



## Endemic orchids of peninsular India: a review

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Orchidaceae is one of the most ecologically and morphologically diverse families of flowering plants. It is the second largest family of flowering plants in the world, comprising of about 779 genera and 22,500 species (Mabberley 2008). They have diverse habits with variously modified vegetative and floral structures. Based on their varying habits, orchids are classified as holomycotrophic or saprophytic (growing on dead and decaying matter), terrestrials (growing on ground) and epiphytic (growing on trees or shrubs). They are very sensitive to habitat degradation and fragmentation. In India, the orchid diversity is represented by 1,331 species belonging to 186 genera (Misra 2007).

The Indian subcontinent has diverse climatic regimes, forest types and habitat conditions that provides a favourable environment for accommodating diverse life forms and species. Being separated by high mountain ranges of the Himalaya in the north and in the south by Arabian Sea, Bay of Bengal and Indian Ocean, the isolation of Indian flora to a large extent helps in the evolution of endemic taxa (Nayar 1996). Geologically the drifting of the Indian subcontinent

**Abstract:** The present analysis of endemic orchids shows a total account of 130 species belonging to 38 genera in peninsular India. Of these, 43 are terrestrial, 85 epiphytic and two holomycotrophic (saprophytic). The Western Ghats comprises of 123 endemic orchid species, Deccan Plateau has 29 endemic orchid species and Eastern Ghats has 22 endemic orchid species. However, in the present analysis the number of endemic species is reduced from the earlier reports because of the rapid development in the taxonomic explorations in the neighboring countries. As a result, many species were found to show extended distribution.

**Key words:** Deccan Plateau, endemic, Eastern Ghats, orchids, peninsular India, Western Ghats.

from the Gondwanaland through various latitudes lead to immigration and extinction of species which are engraved in the present day floristic composition (Axelrod 1971). The endemism in the flora of a country or geographical region provides an important insight into the biogeography of that region and also to the centers of diversity and adaptive evolution of the floristic components of that region (Nayar 1996). In India, the peninsular region has a high degree of endemism making it the second richest endemic centre after the Himalaya. Nayar (1977) surmised, the history of flora of peninsular India is one of the floristic impoverishments due to flow of Deccan lavas during cretaceous-eocene time and spreading aridity in Miocene-quadernary period, causing depletion of its characteristic flora leaving few relict taxa. The peninsular region is a part of Indian plate of Gondwanaland and most of the endemic plants of this region are palaeoendemics. A large concentration of endemic species is found in the tropical moist deciduous and tropical semievergreen patches of Western Ghats and to a much lesser degree in Eastern Ghats (Nayar 1996).

### Materials and Methods

Peninsular India comprises of seven states viz., Andhra Pradesh, Goa, Karnataka, Kerala, Maharashtra, Odisha and Tamil Nadu and one union territory namely Pondicherry. It is bound by Vindhyan Mountains in

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the north, Arabian Sea in the west, Indian Ocean in the south and Bay of Bengal in the east. The geography of the region can be divided into three zones namely the Deccan Plateau, Eastern Ghats and the Western Ghats (Image 1). The Deccan Plateau is the largest plateau in India, making up the majority of the southern part of the country. Eastern Ghats forms a broken chain of hill ranges extending through the states of Odisha, Andhra Pradesh and Tamil Nadu. It runs north-east to south-west direction in peninsular India. Western Ghats starts near the border of Gujarat and Maharashtra, south of the Tapti River and runs approximately 1600km through the states of Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala ending at Kanyakumari. It is also one of the 34 Biodiversity Hotspots of the world (Myers et al. 2000). The vegetation type of peninsular India varies from tropical evergreen forest, tropical semievergreen forests, sholas, moist deciduous forests, dry deciduous forests, scrub jungles and dry savannah forests.

For the present analysis information on the endemic

orchids of peninsular region was collected from literature such as Hooker (1888–1890), Blatter (1928), Fischer (1928), Cooke (1958), Santapau & Kapadia (1966), Saldanha & Nicolson (1976), Pradhan (1976), Bose & Bhattacharjee (1980), Yoganarasimhan et al. (1981), Nayar et al. (1984), Rathakrishnan & Chitra (1984), Rao (1986, 1998), Joseph (1987), Ahmedullah & Nayar (1987), Chandrabose & Nair (1988), Manilal (1988), Henry et al. (1989), Ansari & Balakrishnan (1990), Keshavamurthy & Yoganarasimhan (1990), Kumar & Manilal (1994), Lakshminarasimhan (1996), Nayar (1996), Pullaiah (1997), Karthikeyan (2000), Gopalan & Henry (2000), Mishra & Singh (2001), Singh et al. (2001), Kumar et al. (2001), Yadav & Sardesai (2002), Rao & Kumari (2003), Manilal & Kumar (2004), Sardesai & Yadav (2004), Joshi & Janarthanam (2004), Gaikwad & Yadav (2004), Misra (2007), Misra et al. (2008), Nayar et al. (2008), Bachulkar (2010) and Narayanan et al. (2010). The online databases, namely, Govaerts et al. (2012) <http://apps.kew.org/wcsp>, Tropicos (2012)

