

A synopsis on distribution and endemism of Magnoliaceae s.l. in Indian Subcontinent

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Abstract: The members of the family Magnoliaceae s.l. are distributed mostly in (approximately four-fifths of total taxa) warm temperate and tropical region of East Asia, South-East Asia and the remaining one-fifth are found in Eastern Himalayas, South-Eastern part of North-America, West Indies, and Central America. A preliminary checklist of Magnoliaceae s.l. (comprising of the families: Magnoliaceae S. Str., Illiciaceae A. C. Sm. and Schisandraceae Bl.) in Indian subcontinent has been prepared on the basis of primary observations of different taxa belonging to this family in wild habitats and on secondary observations based on examining herbarium specimens and taxonomic literature. In comparison to global representation, in the Indian subcontinent (comprising Bangladesh, Bhutan, Myanmar, Nepal, Pakistan, Sri Lanka and India), the family Magnoliaceae is poorly represented (15.22%). The present paper deals with distribution, phytoendemism, possible fossil ancestry, potential, survival threat on existing taxa, etc. of Magnoliaceae in Indian subcontinent. For better understanding of the species dynamics of Magnoliaceae in Indian subcontinent, the present status of phytoendemism has been compared to the data of previous investigations done in nineteenth century.

Keywords: Magnoliaceae, distribution, endemism, Indian subcontinent.

Introduction

The type genus of this family is *Magnolia*, an ancient genus (the living taxon found for the first time in 1680), which is named after Pierre Magnol, a renowned botanist from France. From evolutionary viewpoint the members belonging to this family have immense importance as pollination of flowers normally done by beetles (as the winged insects did not evolve at that time); another primitive and important characteristics of this family is presence of 'Tepals', an intermediate form of Sepals and Petals, which has normally been found in primitive, aquatic monocots, e.g. *Aponogeton* L.f. (KUNDU et al, 1998). Magnoliaceae s.l., with the members of trees and shrubs, about ca.18 genera and ca.335 species (AZUMA et al , 1999; AZUMA et al , 2001; BARANOVA & JEFFREY, 2000; CHEN & ZHANG, 1996; CHEN et al , 2005; DANDY, 1927; ENGLER,1882; FIGLAR & NOOTEBOOM, 2004; FRODIN & GOVAERTS, 1996; HAJRA, 1993; HEYWOOD, 1978; KENG, 1978; KIM et al, 2001; KIM et al , 2004; Law, 1984, 1996, 2000, 2004; LAW et al , 1995; LIU et al, 2006; NOOTEBOOM, 1985, 1987, 2000; QIN et al , 2006; RAJU, 1993; RAO & SMITH,1947; SIMA, 2001; SIMA et al , 2001; SPONGBERG, 1998; TOBE, 1993; ZHANG et al , 2006), concentrated mostly in (approximately four-fifths of total taxa) temperate and tropical South-East Asia and the remaining one-fifth are found in Eastern Himalayas south-east of North-America, West Indies and Central America.

The horticultural as well as economic potential (timber yielding plants) members of Magnoliaceae should be considered as genetic resource; naturally deserve conservation. Apart from ethno botanical importance, the underexploited genetic resources belonging to this family deserve conservation which is on the verge of depletion of wild habitats. Though taxonomic reviews on Magnoliaceae family have been done and updated by different plant taxonomists from time to time, the lack of contemporary phytogeographical analysis of Magnoliaceae in South Asian region, lead to undertake the present studies (AHMEDULLAH & NAYAR, 1986; CHEN & ZHANG, 1996; DANDY, 1927; DECANDOLLE, 1824; FIGLAR, 1998, 2000; FRODIN & GOVAERTS, 1996; KENG, 1978; LAW, 1984; LAW et al, 1995; NOOTEBOOM, 1985, 2000; SMITH, 1947). The last phytogeographical review of this family on the Indian subcontinent was done in 1939-40 (CHATTERJEE, 1939). Thus an appraisal is necessary to monitor the species dynamics of Magnoliaceae in the same geographical location after a period of time. Species dynamics is a key indicator in predicting whether a particular group of plants is in a mode of expansion or extinction under any changing factor like: topographic, physiographic, climatic, biological, anthropogenic, etc. (GUO et al, 2005). Apparently, it is an academic study where economic potential of an under-exploited group of plants is not taken into consideration. Hence, species dynamics should be considered as an important parameter in determining sustainable utilization pattern as well as planning of conservation strategies. For a developing country, underexploited plant resource should be considered as potential natural resource, which could play an important role in socio-economic development and empowerment.

