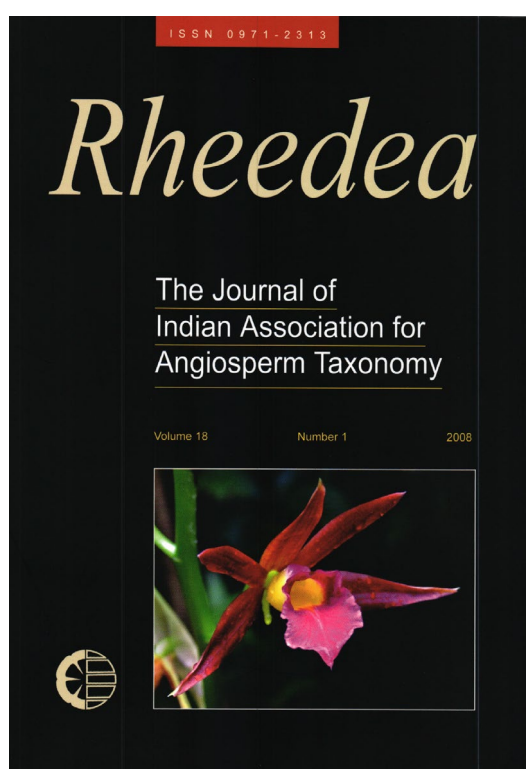




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Flowering Plants of Kerala: Status and Statistics

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Abstract

This paper provides a preliminary analysis of the flowering plants of Kerala based on 1303 publications appeared until 2008. The state harbours 4694 species under 1418 genera and 188 families (*s.l.*). Of these, 4078 are indigenous, 199 are exotic naturalised and 417 are cultivated/planted. Of the 4078 indigenous species, 1568 are endemic to India and of these, 865 are endemic to the Western Ghats. Of the 865 Western Ghats endemics, 237 species are endemic to Kerala. This includes two monotypic genera, *Silentvalleya* and *Haplothismia*. About 5% of the flora come under one or other IUCN red list category. Of all the life forms, herbs constitute more than 50% of the flora and shrubs and trees 15% each. Continent wise analysis shows that 389 species found in Kerala share their distribution with Australia, 442 species with Africa, 31 species with Europe, 190 species with America and 2194 species with different countries in Asia. There are 115 species common to Kerala and South East Asia. Sri Lanka and Malaysia together share 26 species with Kerala and 1866 species share their distribution with Sri Lanka, out of which 538 are exclusively common to Peninsular India and Sri Lanka. Kerala constitutes only 1.18% of the geographical area of India but it accommodates 27.57% of the flowering plants occurring in the country. It has been found that 1170 species possess established medicinal properties. Absence of a comprehensive Flora dealing with all the flowering plants of the state is the major gap; nearly 8% of the flora are not represented in any of the Indian herbaria and illustrations of 35% of the species are not available. The analysis is supported with 12 figures and two appendices.

Keywords: Flowering Plants, Kerala, Phytogeography, Conservation status, Uses, Gaps

Introduction

Kerala located at 8° 18' and 12° 48' N latitude and 74° 52' and 77° 22' E longitude is the southernmost state along the Western Coast of Peninsular India (Fig.1). The authors recently published a work on flowering plants of Kerala (Nayar *et al.*, 2006) which dealt with 4681 species, 57 subspecies and 287 varieties as occurring in the state. The work provided the following details for each species: correct botanical name and important synonyms, habits, distribution in the world, the Western Ghats and Kerala, references to available good descriptions and illustrations in botanical literature, information on indigenous, endemic or exotic nature of each species, conservation status (rare, endangered, threatened, vulnerable), details on phenology, uses (medicine, food, dye, oil, timber, fibre, tannin etc.) and Malayalam names. It could not account one species published by Mohanan and Kumar (2005). Twelve new taxa (three genera, six species and three varieties)

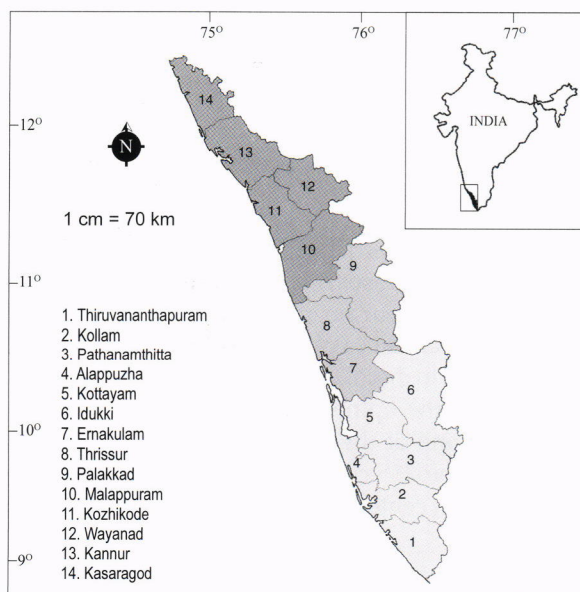


Figure 1. Map of Kerala

and eight new records (seven species and one variety) have been reported from Kerala since the publication of this work (Anilkumar, 2006; Sankar *et al.*, 2006; Sasidharan *et al.*, 2006; Upadhyay *et al.*, 2006, 2008; Geethakumary *et al.*, 2007, 2008; Kumar *et al.*, 2007a, 2007b; Mohanan and Pimenov, 2007; Nazarudeen *et al.*, 2007; Rajkumar and Janarthnam, 2007; Sabeena *et al.*, 2007; Udayan *et al.*, 2007; Joemon *et al.*, 2008; Kumar *et al.*, in press; Muktesh Kumar and Ramesh, 2008; Murugan *et al.*, 2008a, 2008b; Pradeep *et al.*, 2008.) This paper provides status and statistics of 4277 species of flowering plants so far recorded from Kerala, excluding cultivated (156 spp.) and planted (261 spp.), based on the information contained in the above cited works.