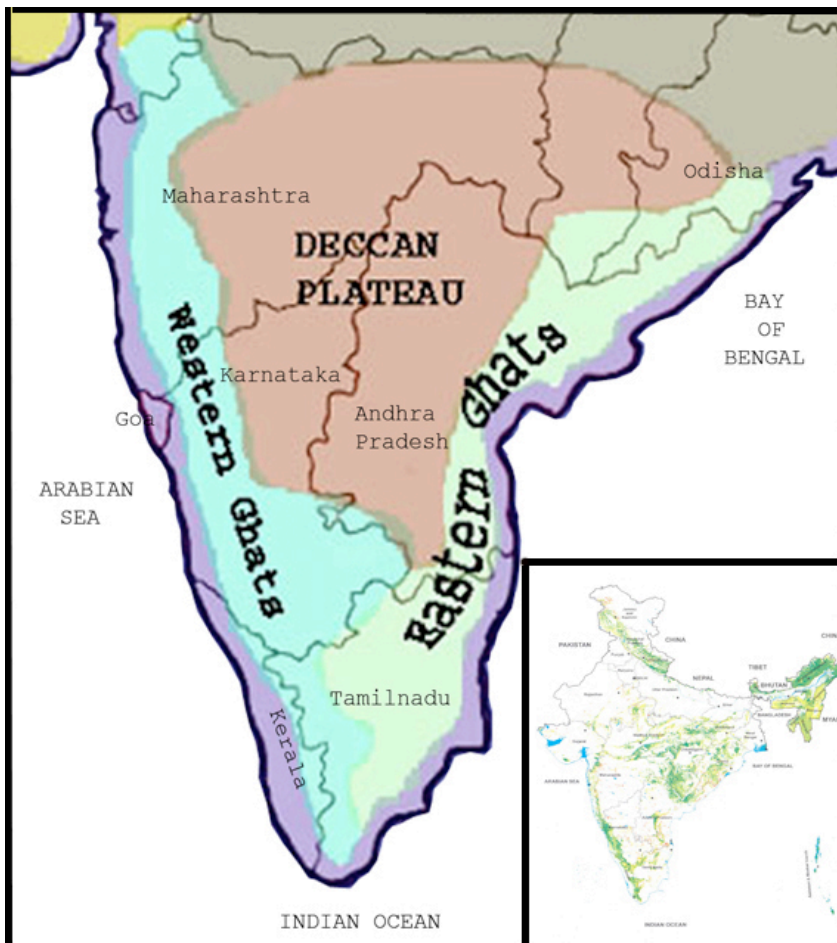


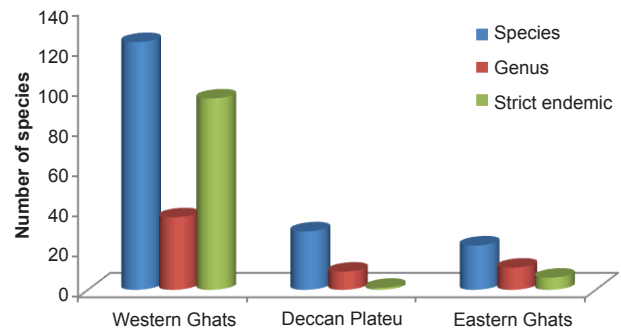
Image 1. Map of peninsular India

www.tropicos.org, IPNI (2012) www.ipni.org, eFloras (2012) www.efloras.org were also consulted for recent updates on the plant names and distribution. Species earlier recorded as endemic but now reported from the other parts of the world, were excluded from the current list and their nomenclatural changes were also updated. The endemic orchid species are listed based on phytogeographical regions and state-wise distribution is also provided. The present work is our modest attempt to give an up-to date account of the endemic orchids of the peninsular region and to include nomenclature changes, new distributional records and new species records.

**Results**

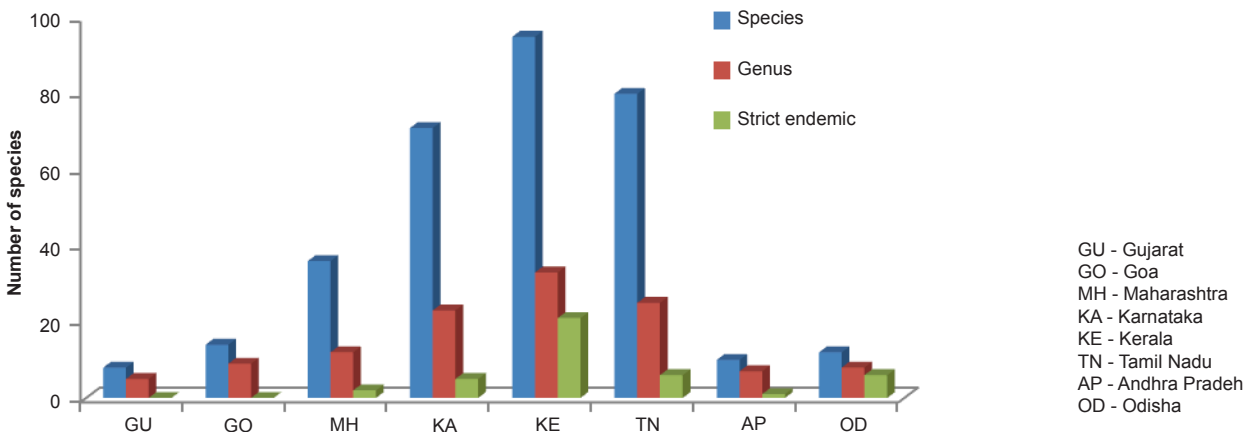
Ahmedullah & Nayar (1987) brought out the first authentic work on the endemic plants of peninsular India and estimated 123 species and 33 genera of endemic orchids from this region. While Nayar (1996) estimated 136 species, later on Kumar & Manilal (1994) recorded 142 species belonging to 38 genera. Further, Rao (1998) estimated 126 endemic species. Singh et al. (2001) recorded 135 species and Misra (2007) recorded 160 species. So far the total endemic orchids in India are 404 (2.3%) (Misra 2007) out of 17,500 total flowering plants, peninsular India represents 39.6% of endemic orchids out of 1,331 total number of orchids.

The present analysis resulted with a total of 130 species belonging to 38 genera endemic to peninsular India (Table 1). Of these, 43 are terrestrial, 85 are epiphytic and two are holomycotrophic. The analysis shows that the genus *Habenaria* (25 spp.), *Oberonia*



**Figure 1. Species richness of endemic orchids in different regions of peninsular India**

(17 spp.), *Bulbophyllum* (15 spp.), *Dendrobium* (11 spp.) and *Eria* (6 spp.), are among the species rich genera representing nearly 60% of total endemic orchids of peninsular India. The Western Ghats region has maximum 123 endemic orchid species followed by Deccan Plateau and then Eastern Ghats (Fig. 1). Of the total endemic orchid species of the peninsular region, 95 (73%) are strict endemics to Western Ghats and five species (4%) are restricted to Eastern Ghats. However, there are no strict endemic species in the Deccan Plateau (Fig. 1). A state wise analysis of distribution of endemic orchids shows that Kerala has a maximum number of endemic species followed by Tamil Nadu, Karnataka and Maharashtra. The states of Gujarat, Andhra Pradesh and Odisha show very poor representation of the endemic species (Fig. 2). A total of 27 orchid species earlier considered as endemic to the peninsular region are excluded from the list owing to their extended distribution in the neighbouring countries (Table 2).



