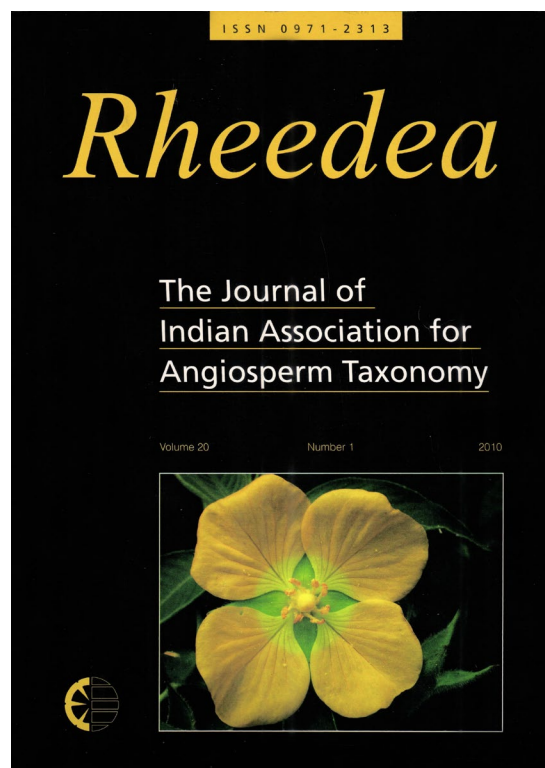




## Endemic genera of Angiosperms in India: A Review

Sheeba J. Irwin & D. Narasimhan



How to cite:

**Irwin S.J. & D. Narasimhan 2011.** Endemic genera of Angiosperms in India: A Review. *Rheedeia* 21(1): 87-105.

<https://dx.doi.org/10.22244/rheedeia.2011.21.01.09>

*Received:* 20.03.2011

*Revised and accepted:* 31.05.2011

*Published in print:* 30.06.2011

*Published Online:* 30.06.2011



# Endemic genera of Angiosperms in India: A Review

Sheeba J. Irwin\* and D. Narasimhan

Centre for Floristic Research, Department of Botany, Madras Christian College (Autonomous),  
Tambaram, Chennai – 600 059, Tamil Nadu, India.

\*E-mail: sheebajirwin@gmail.com

## Abstract

This is an earnest effort to review the earlier recorded endemic genera of angiosperms in India and assess those present within the political boundaries of India. It is concluded that only 49 genera are endemic to India, of which 36 are unispecific. Peninsular India has a high concentration of endemic genera (40 genera). Four are confined to Indian Himalaya and three to Andaman & Nicobar Islands. Genus *Hardwickia* is widely distributed in the dry deciduous forests of Peninsular and North India, excluding Northeast India. *Bentinckia* which is distributed in Peninsular India and Nicobar Islands is the only genus with disjunct distribution. About 71% of the genera are herbaceous and their concentration is more in wet evergreen forests and grasslands. Threat assessment has not been made for majority of the species of these genera. There is an urgent need for an assessment based on current IUCN Criteria.

**Keywords:** Angiosperm, Conservation, Endemic Genera, India

## Introduction

Tropical forests show a high degree of species richness and endemism (Orians & Groom, 2005). Endemic taxa are restricted to specific areas such as oceanic islands, peninsular regions, mountain peaks and unique geographical areas. Globally 'botanically interesting' areas are rich in endemics, especially islands (Richardson, 1978). Regions with high concentration of endemic species are classified as 'Biodiversity Hotspots' by the Conservational International (CI). Of the 34 hotspots recognized by the CI, the following four hotspots fall within the Indian political boundaries (Mittermeier *et al.*, 2004): 1. Indo-Burma covering Mizoram, Manipur, Nagaland, Meghalaya, Tripura and Andaman Islands, 2. Himalaya covering Jammu & Kashmir, Himachal Pradesh, Uttarakhand, northern part of West Bengal (Darjeeling), Sikkim, northern part of Assam and Arunachal Pradesh, 3. Western Ghats falls within the states of Tamil Nadu, Kerala, Karnataka, Goa, Maharashtra and Gujarat and 4. The Sundaland covering the Nicobar Islands. Of the 20,074 taxa of angiosperms reported from India (Karthikeyan, 2009), 5752 (29%) taxa are endemic and are distributed in three major phytogeographical regions, viz., Indian Himalaya, Peninsular India and Andaman & Nicobar Islands (Nayar, 1996). India harbours a large number of endemic species. However, the number of endemic genera is less and no family is endemic to India.

## Methodology

Information on endemic genera of angiosperms were collected from the available literature (Cooke, 1901 – 1908; Chatterjee, 1939; Bor, 1949, 1954, 1958, 1960; Airy Shaw, 1952; Clifford, 1967; Ansari & Hemadri, 1971; Rao, 1972, 1979; Mukherjee & Constance, 1974; Saldanha, 1974; Sohmer, 1976; Hong, 1980; Chakraborti, 1981; Clayton, 1981; Nair *et al.*, 1982, 1983; Panigrahi & Das, 1983; Uniyal & Pal, 1983; Chakrabarty & Rao, 1984; Pandurangan *et al.*, 1984; Bhat, 1986; Mukherjee & Constance, 1986; Rao & Chakrabarty, 1986; Takhtajan, 1986; Ahmedullah & Nayar, 1987; Kumar & Shetty, 1987; Deshpande *et al.*, 1989; Eriksson, 1990; Matthew, 1991; Mill, 1991; Mathew & Lakshminarasimhan, 1994; Kumar, 1995; Sarkar, 1995; Uniyal, 1995; ING, 1996 (<http://botany.si.edu/ing/>); Nayar, 1996; Sharma *et al.*, 1996; Kumar & Rasmussen, 1997; Shivamurthy & Sadanand, 1997; Yoganarasimhan *et al.*, 1997; Rao, 1998; Kumar & Coomar, 1999; Ahmedullah, 2000; Janarthanam *et al.*, 2000; Singh *et al.*, 2001; Yadav & Sardesai, 2002; Fonseca & Janarthanam, 2003; Sasidharan, 2004; Daniel, 2005; Govaerts, 2005 (<http://www.kew.org/wcsp>), 2006 (<http://www.kew.org/wcsp/monocots>); Nayar *et al.*, 2006; Venu, 2006; Balakrishnan & Chakrabarty, 2007; Mitra & Mukherjee, 2007; Rajkumar & Janarthanam, 2007; Anderberg & Pandey, 2008; Mabblerley, 2008;

Kabeer & Nair, 2009; Karthikeyan *et al.*, 2009; Clayton *et al.*, 2011 ([www.kew.org/data/grasses-db](http://www.kew.org/data/grasses-db)); Govaerts *et al.*, 2011 (<http://apps.kew.org/wcsp>); SNMNH, 2011 (<http://botany.si.edu/myanmar>); USDA, 2011 ([www.ars-grin.gov](http://www.ars-grin.gov)); eFloras, 2011 ([www.efloras.org](http://www.efloras.org)); ILDIS, 2011 (<http://www.ildis.org>); IPNI, 2011 ([www.ipni.org](http://www.ipni.org)); Tropicos, 2011 ([www.tropicos.org](http://www.tropicos.org);) and reassessed. Genera that were considered endemic but known to be distributed elsewhere/other regions are listed as well. Nomenclatural changes are recorded and earlier segregated genera that are merged later with the parent/allied genera are also listed.

The endemic genera are listed based on phyto-geographical regions. State-wise distribution is also provided. Species given under each genus is based on literature. These genera are analysed to understand their distribution pattern, habitat, habit and nomenclature. These taxa are organised as per APG III Classification. Threat status of genera earlier assessed by the IUCN, Deshpande (1987a, b, c, 1988); Ansari (1988); Mukherjee (1988); Vajravelu (1988); Ahmedullah & Nayar (1990); Singh & Kulkarni (1990); Nayar (1996, 1997) and Gopalan & Henry (2000) is recorded.

## Results

The political boundaries of India have changed a few times from the colonial period. The first concise account on endemic genera was given by Sarkar (1995) who listed 142 genera, of which four are distributed in Bhutan and one in southern Tibet as well. Later reports on number of endemic genera included 147 genera (Nayar, 1996), 140 (Ahmedullah, 2000) and 121 (Mitra & Mukherjee, 2007). All these reports included several genera as endemic based on then available information on distribution. Similarly, a number of genera reported as endemic but have later undergone nomenclatural changes and merged with the parent/allied genera have not been considered.

The present analysis shows that 62 genera that are earlier considered endemic to India are distributed in other regions as well (Table 1). Twenty two genera have been merged with the parent/allied genera (Table 2). *Pelticalyx* (Annonaceae?) is considered as a doubtful genus (Mabberley, 2008; IPNI, 2011 ([www.ipni.org](http://www.ipni.org)); ING, 1996 (<http://botany.si.edu/ing/>) is excluded.

Table 1. Genera earlier considered endemic but distributed in other regions

Sl. No.	Genus (Family)	Distribution	Source
1.	<i>Biswarea</i> Cogn. (Cucurbitaceae)	China, India, Nepal	<a href="http://efloras.org">http://efloras.org</a>
2.	<i>Brachystemma</i> D. Don (Caryophyllaceae)	China, India, Nepal	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
3.	<i>Caesulia</i> Roxb. (Asteraceae)	India, Myanmar, Nepal	<a href="http://efloras.org">http://efloras.org</a>
4.	<i>Catamixis</i> Thomson (Asteraceae)	India, Nepal	<a href="http://efloras.org">http://efloras.org</a>
5.	<i>Caulokaempferia</i> K. Larsen (Zingiberaceae)	China, India, Laos, Myanmar, Thailand, Vietnam	<a href="http://efloras.org">http://efloras.org</a>
6.	<i>Cautleya</i> Hook.f. (Zingiberaceae)	Bhutan, China, India, Myanmar, Nepal, Thailand, Vietnam	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a> ; <a href="http://botany.si.edu/myanmar">http://botany.si.edu/myanmar</a>
7.	<i>Cavea</i> W.W. Sm. & Small (Asteraceae)	China, India	<a href="http://efloras.org">http://efloras.org</a>
8.	<i>Chionocharis</i> I.M. Johnst. (Boraginaceae)	Bhutan, China, India, Nepal	<a href="http://efloras.org">http://efloras.org</a>
9.	<i>Cleisocentron</i> Brühl (Orchidaceae)	Borneo, India	<a href="http://ipni.org">http://ipni.org</a>
10.	<i>Craniotome</i> Rchb. (Lamiaceae)	Bhutan, China, India, Laos, Myanmar, Nepal, Vietnam	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://botany.si.edu/myanmar">http://botany.si.edu/myanmar</a>
11.	<i>Cryptochilus</i> Wall. (Orchidaceae)	Bhutan, India, Nepal, Tibet, Vietnam	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>

Table 1. contd.