Material and methods

To prepare a preliminary checklist of Magnoliaceae in Indian subcontinent, available floristic works of Indian subcontinent and other major regions have been consulted, starting with Index Kewensis (HOOKER & JACKSON, 1895). For correct nomenclature of plants under present studies, updated, on-line, web-based resource "The International Plant Names Index" (ANONYMOUS, 2008) has been consulted. The list of endemic taxa has been prepared from the literature and confirmed from herbaria, viz. ASSAM (Botanical Survey of India, Eastern Circle, Meghalaya), BSIS (Industrial Section of Indian Museum, Botanical Survey of India), CAL (Central National Herbarium, Botanical Survey of India), BSD (Botanical Survey of India, Northern Circle, DehraDun), CDRI (Botany Divn., Central Drug Research Institute, Lucknow), CIMAP (Herbarium, Central Institute of Medicinal and Aromatic Plants, Lucknow), DD (Herbarium Divn., Forest Research Institute, DehraDun), LWG (National Botanical Research Institute, Lucknow), MH (Botanical Survey of India, Southern Circle, Coimbatore), RBGT (Herbarium, Tropical Botanic Garden, Research Institute, Trivandrum, Kerala), RRCBL (Regional Research Laboratory, Bangalore), RRLB (Regional Research Laboratory, Bhubaneswar) and K (Royal Botanic Gardens, Kew). The microfiches of C. Linnaeus's collection from two European herbaria have also been studied viz. Herbarium, London (LINN) and Herbarium, Stockholm (S). An appraisal of endemic and threatened taxa, have been done by visiting its place of occurrence, available from herbarium data, in parts of North-West, Western and Central Himalayas in India. The required data on threatened taxa of Magnoliaceae were partially accumulated from World Conservation Monitoring Centre, Cambridge, U.K. The results on phytoendemism are more useful for further analysis (from spatio-temporal perspective) and understanding of species dynamics, if floristic provinces are considered than political boundaries (MAJOR, 1990). Though assortment of endemic taxa belonging to Magnoliaceae in Indian subcontinent has been done under political boundaries, the same geographical has been chosen for this studies, where CHATTERJEE (1939) did his first phyto-endemic studies and contemporary studies of assortment of endemic taxa, belonging to Magnoliaceae in different phytocorias¹ has been made following the phytocorial classification of KUNDU (2001). A brief review of economic potential, survival threat and fossil histories of Magnoliaceae in Indian subcontinent has also been studied to understand the pattern of endemism of the family members of a particular group of plants on a geobotanical matrix.

¹ Phytocorial Divisions:

North-West Himalayas (P - 1), Western Himalayas (P - 2), Central Himalayas (P - 3), Eastern Himalayas (P - 4), North East India (P - 5), Indian Desert (P - 6), Semi Arid Region (P - 7), Gangetic plain (P - 8), Central Deccan plateau (P - 9), Northern Eastern Ghat (P - 10), Southern Eastern Ghat (P - 11), North Western Ghat (P - 12), Central Western Ghat (P - 13), Southern Western Ghat (P - 14), Coromandel Coast (P - 15), Malabar Coast (P - 16), Andaman & Nicobar Islands (P - 17), Laccadive & Minicoy Is. (P - 18) (KUNDU, 2001).

Results

Distribution of Magnoliaceae in Indian subcontinent

In India, the family is represented by ca.6 genera and by ca.36 taxa (comprising 32 species and 4 sub-species) [CHOWDHURY & DANIEL, 1981; HOOKER & THOMSON, 1855; RAJU, 1993; RAJU & NAYAR, 1980; RAJU, RAO & HAJRA, 1993; RAO & HAJRA, 1993]. During the present study, it has also been estimated that there are 51 taxa (comprising 46 species and 5 sub-species), under 7 genera distributed throughout Indian subcontinent (DANDY, 1979; GRIERSON, 1984; KHANZADA & KHAN, 1974; KIHARA, 1955; KUNDU & KUNDU, 1998; LAW, 2000, 2004; NOOTEBOOM, 1985, 1987, 2000; SIMA, 2001; SMITH, 1947; TRIMEN, 1974; ZHANG et al , 2006). The checklist of Magnoliaceae in Indian subcontinent is presented in Table 1.