**Figure 3. Species richness of endemic orchids across different states of peninsular India**

GU - Gujarat  
 GO - Goa  
 MH - Maharashtra  
 KA - Karnataka  
 KE - Kerala  
 TN - Tamil Nadu  
 AP - Andhra Pradesh  
 OD - Odisha

Table 1. List of endemic orchids of peninsular India

Sno	Species	Habit	Phytogeographical regions of peninsular India			State wise distribution								
			WG	Deccan	EG	GU	GO	MH	KA	KE	TN	AP	OD	
1	<i>Aenhenrya rotundifolia</i> (Blatt.) C.S. Kumar & F.N. Rasm.	T	+								+	+		
2	<i>Aerides crispa</i> Lindl.	E	+	+		+	+	+	+	+	+	+		
3	<i>Aerides maculosa</i> Lindl.	E	+	+	+	+	+	+	+	+	+	+	+	+
4	<i>Brachycorythis iantha</i> (Wight) Summerh.	T	+	+							+	+		
5	<i>Brachycorythis splendida</i> Summerh.	T	+								+	+		
6	<i>Brachycorythis wightii</i> Summerh.	T	+								+			
7	<i>Bulbophyllum acutiflorum</i> A. Rich. = <i>Bulbophyllum albidum</i> (Wight) Hook. f.	E	+							+	+	+		
8	<i>Bulbophyllum aureum</i> (Hook. f.) J.J. Sm.	E	+								+	+		
9	<i>Bulbophyllum elegantulum</i> (Rolfe) J.J. Sm.	E	+							+	+	+		
10	<i>Bulbophyllum fimbriatum</i> (Lindl.) Rchb.f.	E	+					+	+	+	+	+		
11	<i>Bulbophyllum fuscopurpureum</i> Wight	E	+	+						+	+	+		
12	<i>Bulbophyllum kaitiense</i> Rchb. f. = <i>Cirrhopetalum nilgherrense</i> Wight	E	+	+	+					+	+	+	+	
13	<i>Bulbophyllum keralense</i> M. Kumar & Sequiera	E	+								+			
14	<i>Bulbophyllum mysorensense</i> (Rolfe) J.J. Sm.	E	+	+						+	+			
15	<i>Bulbophyllum nodosum</i> (Rolfe) J.J. Sm. = <i>Rhytionanthos nodosum</i> (Rolfe) Garay	E	+									+		
16	<i>Bulbophyllum orezii</i> C.S. Kumar	E	+								+			
17	<i>Bulbophyllum proudlockii</i> (King & Pantl.) J.J. Sm.	E	+	+						+		+		
18	<i>Bulbophyllum rheedei</i> Manilal & C.S. Kumar = <i>Rhytionanthos</i> <i>rheedei</i> (Manilal & C.S. Kumar) Garay	E	+								+			
19	<i>Bulbophyllum rosemarianum</i> C.S.Kumar, P.C.S.Kumar & Saleem	E	+								+			
20	<i>Bulbophyllum silentvalliensis</i> M.P. Sharma & S.K. Srivast.	E	+								+			
21	<i>Bulbophyllum tremulum</i> Wight	E	+							+	+	+		
22	<i>Cheirostylis seidenfadeniana</i> C.S. Kumar & F.N. Rasm.	E	+								+			
23	<i>Chiloschista glandulosa</i> Blatt. & McCann	E	+							+	+			
24	<i>Coelogyne mossiae</i> Rolfe = <i>Coelogyne glandulosa</i> var. <i>bournei</i> S. Das & S.K. Jain = <i>Coelogyne glandulosa</i> var. <i>sathanarayanae</i> S. Das & S.K. Jain	E	+								+	+		
25	<i>Coelogyne nervosa</i> A. Rich. = <i>Coelogyne glandulosa</i> Lindl.	E	+							+	+	+		