12.	<i>Cyathopus</i> Stapf (Poaceae)	Bhutan, China, India	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://www.kew.org/data/grasses-db">www.kew.org/data/grasses-db</a>
13.	<i>Dioecrescis</i> Tirveng. (Rubiaceae)	India, Myanmar	<a href="http://ipni.org">http://ipni.org</a> ; <a href="http://botany.si.edu/myanmar">http://botany.si.edu/myanmar</a>
14.	<i>Diplocentrum</i> Lindl. (Orchidaceae)	India, Sri Lanka	<a href="http://www.kew.org/wcsp/monocots">http://www.kew.org/wcsp/monocots</a>
15.	<i>Diplomeris</i> D. Don (Orchidaceae)	China, Bhutan, India, Nepal	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
16.	<i>Edgaria</i> C.B. Clarke (Cucurbitaceae)	China, Bhutan, India, Nepal	<a href="http://efloras.org">http://efloras.org</a>
17.	<i>Eparmatostigma</i> Garay (Orchidaceae)	India, Laos, Vietnam	<a href="http://www.kew.org/wcsp/monocots">http://www.kew.org/wcsp/monocots</a>
18.	<i>Eriophyton</i> Benth. (Lamiaceae)	Bhutan, China, India, Nepal, Tibet	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
19.	<i>Himalrandia</i> T. Yamaz. (Rubiaceae)	Afghanistan, Bhutan, China, India, Nepal, Pakistan	<a href="http://efloras.org">http://efloras.org</a>
20.	<i>Hoppea</i> Willd. (Gentianaceae)	India, Malaysia, Myanmar, Sri Lanka	<a href="http://efloras.org">http://efloras.org</a>
21.	<i>Indofevillea</i> Chatterjee (Cucurbitaceae)	China, India	<a href="http://efloras.org">http://efloras.org</a>
22.	<i>Indotristicha</i> P. Royen (Podostemaceae)	India, Malaysia, Thailand	<a href="http://ipni.org">http://ipni.org</a>
23.	<i>Jaeschkea</i> Kurz (Gentianaceae)	China, India, Pakistan	<a href="http://efloras.org">http://efloras.org</a>
24.	<i>Kamettia</i> Kostel. (Apocynaceae)	India, Thailand	<a href="http://ipni.org">http://ipni.org</a>
25.	<i>Kedarnatha</i> P.K. Mukh. & Constance (Apiaceae)	Bhutan, India, Myanmar, Nepal	<a href="http://ipni.org">http://ipni.org</a>
26.	<i>Khasiaclunea</i> Ridsdale (Rubiaceae)	India, Myanmar	<a href="http://botany.si.edu/myanmar">http://botany.si.edu/myanmar</a> ; <a href="http://apps.kew.org/wcsp">http://apps.kew.org/wcsp</a>
27.	<i>Lacaitaea</i> Brand (Boraginaceae)	India, Myanmar	<a href="http://ipni.org">http://ipni.org</a> ; <a href="http://botany.si.edu/myanmar">http://botany.si.edu/myanmar</a>
28.	<i>Lalldhwojia</i> Farille (Apiaceae)	India, Myanmar, Nepal	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
29.	<i>Lepidostemon</i> Hook.f. & Thomson (Brassicaceae)	Bhutan, China, India, Nepal, Tibet	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
30.	<i>Leptocodon</i> (Hook.f.) Lem. (Campanulaceae)	China, India, Myanmar, Nepal, Tibet	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
31.	<i>Loxostigma</i> C.B. Clarke (Gesneriaceae)	Bhutan, China, India, Myanmar, Nepal, Vietnam	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
32.	<i>Meeboldia</i> H. Wolff (Apiaceae)	Bhutan, China, India, Nepal	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
33.	<i>Megacodon</i> (Hemsl.) Harry Sm. (Gentianaceae)	Bhutan, China, India, Nepal	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
34.	<i>Milula</i> Prain (Alliaceae)	China, India, Nepal	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>

Table 1. contd.

35.	<i>Moullava</i> Adans. (Fabaceae)	India, Indonesia, Malaysia	<a href="http://www.ildis.org">http://www.ildis.org</a>
36.	<i>Neoconopodium</i> (Koso-Pol.) Pimenov & Kljuykov (Apiaceae)	Afghanistan, India, Pakistan	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
37.	<i>Neohymenopogon</i> Bennet (Rubiaceae)	Bhutan, China, India, Myanmar	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
38.	<i>Neopicrorhiza</i> D.Y. Hong (Scrophulariaceae)	Bhutan, China, India, Nepal	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
39.	<i>Notochaete</i> Benth. (Lamiaceae)	China, India	<a href="http://ipni.org">http://ipni.org</a>
40.	<i>Oreocome</i> Edgew. (Apiaceae)	China, India, Nepal, Pakistan	<a href="http://ipni.org">http://ipni.org</a>
41.	<i>Paroxygraphis</i> W.W. Sm. (Ranunculaceae)	Bhutan, India, Nepal	<a href="http://efloras.org">http://efloras.org</a>
42.	<i>Parrotiopsis</i> (Nied.) C.K. Schneid. (Hamamelidaceae)	Afghanistan, India, Pakistan	<a href="http://efloras.org">http://efloras.org</a>
43.	<i>Penkimia</i> Phukan & Odyuo (Orchidaceae)	China, India	<a href="http://efloras.org">http://efloras.org</a>
44.	<i>Piptanthus</i> Sweet (Fabaceae)	Bhutan, China, India, Myanmar, Tibet	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a> <a href="http://botany.si.edu/myanmar">http://botany.si.edu/myanmar</a>
45.	<i>Platystemma</i> Wall. (Gesneriaceae)	Bhutan, China, India, Nepal	<a href="http://efloras.org">http://efloras.org</a>
46.	<i>Pleurospermopsis</i> C. Norman (Apiaceae)	Bhutan, China, India, Nepal	<a href="http://efloras.org">http://efloras.org</a>
47.	<i>Polyura</i> Hook.f. (Rubiaceae)	China, India, Vietnam	<a href="http://efloras.org">http://efloras.org</a>
48.	<i>Pottingeria</i> Prain (Celastraceae)	India, Thailand	<a href="http://ipni.org">http://ipni.org</a>
49.	<i>Praecitrullus</i> Pangalo (Cucurbitaceae)	India, Pakistan	<a href="http://efloras.org">http://efloras.org</a>
50.	<i>Pseudaidia</i> Tirveng. (Rubiaceae)	India, Sri Lanka	<a href="http://apps.kew.org/wcsp">http://apps.kew.org/wcsp</a>
51.	<i>Pseudodichanthium</i> Bor (Poaceae)	Arabia, India	<a href="http://www.kew.org/data/grasses-db">www.kew.org/data/grasses-db</a>
52.	<i>Pycnoplinthus</i> O.E. Schulz (Brassicaceae)	China, India, Tibet	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
53.	<i>Roylea</i> Wall. ex Benth. (Lamiaceae)	India, Nepal	<a href="http://efloras.org">http://efloras.org</a>
54.	<i>Sadiria</i> Mez (Myrsinaceae)	India, Myanmar	<a href="http://ipni.org">http://ipni.org</a> ; <a href="http://botany.si.edu/myanmar">http://botany.si.edu/myanmar</a>
55.	<i>Spermadictyon</i> Roxb. (Rubiaceae)	Bhutan, India, Nepal, Pakistan	<a href="http://efloras.org">http://efloras.org</a>
56.	<i>Sphaerosacme</i> Wall. ex M. Roem. (Meliaceae)	Bhutan, India, Nepal	<a href="http://efloras.org">http://efloras.org</a>
57.	<i>Stilbanthus</i> Hook.f. (Amaranthaceae)	Bhutan, India, Myanmar	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://botany.si.edu/myanmar">http://botany.si.edu/myanmar</a>
58.	<i>Theropogon</i> Maxim. (Convallariaceae)	Bhutan, China, India, Nepal	<a href="http://efloras.org">http://efloras.org</a>
59.	<i>Tordyliopsis</i> DC. (Apiaceae)	Bhutan, China, India, Nepal	<a href="http://efloras.org">http://efloras.org</a>

60.	<i>Trachydium</i> Lindl. (Apiaceae)	Afghanistan, China, India, Iran, Tibet, Turkestan	<a href="http://efloras.org">http://efloras.org</a> ; <a href="http://ipni.org">http://ipni.org</a>
61.	<i>Treutlera</i> Hook.f. (Apocynaceae)	Bhutan, India, Nepal	<a href="http://efloras.org">http://efloras.org</a>
62.	<i>Trochiscus</i> O.E. Schulz (Brassicaceae)	India, New Guinea	<a href="http://ipni.org">http://ipni.org</a>

Table 2. Genera earlier considered endemic but now merged with parent/allied genera