Endemism of Magnoliaceae in India

Analysis of Magnoliaceae species distribution revealed that there are four taxa restricted in distribution in Indian Territory (Table 2). Out of five taxa, four (3 taxa of *Magnolia* and 1 taxon of *Pachylarnax*) are found in North-Eastern India (P-5) and Eastern Himalayas (P-4) and the rest of one (belonging to *Kadsura*) is found in North-Eastern India (P-5). Hence, North-Eastern India along with Eastern Himalayas should be considered as an ideal resort for endemic Magnoliaceae in India. The species composition and representation of endemic taxa in India is presented in Table 3.

Endemism of Magnoliaceae in Indian subcontinent

In the Broader aspect, extent of endemism of Magnoliaceae in Indian subcontinent is tabulated in Table 2. During the present investigation, it has been estimated that there are fifty one taxa distributed throughout Indian subcontinent and other places (Table 1). Out of fifty-one taxa, nineteen are spatially confined in Indian subcontinent (Table 2) and out of nineteen five taxa are strictly confined in Indian Territory whereas rest of the fourteen taxa are found in Indian Territory and neighboring countries (comprising of Indian subcontinent) and those are not found elsewhere beyond Indian subcontinent. The five taxa which are strictly confined in Indian Territory should be considered as "Narrow Range Endemics" or N.R.E.s (KUNDU, 2005). On the contrary, those fourteen taxa restricted in Indian subcontinent, should be considered as "Broad Range Endemics" or B.R.E.s (KUNDU, 2005). Comprising N.R.E.s and B.R.E.s there are 19 taxa "Endemic in Indian Subcontinent" or E.I.S. and the phytogeographical distribution of which is presented in Fig.1. Out of nineteen taxa (E.I.S.), five taxa are restricted in Indo-Myanmar region, followed by two taxa in Indo-Sri Lankan region, two taxa in Indo-Bangladesh region, two taxa in Indo-Bhutan-Bangladesh, one taxon in Indo-Bangla-Myanmar, one in Indo-Bhutan Myanmar region and the last one in Indo-Nepal- Bhutan region. From the distributional pattern, Central Himalayan regions and Indo-Bangla-Myanmar regions (the gateway of S.E. Asia)

are considered as two ideal matrices for endemic Magnoliaceae in Indian subcontinent. The extent of endemism of a particular genus may be better understood from the ratio of "Narrow Range-Endemics" and "Broad Range Endemics" (Table 4). It has been found that the total number of taxa belonging to Magnoliaceae on the Indian subcontinent is 51; whereas the total number of taxa in India is 36 (70.58%). The number of endemic taxa in Indian subcontinent is not so impressive: 19 (37.25%). The number of Narrow Range Endemics is 5 (9.80%) and the number of Broad Range Endemics is 14 (27.45%).

Threatened taxa, belonging to the family Magnoliaceae in India

The endemics of Magnoliaceae and locally confined pan endemics with isolated small populations are the outfall of habitat disturbance and anthropogenic interferences like ethno-botanical utilization, conversion of wild habitat to cultivation field, urbanization, etc. It has noticed that there are eleven taxa of Indian Magnoliaceae facing various degrees of threats, mainly due to anthropogenic exploitation for its commercial potentialities as timber yielding properties (used to prepare cabinet making, tea chest, furniture, house building, etc.), horticultural and medicinal importance. Out of eleven taxa, five are in *Magnolia*, three are in *Michelia*, two in *Schisandra* and in one *Pachylarnax* as given in Table 5.

The oil extracted from *M.champaca* used in perfumery (ARCTANDER, 1960) and the bark of *Michelia* is used as adulterants of cinnamon (SMITH, 1969). Hence, threat is considered to be mainly anthropogenic. Some of the members have immense medicinal importance. Though, species like *Magnolia grandiflora* and *Michelia champaca* are not threatened taxa but these taxa are exploited commercially for horticultural as well as for its medicinal importance, e.g. the active allergenic principles like sesquiterpene lactone, parthenolide extracted from *M.grandiflora* (WIEDHOPF *et.al.* 1973); Parthenolide is also extracted from *M.champaca* (GOVINDACHARI *et al* 1964). *Illicium* species has no much economic potential but it has huge biological importance from phylogenetic viewpoint as it shows the gradual transition of the spiral perianth from sepaloïd to petaloïd structure (found in *Nymphaea*). In case of *Magnolia gustavii* and *Michelia kisopa*, the threat is no direct anthropogenic pressure, rather its scanty and disjunctive population size is affecting the normal reproductive biology, which has been witnessed by 40-55% germination failure of mature seeds² and this type of biological incompatibility may gradually be pushed aside these taxa on the verge of extinction.