Sno	Species	Habit	Phytogeographical regions of peninsular India			State wise distribution								
			WG	Deccan	EG	GU	GO	MH	KA	KE	TN	AP	OD	
26	<i>Conchidium filiforme</i> (Wight) Rauschert = <i>Eria dalzellii</i> (Hook. ex Dalzell) Lindl.	E	+						+	+	+	+		
27	<i>Conchidium microchilos</i> (Dalzell) Rauschert = <i>Eria microchilos</i> (Dalzell) Lindl. = <i>Eria tiagii</i> Manilal, C.S. Kumar & J.J. Wood	E	+					+	+	+	+	+		
28	<i>Conchidium nanum</i> (A. Rich.) Brieger = <i>Eria nana</i> A. Rich. = <i>Eria muscicola</i> var. <i>brevilinguis</i> J. Joseph & V. Chandras.	E	+							+	+	+		
29	<i>Dendrobium anamlayanum</i> Chandrab., V. Chandras & N.C. Nair	E	+								+	+		
30	<i>Dendrobium aequum</i> Lindl.	E	+	+	+			+	+	+	+	+	+	
31	<i>Dendrobium barbatulum</i> Lindl.	E	+				+	+	+	+	+	+		
32	<i>Dendrobium didon</i> subsp. <i>kodayarensis</i> Gopalan & A.N. Henry	E	+									+		
33	<i>Dendrobium heyneanum</i> Lindl.	E	+	+						+	+	+		
34	<i>Dendrobium nanum</i> Hook. f.	E	+	+					+	+	+	+		
35	<i>Dendrobium lawianum</i> Lindl.	E	+	+					+	+	+			
36	<i>Dendrobium microbulbon</i> A. Rich.	E	+				+	+	+	+	+	+		
37	<i>Dendrobium nodosum</i> Dalzell = <i>Flickingeria nodosa</i> (Dalzell) Seidenf.	E	+	+					+	+	+	+		
38	<i>Dendrobium ovatum</i> (L.) Kraenzl.	E	+	+	+	+	+	+	+	+	+	+	+	
39	<i>Dendrobium wightii</i> A.D. Hawkes & A.H. Heller	E	+							+	+	+		
40	<i>Didymoplexis seidenfadenii</i> C.S. Kumar & Ormerod	H	+								+			
41	<i>Diplozentrum congestum</i> Wight	E	+	+						+	+			
42	<i>Disperis monophylla</i> Blatt. ex C.E.C. Fisch.	T	+									+		
43	<i>Eria albiflora</i> Rolfe	E	+							+	+	+		
44	<i>Eria exilis</i> Hook. f. = <i>Porpax chandrasekharanii</i> Bhargavan & C.N. Mohanan	E	+					+	+	+	+	+		
45	<i>Eria meghasaniensis</i> (S. Misra) S. Misra	E			+									+
46	<i>Eria mysorensis</i> Lindl.	E	+						+	+	+	+		
47	<i>Eria pauciflora</i> Wight	E	+								+	+		
48	<i>Eria pseudoclavicaulis</i> Blatt.	E	+								+	+		
49	<i>Eulophia emilianae</i> Saldanha	T	+							+	+			
50	<i>Eulophia ochreatea</i> Lindl.	T		+	+	+		+	+				+	+
51	<i>Eulophia pratensis</i> Lindl.	T	+								+	+		
52	<i>Gastrochilus flabelliformis</i> (Blatt. & McCann) C.J. Saldanha	E	+					+		+	+			
53	<i>Gastrodia silentvalleyana</i> C.S. Kumar, P.C.S. Kumar, Sibi & S. Anil Kumar	H	+									+		
54	<i>Habenaria barnesii</i> Summerh. ex C.E.C. Fisch.	T	+									+	+	
55	<i>Habenaria caranjensis</i> Dalzell	T	+						+					

Sno	Species	Habit	Phytogeographical regions of peninsular India			State wise distribution							
			WG	Deccan	EG	GU	GO	MH	KA	KE	TN	AP	OD
56	<i>Habenaria cephalotes</i> Lindl.	T	+					+	+	+	+		
57	<i>Habenaria crassifolia</i> A. Rich.	T	+	+	+			+	+	+	+		+
58	<i>Habenaria elliptica</i> Wight	T	+						+	+	+		
59	<i>Habenaria elwesii</i> Hook. f.	T	+					+	+	+	+		
60	<i>Habenaria flabelliformis</i> Summerh. ex C.E.C. Fisch.	T	+							+			
61	<i>Habenaria foliosa</i> A. Rich. = <i>Habenaria digitata</i> var. <i>gibsonii</i> (Hook.f.) C.E.C. Fisch. = <i>Habenaria foliosa</i> var. <i>foetida</i> (Blatt. & McCann) Bennet = <i>Habenaria foliosa</i> var. <i>gibsonii</i> (Hook. f.) Bennet = <i>Habenaria gibsonii</i> Hook. f. = <i>Habenaria gibsonii</i> var. <i>foetida</i> Blatt. & McCann	T	+	+	+			+	+				+
62	<i>Habenaria grandifloriformis</i> Blatt. & McCann	T	+	+	+	+		+	+	+	+		+
63	<i>Habenaria heyneana</i> Lindl.	T	+	+			+	+	+	+	+		
64	<i>Habenaria hollandiana</i> Santapau = <i>Habenaria indica</i> C.S. Kumar & Manilal	T	+	+	+			+	+		+	+	
65	<i>Habenaria longicornu</i> Lindl. = <i>Habenaria decipiens</i> Wight	T	+	+					+	+	+		
66	<i>Habenaria multicaudata</i> Sedgw.	T	+				+	+	+	+	+		
67	<i>Habenaria ovalifolia</i> Wight	T	+					+	+	+	+		
68	<i>Habenaria pallideviridis</i> Seidenf. ex K.M. Matthew	T	+								+		
69	<i>Habenaria panigrahiana</i> S. Misra	T			+								+
70	<i>Habenaria panigrahiana</i> var. <i>parviloba</i> S. Misra	T			+								+
71	<i>Habenaria panchganiensis</i> Santapau & Kapadia	T	+					+					
72	<i>Habenaria periyarensis</i> Sasidh., K.P. Rajesh & Augustine	T	+							+			
73	<i>Habenaria perrottetiana</i> A. Rich.	T	+						+	+	+		
74	<i>Habenaria polyodon</i> Hook. f.	T	+								+		
75	<i>Habenaria ramayyana</i> Ram. Chary & J.J. Wood	T			+							+	
76	<i>Habenaria rariflora</i> A. Rich.	T	+	+	+			+	+	+	+	+	
77	<i>Habenaria richardiana</i> Wight	T	+							+	+		
78	<i>Habenaria suaveolens</i> Dalzell	T	+	+				+	+				
79	<i>Ipsea malabarica</i> (Rchb. f.) Hook. f.	T	+							+	+		
80	<i>Liparis beddomei</i> Ridl.	E	+								+		
81	<i>Liparis biloba</i> Wight	E	+						+		+		
82	<i>Liparis platyphylla</i> Ridl.	E	+						+		+		
83	<i>Liparis vestita</i> Rchb. f. = <i>Liparis espeevisii</i> S. Misra	E			+								+
84	<i>Liparis walakkadensis</i> M. Kumar & Sequiera	E	+							+			
85	<i>Luisia abrahamii</i> Vatsala	E	+							+			
86	<i>Luisia macrantha</i> Blatt. & McCann	E	+						+	+			