Sl. No.	Genus (Family)	Genus with which merged	Source
1.	<i>Aechmanthera</i> Nees (Acanthaceae)	<i>Strobilanthes</i> Blume	Moylan <i>et al.</i> , 2004; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
2.	<i>Archiclematis</i> (Tamura) Tamura (Ranunculaceae)	<i>Clematis</i> L.	Grey-Wilson, 2000; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a> ; <a href="http://efloras.org">http://efloras.org</a>
3.	<i>Baeolepis</i> Decne. ex Moq. (Apocynaceae)	<i>Decalepis</i> Wight & Arn.	Venter & Verhoeven, 1997; Mabberley, 2008
4.	<i>Brachycaulos</i> R.D. Dixit & Panigrahi (Rosaceae)	<i>Chamaerhodos</i> Bunge	Brummitt, 1992; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
5.	<i>Carvia</i> Bremek. (Acanthaceae)	<i>Strobilanthes</i> Blume	Venu, 2006; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
6.	<i>Curcumorpha</i> A.S. Rao & D.M. Verma (Zingiberaceae)	<i>Boesenbergia</i> Kuntze	<a href="http://www.kew.org/wcsp/monocots">http://www.kew.org/wcsp/monocots</a> ; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
7.	<i>Dicoelospermum</i> C.B. Clarke (Cucurbitaceae)	<i>Cucumis</i> L.	Ghebretinsae <i>et al.</i> , 2007; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
8.	<i>Frerea</i> Dalzell (Apocynaceae)	<i>Desmidorchis</i> Ehrenb.	Almeida, 2001; <a href="http://ipni.org">http://ipni.org</a>
9.	<i>Griffithella</i> (Tul.) Warm. (Podostemaceae)	<i>Cladopus</i> H.A. Möller	<a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
10.	<i>Hydrobryopsis</i> Engl. (Podostemaceae)	<i>Zeylanidium</i> (Tul.) Engl.	Mabberley, 2008
11.	<i>Indoneesiella</i> Sreem. (Acanthaceae)	<i>Andrographis</i> Wall. ex Nees	<a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
12.	<i>Janakia</i> J. Joseph & V. Chandras. (Apocynaceae)	<i>Decalepis</i> Wight & Arn.	Venter & Verhoeven, 1997; Mabberley, 2008; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
13.	<i>Jejosephia</i> A.N. Rao & Mani (Orchidaceae)	<i>Trias</i> Lindl.	Mabberley, 2008
14.	<i>Maferria</i> C. Cusset (Podostemaceae)	<i>Farmeria</i> Willis ex Trimen	Sasidharan, 2004; <a href="http://apps.kew.org/wcsp">http://apps.kew.org/wcsp</a>
15.	<i>Pauia</i> Deb & R.M. Dutta (Solanaceae)	<i>Atropa</i> L.	Hunziker, 2001; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
16.	<i>Paracautleya</i> R.M. Sm. (Zingiberaceae)	<i>Curcuma</i> L.	Škornickova & Sabu, 2005; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
17.	<i>Pentabothra</i> Hook.f. (Apocynaceae)	<i>Vincetoxicum</i> Wolf	Liede, 1997; Mabberley, 2008; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
18.	<i>Proteroceras</i> J. Joseph & Vajr. (Orchidaceae)	<i>Pteroceras</i> Hasselt ex Hassk.	<a href="http://www.kew.org/wcsp/monocots">http://www.kew.org/wcsp/monocots</a>

Table 2. contd.

19.	<i>Pubistylus</i> Thoth. (Rubiaceae)	<i>Diplospora</i> DC.	Gangopadhyay & Chakrabarty, 1993; <a href="http://ipni.org">http://ipni.org</a>
20.	<i>Staintoniella</i> H. Hara (Brassicaceae)	<i>Aphragmus</i> Andr. ex DC.	Al-Shehbaz, 2000; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
21.	<i>Supushpa</i> Suryan. (Acanthaceae)	<i>Strobilanthes</i> Blume	Venu, 2006; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>
22.	<i>Utleria</i> Bedd. ex Benth. & Hook.f. (Apocynaceae)	<i>Decalepis</i> Wight & Arn.	Venter & Verhoeven, 2001; <a href="http://www.ars-grin.gov">http://www.ars-grin.gov</a>

### Current estimate of endemic genera in India

A total of 2991 genera are reported to occur in India (Karthikeyan, 2009). A critical analysis of literature including plant database websites shows that only 49 genera are endemic to India that belong to 22 families and contain 80 taxa (Table 3). Among these 40 genera are confined to Peninsular India, four in the Himalaya and three in the Andaman & Nicobar Islands and one i.e., *Bentinckia* shows disjunct distribution. *Hardwickia* is widely distributed throughout the dry deciduous forests of Peninsular and North India, excluding Northeast India. The families, Poaceae, Apiaceae, Asteraceae and Orchidaceae account for nearly 51% of generic endemism in India among which Poaceae alone accounts for 27%. These genera are represented by 34 herbaceous, 12 arborescent and three shrubby species.

These genera are distributed in various forest types (Fig. 1). A few genera such as *Anaphyl-lum*, *Decalepis*, *Helicanthes*, *Otonophelium* and *Sphyranthera* occur in close ranging forest types

such as moist deciduous and wet evergreen forests.

Thirty six genera are unispecific of which 25 are herbaceous, two are shrubby and nine are arborescent. Of the 25 unispecific herbaceous genera 21 are restricted to Peninsular India.

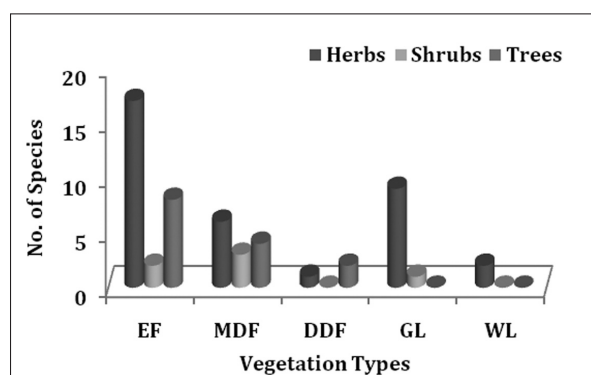


Fig. 1. Habitat and life-forms of endemic genera (EF – Evergreen Forests; MDF – Moist Deciduous Forests; DDF – Dry Deciduous Forests; GL – Grasslands; WL – Wetlands).

Table 3. Endemic genera of India

Sl. No.	Genera (Family)	Species	Habit	Habitat	Distribution	Threat Status/ Source
<b>HIMALAYA</b>						
1.	<i>India</i> A.N. Rao (Orchidaceae)	<i>I. arunachalensis</i> A.N. Rao	H	EF	ARP	NA
2.	<i>Kashmiria</i> D.Y. Hong (Scrophulariaceae)	<i>K. himalaica</i> (Hook.f.) D.Y. Hong	H	EF	J & K	NA
3.	<i>Parakaempferia</i> A.S. Rao & D.M. Verma (Zingiberaceae)	<i>P. synantha</i> A.S. Rao & D.M. Verma	H	EF	AS	NA
4.	<i>Stapletonia</i> P. Singh <i>et al.</i> (Poaceae)	<i>S. arunachalensis</i> (H.B. Naithani) P. Singh <i>et al.</i>	H	EF	ARP	NA

Table 3. contd.

PENINSULAR INDIA						
5.	<i>Adenoon</i> Dalzell (Asteraceae)	<i>A. indicum</i> Dalzell	H	GL	WG of KA, KL, MH, TN	NA
6.	<i>Aenhenrya</i> Gopalan (Orchidaceae)	<i>A. rotundifolia</i> (Blatt.) C.S. Kumar & F.N. Rasm.	H	EF	WG of KL, TN	CR (Gopalan & Henry, 2000)
7.	<i>Agasthiyamalaia</i> S. Rajkumar & Janarth. (Calophyllaceae)	<i>A. pauciflora</i> (Bedd.) S. Rajkumar & Janarth.	T	EF	WG of KL, TN	CE (B1+2c) (WCMC, 1998)
8.	<i>Anaphyllum</i> Schott (Araceae)	<i>A. beddomei</i> Engl.	H	EF	WG of KL, TN	NA
		<i>A. wightii</i> Schott	H	EF, MDF	WG of KL, TN	NA
9.	<i>Bhidea</i> Stapf ex Bor (Poaceae)	<i>B. borii</i> Deshp. <i>et al.</i>	H	GL	WG of KA	NA
		<i>B. burnsiana</i> Bor	H	GL	WG of KA, KL, MH	R (Deshpande, 1987a)
		<i>B. fischeri</i> Sreek. & B.V. Shetty	H	GL	WG of KL, MH	NA
10.	<i>Blepharistemma</i> Wall. ex Benth. (Rhizophoraceae)	<i>B. serratum</i> (Dennst.) Suresh	ST	MDF	WG of KA, KL	V (Nayar, 1996)
11.	<i>Chandrasekharania</i> V.J. Nair <i>et al.</i> (Poaceae)	<i>C. keralensis</i> V.J. Nair <i>et al.</i>	H	GL	WG of KA, KL	NA
12.	<i>Danthonidium</i> C.E. Hubb. (Poaceae)	<i>D. gammiei</i> (Bhide) C.E. Hubb.	H	GL	WG of KA, KL, MH	NA
13.	<i>Decalepis</i> Wight & Arn. (Apocynaceae)	<i>D. arayalpathra</i> (J. Joseph & V. Chandras.) Venter	S	RSH	WG of KL, TN	CE (Gopalan & Henry, 2000)
		<i>D. hamiltonii</i> Wight & Arn.	CS	DDF/SJ	WG of KA, KL, TN and EG of AP, TN	NA
		<i>D. nervosa</i> (Wight & Arn.) Venter	CS	EF	WG of KL, TN	NA
		<i>D. salicifolia</i> (Bedd. ex Hook.f.) Venter	S	GL	WG of KL, TN	E (Nayar, 1996)
14.	<i>Deccania</i> Tirveng. (Rubiaceae)	<i>D. pubescens</i> (Roth) Tirveng. var. <i>pubescens</i>	T	DEF, DDF	AP, TN	NA
		<i>D. pubescens</i> var. <i>candolleana</i> (Wight & Arn.) Tirveng.	T	DEF, DDF	AP, KA, TN	NA



Table 3. contd.