Possible fossil evidence in relation to endemics of Magnoliaceae in India

It is interesting to focus on phylogenetic relationship by studying the fossil remains of the ancestors of the modern taxa, which are referable to the endemic taxa of the family Magnoliaceae now-a-days. It is a unique observation of the

² Either intra-population gap i.e. disjunct population patches affects cross pollination carried out by vectors or inbreeding depression is responsible for high rate of infertility of seeds.

fossil remains of the family Magnoliaceae, as the fossil records ascertain its widespread predominance in Northern Hemisphere e.g. Greenland and Europe (Heywood, 1978). The fossil remnants of *M. acuminata* have been found twenty million years old. The fossil wood *Michelioxylon* of Eocene period, Tertiary era, has been found in Mandla district of Madhya Pradesh, the part of Central Deccan Plateau (P-9). *Michelioxylon* is represented by the living representative of *Michelia*: *Michelia nilagirica* Zenk. var. *nilagirica*, which is confined to Southern-Western Ghat (P-14) of India and Sri Lanka (AHMEDULLAH & NAYAR, 1986).

From the viewpoint of species dynamics, the percentage of endemism of Magnoliaceae on Indian subcontinent in 1939-1940 (CHATTERJEE, 1939) was 65.11%, whereas in 2002-2004, it has become 37.25%. The negative index of phytoendemism in the same matrix in a time interval could be defined as either decreasing number of endemic taxa, invasion of pan-endemic taxa or endemic taxa in the mode of further expansion (i.e. shifting of mode of expansion from 'endemism' to 'pan-endemism') or combination of all factors. The main reason behind narrowing of endemism is more number of exploitations taken by various investigators, compilation and updating of literature and comparison of world literature. Other reasons are of minor importance.

The overall distributional pattern of endemic taxa of Magnoliaceae in Indian subcontinent clearly shows the transition toward favorable ecological condition created by Indo-Myanmar-Bangladesh region, i.e. the gateway to subtropical South East Asia, the ideal resort is followed by Indo-Bhutan region, i.e. part of Central Himalayas and this distributional feature is clearly supported by HEYWOOD'S (1978) view that once it (Magnoliaceae) was predominant in Northern Hemisphere (evidenced by fossil records) but presently, widespread in South-East Asia. Naturally, the arborescent, taxonomically isolated, endemic taxa of Magnoliaceae are apparently considered as "Palaeoendemics" (Engler, 1882; CHEVALIER & GUENOT, 1925) but other factors like concentration of endemic taxa in Eastern Himalayas and North-East India and contemporary species dynamics (i.e. negative index of endemism) incites to consider it as "Holoendemics" (RICHARDSON, 1973) rather than "Palaeoendemics" and most of the 'Holoendemics' are extinction-pronged, due to converged radial adoption (AHMEDULLAH & NAYAR, 1986).

From the viewpoint of fiscal evaluation of natural resources, the increasing rate of phytoendemism is an important index for national economy of any developing state but shrinkage of a particular germplasm due to habitat destruction and anthropogenic interference is a key negative gradient from conservation as well as economic viewpoint. It is ascertained that there are eleven taxa of Indian Magnoliaceae facing various degree of threats, mainly due to anthropogenic exploitation for its horticultural importance (over-exploited by nurserymen) and timber yielding potentialities.

The fossil studies of the family Magnoliaceae has also helped to correlate the relationship between the fossil ancestors with its present day living successors. The predominance of living germplasm of Magnoliaceae in temperate and tropical regions of Eastern Himalayas, South-East Asia, and North America leads

us to two different line of hypothesis: i. Migration of members belonging to this family from Alpine/Sub-Alpine region to Temperate/Sub-tropical regions through climatic changes in passage of time, and ii. Plate tectonic movements change the original distributional pattern. The fossil ancestry further ascertains to consider the endemic taxa of Magnoliaceae as “Holoendemic”s rather than “Palaeoendemic”s.