Sno	Species	Habit	Phytogeographical regions of peninsular India			State wise distribution							
			WG	Deccan	EG	GU	GO	MH	KA	KE	TN	AP	OD
87	<i>Malaxis crenulata</i> (Ridl.) Kuntze = <i>Seidenfia crenulata</i> (Ridl.) Szlach.	T	+							+			
88	<i>Malaxis intermedia</i> (A. Rich.) Seidenf. = <i>Seidenfia intermedia</i> (A. Rich.) Szlach.	T	+						+	+	+		
89	<i>Nervilia hispida</i> Blatt. & McCann.	T	+						+				
90	<i>Oberonia agastyamalayana</i> C.S. Kumar	E	+							+			
91	<i>Oberonia anamalayana</i> Joseph	E	+								+		
92	<i>Oberonia balakrishnanii</i> R. Ansari	E	+								+		
93	<i>Oberonia bellii</i> Blatt. & McCann	E	+						+				
94	<i>Oberonia brachyphylla</i> Blatt. & McCann	E	+					+	+				
95	<i>Oberonia brunoniana</i> Wight	E	+	+	+		+	+	+	+	+	+	
96	<i>Oberonia chandrasekharanii</i> V.J. Nair, V.S. Ramach. & R. Ansari	E	+						+	+			
97	<i>Oberonia josephi</i> C.J. Saldanha	E	+						+				
98	<i>Oberonia nayarii</i> R. Ansari & R. Balakrishnan	E	+						+	+	+		
99	<i>Oberonia proudlockii</i> King & Pantl.	E	+	+	+				+		+		+
100	<i>Oberonia platycaulon</i> Wight	E	+					+		+	+		
101	<i>Oberonia santapau</i> Kapadia	E	+	+	+			+	+	+	+		
102	<i>Oberonia sebastiana</i> B.V. Shetty & Vivek.	E	+							+	+		
103	<i>Oberonia seidenfadeniana</i> J. Joseph & Vajr.	E	+							+	+		
104	<i>Oberonia swaminathanii</i> Ratheesh, Manudev & Sujanapal	E	+							+			
105	<i>Oberonia verticillata</i> Wight	E	+	+	+				+	+	+		
106	<i>Oberonia wynadensis</i> Sivad. & R.T. Balakrishnan	E	+							+			
107	<i>Odisha cleistantha</i> S.Misra	T			+							+	+
108	<i>Paphiopedilum druryi</i> (Bedd.) Stein	T	+							+	+		
109	<i>Peristylus brachyphyllus</i> A. Rich	T	+							+	+		
110	<i>Peristylus lancifolius</i> A. Rich.	T	+							+	+		
111	<i>Peristylus stocksii</i> (Hook. f.) Kraenzl.	T	+				+	+	+		+		
112	<i>Pinalia polystachya</i> (A. Rich.) Kuntze	E	+							+	+		
113	<i>Porpax jerdoniana</i> (Wight) Rolfe	E	+					+	+	+	+		
114	<i>Pteroceras indicum</i> Puneekar	E	+						+				
115	<i>Pteroceras monsooniae</i> Sasidh. & Sujanapal	E	+							+			
116	<i>Robiquetia josephiana</i> Manilal & C.S. Kumar	E	+							+	+		
117	<i>Saccolabium congestum</i> (Lindl.) Hook. f.	E	+							+			
118	<i>Schoenorchis jerdoniana</i> (Wight) Garay	E	+	+	+				+	+	+	+	
119	<i>Schoenorchis latifolia</i> (C.E.C. Fisch.) Saldanha	E	+						+				

Sno	Species	Habit	Phytogeographical regions of peninsular India			State wise distribution							
			WG	Deccan	EG	GU	GO	MH	KA	KE	TN	AP	OD
120	<i>Schoenorchis manilaliana</i> M. Kumar & Sequiera	E	+							+			
121	<i>Seidenfadeniella rosea</i> (Wight) C.S. Kumar	E	+							+	+		
122	<i>Smithsonia maculata</i> (Dalzell) Saldanha	E	+					+	+	+	+		
123	<i>Smithsonia straminea</i> Saldanha	E	+						+	+			
124	<i>Smithsonia viridiflora</i> (Dalzell) Saldanha	E	+					+	+	+			
125	<i>Taeniophyllum scaberulum</i> Hook. f.	E	+							+			
126	<i>Trias bonaccordensis</i> C.S. Kumar	E	+							+	+		
127	<i>Trias stocksii</i> Benth. ex Hook. f.	E	+					+	+	+	+		
128	<i>Xenikophyton seidenfadenianum</i> M. Kumar	E	+							+			
129	<i>Xenikophyton smeeanum</i> (Rchb.f.) Garay	E	+						+	+	+		
130	<i>Zeuxine lindleyana</i> A.N. Rao	T			+								+
<b>Total</b>			<b>123</b>	<b>29</b>	<b>22</b>	<b>7</b>	<b>14</b>	<b>36</b>	<b>71</b>	<b>95</b>	<b>80</b>	<b>11</b>	<b>12</b>

T - Terrestrial; E - Epiphytic; H - Holomycotrophic; WG - Western Ghats; EG - Eastern Ghats; Gu - Gujarat; Go - Goa; MH - Maharashtra; KA - Karnataka; KE - Kerala; TN - Tamil Nadu; AP - Andhra Pradesh; OD - Odisha

## Discussion

Endemic taxa occur in a restricted area usually isolated by geographical or temporal barriers (Ahmedullah & Nayar 1987). The endemic taxa occurring in such isolated/restricted areas are possible survivors of their ancient stock that occurred in continental areas which were subjected to cataclysmic geological and climatic changes (Nayar 1996). The major concentrations of endemic orchid species are found in the Western Ghats (Subramanayam & Nayar 1974). Agasthyamalai Hills, Anamalai-High Ranges, Nilgiris-Silent Valley-Waynad-Kodagu region, Shimoga-Kanara, Mahabaleswar-Khandala and Konkan-Raigad are some of the important centers of endemism in the Western Ghats. Ninety five endemic orchid species are particularly restricted to these areas. Eastern Ghats have geological antiquity with isolated mountain ranges. The Eastern Ghats have some "ecological islands" that harbor endemic orchids. These are Ganjam-Koraput range in Odisha, Visakhapatnam Hills, Nallamalai-Cuddappah range and Tirupati Hills of Andhra Pradesh. Though Eastern Ghats possess a few rich forest patches, it has been poorly explored floristically as compared to Western Ghats. *Eria meghasaniensis* (S. Misra) S. Misra, *Habenaria panigrahiana* S. Misra, *Habenaria panigrahiana* var.