15.	<i>Erinocarpus</i> Nimmo ex J. Graham (Malvaceae)	<i>E. nimmonii</i> J. Graham	T	MDF, DDF	WG of MH, KA	R (Ahmedullah & Nayar, 1990)
16.	<i>Glyphochloa</i> Clayton (Poaceae)	<i>G. acuminata</i> (Hack.) Clayton var. <i>acuminata</i>	H	GL	WG of KA, KL, MH, TN	NA
		<i>G. acuminata</i> var. <i>stocksii</i> (Hook.f.) Clayton	H	GL	WG of MH	NA
		<i>G. acuminata</i> var. <i>woodrowii</i> (Bor) Clayton	H	GL	WG of MH	NA
		<i>G. divergens</i> (Hack.) Clayton var. <i>divergens</i>	H	GL	WG of KA, KL	R (Deshpande, 1987b)
		<i>G. divergens</i> var. <i>hirsuta</i> (C.E.C. Fisch.) Clayton	H	GL	WG of KA	NA
		<i>G. forficulata</i> (C.E.C. Fisch.) Clayton	H	GL	WG of KA, KL, MH, TN	NA
		<i>G. goaensis</i> (R.S. Rao & Hemadri) Clayton	H	GL	WG of GA	NA
		<i>G. henryi</i> Janarth. <i>et al.</i>	H	GL	WG of GA	NA
		<i>G. mysorensis</i> (S.K. Jain & Hemadri) Clayton	H	GL	WG of KA	NA
		<i>G. ratnagirica</i> (Kulkarni & Hemadri) Clayton	H	GL	WG of MH	NA
		<i>G. santapau</i> (S.K. Jain & Deshp.) Clayton	H	GL	WG of MH	R (Deshpande, 1988)
		<i>G. talbotii</i> (Hook.f.) Clayton	H	GL	WG of MH	V (Deshpande, 1987c)
		<i>G. veldkampii</i> M.A. Fonseca & Janarth.	H	GL	WG of GA	NA

Table 3. contd.

17.	<i>Haplanthodes</i> Kuntze (Acanthaceae)	<i>H. nilgherrensis</i> (Wight) Majumdar	H	MDF	WG of KA, KL	NA
		<i>H. plumosa</i> (T. Anderson) Panigrahi & G.C. Das	H	MDF	WG of MH	V (Nayar, 1996)
		<i>H. tentaculatus</i> (L.) Majumdar	H	MDF	WG of GJ, MH	NA
		<i>H. verticillatus</i> (Roxb.) Majumdar	H	MDF	WG of KA, MH	NA
18.	<i>Haplothismia</i> Airy Shaw (Burmanniaceae)	<i>H. exannulata</i> Airy Shaw	H	EF	WG of KL	PE (Nayar, 1997); relocated by Sasidharan & Sujanapal (2000). NA.
19.	<i>Helicanthes</i> Danser (Loranthaceae)	<i>H. elastica</i> (Desr.) Danser	S	EF, MDF/P	WG of KA, MH	NA
20.	<i>Hubbardia</i> Bor (Poaceae)	<i>H. heptaneuron</i> Bor	H	MRL in MDF	WG of KA, MH	CE (Yadav <i>et al.</i> , 2009)
21.	<i>Indobanalia</i> A.N. Henry & B. Roy (Amaranthaceae)	<i>I. thyrsiflora</i> (Moq.) A.N. Henry & B. Roy	H	EF	WG of KA, KL, TN	NA
22.	<i>Indopoa</i> Bor (Poaceae)	<i>I. paupercula</i> (Stapf) Bor	H	R/TT/W	WG of KA, KL, MH	NA
23.	<i>Jerdonia</i> Wight (Scrophulariaceae)	<i>J. indica</i> Wight	H	EF	WG of KA, KL, TN	NA
24.	<i>Karnataka</i> P.K. Mukh. & Constance (Apiaceae)	<i>K. benthamii</i> (C.B. Clarke) P.K. Mukh. & Constance	H	EF	WG of KA	NA
25.	<i>Lamprachaenium</i> Benth. (Asteraceae)	<i>L. microcephalum</i> Benth.	H	MDF	WG of GA, KA, MH	NA
26.	<i>Leucoblepharis</i> Arn. (Asteraceae)	<i>L. subsessilis</i> Arn.	S	MDF	WG of KA, MH, MP, TN and EG of AP	NA
27.	<i>Limnopoia</i> C.E. Hubb. (Poaceae)	<i>L. meeboldii</i> (C.E.C. Fisch.) C.E. Hubb.	H	WL	WG of KA, KL	NA

Table 3. contd.

28.	<i>Lophopogon</i> Hack. (Poaceae)	<i>L. kingii</i> Hook.f.	H	DL	BI	NA
		<i>L. tridentatus</i> (Roxb.) Hack.	H	P – LA/ DL	AP, BI, GJ, KA, MP, MH, TN	NA
29.	<i>Meteoromyrtus</i> Gamble (Myrtaceae)	<i>M. wynaadensis</i> (Bedd.) Gamble	ST	EF	WG of KL, TN	CE (B1+2c) (WCMC, 1998)
30.	<i>Nanothamnus</i> Thomson (Asteraceae)	<i>N. sericeus</i> Thomson	H	GSGS	WG of KA, MH	R (Nayar, 1996)
31.	<i>Otonephelium</i> Radlk. (Sapindaceae)	<i>O. stipulaceum</i> (Bedd.) Radlk.	T	EF, MDF	WG of KA, KL, TN	NA
32.	<i>Paracaryopsis</i> (Riedl) R.R. Mill (Boraginaceae)	<i>P. coelestina</i> (Lindl.) R.R. Mill	H	RSLP	WG of MH	NA
		<i>P. lambertiana</i> (C.B. Clarke) R.R. Mill	H	GL	WG of MH	NA
		<i>P. malabarica</i> (C.B. Clarke) R.R. Mill	H	GL	WG of MH	NA
33.	<i>Pinda</i> P.K. Mukh. & Constance (Apiaceae)	<i>P. concanensis</i> (Dalzell) P.K. Mukh. & Constance	H	MDF	WG of MH	R (Nayar, 1996)
34.	<i>Poeciloneuron</i> Bedd. (Calophyllaceae)	<i>P. indicum</i> Bedd.	T	EF	WG of KA, KL, TN	NA
35.	<i>Pogonachne</i> Bor (Poaceae)	<i>P. racemosa</i> Bor	H	SGWC	WG of MH	NA
36.	<i>Polyzygus</i> Dalzell (Apiaceae)	<i>P. tuberosus</i> Dalzell	H	GL	WG of KA, KL, MH	R (Singh & Kulkarni, 1990)
37.	<i>Seshagiria</i> M.Y. Ansari & Hemadri (Apocynaceae)	<i>S. sahyadrica</i> M.Y. Ansari & Hemadri	H	MDF	WG of KA, MH, TN	R (Ansari, 1988)
38.	<i>Silentvalleya</i> V.J. Nair <i>et al.</i> (Poaceae)	<i>S. nairii</i> V.J. Nair <i>et al.</i>	H	HAG	WG of KL	NA
39.	<i>Smithsonia</i> C.J. Saldanha (Orchidaceae)	<i>S. maculata</i> (Dalzell) C.J. Saldanha	H	MDF	WG of KA, KL, TN	NA
		<i>S. straminea</i> C.J. Saldanha	H	EF	WG of KA, KL	NA
		<i>S. viridiflora</i> (Dalzell) C.J. Saldanha	H	EF	WG of KA, KL, MH	NA

Table 3. contd.

40.	<i>Trilobachne</i> Schenck ex Henrard (Poaceae)	<i>T. cookei</i> (Stapf) Schenck ex Henrard	H	HS	WG of GJ, KA, KL, MH	NA
41.	<i>Triplopogon</i> Bor (Poaceae)	<i>T. ramosissimus</i> (Hack.) Bor	H	SPHF	WG of MH	NA
42.	<i>Vanasushava</i> P.K. Mukh. & Constance (Apiaceae)	<i>V. pedata</i> (Wight) P.K. Mukh. & Constance	H	HAG	WG of KA, KL, TN	R (Mukherjee, 1988)
43.	<i>Willisia</i> Warm. (Podostemaceae)	<i>W. arekaliana</i> Shivam. & K.B. Sadanand	H	AQ	KL	NA
		<i>W. selaginoides</i> (Bedd.) Warm. ex J.C. Willis	H	RRS	WG of KL, TN	R (Vajravelu, 1988)
44.	<i>Xenikophyton</i> Garay (Orchidaceae)	<i>X. seidenfadenianum</i> M. Kumar <i>et al.</i>	H	EF	WG of KL	NA
		<i>X. smeeanum</i> (Rchb.f.) Garay	H	EF	WG of KA, KL, TN	NA
<b>ANDAMAN &amp; NICOBAR ISLANDS</b>						
45.	<i>Nicobariodendron</i> Vasudeva Rao & Chakrab. (Celastraceae)	<i>N. sleumeri</i> Vasudeva Rao & Chakrab.	T	MDF, EF	NI	NA
46.	<i>Pseudodiplospora</i> Deb (Rubiaceae)	<i>P. andamanica</i> (N.P. Balakr. & N.G. Nair) Deb	T	EF	AI	R (Nayar, 1996)
47.	<i>Sphyrnanthera</i> Hook.f. (Euphorbiaceae)	<i>S. airyshawii</i> Chakrab. & Vasudeva Rao	T	MDF, EF	A & NI	R (Nayar, 1996)
		<i>S. lutescens</i> (Kurz) Pax & K. Hoffm.	T	LF	A & NI	NA
<b>PENINSULAR AND NORTH INDIA (excluding Northeast India)</b>						
48.	<i>Hardwickia</i> Roxb. (Fabaceae)	<i>H. binata</i> Roxb.	T	DDF	AP, BI, DL, GA, GJ, KA, KL, MP, MH, PB, RJ, TN, UP	NA

## DISJUNCT

49.	<i>Bentinckia</i> Berry ex Roxb. (Arecaceae)	<i>B. condapanna</i> Berry ex Roxb.	T	EF	WG of KL, TN	V (A1c) (Johnson, 1998)
		<i>B. nicobarica</i> (Kurz) Becc.	T	EF	NI	E (C2a) (Johnson, 1998)

Habit: CS – Climbing Shrub; H – Herb; S – Shrub; ST – Small Tree; T – Tree.