Publications

An estimate made until 2008 shows that there are 1303 publications on the flowering plants of Kerala partly or fully dealing with the botanical wealth of the state (Fig. 2). The decade between 1981 and 1990 witnessed a marked increase in the number of publications: out of 496 publications brought out during this period, 119 papers dealt with 168 new species from the state. It is evident that the establishment of Botany Department at Calicut University (Malappuram district) (1968), Kerala Forest Research Institute at

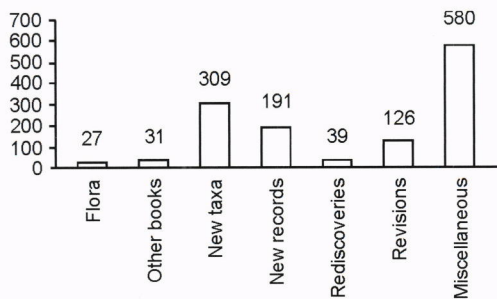


Figure 2. Publications on Kerala flora upto 2008

Peechi (Thrissur district) (1975) and Tropical Botanic Garden and Research Institute at Palode (Thiruvananthapuram district) (1978) triggered intensive botanical explorations in Kerala forests, which helped to discover this many new species. This underscores the opinion expressed by Bawa *et al.* (2004) that one of the many challenges in tropical botany for the 21st century is the establishment of more research centers for inventorisation of tropical biodiversity.

Number of species

Kerala harbours 4694 species of flowering plants under 1418 genera and 188 families (*s.l.*). The state constitutes only 1.18% of the geographical area of India but it accommodates 27.57% (total 17023 species, Karthikeyan, 1999) of the flowering plants occurring in the country. Excluding 417 cultivated and/or planted species, there are 4277 species in the state, that come under 1238 genera and 173 families

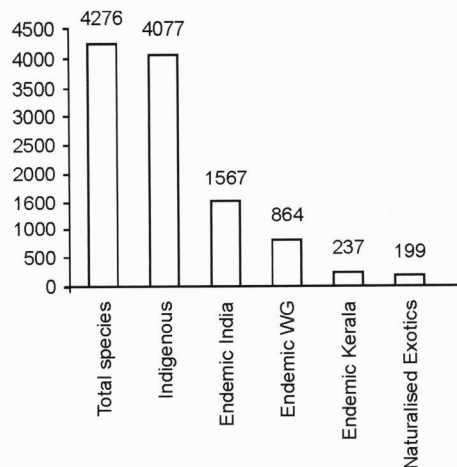


Figure 3. Nativity

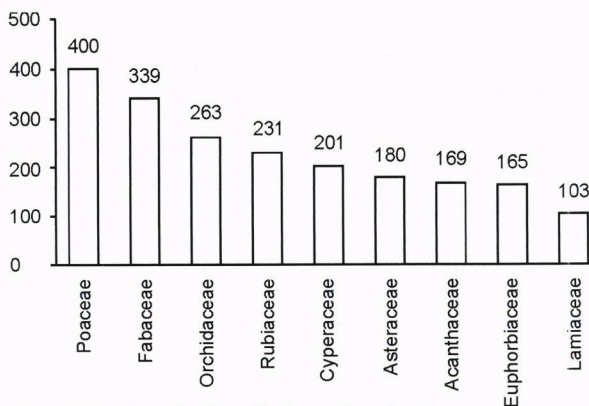


Figure 4. Dominant families with the number of species

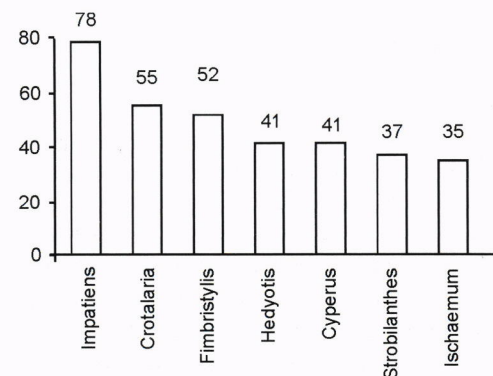


Figure 5. Dominant genera with the number of species

(s.l.) (Appendix I). An analysis of these species with reference to their indigenous and endemic nature has been presented (Fig. 3). Out of 4078 indigenous species, 237 species (5.81%) are found only within the political boundary of Kerala. In that sense, they are endemic to Kerala. More than 45% (2051 spp.) of the total species are represented by nine families which accommodate more than 100 species (Fig. 4). Rest of the families have ≤ 83 species. Fifty six families are represented by a single genus and out of which 25 families by a single species. Seven genera (out of 1238) have 35 or more species. *Impatiens* is the largest genus with 78 species (Fig. 5).

Endemics

The 237 species exclusively seen within the present political boundary of Kerala are distributed within 47 families (Appendix II). Out of this, 117 species (49.15%) are represented by five families (Fig. 6). There are six families in Kerala which are represented by species only endemic to India (Ancistrocladaceae, Chrysobalanaceae, Cornaceae, Proteaceae, Valerianaceae, Xanthophyllaceae). Of these, species of Chrysobalanaceae [*Atuna indica* (Bedd.) Kosterm. and *Atuna travancorica* (Bedd.) Kosterm.], Cornaceae [*Mastixia arborea* (Wight) Bedd. and *M. pentandra* Blume] and Xanthophyllaceae (*Xanthophyllum arnottianum* Wight) represented in Kerala are endemic to the Western Ghats. There is no family endemic to Kerala. There are two monotypic genera (*Silentvalleya*

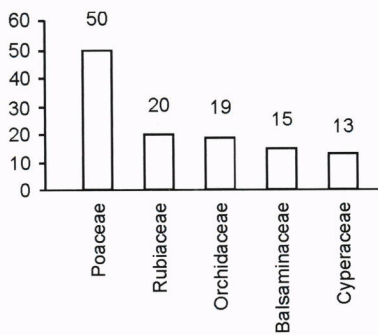


Figure 6. Dominant families of endemic species

and *Haplothysmia*) endemic to the state. *Ischaemum* is the largest genus having maximum number of endemics (18 sp.) followed by *Impatiens*, *Dimeria* (15 sp. each) and *Fimbristylis* (9 sp.). It can be observed that publication of new species from the state, especially after 1980s, enhanced more than three times the percentage of endemism in the state.

