagnoidea**Miliusa eriocarpa**Taxillus heyneanus*

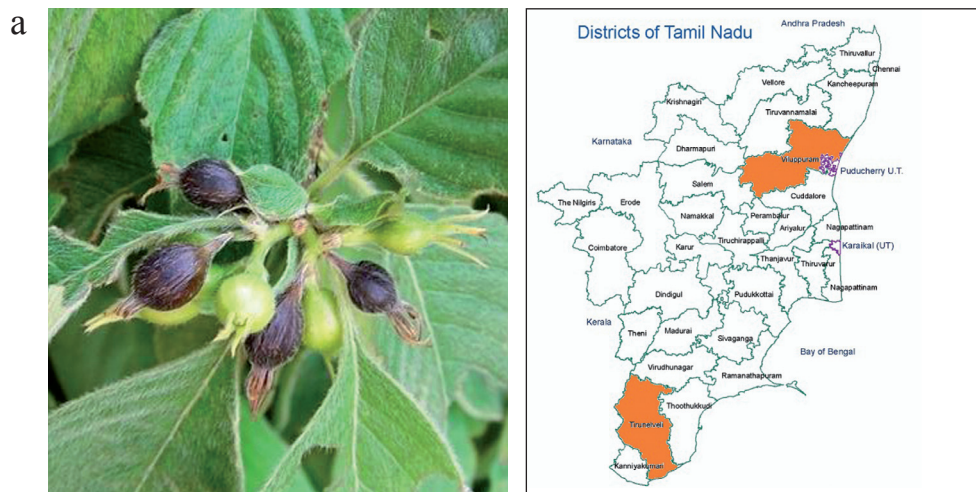
b

*Barleria longiflora**Pterospermum xylocarpum**Justicia glauca*

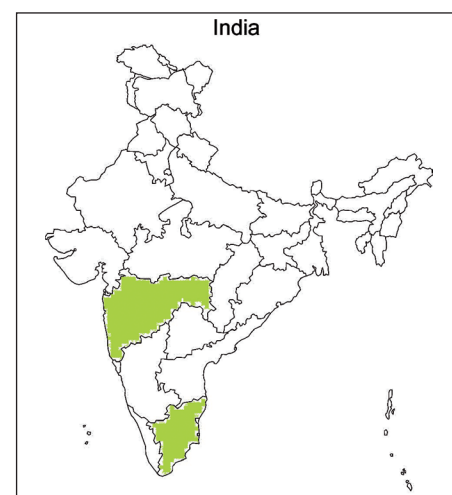
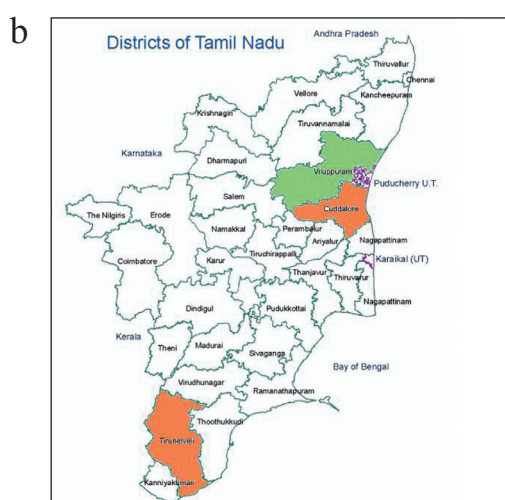
c

*Dolichandrone falcata**Hardwickia binata**Crotalaria pusilla*

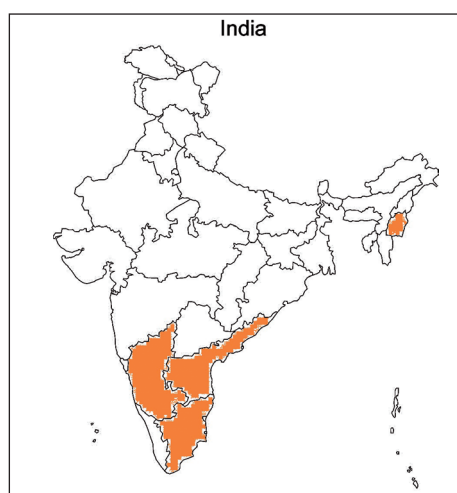
Appendix 4. Disjunctly distributed endemic plants from the Coromandel Coast of north Tamil Nadu:
a – within the state Tamil Nadu, b – within the state Tamil Nadu and Peninsular India, c – between two bioregions



Mussaenda tomentosa & *Justicia beddomei*



Discospermum sphaerocarpum



Leucas wightiana & *Manisuris myurus*