Habitat: AQ – Aquatic; DDF – Dry deciduous forests; DDF/SJ – Dry deciduous forests/scrub jungle; DEF – Dry evergreen forests; DL – Dry localities; EF – Evergreen forests; P – Plains; GL – Grasslands; GSGS – Grassy slopes and gravelly soil; HAG – High altitude grasslands; HS – Hill slopes; LF – Littoral forests; DDF – Dry deciduous forests; MDF – Moist deciduous forests; MRL – Moist rocky localities; P – LA/DL – Plains to low altitude, dry localities; RRS – Rocks, in running streams; RSH – Rocky slopes in hills; RSLP – Rocky slopes and lateritic plateaus; R/TT/W – On rocks, tree trunks and on old walls; SGWC – Slopes of Ghats near water courses; SP – HF – Stony places in the hill forests; WL – Wetlands.

Distribution: AI – Andaman Islands; A & NI – Andaman & Nicobar Islands; AP – Andhra Pradesh; ARP – Arunachal Pradesh; AS – Assam; BI – Bihar; DL – Delhi; GA – Goa; GJ – Gujarat; J & K – Jammu & Kashmir; KA – Karnataka; KL – Kerala; MP – Madhya Pradesh; MH – Maharashtra; NI – Nicobar Islands; PB – Punjab; RJ – Rajasthan; TN – Tamil Nadu; UP – Uttar Pradesh; WG – Western Ghats; EG – Eastern Ghats; W & EG – Western & Eastern Ghats.

Threat Status: CR – Critically Endangered; E – Endangered; NA – Not Assessed; PE – Possibly Extinct; R – Rare; V – Vulnerable.

All the genera of the Himalaya are unispecific and herbaceous. Family such as Poaceae (10 genera), Apiaceae, Asteraceae and Orchidaceae (4 genera each) have more number of herbaceous unispecific genera.

### Threat status of indian endemic genera

Though most of the species of these genera are confined to a narrow range; species belonging to only four genera have been assessed by the IUCN. *Agasthiyamalaia pauciflorum* (earlier treated as *Poeciloneuron pauciflorum*) is reported as critically endangered. *Bentinckia condapanna* categorised as vulnerable and *Bentinckia nicobarica* as endangered. *Meteoromyrtus wynaadensis* is reported as critically endangered. *Haplothismia exannulata* has been assessed as possibly extinct (Nayar, 1997). However, Sasidharan & Sujana (2000) relocated it from its type locality. Hence, its present status should be assessed. However, species of these genera such as *Erinocarpus nimmonii*, assessed as Rare by Ahmedullah & Nayar (1990); Deshpande (1987a, b, c, 1988) assessed *Bhidea burnsiana* (Rare), *Glyphochloa divergens* (Rare), *G. santapau* (Rare) and *G. talbotii* (Vulnerable). Singh & Kulkarni (1990) assessed *Polyzygus tuberosus* (Rare), Mukherjee (1988) assessed *Vanasushava pedata* (Rare), Ansari (1988) assessed *Seshagiria sahyadrica* (Rare) and Vajravelu (1988) assessed *Willisia selaginoides* (Rare). All these assessments were based on pre 1994 IUCN Criteria.

## Discussion

### Life-forms of the endemic genera

About 71% of the genera are herbaceous. Angiosperms in India are usually dominated by herbaceous families (Karthikeyan, 2009). A review on the unispecific taxa of India also reveals that herbs showing high level endemism than other life-forms (Rana & Ranade, 2009). The study by Joshi & Janarthanam (2004) on the endemic plants of Western Ghats in Goa also corroborates our observation.

### Unispecific genera

Unispecific genera are restricted to small geographical areas and are the key floristic elements of a region (Rana & Ranade, 2009). They are more vulnerable due to narrow distributional range. About 69% of the unispecific genera are herbaceous. Nine of them are trees of which six are restricted to the Western Ghats. They are *Agasthiyamalaia*, *Blepharistemma*, *Erinocarpus*, *Meteoromyrtus*, *Otonophelium* and *Poeciloneuron*. The families Calophyllaceae, Rhizophoraceae, Malvaceae and Sapindaceae to which these genera belong, have evolved 80 – 100 mya (Soltis *et al.*, 2005). Based on the evolutionary age of the family and geological age of the region the endemic tree genera of the Western Ghats may be considered as paleoendemic relicts. *Nicobariodendron* and *Pseudodiplospora* are the two

unispecific genera reported from the Andaman & Nicobar Islands. Though the shrub community is very rich in the understory of wet evergreen forest in Western Ghats, endemism among the shrub genera is very poor (Krishnan & Davidar, 2007). *Helicanthes* and *Leucoblepharis* are the only two unispecific shrub genera reported from Peninsular India.

### Endemic genera of the Indian Himalaya

Indian Himalaya is classified into five subdivisions namely Trans Himalaya (Northern and Central Jammu & Kashmir and Northern Himachal Pradesh), Northwestern Himalaya (Southern part of Jammu & Kashmir and Central Himachal Pradesh), Western Himalaya (Uttarakhand), Central Himalaya (Sikkim and North Bengal (Darjeeling)) and Eastern Himalaya (Arunachal Pradesh, Assam Hills, Meghalaya, Nagaland, Manipur, Mizoram and Tripura) (Nandy *et al.*, 2006). Nayar (1996) reported 70 genera as endemic to the Himalaya whereas, Mitra & Mukherjee (2007) reported only 56 genera. Majority of these genera are distributed in the neighbouring countries as well and a few are merged with their parent/allied genera. The present analysis shows that only four genera namely, *India*, *Kashmiria*, *Parakaempferia* and *Stapletonia* are endemic to the Indian Himalaya. These unispecific genera were described in the last four decades except the latter which has recently been described (Dash *et al.*, 2009).

### Endemic genera of Peninsular India

Peninsular India is the richest endemic centre that harbours nearly 82% of the total endemic genera of the country. Hill tops provide a good environment for endemism next to islands (Turill, 1964). The high percentage of endemism in the Western Ghats resembles oceanic islands (Subramanyam & Nayar, 1974). The species richness in the Western Ghats is due to varied latitudinal and altitudinal gradients with varied rainfall and temperature. These characters also favour a high degree of endemism. Nayar (1996) concluded that most of the endemic species in peninsular region are paleoendemics that are found in hills of Peninsular India and the present analysis corroborates.

Of the 40 endemic genera in Peninsular India 36 are distributed in the Western Ghats and three in the Western and Eastern Ghats. The genus *Lophopogon* is distributed in the dry localities. Nayar (1996) recognized eight micro-endemic centres in the Western Ghats based on high percentage of endemism. The genera are mostly concentrated and widespread in these eight micro-endemic centres except a few very narrow endemics. *Paracaryopsis* is

confined to the Mahabaleshwar – Khandala micro-endemic centre, *Pinda* and *Pogonachne* are confined to the Konkan – Raigad centre and *Triplopogon* confined to the Konkan – Raigad and Mahabaleshwar – Khandala centres. Whereas *Haplothismia* and *Silentvalleya* are confined to the Nilgiri – Silent Valley – Wayanad – Kodagu centre and *Karnataka* is confined to the Shimoga – Kanara centre.

Poaceae are the dominant family in Western Ghats (Arora, 1964; Parthasarathy, 1983; Nair & Daniel, 1986; Venu, 1998). Grass genera are mostly concentrated in Karnataka, Kerala and Maharashtra. The family shows the highest generic endemism represented by 13 endemic genera. Higher number of endemic genera in Poaceae can be attributed to earlier stages in evolution and dynamism of the family. About 72% of the genera of Poaceae have been reported from grasslands. Two namely *Limnopoia* and *Pogonachne* occur in wetland habitats. The genus *Glyphochloa* consists of more number of taxa (13 taxa).

Seven tree genera have been reported from Peninsular India of which six are distributed in the Western Ghats. *Agasthiyamalaia* and *Meteoromyrtus* are confined to the Southern Western Ghats of Kerala and Tamil Nadu. *Erinocarpus* distributed in central and northern Western Ghats whereas, *Blepharistemma*, *Otonephelium* and *Poeciloneuron* are distributed in central and southern Western Ghats. *Deccania* occurs in dry deciduous forests of Tamil Nadu, Andhra Pradesh and Karnataka.

### Endemic genera of the Andaman & Nicobar Islands

Andaman & Nicobar Islands located in the Bay of Bengal are considered as continental islands. Continental Islands are usually rich in flora but show poor endemism (Nayar, 1996). Based on the phylogeographical affinities Takhtajan (1986) included the Andaman Islands under the Indochinese region and the Nicobar Islands under the Malesian region. The present analysis shows that only three genera are endemic to these islands and occur in wet evergreen to moist deciduous forests. *Nicobariodendron* (Celastraceae) described from Nicobar Islands was treated as an uncertain genus by Simons (2004). However, following Mitra & Mukherjee (2007) and Mabberley (2008) it is treated here as distinct genus. The Andaman Islands are rich in tree diversity and dominated by Euphorbiaceae followed by Rubiaceae (Padalia *et al.*, 2004; Reddy & Prasad, 2008). The two endemic genera of these islands, *Pseudodiplospora* and *Sphyrnanthera* belong to Rubiaceae and Euphorbiaceae respectively.

### Distribution of *Hardwickia*

The genus *Hardwickia* is widely distributed throughout the degraded dry deciduous forests of Peninsular and North India, excluding Northeast India. It thrives well in dry places. This is the only endemic genus seen in cultivation for fodder and timber (Watt, 1890; CSIR, 1959). *Hardwickia binata* has been introduced in Pakistan as ornamental tree (<http://efloras.org>).