Exotics

There are 199 exotic species naturalised in Kerala (Fig. 7). Six families (Cactaceae, Papaveraceae, Phytolaccaceae, Tropaeolaceae, Turneraceae, Iridaceae) are represented only with exotic species.

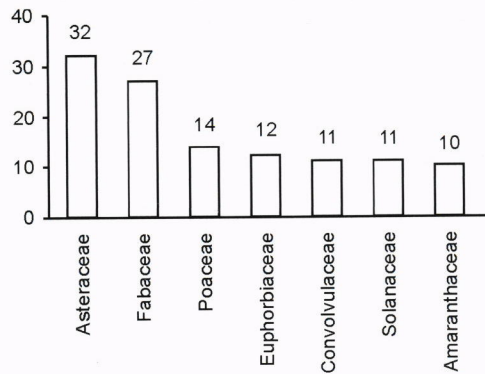


Figure 7. Dominant families of naturalised species

Of the 199 naturalised exotics, 143 are American, 23 African, 7 Asian, 2 European, 5 Mediterranean, 1 East Indian, 1 Indonesian, 2 Madagascan, 3 Malaysian, 9 West Indian, 1 Sri Lankan, 1 Mauritian and 1 Australian in origin.

Life forms

Flowering plants of Kerala exhibit all known life forms (Fig. 8). There are certain species that show

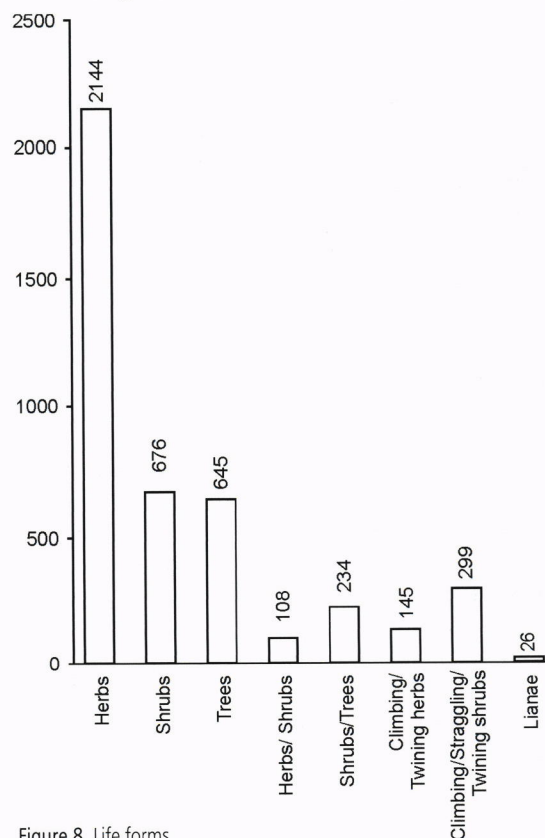


Figure 8. Life forms

both the habits of herb and shrub (108) and, shrub and tree (234) depending on the habitats. Besides the erect shrubs (676 spp.) there are shrubby climbers (232), stragglers (19) and twiners (48). Likewise, there are 82 climbers and 63 twiners under the category of herbs apart from their erect forms (2144 spp.). Avoiding the intermittent forms, herbs constitute 50.1%, shrubs 15.8 % and trees 15.08% of the total flowering plant species of the state.

Phytogeography

Of the 4078 indigenous species found in Kerala, 2274 occur in different countries of the Old World whereas 234 species share their distribution with countries both in Old World and New World . Nativity of two species could not be ascertained. The rest 1568 species are endemic to India. Continent wise analysis shows that Kerala has 389 species that share their distribution with Australia, 442 with Africa, 31 with Europe, 190 with America and 2194 with different countries in Asia. Out of these 2194, 115 species are found common to Kerala and South East Asia. The state share distribution of 26 species with Sri Lanka and Malaysia together and it has 1866 species that share their distribution with Sri Lanka, out of which 538 are exclusively common to Peninsular India and Sri Lanka.

Pattern of species distribution

For the convenience of assessing species distribution within the state, Kerala is horizontally segmented into three: *Southern* (Thiruvananthapuram, Kollam, Alappuzha, Pathanamthitta, Idukki and Kottayam districts), *Central* (Ernakulam, Thrissur and Palakkad districts) and *Northern* (Malappuram, Kozhikode, Wayanad, Kannur and Kasaragod districts). There are 378 species found in southern and central Kerala

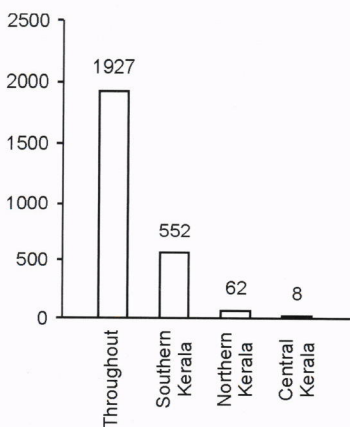


Figure 9. Species distribution in Kerala

alone, 228 species in southern and northern Kerala alone and 36 species in central and northern Kerala alone. There are 1927 species distributed throughout the state (Fig. 9). There are 531 species restricted to different individual districts and 118 species restricted to specific localities. Twenty nine species are restricted to coastal zone but they are found throughout this zone.

There are 52 species in Kerala, that are found common in the Western Ghats part of Maharashtra, Nagar Haveli, Karnataka and Tamil Nadu and 82 species, likewise, are common to Maharashtra, Nagar Haveli, Goa, Karnataka and Tamil Nadu . The state harbours 963 species that are of common occurrence in Maharashtra, Karnataka and Tamil Nadu. There are 119 species that are found both in Maharashtra and Karnataka, 64 species both in Maharashtra and Tamil Nadu, 727 species both in Karnataka and Tamil Nadu. Thirty seven species that occur in Kerala share their distribution only with Maharashtra, 113 species only with Karnataka and 783 species only with Tamil Nadu. There are 213 species in the state that share their distribution only with other parts of India, avoiding the above mentioned states.