*parviloba* S. Misra, *Odisha cleistantha* S. Misra and *Zeuxine lindleyana* A.N. Rao are strictly endemic to Odisha State. *Aerides maculosa* Lindl., *Bulbophyllum kaitiense* (Wight) Rchb.f., *Dendrobium aqueum* Lindl., *Dendrobium ovatum* (L.) Kraenzl., *Eulophia ochreatea* Lindl., *Habenaria crassifolia* A. Rich., *Habenaria foliosa* A. Rich., *Habenaria grandifloriformis* Blatt. & McCann, *Habenaria hollandiana* Santapau, *Habenaria rariflora* A. Rich., *Oberonia brunoniana* Wight, *Oberonia proudlockii* King & Pantl., *Oberonia santapau* Kapadia, *Oberonia verticillata* Wight and *Schoenorchis jerdoniana* (Wight) Garay have very wide distribution in the peninsular region.

The endemic orchids of the peninsular region are facing various kinds of localized threats like livestock grazing and forest fires as well as landscape-level threats such as mining, construction of roads, large as well as micro-hydel power projects, wind farms, large-scale agricultural expansion and creation of monoculture plantations. To cite an example *Paphiopedilum druryi* (Bedd.) Stein. which was once found in plenty in Agasthyamalai Hills in southern India is now difficult to locate.



**Table 2. Species earlier considered endemic but distributed in other regions**

Sno	Plant name	Distribution	References
1	<i>Anoectochilus elatus</i> Lindl.	Sri Lanka	Fernando & Ormerod 2008
2	<i>Bulbophyllum xylophyllum</i> E.C. Parish & Rchb. f. = <i>Bulbophyllum agastyamalayanum</i> Gopalan & A.N. Henry	China, Myanmar, Thailand and Vietnam	Rao 1998; Govaerts et al. 2012
3	<i>Bulbophyllum sterile</i> (Lam.) Suresh = <i>Bulbophyllum nilgherrense</i> Wight	Nepal, Bangladesh, Myanmar	Lucksom 2007; Govaerts et al. 2012
4	<i>Chrysoglossum ornatum</i> Blume = <i>Chrysoglossum hallbergii</i> Blatt.	Nepal, Cambodia, Thailand, Vietnam, Sumatra, Java	Lucksom 2007; Raskoti 2009; Govaerts et al. 2012
5	<i>Bulbophyllum fischeri</i> Seidenf. = <i>Cirrhopetalum gambiei</i> Hook. f.	Sri Lanka, Indo-China	Fernando & Ormerod 2008; Govaerts et al. 2012
6	<i>Bulbophyllum sarcophyllum</i> (King & Pantl.) J.J. Sm. = <i>Cirrhopetalum panigrahanum</i> (S.Misra) S. Misra	Nepal and Myanmar	Lucksom 2007; Govaerts et al. 2012
7	<i>Dendrobium herbaceum</i> Lindl.	Bangladesh	Govaerts et al. 2012
8	<i>Dendrobium jerdonianum</i> Wight	Sri Lanka	Govaerts et al. 2012
9	<i>Dendrobium panduratum</i> Lindl.	Sri Lanka	Govaerts et al. 2012
10	<i>Dendrobium salaccense</i> (Blume) Lindl. = <i>Dendrobium cathcartii</i> Hook. f.	Sri Lanka, Laos, Myanmar, Thailand, Vietnam	Fernando & Ormerod 2008; Wu & Hong 2009; Govaerts et al. 2012
11	<i>Disperis neilgherrensis</i> Wight	Sri Lanka, Thailand, Java	Kurzweil 2005; Govaerts et al. 2012
12	<i>Eria reticosa</i> Wight	Sri Lanka, E. Himalaya	Govaerts et al. 2012
13	<i>Eulophia flava</i> (Lindl.) Hook. f. = <i>Eulophia cullenii</i> (Wight) Blume	Nepal, Laos, Thailand, Vietnam	Wu & Hong 2009; Govaerts et al. 2012
14	<i>Habenaria roxburghii</i> Nicolson	Sri Lanka	Fernando & Ormerod 2008
15	<i>Habenaria digitata</i> Lindl. = <i>Habenaria travancorica</i> Hook. f.	Uttarakhand, Assam, Nepal, Bangladesh, Laos, Myanmar	Khanam et al. 2001; Govaerts et al. 2012
16	<i>Habenaria longicorniculata</i> Graham	Sri Lanka	Govaerts et al. 2012
17	<i>Hetaeria oblongifolia</i> Blume = <i>Hetaeria ovalifolia</i> (Wight) Hook. f.	Bangladesh, Thailand, Myanmar, Java	Govaerts et al. 2012
18	<i>Luisia tenuifolia</i> Blume = <i>Luisia evangelinae</i> Blatt. & McCann	Sri Lanka	Fernando & Ormerod 2008
19	<i>Nervilia concolor</i> (Blume) Schltr. = <i>Nervilia scottii</i> (Rchb.f.) Schltr.	Nepal, Bangladesh, Myanmar	Govaerts et al. 2012
20	<i>Oberonia wightiana</i> Lindl. = <i>Oberonia arnotiana</i> Wight	Sri Lanka	Fernando & Ormerod 2008
21	<i>Pachystoma pubescens</i> Blume = <i>Pachystoma hirsuta</i> (J. Joseph & Vajr.) C.S. Kumar & Manilal	China, Taiwan, Nepal, Cambodia, Laos, Myanmar	Govaerts et al. 2012
22	<i>Peristylus lawii</i> Wight	Nepal, Myanmar	Govaerts et al. 2012
23	<i>Peristylus spiralis</i> A.Rich.	Sri Lanka	Fernando & Ormerod 2008
24	<i>Phalaenopsis mysorensis</i> C.J. Saldanha = <i>Kingidium niveum</i> C.S. Kumar	Sri Lanka	Fernando & Ormerod 2008
25	<i>Thrixspermum musciflorum</i> A.S. Rao & J. Joseph = <i>Thrixspermum musciflorum</i> var. <i>nilagiricum</i> J. Joseph & Vajr.	Arunachal Pradesh	Lucksom 2007; Govaerts et al. 2012
26	<i>Vanda wightii</i> Rchb. f.	Sri Lanka	Fernando & Ormerod 2008
27	<i>Vanilla wightii</i> Lindl. ex Wight = <i>Vanilla wightiana</i> Lindl.	Sri Lanka	Arenas & Cribb 2010