### Disjunct distribution of *Bentinckia* species

*Bentinckia* though has two species shows disjunct distribution. *Bentinckia condapanna* is distributed in the Southern Western Ghats in Peninsular India whereas *B. nicobarica* is restricted to the Nicobar Islands. Geographical isolation is the key factor in the evolution of these two species. Studies on endemic species of Juan Fernandez Islands, Chile showed that spatial isolation is one of the major contributing factors that separate the closely related pairs of endemic species (Stuessy *et al.*, 1998). However, molecular systematic studies might provide a better understanding of the affinities of these two disjunct species.

### Threat status and conservation

A large number of species belonging to endemic genera of India are yet to be assessed for their status. Of the 80 taxa belonging to these genera only 23 taxa have been assessed. Among these only four belonging to *Agasthiyamalaia* (1 sp.), *Bentinckia* (2 spp.) and *Meteoromyrtus* (1 sp.) have been assessed filling the IUCN Criteria (version 2.3). Hence, there is a need to assess the status of all the rest of the taxa on a priority basis. The status of taxa that have been already assessed also needs to be reassessed (Table 3). Majority of the endemic species are threatened due to their narrow habitat, presence of few seeds per fruit, low dispersal rate and less viable seeds (Gomez-Pompa *et al.*, 1972; Bawa, 1974; Ashton, 1981; Chithra & Nair, 1999; Abeli, 2010). Endemic taxa, especially narrow endemics, are more vulnerable and may get extinct due to the anthropogenic interferences (Rossi, 2009; Abeli, 2010). Nayar (1980) reported that most of the paleoendemic species that occur in geographically isolated habitats are prone to extinction due to genetic or ecological barriers.

Conservation priority should be given to endemic genera/species which are confined to a particular ecological region/niche as species once lost will be lost forever (Raven, 1988; Nayar, 1996). Population of many of the endemic taxa are fragmented. If the dispersal rate of the fragmented population

is not as fast as the change in landscape, their survival is at stake (Fahrig & Merriam, 1994; Abeli, 2010). Continuous monitoring of these fragmented population is required for better conservation management (Ramesh *et al.*, 1997). There is an acute paucity of data on reproductive biology and genetic variations of these populations that calls for focused studies. Some efforts have been undertaken by various research/academic institutions to conserve species of these endemic genera. One of the examples is the propagation of a critically endangered grass species, *Hubbardia heptaneuron* and its successful reintroduction in its type locality and in similar habitats in the Western Ghats in the states of Karnataka, Goa and Maharashtra (Yadav *et al.*, 2009). This provides a model for conservation of other species of endemic grass genera. The same model can also be followed for species of other herbaceous endemic genera of other families.

### Acknowledgements

We thank Dr. P. Lakshminarasimhan, Scientist D, Botanical Survey of India, Kolkata, Dr. S. Karthikeyan, Deputy Director (Retd.), Botanical Survey of India, Pune and Dr. V.P. Prasad, the former Indian Botanical Liaison Officer, Royal Botanic Gardens, Kew, for their help in literature. We also thank Dr. G.V.S. Murthy, Scientist F, Botanical Survey of India, Coimbatore, for permitting to refer the herbarium and library. We thank Dr. W. Arisdason, Assistant Professor, Department of Botany, Madras Christian College, Chennai, for critically going through the manuscript.

### Literature Cited

- Abeli, T. 2010.** Survival of small isolated plant populations: An integrated approach to evaluate population viability for future conservation actions. *Scientifica Acta* 4: 3 – 9.
- Ahmedullah, M. 2000.** Endemism in the Indian Flora. In: Singh, N.P., Singh, D.K., Hajra, P.K. & B.D. Sharma (Ed.), *Flora of India, Introductory Volume 1. Part 2*. Botanical Survey of India, Calcutta. pp. 246 – 265.
- Ahmedullah, M. & M.P. Nayar 1987.** *Endemic Plants of the Indian Region. Vol. 1. Peninsular India*. Botanical Survey of India, Calcutta.
- Ahmedullah, M. & M.P. Nayar 1990.** *Erinocarpus nimmonii* J. Graham. In: Nayar, M.P. & A.R.K. Sastry (Ed.), *Red Data Book of Indian Plants*. Vol. 3. Botanical Survey of India, Calcutta. p. 257.

- Airy Shaw, H.K. 1952.** A new genus and species of Burmanniaceae from South India. *Kew Bull.* **2:** 277 – 279.
- Almeida, M.R. 2001.** *Flora of Maharashtra State*. Vol. 3A. Orient Press, Mumbai. p. 241.
- Al-Shehbaz, I.A. 2000.** *Staintoniella* is reduced to synonymy of *Aphragmus* (Brassicaceae). *Harvard Pap. Bot.* **5:** 109 – 112.
- Anderberg, A.A. & A.K. Pandey 2008.** *Nanothamnus sericeus* Thomson, a derived species of *Blumea*. *Compos. Newsl.* **46:** 8 – 19.
- Ansari, M.Y. 1988.** *Seshagiria sahyadrica* M.Y. Ansari & Hemadri. In: Nayar, M.P. & A.R.K. Sastry (Ed.), *Red Data Book of Indian Plants*. Vol. 2. Botanical Survey of India, Calcutta. p. 62.
- Ansari, M.Y. & K. Hemadri 1971.** *Seshagiria* Ansari et Hemadri – A new genus of Asclepiadaceae from Sahyadri Ranges, India. *Indian Forester* **97:** 126 – 127.
- Arora, R.K. 1964.** Phytogeographical notes on the humid tropical flora of India – World distribution and analysis of the woody dicotyledonous flora of Western Ghats and Assam. *J. Indian Bot. Soc.* **43:** 220 – 228.
- Ashton, P.S. 1981.** Techniques for the identification and conservation of threatened species in tropical forests. In: Syngé, H. (Ed.), *The Biological Aspects of Rare Plant Conservation*. Wiley Inter Science, New York. pp. 155 – 164.
- Balakrishnan, N.P. & T. Chakrabarty 2007.** *The Family Euphorbiaceae in India*. Bishen Singh Mahendra Pal Singh, Dehra Dun.
- Bawa, K.S. 1974.** Breeding systems of tree species of a lowland tropical community. *Evolution* **28:** 85 – 92.
- Bhat, K.G. 1986.** *Limnopoia meeboldii* (Fischer) C.E. Hubb. (Poaceae), A new record for Karnataka. *Indian J. Forest.* **9:** 275.
- Bor, N.L. 1949.** *Pogonachne* Bor: A new genus of Indian grasses. *Kew Bull.* **4:** 176 – 178.
- Bor, N.L. 1954.** Notes on Asiatic Grasses: XV. *Triplopogon* Bor, a new genus of Indian grasses. *Kew Bull.* **9:** 51 – 56.
- Bor, N.L. 1958.** Notes on Asiatic Grasses: XXXII. *Indopoa* Bor, a new genus of Indian grasses. *Kew Bull.* **13:** 225 – 226.
- Bor, N.L. 1960.** *The Grasses of Burma, Ceylon, India and Pakistan*. Pergamon Press, London.
- Brummitt, R.K. 1992.** *Vascular Plant Families and Genera*. Royal Botanic Gardens, Kew.
- Chakrabarty, T. & V. Rao 1984.** A new species of *Sphyrnanthera* (Euphorbiaceae) from North Andaman Island. *J. Econ. Taxon. Bot.* **5:** 959 – 961.
- Chakraborti, S. 1981.** A new species of *Blepharistemma* from Western Ghats of India. *Indi. Sci. Congr. Assoc. Proc.* **68:** 69.
- Chatterjee, D. 1939.** Studies on the endemic flora of India and Burma. *J. Asiat. Soc. Bengal. Sci.* **5:** 19 – 68.
- Chithra, V. & V.J. Nair 1999.** Tamil Nadu. In: Mudgal, V. & P.K. Hajra (Ed.), *Floristic Diversity and Conservation Strategies in India*. Vol. 3. Botanical Survey of India, Calcutta. pp. 1451 – 1510.
- Clayton, W.D. 1981.** Notes on the Tribe Andropogoneae (Gramineae). *Kew Bull.* **35:** 813 – 818.
- Clayton, W.D., Harman, K.T. & H. Williamson 2011.** GrassBase – The Online World Grass Flora. <http://www.kew.org/data/grasses-db.html>.
- Clifford, H.T. 1967.** A contribution to the leaf-anatomy of *Hubbardia heptaneuron* Bor (Gramineae). *Kew Bull.* **21:** 169 – 174.
- Cooke, T. 1901 – 1908.** *The Flora of the Presidency of Bombay*. Vol. 1 & 2. Taylor & Francis, London.
- CSIR, 1959.** *The Wealth of India, A dictionary of Indian raw materials and industrial products*. Council of Scientific and Industrial Research, New Delhi. pp. 6 – 8.
- Dash, S.S., Kumari, P. & P. Singh 2009.** Notes on flowering in *Schizostachyum arunachalensis* H.B. Naithani (Poaceae: Bambusoideae). *Nelumbo* **51:** 241 – 244.
- Daniel, P. (Ed.) 2005.** *Flora of Kerala*. Vol. 1. Ranunculaceae – Connaraceae. Botanical Survey of India, Kolkata.
- Deshpande, U.R. 1987a.** *Bhidea burnsiiana* Bor. In: Nayar, M.P. & A.R.K. Sastry (Ed.), *Red Data Book of Indian Plants*. Vol. 1. Botanical Survey of India, Calcutta. p. 290.
- Deshpande, U.R. 1987b.** *Glyphochloa divergens* (Hack.) Clayton. In: Nayar, M.P. & A.R.K. Sastry (Ed.), *Red Data Book of Indian Plants*. Vol. 1. Botanical Survey of India, Calcutta. p. 301.
- Deshpande, U.R. 1987c.** *Glyphochloa talbotii* (Hook.f.) Clayton. In: Nayar, M.P. & A.R.K.