Conservation status

Out of the 4078 indigenous species, 203 species (4.97%) come under one or other IUCN red list category (2008) (Fig. 10). There are 325 species of flowering plants from India in this list. This shows that Kerala represents 62.46% (203 spp.) of threatened plants of the country. Four species from the state [*Ilex gardneriana* Wight (Aquifoliaceae), *Cynometra*

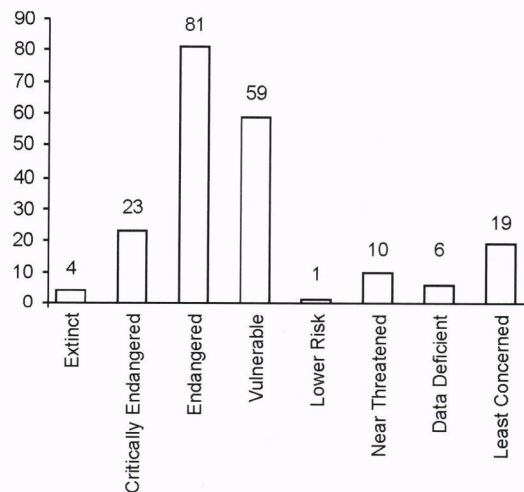


Figure 10. Conservation status based on IUCN red list (2008)

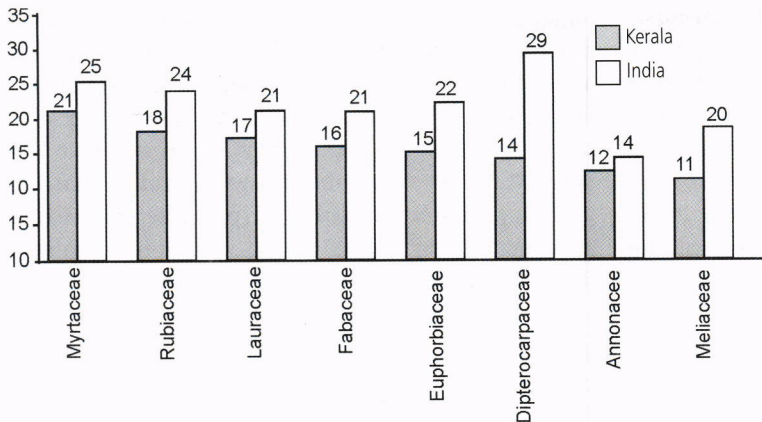


Figure 11. Major families and the number of species in Kerala and India under IUCN red list (2008)

beddomei Prain (Fabaceae), *Syzygium gambellanum* Rathakr. & Chithra (Myrtaceae) and *Wendlandia angustifolia* Wight (Rubiaceae)] come under the Extinct category. However, *C. beddomei* has been collected from Agasthyamala (Mohanan & Sivadasan, 2002) and *W. angustifolia* from Tamil Nadu (Viswanathan et al., 2000). An earlier IUCN red list (Walter and Gillett 1998; Rao et al., 2003) had included three more species from Kerala under the Extinct category (*Ophiorrhiza brunonis* Wight & Arn., *O. caudata* Fischer, *O. radicans* Gardner ex Thwaites) though the 2008 list has excluded them. There are reports that *O. brunonis* has been collected from Thrissur and Nilambur (Sasidharan & Sivarajan, 1996; Sivarajan & Mathew, 1997). As per the 2008 IUCN red list, families which have more number of species under different categories of threat in Kerala are Myrtaceae (21 spp.), Rubiaceae (18 spp.), Lauraceae (17 spp.), Fabaceae (16 spp.), Euphorbiaceae (15 spp.), Dipterocarpaceae (14 spp.), Annonaceae (12 spp.) and Meliaceae (11 spp.).

Uses

Many species in Kerala are of good economic use (Fig. 12). There are 1170 species used for soft wood purposes, 146 species for extraction of tannin, 29

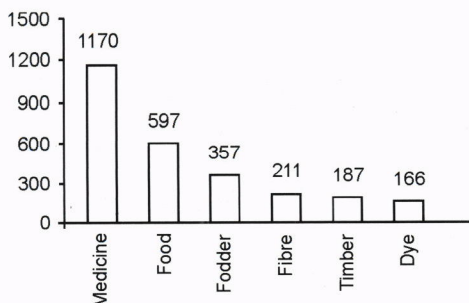


Figure 12. Uses

species for latex, 111 species for gum, 65 species for resin and 284 species for oil. There are 224 species having poisonous properties. About 1,000 species are used for basketry and as detergent, sand binder, green manure and so on.

Medicinal Uses

It has been found that 1170 species occurring in the state (27.35%) are used medicinally. Out of these, 1096 species are indigenous and the rest 74 are exotic. It was found that 104 species (8.88%) used for different

ailments are endemic to India, 34 species endemic to the Western Ghats and one endemic to Kerala (*Dialium travancoricum* Bourd.).

An analysis of medicinal uses shows that 669 species are used in stomach disorders, 123 as antidote to poison, 141 as pain killers, 261 in fever and 191 in skin diseases. There are 161 species in Kerala used in different gynaecological problems; and 63 species are employed in natal health care, 155 species in ailments connected with lungs, 75 species in nerve, 346 species in kidney and 42 species in liver disorders, 206 species in bone fracture and associated complaints, 60 species in heart ailments, 182 species in diseases of eye and ear, 47 species against diseases born of microbial activities, 151 species as preventives, 11 species in sleeping disorders and 10 species in different veterinary medicines. The above account does not include potential ethnomedicinal uses reported on different species from the state.

Categorisation of properties and biological activities shows that 292 species are employed as anthelmintic, 242 species as antidiarrhoeic or antidysenteric, 184 species as anti-rheumatic, 200 species as aphrodisiac, 364 species as astringent, 60 species as cardiopathic, 185 species as carminative, 322 species as diuretic, 113 species as emollient, 188 species as expectorant, 320 species as febrifuge, 243 species as laxative, 127 species as ophthalmic, 144 species as purgatives, 137 species as stimulants, 180 species as tonic and 94 species in venereal diseases.