## REFERENCES

- Ahmedullah, M. & M.P. Nayar (1987).** *Endemic Plants of the Indian region—Vol. 1. Peninsular India*, Botanical Survey of India, Calcutta, 262pp.
- Axelrod, D.I. (1971).** *Plate tectonics in relation to the history of angiosperm vegetation in India*. Birbal Sahni Institute Paleobotany Special Publication 1: 5–18.
- Ansari, R. & N.P. Balakrishnan (1990).** A revision of the India species *Oberonia* (Orchidaceae). *Orchid Monographs* 4: 1–82.
- Arenas, M.A.S. & P. Cribb (2010).** A new infrageneric classification and synopsis of the genus *Vanilla* Plum. ex Mill. (Orchidaceae: Vanillinae). *Lankesteriana* 9: 355–398.
- Bachulkar, M. (2010).** Addition to the flora of Maharashtra. *Journal of the Bombay Natural History Society* 107(3): 266.
- Blatter, E. (1928).** A list of orchids with some new species from High Wavy Mountain (Madurai District). *Journal of the Bombay Natural History Society* 32: 518–523.
- Bose, T.K. & S.K. Bhattacharjee (1980).** *Orchids of India*. Naya Prokash, Calcutta, xxiii+538pp.
- Chandrabose, M. & N.C. Nair (1988).** *Flora of Coimbatore*. Bishen Singh Mahendra Pal Singh, Dehradun, xxxviii+398pp.
- Cooke, T. (1958).** *Flora of Bombay*. Vol. 3. (Repd. ed.) Botanical Survey of India, Calcutta, 649pp.
- eFloras (2012).** Published on the Internet, <http://www.efloras.org> by Missouri Botanical Garden, St. Louis, Missouri & Harvard University Herbaria, Cambridge.
- Fernando, S.S. & P. Ormerod (2008).** An Annotated checklist of the Orchids of Sri Lanka. *Rheedea* 18: 1–28.
- Fischer, C.E.C. (1928).** Orchidaceae In: Gamble, J.S. (ed.) *Flora of Presidency of Madras*. West, Newman and Adlard, London, 8: 1399–1478.
- Gaikwad, S.P. & S.R. Yadav (2004).** Endemic Flowering Plant species of Maharashtra and their possible utilization, pp. 27–58. In: Pullaiah, T. (ed.) *Biodiversity in India—Vol. 3*. Regency Publications, New Delhi, vii+244.
- Gopalan, R. & A.N. Henry (2000).** *Endemic Plants of India: CAMP for the Strict Endemics of Agasthiyamalai Hills, SW Ghats*. Bishen Singh Mahendra Pal Singh, Dehradun, 476pp.
- Govaerts, R., Dransfield, J., Zona, S.F., Hodel, D.R. & A. Henderson (2012).** World Checklist of Arecaceae. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; <http://apps.kew.org/wcsp/> Retrieved 2012-01-22.
- Henry, A.N., V. Chitra & N.P. Balakrishnan (1989).** *Flora of Tamilnadu. India Ser. 1: Analysis. Vol. 3*, Botanical Survey of India, Coimbatore, 171pp.
- Hooker, J.D. (1888–1890).** *Flora of British India*. Vols. 5 & 6. L. Reeve & Co., London. 667–858 & 1–198pp.
- IPNI (2012).** *The International Plant Name Index*. <http://www.ipni.org>.
- Joseph, J. (1987).** *Orchids of Nilgiris*. Botanical Survey of India, Howrah, 184pp.
- Joshi, V.C. & M.K. Janarthanam (2004).** The diversity of life-form type, habitat preference and phenology of the endemics in the Goa region of the Western Ghats, India. *Journal of Biogeography* 31: 1227–1237.
- Karthikeyan, S. (2000).** A statistical analysis of flowering plants of India, pp. 201–217. In: Singh, N.P., P.K. Singh, P.K. Hajra & B.D. Sharma (eds.). *Flora of India*, Introductory Vol. 2, Botanical Survey of India, Calcutta, xi+469pp.
- Keshavamurthy, K.R. & S.N. Yoganarasimhan (1990).** *Flora of Coorg (Kodagu), Karnataka, India*. Vinsat Publishers, Bangalore, vii+794pp.
- Khanam, M., M.Z. Uddin, M.S. Khan & M.A. Hassan (2001).** Our present knowledge on the Terrestrial Orchidaceae. *Bangladesh Journal of Plant Taxonomy* 8(2): 35–49.
- Kumar, C.S. & K.S. Manilal (1994).** *A Catalogue of India Orchids*. Bishen Singh Mahendra Pal Singh, Dehradun, iii+162pp.
- Kumar, C.S., B.V. Shetty, S.S.R. Bennet, T.A. Rao, S. Molur & S. Walker (eds.) (2001).** Endemic Orchids of the Western Ghats. Conservation Assessment and Management Plan (C.A.M.P.) Workshop. Wildlife Information Liaison Development Society and Zoo Outreach Organisation, Coimbatore, India, 195pp.
- Kumar, C.S., P.C. Suresh Kumar, M. Sibi & A. Kumar (2008).** A new species of *Gastrodia* R. Br. (Orchidaceae) from Silent Valley, Kerala, India. *Rheedea* 18(2): 107–110.
- Kurzweil, H. (2005).** Taxonomic Studies in the Genus *Disperis* (Orchidaceae) in Southeast Asia. *Blumea* 50: 143–152.
- Lakshminarasimhan, P. (1996).** Monocotyledons. In: Sharma, B.D., S. Karthikeyan & N.P. Singh (eds). *Flora of Maharashtra State, Series 2*. Botanical Survey of India, Calcutta 794pp.
- Lucksom, S.Z. (2007).** *The Orchids of Sikkim and North East Himalaya*. S.Z. Lucksom, Siliguri, xxxx+984pp.
- Mabberley, D.J. 2008.** *Mabberley's plant-book: a portable dictionary of plants, their classification and uses*, third edition, revised, Cambridge University Press, Cambridge, xviii, 1021pp.
- Manilal, K.S. (1988).** *Flora of Silent Valley, Tropical Rain forests of India*, Calicut, xi+398pp.
- Manilal, K.S. & C.S. Kumar (2004).** *Orchid Memories: A tribute to Gunnar Seidenfaden*. Indian Association for Angiosperm Taxonomy (IAAT), Calicut, 265pp.
- Mishra, D.K. & N.P. Singh (2001).** *Endemic and Threatened Flowering Plants of Maharashtra*. Botanical Survey of India, Calcutta, 414pp.
- Misra, S. (2007).** *Orchids of India - A Glimpse*. Bishen Singh Mahendra Pal Singh, Dehradun, v+402pp.
- Misra, S., S.P. Panda & D. Sahoo (2008).** Orchid Flora of Andhra Pradesh, India. *Bulliten of Botanical Survey of India* 50(1–4): 129–146.
- Myers, N., R.A. Mittermeier, C.G. Mittermeier, G.A.B. da Fonseca & J. Kent (2000).** Biodiversity hotspots for conservation priorities. *Nature* 403: 853–858.