- Sastry (Ed.), *Red Data Book of Indian Plants*. Vol. 1. Botanical Survey of India, Calcutta. p. 302.
- Deshpande, U.R. 1988.** *Glyphochloa santapau* (S.K. Jain & U. Deshp.) Clayton. In: Nayar, M.P. & A.R.K. Sastry (Ed.), *Red Data Book of Indian Plants*. Vol. 2. Botanical Survey of India, Calcutta. p. 185.
- Deshpande, U.R., Prakash, V. & N.P. Singh 1989.** *Bhidea borii*, a new species of Poaceae from India. *Curr. Sci.* **58**: 1094 – 1095.
- eFloras, 2011.** Published on the Internet, <http://www.efloras.org> by Missouri Botanical Garden, St. Louis, Missouri & Harvard University Herbaria, Cambridge.
- Eriksson, T. 1990.** Reinstatement of the genus *Leucoblepharis* Arnott (Asteraceae: Heliantheae). *Bot. Jahrb. Syst.* **112**: 167 – 191.
- Fahring, L. & G. Merriam 1994.** Conservation of fragmented populations. *Conserv. Biol.* **8**: 52 – 59.
- Fonseca, M.A. & M.K. Janarthanam 2003.** A new species of *Glyphochloa* W.D. Clayton (Poaceae) from Goa, India. *Rheedea* **13**: 35 – 38.
- Gangopadhyay, M. & T. Chakrabarty 1993.** Additional notes on the status of *Pubistylus* Thoth. (Rubiaceae). *J. Econ. Taxon. Bot.* **17**: 439 – 440.
- Ghebretinsae, A.G., Thulin, M. & J.C. Barber 2007.** Nomenclatural changes in *Cucumis* (Cucurbitaceae). *Novon* **17**: 178.
- Gomez-Pompa, A., Vazquez-Yanes, G. & S. Guevara 1972.** The Tropical Rain Forest: A non-renewable resource. *Science* **177**: 762 – 765.
- 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, Dehra Dun.
- Govaerts, R. 2005.** *World Checklist of Myrtaceae*. The Board of Trustees of the Royal Botanic Gardens, Kew. Published on the Internet, <http://www.kew.org/wcsp>.
- Govaerts, R. 2006.** *World Checklist of Monocotyledons*. The Board of Trustees of the Royal Botanic Gardens, Kew. Published on the Internet, <http://www.kew.org/wcsp/monocots>.
- Govaerts, R., Ruhsam, M., Andersson, L., Robbrecht, E., Bridson, D.M., Davis, A.P., Schanzer, I. & B. Sonké 2011.** *World Checklist of Rubiaceae*. The Board of Trustees of the Royal Botanic Gardens, Kew. Published on the Internet: <http://apps.kew.org/wcsp>.
- Grey-Wilson, C. 2000.** *Clematis the Genus. A comprehensive guide for gardeners, horticulturists and botanists*. Timber Press, Portland.
- Hong, D.Y. 1980.** *Kashmiria* (Scrophulariaceae, Veroniceae), a new name for *Falconeria* Hook.f. from the Western Himalaya. *Bot. Not.* **133**: 565 – 567.
- Hunziker, A.T. 2001.** *The Genera of Solanaceae*. Ruggel, Lichtenstein, A.R.G. Gantner, Verlag.
- ILDIS, 2011.** *International Legume Database & Information Service*. <http://www.ildis.org>
- ING, 1996.** *Index Nominum Genericorum*. <http://botany.si.edu/ing/>
- IPNI, 2011.** *The International Plant Name Index*. <http://www.ipni.org>.
- Janarthanam, M.K., Joshi, V.C. & S. Rajkumar 2000.** *Glyphochloa henryi*, a New Species of Poaceae from Goa, India. *Rheedea* **10**: 99 – 102.
- Johnson, D. 1998.** *Bentinckia condapanna*, *Bentinckia nicobarica*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2010.4. [www.iucnredlist.org](http://www.iucnredlist.org). Downloaded on 28 May 2011.
- Joshi, V.C. & M.K. Janarthanam 2004.** The diversity, life-form type, habitat preference and phenology of the endemics in the Goa region of the Western Ghats, India. *J. Biogeogr.* **31**: 1227 – 1237.
- Kabeer, K.A.A. & V.J. Nair 2009.** *Flora of Tamil Nadu – Grasses*. Botanical Survey of India, Kolkata.
- Karthikeyan, S. 2009.** Flowering Plants of India in 19th and 21st Centuries – A Comparison. In: Krishnan, S. & D.J. Bhat (Ed.), *Plant and Fungal Biodiversity and Bioprospecting*. Broadway Book Centre, Goa. pp. 19 – 30.
- Karthikeyan, S., Sanjappa, M. & S. Moorthy 2009.** *Flowering Plants of India. Dicotyledons. Vol. I. Acanthaceae – Avicenniaceae*. Botanical Survey of India, Kolkata.
- Krishnan, R.M. & P. Davidar 2007.** The shrubs of the Western Ghats (South India): Floristics and status. *J. Biogeogr.* **23**: 783 – 789.
- Kumar, C.S. & F.N. Rasmussen 1997.** The Reappearance of *Odontochilus rotundifolius* Blatter and its transfer to *Aenhenrya* Gopalan (Orchidaceae). *Novon* **7**: 81 – 84.

- Kumar, P.V.S. & T. Coomar 1999.** *Bentinckia nicobarica*: An endemic, endangered palm of the Nicobar Islands. *Palms* **43**: 118 – 121.
- Kumar, P.V.S. & B.V. Shetty 1987.** *Bhidea fischeri*, a new species of Gramineae from India. *Kew Bull.* **42**: 683 – 685.
- Kumar, S. 1995.** Subtribe 6. Plucheineae Cass. In: Hajra, P.K., Rao, R.R., Singh, D.K. & B.P. Uniyal (Ed.), *Flora of India*. Vol. **13**. Botanical Survey of India, Calcutta. pp. 151 – 153.
- Liede, S. 1997.** Subtribes and genera of the tribe Asclepiadeae (Apocynaceae, Asclepiadoideae) – A synopsis. *Taxon* **46**: 238.
- Mabberley, D.J. 2008.** *Mabberley's Plant-Book, A portable dictionary of plants, their classification and uses*. Third Edition. Cambridge University Press, Cambridge.
- Mathew, S.P. & P. Lakshminarasimhan 1994.** Notes on two endemic Euphorbiaceae taxa from Andaman-Nicobar Islands, India. *Bull. Bot. Surv. India* **33**: 311 – 314.
- Matthew, K.M. 1991.** Notes on the distribution of *Bentinckia condapanna* on the Palani Hills in Peninsular India. *Principes* **35**: 139 – 141.
- Mill, R.R. 1991.** The generic position of C.B. Clarke's species of *Paracaryum* Boraginaceae. *Edinb. J. Bot.* **48**: 55 – 62.
- Mitra, S. & S.K. Mukherjee 2007.** Reassessment and diversity of endemic Angiospermic genera of India. *J. Econ. Taxon. Bot.* **31**: 163 – 176.
- Mittermeier, R.A., Gil, P.R., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C.G., Lamoreux, J. & G.A.B. da Fonseca 2004.** *Hotspots Revisited: Earth's biologically richest and most endangered terrestrial ecoregions*. CEMEX, Mexico.
- Moylan, E.C., Bennett, J.R., Carine, M.A., Olmstead, R.G. & R.W. Scotland 2004.** Phylogenetic relationships among *Strobilanthes* s.l. (Acanthaceae): Evidence from ITS nrDNA, trnL-F cpDNA, and morphology. *Amer. J. Bot.* **91**: 724 – 735.
- Mukherjee, P.K. 1988.** *Vanasushava pedata* (Wight) P.K. Mukh. & Constance. In: Nayar, M.P. & A.R.K. Sastry (Ed.), *Red Data Book of Indian Plants*. Vol. **2**. Botanical Survey of India, Calcutta. p. 30.
- Mukherjee, P.K. & L. Constance 1974.** *Vanasushava*, an old South Indian Umbellifer renamed. *Kew Bull.* **29**: 593 – 596.
- Mukherjee, P.K. & L. Constance 1986.** A New disposition of the South Indian *Heracleum concanense* Dalzell (Umbelliferae). *Kew Bull.* **41**: 223 – 229.
- Nair, N.C. & P. Daniel 1986.** The floristic diversity of the Western Ghats and its conservation: A Review. *Proc. Ind. Acad. Sci. (Animal /Pl. Sci.) Suppl.* **3**: 127 – 263.
- Nair, V.J., Ramachandran, V.S. & P.V. Sreekumar 1982.** *Chandrasekharania*: A new genus of Poaceae from Kerala India. *Proc. Ind. Acad. Sci. (Pl. Sci.)* **91**: 79 – 82.
- Nair, V.J., Sreekumar, P.V., Vajravelu, E. & P. Bhargavan 1983.** *Silentvalleya*: A new genus of Poaceae from Kerala, India. *J. Bombay Nat. Hist. Soc.* **79**: 654 – 657.
- Nandy, S.N., Dhyani, P.P. & P.K. Samal 2006.** Resource information database of the Indian Himalaya. *ENVIS Monograph* **3**: 1 – 123.
- Nayar, M.P. 1980.** Endemic flora of Peninsular India and its significance. *Bull. Bot. Surv. India* **22**: 12 – 23.
- Nayar, M.P. 1996.** *Hot spots of endemic plants of India, Nepal and Bhutan*. Tropical Botanic Garden and Research Institute, Thiruvananthapuram.
- Nayar, M.P. 1997.** Biodiversity challenges in Kerala and science of conservation biology. In: Pushpangadan, P. & K.S.S. Nair (Ed.), *Biodiversity of Tropical Forests – The Kerala Scenario*. The State Committee on Science, Technology and Environment (STEC), Govt. of Kerala. pp. 7 – 23.
- Nayar, T.S., Beegam, A.R., Mohanan, N. & G. Rajkumar 2006.** *Flowering Plants of Kerala – A Handbook*. Tropical Botanic Garden and Research Institute, Thiruvananthapuram.
- Orians, G.H. & M.J. Groom 2005.** Global Biodiversity: Patterns and Processes. In: Groom, M.J., Meffe, G.K. & R.C. Carroll (Ed.), *Principles of Conservation Biology*. Sinauer Associates, Inc. Publ., Massachusetts. pp. 27 – 60.
- Padalia, H., Chauhan, N., Porwal, M.C. & P.S. Roy 2004.** Phytosociological Observations on Tree Species Diversity of Andaman Islands, India. *Curr. Sci.* **87**: 799 – 806.
- Pandurangan, A.G., Ramachandran, V.S. & N.C. Nair 1984.** A note on new distribution and undescribed fruits of the rare plant *Meteoromyrtus wynaadensis* (Bedd.) Gamble (Myrtaceae) Kerala, India. *J. Econ. Taxon. Bot.* **5**: 1185 – 1188.