Major gaps

In spite of the fact there are many publications on flowering plants of Kerala, Floras dealing with comprehensive descriptions (a description that helps to rule out, if wrong, the identification done through

artificial keys) of species are absent. Species descriptions in many Floras are scanty and repetitive. One has to depend on books published on plants from outside the state like The Flora of the Tamil Nadu Carnatic 1-3 (Matthew, K.M., 1983) or old works such as Flora of British India (Hooker, J. D., 1875-1897) or Flora of the Presidency of Bombay (Cooke, T., 1908) for detailed descriptions. Lack of herbarium citation and inconsistency in framing the pattern of Flora (nomenclatural citation, mention on distribution in the world, India or state, statement on uses, threat categories and inclusion of local names etc.) are other drawbacks. Useful field notes and critical comments are absent in almost all of them.

Out of the 4277 species, only 3952 species (92.4%) are collectively represented in Indian herbaria (TBGT, CALI, KFRI, MH and CAL). Good illustrations are available only for 2897 species (67.7%), that too when one depends on publications dealing with areas outside Kerala. Many good illustrations available are those published along with publication of new species or new records. Authors of the Floras (all of them are attempts by individuals), it appears, have not taken seriously the task of providing good illustrations in their works.

About 3,990 Malayalam names have been recorded for 1507 species (35.1%) and rest of them (3187 species) do not possess Malayalam names, possibly because they are not used by the locals, not accessible to them or local names are not fully documented.

Conclusion

Though all the 14 districts in Kerala are already explored and flowering plants are considered as fully documented, the above accounts indicate some major gaps the taxonomists who work on the flowering plants of Kerala have to fill up on priority basis. A fully blown Flora for Kerala, in absence of such a work for India, is the most desired with nomenclatural citations providing access to major botanical works in India and the state, details on types, comprehensive and original descriptions, field data, critical notes on morphology and nomenclature, observations on phenology, world wide distributional details, quality illustrations, extensive herbarium citations, sharp keys and honest statements on existing taxonomic problems (if any) with a view to solve them in future. What is needed is a time targeted and dedicated institutionalised attempt at one of the taxonomic research centres of the state (TBGRI, KFRI or Calicut University) involving experts from different quarters and

ensuring participation from national centres like Botanical Survey of India and International establishments like Kew and British Museum. This is an already delayed matter and more delay in accomplishing this task may even outdate the approach. What we should not forget is that 21st century demands Floras to provide quantified information on species (seeds, seedlings/saplings included), especially on endemics and those under different threat categories, besides details on pollinators, seed dispersers and other relevant field situations which are potential to impart useful hints to conservation biologists to investigate causes of threat and policy makers to evolve strategies for practical conservation.

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Appendix I

Number of species in Kerala

Sl. No	Family	Genera	Species	Sl. No	Family	Genera	Species
1	Acanthaceae (<i>s.l.</i>)	36	169	49	Elaeagnaceae	1	3
2	Aizoaceae (<i>s.l.</i>)	5	12	50	Elaeocarpaceae	1	8
3	Alangiaceae	1	1	51	Elatinaceae	2	4
4	Amaranthaceae	15	29	52	Ericaceae	2	3
5	Anacardiaceae	9	24	53	Erythroxylaceae	1	4
6	Ancistrocladaceae	1	1	54	Euphorbiaceae (<i>s.l.</i>)	46	165
7	Annonaceae	16	47	55	Fabaceae		
8	Apiaceae	12	24		Papilionoideae	56	259
9	Apocynaceae	20	30		Caesalpinioideae	13	53
10	Aquifoliaceae	1	5		Mimosoideae	12	27
11	Araliaceae	4	12	56	Flacourtiaceae	6	23
12	Aristolochiaceae	2	11	57	Gentianaceae	6	28
13	Asclepiadaceae	27	83	58	Geraniaceae	1	1
14	Asteraceae	64	180	59	Gesneriaceae	5	15
15	Balanophoraceae	1	2	60	Goodeniaceae	1	1
16	Balsaminaceae	2	79	61	Haloragaceae	2	3
17	Begoniaceae	1	11	62	Hydrophyllaceae	1	1
18	Berberidaceae	2	2	63	Hypericaceae	1	4
19	Bignoniaceae	6	9	64	Icacinaceae	6	7
20	Bixaceae (<i>s.l.</i>)	1	1	65	Lamiaceae	22	103
21	Bombacaceae	2	4	66	Lauraceae (<i>s.l.</i>)	11	63
22	Boraginaceae	9	26	67	Lecythidaceae (<i>s.l.</i>)	2	3
23	Brassicaceae	3	6	68	Leeaceae	1	6
24	Burseraceae	4	5	69	Lentibulariaceae	1	24
25	Buxaceae	1	1	70	Linaceae (<i>s.l.</i>)	2	3
26	Cactaceae	2	2	71	Loganiaceae (<i>s.l.</i>)	6	12
27	Campanulaceae (<i>s.l.</i>)	4	10	72	Loranthaceae	6	19
28	Capparaceae (<i>s.l.</i>)	4	27	73	Lythraceae	6	25
29	Caprifoliaceae	2	4	74	Magnoliaceae	2	3
30	Caryophyllaceae	6	6	75	Malpighiaceae	2	4
31	Celastraceae	12	38	76	Malvaceae	14	55
32	Ceratophyllaceae	1	1	77	Melastomataceae	6	64
33	Chenopodiaceae	2	3	78	Meliaceae	14	27
34	Chloranthaceae	1	1	79	Menispermaceae	10	17
35	Chrysobalanaceae	1	2	80	Menyanthaceae	1	7
36	Clusiaceae	6	19	81	Moraceae	6	35
37	Combretaceae	7	18	82	Myristicaceae	3	4
38	Connaraceae	3	6	83	Myrsinaceae	7	23
39	Convolvulaceae (<i>s.l.</i>)	16	74	84	Myrtaceae	4	46
40	Cornaceae	1	2	85	Nyctaginaceae	2	4
41	Crassulaceae	1	6	86	Nymphaeaceae (<i>s.l.</i>)	2	3
42	Cucurbitaceae	19	34	87	Ochnaceae	2	3
43	Datisceae	1	1	88	Olaceaeae (<i>s.l.</i>)	5	5
44	Dichapetalaceae	1	1	89	Oleaceae	6	31
45	Dilleniaceae	3	8	90	Onagraceae	1	6
46	Dipterocarpaceae	5	13	91	Opiliaceae	2	2
47	Droseraceae	1	3	92	Orobanchaceae	2	8
48	Ebenaceae	1	30	93	Oxalidaceae	2	14