- Narayanan, M.K.R., K.M. Manudev, P. Sujanalpal, N.A. Kumar, M. Sivadasan & A.H. Alfarhan (2010).** *Oberonia swaminathanii* sp. nov. (Orchidaceae) from Kerala, India. *Nordic Journal of Botany* 28: 713–715.
- Nayar, M.P. (1977).** Changing pattern of distribution of endemic genera (Angiosperm). *Journal of Economic and Taxonomic Botany* 1: 99–110.
- Nayar, M.P. (1996).** *Hot Spots of Endemic Plants of India, Nepal and Bhutan*. Tropical Botanic Garden and Research Institute, Thiruvananthapuram, 252pp.
- Nayar, M.P., M. Ahmed & D.C.S. Raju (1984).** Endemic and rare plants of Eastern Ghats. *Indian Journal of Forestry* 7: 35–42.
- Nayar, T.S., M. Sibi, A.R. Beegam, N. Mohanan & G. Rajkumar (2008).** Flowering Plants of Kerala: Status and Statistics. *Rheedea* 18(2): 95–106.
- Pradhan, U.C. (1976).** *Indian Orchids: Guide to Identification and Culture 1*. Kalimpong. Premulaceae Books, 188pp.
- Pullaiah, T. (1997).** *Flora of Andhra Pradesh—Vol. 3*. Scientific Publishers, Jodhpur, IV+1349pp.
- Rao, G.V.S. & G.R. Kumari (2003).** *Flora of Visakapatnam District—Vol. 1*. Botanical Survey of India, Kolkata, xiv+612pp.
- Rao, R.S. (1986).** *Flora of Goa, Diu, Daman, Dadra and Nagarhaveli—Vol. 2*. Botanical Survey of India, Howrah, xxx+546pp.
- Rao, T.A. (1998).** *Conservation of Wild Orchids of Kodagu in the Western Ghats*. The Karnataka Association for the Advancement of Science, Bangalore, 242pp.
- Raskoti, B.B. (2009).** *The Orchids of Nepal*. Bhakta Bahadur Raskoti & Rita Ale. iv+251pp.
- Rathakrishnan, N.C. & V. Chitra (1984).** Distribution of endemic orchids in Karnataka, Kerala and Tamil Nadu. *Journal of Economic and Taxonomic Botany* 5: 1001–1006.
- Saldanha, C.J. & D.H. Nicolson (1976).** *Flora of Hassan District, Karnataka, India*. Amerind Publishing Co. Pvt. Ltd., New Delhi, viii+922pp.
- Santapau, H. & Z. Kapadia (1966).** *The Orchids of Bombay*. Manager of Publications, Delhi, vi+239pp.
- Sardesai, M.M. & S.R. Yadav (2004).** Genus *Habenaria* Willd. (Orchidaceae) in Maharashtra, pp. 144–172. In: Pullaiah, T. (ed.). *Biodiversity in India—Vol. 3*. Regency Publications, New Delhi, vii+244pp.
- Singh, K.P., S. Phukan & P. Bujarbarua (2001).** Orchidaceae, pp. 1735–1846. In: Singh, N.P. & D.K. Singh (eds.). *Floristic Diversity and Conservation Strategies in India—Vol. 4*. Botanical Survey of India, Kolkata. vii+2340pp.
- Subramanayam, K. & M.P. Nayar (1974).** Vegetation and phytogeography of the Western Ghats, pp. 178–196. In: Mani, M.S. (ed.). *Ecology and Biogeography of India*. Hague, Netherland, 773pp.
- Tropicos (2012).** Missouri Botanical Garden, Shaw Boulevard, St. Louis, Missouri. <http://www.tropicos.org>.
- Wu, Z. & D. Hong (eds.) (2009).** *Flora of China*. Missouri Botanical Garden Press, St. Louis, 570pp.
- Yadav, S.R. & M.M. Sardesai (2002).** *Flora of Kolhapur District*. Shivaji University, Kolhapur, xiv+679pp.
- Yoganarasimhan, S.N., K. Subramanyam & B.A. Razi (1981).** *Flora of Chikamagalur district, Karnataka, India*. International Book Distributors, Dehradun, vii+407pp.