- Panigrahi, G. & G.C. Das 1983.** A revision of *Haplanthodes* O. Kuntze (Acanthaceae). *Bull. Bot. Surv. India* **23**: 197 – 203.
- Parthasarthy, N. 1983.** A phytogeographic analysis of the flora of Kalakad Reserve Forest, Western Ghats. *J. Indian Bot. Soc.* **67**: 342 – 346.
- Rajkumar, S. & M.K. Janarthanam 2007.** *Agasthiyamalaia* (Clusiaceae), a new genus for *Poeciloneuron pauciflorum*, an endemic and endangered tree of Western Ghats, India. *J. Bot. Res. Inst. Texas* **1**: 129 – 133.
- Ramesh, B.R., Menon, S. & K.S. Bawa 1997.** A vegetation based approach to biodiversity gap analysis in the Agastiyamalai region, Western Ghats, India. *Ambio* **26**: 529 – 536.
- Rana, T.S. & S.A. Ranade 2009.** The enigma of monotypic taxa and their taxonomic implications. *Curr. Sci.* **96**: 219 – 229.
- Rao, A.N. 1998.** *India arunachalensis* Nageswara Rao (Orchidaceae) – A new genus and species from Arunachal Pradesh (India). *J. Econ. Taxon. Bot.* **22**: 701 – 703.
- Rao, C.K. 1972.** Angiosperm genera endemic to the Indian floristic region and its neighboring areas I. *Indian Forester* **98**: 560 – 566.
- Rao, C.K. 1979.** Angiosperm Genera Endemic to the Indian Floristic Region and its Neighboring Areas II. Addition, Deletion and Correction. *Indian Forester* **105**: 335 – 341.
- Rao, M.K.V. & T. Chakrabarty 1986.** *Nicobariodendron* Vasud. & T. Chakrab. (Celastraceae): A new genus from the Nicobar Islands, India. *J. Econ. Taxon. Bot.* **7**: 513 – 516.
- Raven, P.H. 1988.** Tropical floristics tomorrow. *Taxon* **37**: 549 – 560.
- Reddy, C.S. & P.R.C. Prasad 2008.** Tree flora of Saddle Peak National Park, Andaman, India. *J. Pl. Sci.* **3**: 1 – 17.
- Richardson, I.B.K. 1978.** Endemic taxa and the taxonomist. In: Street, H.E. (Ed.), *Essays in Plant Taxonomy*. Academic Press, London. pp. 245 – 262.
- Rossi, G., Parolo, G. & T. Ulian 2009.** Human trampling as a threat factor for the conservation of peripheral plant populations. *Plant Biosystems* **143**: 104 – 113.
- Saldanha, C.J. 1974.** *Smithsonia* (Orchidaceae) a new genus from Western India. *J. Bombay Nat. Hist. Soc.* **71**: 70 – 75.
- Sarkar, A.K. 1995.** Endemic genera of Angiosperms and their species in India. In: Gupta, S.K. (Ed.), *Higher Plants of Indian Subcontinent*. Vol. 1. (*Indian J. Forest. Addit. Ser. IV*). Dehra Dun. pp. 235 – 257.
- Sasidharan, N. 2004.** *Biodiversity Documentation of Kerala Part 6: Flowering Plants*. Kerala Forest Research Institute, Peechi.
- Sasidharan, N. & P. Sujanapal 2000.** Rediscovery of *Haplothismia exannulata* Airy Shaw (Burmanniaceae) from its type locality. *Rheedea* **10**: 131 – 134.
- Sharma, B.V., Karthikeyan, S. & N.P. Singh (Ed.) 1996.** *Flora of Maharashtra State (Dicotyledones)*. Vol. 1. Botanical Survey of India, Calcutta.
- Shivamurthy, G.R. & K.B. Sadanand 1997.** A new species of *Willisia* Warm. (Podostemaceae) from the Silent Valley of Kerala, India. *Kew Bull.* **52**: 243 – 245.
- Simmons, M.P. 2004.** Celastraceae. In: Kubitzki, K. (Ed.), *The Families and Genera of Vascular Plants*. Vol. VI. Springer-Verlag, Berlin. p. 61.
- Singh, N.P. & B.G. Kulkarni 1990.** *Polyzygus tuberosus* Dalzell. In: Nayar, M.P. & A.R.K. Sastry (Ed.), *Red Data Book of Indian Plants*. Vol. 3. Botanical Survey of India, Calcutta. p. 21.
- Singh, N.P., Lakshminarasimhan, P., Karthikeyan, S. & P.V. Prasanna (Ed.) 2001.** *Flora of Maharashtra State Dicotyledones*. Vol. 2. Botanical Survey of India, Calcutta.
- Škornickova, J. & M. Sabu 2005.** The recircumscription of *Curcuma* L. to include the genus *Paracautleya* R.M. Sm. *Gard. Bull. Singapore* **57**: 37 – 46.
- SNMNH (Smithsonian National Museum of Natural History), 2011.** *A checklist of the Trees, Shrubs, Herbs and Climbers of Myanmar* [Online Database] <http://botany.si.edu/myanmar>.
- Sohmer, S.H. 1976.** Studies in the Amaranthaceae: 1. The genus *Indobanalia*. *Phytologia* **34**: 235 – 239.
- Soltis, D.E., Soltis, P.S., Endress, P.K. & M.W. Chase 2005.** *Phylogeny and evolution of Angiosperms*. Sinauer Associates, Inc, Sunderland.
- Stuessy, T.F., Daniel, J.C., Clodmiro, M. & S.O. Mario 1998.** Isolation mechanisms and modes of speciation in endemic angiosperms of the Juan Fernandez Islands. In: Stuessy, T.F. & M. Ono (Ed.), *Evolution and speciation*

- of island plants. Cambridge University Press, Cambridge. pp. 79 – 96.
- Subramanyam, K. & M.P. Nayar 1974.** Vegetation and phytogeography of the Western Ghats. In: Mani, M.S. (Ed.), *Ecology and Biogeography of India*. Vol. 23. Dr. W. Junk Publishers, Hague. pp. 178 – 196.
- Takhtajan, A. 1986.** *Floristic Regions of the World*. University of California Press, Berkeley.
- Tropicos, 2011.** Missouri Botanical Garden, Shaw Boulevard, St. Louis, Missouri. <http://www.tropicos.org>.
- Turill, W.B. 1964.** Plant taxonomy, phytogeography and plant ecology. In: Turill, W.B. (Ed.), *Vistas in Botany*. Vol. 4. Pergamon Press, London. pp. 187 – 224.
- USDA, ARS, GRIN, 2011.** United States Department of Agriculture, Agricultural Research Service, *Germplasm Resources Information Network - (GRIN)* [Online Database] <http://www.ars-grin.gov/cgi-bin/npgs/html/taxgenform.pl>.
- Uniyal, B.P. 1995.** Tribe 12. Vernonieae Cass. In: Hajra, P.K., Rao, R.R., Singh, D.K. & B.P. Uniyal, (Ed.), *Flora of India*. Vol. 13. Botanical Survey of India, Calcutta.
- Uniyal, B.P. & D.C. Pal 1983.** Additional locality for *Chandrasekharania keralensis*. *J. Econ. Taxon. Bot.* 4: 950.
- Vajravelu, E. 1988.** *Willisia selaginoides* (Bedd.) Warm. ex J.C. Willis. In: Nayar, M.P. & A.R.K. Sastry (Ed.), *Red Data Book of Indian Plants*. Vol. 2. Botanical Survey of India, Calcutta. p. 194.
- Venter, H.J.T. & R.L. Verhoeven 1997.** A tribal classification of the Periplocoideae (Apocynaceae). *Taxon* 46: 712.
- Venter, H.J.T. & R.L. Verhoeven 2001.** Diversity and relationships within the Periplocoideae (Apocynaceae). *Ann. Missouri Bot. Gard.* 88: 564.
- Venu, P. 1998.** A review of floristic diversity, inventory and monitoring methods in India. *Proc. Ind. Acad. Sci. (Pl. Sci.)* 64: 281 – 292.
- Venu, P. 2006.** *Strobilanthes Blume (Acanthaceae) in Peninsular India*. Botanical Survey of India, Kolkata.
- Watt, G. 1890.** *A Dictionary of the Economic Products of India*. Vol. IV. Superintendent of Govt. Printing, Calcutta. pp 200 – 201.
- WCMC (World Conservation Monitoring Centre), 1998.** *Meteoromyrtus wynaadensis, Poeciloneuron pauciflorum*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2010.4. [www.iucnredlist.org](http://www.iucnredlist.org). Downloaded on 28 May 2011.
- Yadav, S.R. & M.M. Sardesai 2002.** *Flora of Kolhapur District*. Shivaji University, Kolhapur.
- Yadav, S.R., Chandore, A.N., Nimbalkar, M.S. & R.V. Gurav 2009.** Reintroduction of *Hubbardia heptaneuron* Bor, a critically endangered endemic grass in Western Ghats. *Curr. Sci.* 96: 880.
- Yoganarasimhan, S.N., Rao, M.R. & K.R.K. Murthy 1997.** Occurrence of *Seshagiria sahyadrica* Ansari et Hemadri: An endemic Asclepiadaceae in Karnataka. *J. Econ. Taxon. Bot.* 21: 471 – 472.

---

Received: 20.3.2011

Revised and Accepted: 31.5.2011