Sl. No	Family	Genera	Species	Sl. No	Family	Genera	Species
94	Papaveraceae	1	1	134	Turneraceae	1	2
95	Passifloraceae	2	7	135	Ulmaceae	4	5
96	Pedaliaceae (s.l.)	3	5	136	Urticaceae	13	31
97	Phytolaccaceae (s.l.)	3	3	137	Valerianaceae	1	3
98	Piperaceae (s.l.)	3	22	138	Verbenaceae (s.l.)	15	39
99	Pittosporaceae	1	5	139	Violaceae	3	7
100	Plantaginaceae	1	1	140	Viscaceae	2	8
101	Plumbaginaceae	1	2	141	Vitaceae	6	30
102	Podostemaceae	9	18	142	Xanthophyllaceae	1	1
103	Polygalaceae	2	15	143	Zygophyllaceae (s.l.)	2	2
104	Polygonaceae	5	13	144	Agavaceae (s.l.)	2	2
105	Portulacaceae	2	6	145	Alismataceae	5	5
106	Primulaceae	2	3	146	Aponogetonaceae	1	2
107	Proteaceae	1	2	147	Araceae	17	57
108	Ranunculaceae	5	12	148	Arecaceae	8	27
109	Rhamnaceae	8	16	149	Burmanniaceae	2	7
110	Rhizophoraceae	7	10	150	Commelinaceae	8	53
111	Rosaceae	7	16	151	Cyperaceae	21	201
112	Rubiaceae	46	231	152	Dioscoreaceae	1	12
113	Rutaceae	16	28	153	Eriocaulaceae	1	37
114	Sabiaceae (s.l.)	2	2	154	Flagellariaceae	1	1
115	Salicaceae	1	1	155	Haemodoraceae	1	1
116	Salvadoraceae	1	1	156	Hydrocharitaceae	5	7
117	Santalaceae	4	4	157	Iridaceae	1	1
118	Sapindaceae (s.l.)	10	18	158	Juncaceae	2	5
119	Sapotaceae	7	18	159	Lemnaceae	3	4
120	Saxifragaceae (s.l.)	3	4	160	Liliaceae (s.l.)	17	31
121	Scrophulariaceae	25	68	161	Marantaceae	3	3
122	Simaroubaceae	3	5	162	Musaceae	2	3
123	Solanaceae	6	26	163	Najadaceae	1	3
124	Sonneratiaceae	1	2	164	Orchidaceae	79	263
125	Sphenocleaceae	1	1	165	Pandanaceae	1	5
126	Staphyleaceae	1	2	166	Poaceae (s.l.)	119	400
127	Sterculiaceae	13	26	167	Pontederiaceae	2	3
128	Symplocaceae	1	14	168	Potamogetonaceae	1	3
129	Theaceae (s.l.)	3	4	169	Taccaceae	1	1
130	Thymelaeaceae	2	2	170	Triuridaceae	1	1
131	Tiliaceae	4	35	171	Typhaceae	1	1
132	Trapaceae	1	1	172	Xyridaceae	1	3
133	Tropaeolaceae	1	1	173	Zingiberaceae (s.l.)	9	45
Total						1238	4277

Appendix II

Endemic plants of Kerala

DICOTYLEDONS

Acanthaceae

- Andrographis chendurunii* Santhosh, Shanavas & Seema
Gymnostachyum sahyadricum Mohanan, Remadevi & Binojkumar
Justicia ekakusuma Pradeep & Sivarajan
Lepidagathis keralensis P.V. Madhusoodanan & N.P. Singh
Ruellia sivarajanii Sreedevi, Remadevi & Binojkumar
Strobilanthes dupenii Bedd.
Strobilanthes pushpangadanii Santhosh, Jabbar & Shanavas

Anacardiaceae

- Buchanania barberi* Gamble

Annonaceae

- Orophea malabarica* Sasidharan & Sivarajan
Orophea sivarajanii Sasidharan
Phaeanthus malabaricus Bedd.
Polyalthia shendurunii Basha & Sasidharan
Sageraea grandiflora Dunn

Araliaceae

- Schefflera chandrasekharanii* Ramam. & Rajan

Aristolochiaceae

- Thottea abrahamii* M. Dan, P.J. Mathew, C.M. Unnithan &
P. Pushpangadan

- Thottea idukkiana* A.G. Pandurangan & V.J. Nair

- Thottea ponmudiana* Sivarajan

- Thottea sivarajanii* Santhosh, Shanavas & Binu

Asclepiadaceae

- Ceropegia beddomei* Hook. f.
Heterostemma vasudevani Swarup. & Mangaly

Asteraceae

- Anaphalis barnesii* Fischer
Vernonia anaimudica Shetty & Vivek.
Vernonia beddomei Hook. f.
Vernonia multibracteata Gamble

Balsaminaceae

- Impatiens cochinicola* Hook. f.
Impatiens coelotropis C. Fischer
Impatiens concinna Hook. f.
Impatiens johnii Barnes
Impatiens kulamavuensis A.G. Pandurangan & V.J. Nair
Impatiens macrocarpa Hook. f.
Impatiens munnarensis Barnes
Impatiens pallidiflora Hook. f.
Impatiens pandata Barnes
Impatiens platyadena C. Fischer
Impatiens sholayarensis M. Kumar & Sequiera
Impatiens sivarajanii Muktesh & Stephen
Impatiens tilo (DC.) Suresh
Impatiens verecunda Hook. f.
Impatiens violacea M. Kumar & Sequiera

Celastraceae

- Cassine kedarnathii* Sasidharan & Swarup.

Connaraceae

- Connarus parameswaranii* Ramam. & Rajan

Convolvulaceae

- Lepistemon verdcourtii* P. Mathew & Biju
Stictocardia sivarajanii Biju, Pushpangadan & P. Mathew

Cucurbitaceae

- Cucumella silentvalleyii* Manilal, Sabu & P. Mathew
Luffa umbellata (Klein) M. Roemer

Dilleniaceae

- Acrotrema agastyamalayanum* Santhosh, M. Dan & G. M. Nair

Ebenaceae

- Diospyros sulcata* Bourd.

Euphorbiaceae

- Antidesma keralense* Chakrab. & Gangop.
Aporusa bourdillonii Stapf
Cleistanthus sankunnianus Sivarajan & Indu Balachandran

Fabaceae

- Papilionoideae
Dalbergia beddomei Thoth.
Kunstleria keralensis C.N. Mohanan & N.C. Nair
Smithia venkobarrowii Gamble
Tephrosia travancorica Thoth. & Das
Tephrosia wynaadensis Drumm.

Caesalpiniodeae

- Cynometra beddomei* Prain
Dialium travancoricum Bourd.

Mimosoideae

- Calliandra cynometroides* Bedd.

Flacourtiaceae

- Hydnocarpus pendulus* Manilal, Sabu & Sivarajan

Gesneriaceae

- Didymocarpus macrostachya* Barnes

Lamiaceae

- Leucas beddomei* (Hook. f.) Sunojkumar & P. Mathew
Pogostemon peethapushpum Pradeep

Lauraceae

- Cinnamomum nicolsianum* Manilal & Shylaja
Litsea beeii Mohanan & Santhosh
Litsea travancorica Gamble

Lentibulariaceae

- Utricularia subramanii* M.K. Janarthanam & A.N. Henry

Lythraceae

- Rotala cookii* Joseph & Sivarajan
Rotala malabarica Pradeep, Joseph & Sivarajan
Rotala vasudevani Joseph & Sivarajan

Malvaceae

- Hibiscus sreenarayananus* Anilkumar & Ravi
Julostylis ampumalensis Pradeep & Sivarajan
Julostylis polyandra Ravi & Anilkumar
Sida fryxellii Sivarajan & Pradeep
Sida ravii Sivadasan & Anilkumar

Melastomataceae

- Medinilla anamalaiana* Sasidharan & Sujanapal
Memecylon agastyamalaianum Santhosh, Raju & Shanavas
Memecylon sivadasanii N. Mohanan, Ravi, Kiran Raj & Shaju
Memecylon wightianum Triana
Osbeckia abrahamii Giri & Nayar
Osbeckia lawsonii Gamble
Sonerila nemakadensis C. Fischer
Sonerila wynaadensis Nayar

Meliaceae

- Aglaiia malabarica* Sasidharan
Dysoxylum beddomei Hiern
Dysoxylum swaminathanianum Anilkumar & Sivadasan

Menyanthaceae

- Nymphoides krishnakesara* Joseph & Sivarajan
Nymphoides macrospermum Vasudevan
Nymphoides sivarajanii Joseph

Myrsinaceae

- Antistrophe glabra* A.G. Pandurangan & V.J. Nair
Ardisia stonei Sasidharan & Sivarajan

Myrtaceae

- Eugenia argentea* Bedd.
Syzygium bourdillonii (Gamble) Rathakr. & N.C. Nair
Syzygium chavaran (Bourd.) Gamble
Syzygium palghatense Gamble
Syzygium periyarensis Jomy & Sasidharan

Oleaceae

- Jasminum agasthyamalaianum* Sabeena, Asmitha, Mulani, Santhosh & Sabin

Orobanchaceae

- Christisonia indica* Anil Kumar
Christisonia keralensis Erady

Oxalidaceae

- Biophytum congestiflorum* Govind.
Biophytum longipedunculatum Govind.
Biophytum veldkampii Shanavas, Santhosh, Binu & Pushpangadan

Piperaceae

- Piper silentvalleyensis* P.N. Ravindran, M.K. Nair & R. Asokan

Podostemaceae

- Podostemum munnarensense* (Nagendran & Arekal) C.J. Mathew & V.K. Satheesh

- Willisia arekaliiana* Shivamurthy & Sadanand
Zeylanidium maheshwaraii C.J. Mathew & V.K. Satheesh

Rhamnaceae

- Colubrina travancorica* Bedd.

Rubiaceae

- Argostemma anupama* Sivarajan
Ixora agasthyamalayana Sivadasan & N. Mohanan
Ixora beddomei T. Husain & S.R. Paul
Ixora johnsonii Hook. f.
Ixora manantoddii T. Husain & S.R. Paul
Ixora sivarajiana Pradeep
Ophiorrhiza barnesii Fischer
Ophiorrhiza caudata Fischer

- Ophiorrhiza munnarensis* Fischer
Ophiorrhiza nairii Ramam. & Rajan
Ophiorrhiza shendurunii Shanavas Khan, Santhosh Kumar & Pushpangadan

- Pavetta bourdillonii* Sivadasan & N. Mohanan
Pavetta nemoralis Bremek.
Pavetta oblanceolata Bremek.
Pavetta travancorica Bremek.
Psilanthus malabaricus Sivarajan, Biju & P. Mathew
Psychotria keralensis Deb & Gangop.
Saprosma beddomei Gangop.
Spermacoce malabarica (Sivarajan & Manilal) Sivarajan, R.V. Nair & Ahmed Kunju

- Tarenna trichurensis* Sasidharan & Sivarajan

Sapotaceae

- Palaquium ravii* Sasidharan & Vink

Scrophulariaceae

- Adenosma malabaricum* Hook. f.

Tiliaceae

- Grewia palodensis* Santhosh, Shanavas, Binu & S.M. Almeida

Vitaceae

- Ampelocissus birii* P. Singh & Shetty

MONOCOTYLEDONS

Araceae

- Amorphophallus bonaccordensis* Sivadasan & N. Mohanan
Amorphophallus nicolsonianus Sivadasan
Arisaema agasthyanum Sivadasan & Sathish Kumar
Arisaema attenuatum E. Barnes & C.E.C. Fisch.
Arisaema peltatum C.E.C. Fisch.
Arisaema psittacus E. Barnes
Arisaema sarracenioides Barnes & C.E.C. Fisch
Lagenandra keralensis Sivadasan & Jaleel
Pothos keralensis A. G. Pandurangan & V.J. Nair

Areaceae

- Calamus neelagicus* Renuka
Calamus renukae Joemon Jacob, Mohanan & Kariyappa
Calamus shendurunii Anto, Renuka & Sreekumar

Burmanniaceae

- Burmannia indica* Jonker
Burmannia stricta Jonker
Haplothismia exannulata Airy Shaw

Cyperaceae

- Fimbristylis angamoozhiensis* Ravi & Anilkumar
Fimbristylis dauciformis Govind.
Fimbristylis hirsutifolia Govind.
Fimbristylis humerosa Govind.
Fimbristylis hyalina Govind. & Sasidharan
Fimbristylis manilaliana Govind.
Fimbristylis perspicua Govind. & Sasidharan
Fimbristylis pseudonarayanii Ravi & Anilkumar
Fimbristylis stigmatotecta Govind.
Fuirena ponnudiensis Ravi & Anilkumar
Fuirena simpsonii Ravi, N. Mohanan & Shaju

Pycnus palghattensis Govind.

Pycnus similinervulosus Govind.

Eriocaulaceae

Eriocaulon ansarii Pradeep & Sunil

Eriocaulon devendranii R. Vijaya Sankar, K. Ravikumar & N.M. Ganesh Babu

Eriocaulon sivarajanii R. Ansari & Balakr.

Eriocaulon vasudevanii R. Ansari & Balakr.

Orchidaceae

Acampe congesta (Lindley) Lindley

Bulbophyllum keralensis Muktesh & Stephen

Bulbophyllum orezii Sathish

Bulbophyllum rosemarianum Sathish, Suresh & Saleem

Bulbophyllum silentvalliensis Sharma & Srivastava

Cheirostylis seidenfadeniana Sathish & Rasmussen

Eria tiagii Manilal, Sathish & Wood

Gastrodia silentvalleyana Sathish, Suresh, Sibi & Anil

Habenaria flabelliformis Summerh. ex Fischer

Habenaria periyarensis Sasidharan, Rajesh & Jomy

Ipea malabarica (Reichb. f.) Hook. f.

Kingidium niveum Sathish

Liparis walakkadensis Muktesh & Stephen

Oberonia agasthyamalayana Sathish

Oberonia wynadensis Sivadasan & Balakr.

Pteroceras monsooniae Sasidharan & Sujanapal

Schoenorchis manilaliana Muktesh & Stephen

Taeniophyllum scaberulum Hook. f.

Xenikophyton seidenfadenianum M. Kumar, S. Seq. & J.J. Wood.

Poaceae

Arundinella kannanorica V.J. Nair, P.V. Sreekumar & N.C. Nair

Arundinella ravii Shaju & N. Mohanan

Bothriochloa parameswaranii P.V. Sreekumar, C.P. Malathi & V.J. Nair

Chrysopogon purushothamanii Ravi, N. Mohanan & Kiranraj

Chrysopogon tadulingamii P.V. Sreekumar, V.J. Nair & N.C. Nair

Dimeria agasthyamalayana Kiran Raj & Ravi

Dimeria borii P.V. Sreekumar, V.J. Nair & N.C. Nair

Dimeria chelariensis Ravi

Dimeria copeana Sreekumar P.V., Nair V.J. & N.C. Nair

Dimeria copei Ravi

Dimeria eradii Ravi

Dimeria idukkiensis Ravi & Anilkumar

Dimeria jainii P.V. Sreekumar, V.J. Nair & N.C. Nair

Dimeria josephii Ravi & N. Mohanan

Dimeria kalavoorensis Ravi

Dimeria keralae N.C. Nair, P.V. Sreekumar & V.J. Nair

Dimeria kurunthotticalana Jacob

Dimeria namboodiriana Ravi & N. Mohanan

Dimeria sivarajanii N. Mohanan & Ravi

Dimeria sreenarayanii Ravi & Anilkumar

Isachne fischeri Bor

Isachne henryi Srinivasan & Sreekumar

Isachne jayachandranii Gopalan & Chandrasekharan

Ischaemum abrahamii Ravi, N. Mohanan & Rajesh

Ischaemum agasthyamalayanum P.V. Sreekumar, M.K. Janarthanam & A.N. Henry

Ischaemum calicutensis P.V. Sreekumar, V.J. Nair & N.C. Nair

Ischaemum kannanorensis P.V. Sreekumar, V.J. Nair & N.C. Nair

Ischaemum copeanum P.V. Sreekumar, V.J. Nair & N.C. Nair

Ischaemum elimalayanum P.V. Sreekumar, V.J. Nair & N.C. Nair

Ischaemum jayachandranii R. Ansari, V.S. Ramachandran & P.V. Sreekumar

Ischaemum kumarakodiensis Ravi, Mohanan & Kiranraj

Ischaemum lanatum Ravi, N. Mohanan & Shaju

Ischaemum malabaricum P.V. Sreekumar, V.J. Nair & N.C. Nair

Ischaemum nairii V.J. Nair & P.V. Sreekumar

Ischaemum pappinisseriensis Ravi, N. Mohanan & Rajesh

Ischaemum pushpangadanii Ravi, N. Mohanan & Kiranraj

Ischaemum quilonensis Ravi & Shaju

Ischaemum ravi P.V. Sreekumar, V.J. Nair & N.C. Nair

Ischaemum tadulingamii N.C. Nair & P.V. Sreekumar

Ischaemum vembanadense Patil & D'cruz

Ischaemum wayanadense Ravi, N. Mohanan & Shaju

Ochlandra ebracteata Raiz. & Chatterjee

Ochlandra keralensis Muktesh, Remesh & Stephen

Ochlandra soderstromiana Muktesh & Stephen

Ochlandra spirostylis Muktesh, Seetha & Stephen

Oxytenanthera bourdillonii Gamble

Silentoalleya nairii V.J. Nair, P.V. Sreekumar, E. Vajravelu & P. Bhargavan

Tripogon sivarajanii Sunil

Tripogon vellarianus Pradeep

Zenkeria jainii N.C. Nair, P.V. Sreekuamr & V.J. Nair

Zingiberaceae

Alpinia smithiae Sabu & Mangaly

Curcuma coriacea Mangaly & Sabu

Curcuma ecalcarata Sivarajan & Indu Balachandran

Curcuma haritha Mangaly & Sabu

Curcuma mutabilis Skornickova, Sabu & M. G. Prasanthkumar

Curcuma raktakanta Mangaly & Sabu