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Tab. 1. The checklist of Magnoliaceae in Indian subcontinent and other places

Name of taxa	Place of occurrence
1 <i>Illicium cambodianum</i> Hance in J. Bot. 14: India, Myanmar, Kampuchea. 240. 1876.	
2 <i>I. burmanicum</i> E. H. Wilson in J. Arn. Arb. 7: Myanmar, China. 238. 1926.	
3 <i>I. griffithii</i> Hook. f. & Thoms., Fl. Ind. 74. 1855. India, Bhutan, Bangladesh, Myanmar, China.	
4 <i>I. manipurensense</i> Watt ex King in Ann. R. Bot. India, Myanmar. Gard. Calc. 3: 200. 1891.	
5 <i>I. simonsii</i> Maxim in Bull. Acad. Sci. St. India, Myanmar, China. Petersb. 32. 480. 1888.	
6 <i>I. majus</i> Hook. f. & Thoms., Fl. Brit. India 1: Myanmar, China, Vietnam. 40. 1872.	
7 <i>I. merrillianum</i> A. C. Smith in Sargentia 7: 67. Myanmar, China. 1947.	
8 <i>I. wardii</i> A. C. Smith in Sargentia 7: 20. 1947. Myanmar, China.	
9 <i>Kadsura acuminata</i> P. Parm. Bull. Sci. France India. Belgique. 27: 315. 1896.	
10 <i>K. calophylla</i> A. C. Smith in Sargentia 7: 171. Myanmar. 1947.	
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- 38 *M. nilagirica* Zenk. var. *walkeri* Hook. f. & Thoms., Fl. Ind. 1: 82. 1855. Sri Lanka.
- 39 *M. oblonga* Wall. ex Hook. f. & Thoms. Fl. Ind. 1: 81, 1855. India, Bangladesh.
- 40 *M. punduana* Hook. f. & Thoms. Fl. Ind. 1: 81. 1855. India, Bhutan, Bangladesh.
- 41 *M. velutina* DC. Prodr. (DC.) 1: 79. 1824. India, Nepal, Bhutan, Myanmar, China, Vietnam.
- 42 *M. wardii* Dandy in J. Bot. 65: 222. 1929. India, China.
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- 47 *S. neglecta* A. C. Smith in Sargentia 7: 127. 1947. India, Nepal, Bhutan, Myanmar, China.
- 48 *S. plena* A. C. Smith in Sargentia 7: 154. 1947. India, China.
- 49 *S. propinqua* (Wall.) Baill. ex A. C. Smith var. *propinqua* in Sargentia 7: 149. 1947. India, Nepal, Bhutan, China.
- 50 *S. propinqua* (Wall.) Baill. ex A. C. Smith var. *intermedia* A. C. Smith in Sargentia 7: 152. 1947. India, Myanmar.
- 51 *S. rubiflora* Rehder & Wilson in Sargentia 1: 28. 1935. India, Myanmar, China.
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Tab. 2. The checklist of endemic taxa belonging to the family Magnoliaceae in Indian subcontinent.

Name of Taxa	India	Pakistan	Nepal	Bhutan	Bangladesh	Myanmar	Sri Lanka	Alt. (m)	Fl. Time
<i>Illicium manipurens</i> Watt ex King ^B	+	-	-	-	-	+	-	#	Mar.- July
<i>Kadsura acuminata</i> Parment ^N	+	-	-	-	-	-	-	1500	Mar.
	(P-5)								
<i>Kadsura calophylla</i> A. C. Smith ^B	-	-	-	-	-	+	-	#	#
<i>Magnolia andamanica</i> (King) Raju & Nayar ^B	+	-	-	-	-	+	-	100	Apr.- Dec.
<i>M. caveana</i> (Hook. f. & Thoms.) Raju & Nayar ^N	+	-	-	-	-	-	-	1400- 2400	Mar.- Aug.
	(P-4,P-5)								
<i>M. griffithii</i> Hook. f. & Thoms. ^B	+	-	-	-	+	+	-	1500- 2000	Mar.- Sept.
<i>M. gustavi</i> King ^N	+	-	-	-	-	-	-	1500- 2300	Mar.- Sept.
	(P-4,P-5)								
<i>M. pterocarpa</i> Roxb.B	+	-	-	+	-	+	-	1500- 2000	Apr.- Nov.
<i>M. rabaniana</i> (Hook. f. & Thoms.) Raju & Nayar ^N	+	-	-	-	-	-	-	1300- 2400	Mar.- Sept.
	(P-4,P-5)								
<i>Michelia glabra</i> Parm. ^B	+	-	-	+	+	-	-	300- 1000	Aug.- Nov.
<i>M. kisopa</i> Buch.-Ham. ex DC. ^B	+	-	+	+	-	-	-	1400- 1800	July- Sept.
<i>M. mannii</i> King ^B	+	-	-	-	+	-	-	100- 1000	Oct.- Dec.
<i>M. nilagirica</i> Zenk. var. <i>nilagirica</i> ^B	+	-	-	-	-	-	+	#	Mar.- Aug.
<i>M. nilagirica</i> Zenk. var. <i>walkeri</i> Hook. f. & Thoms. ^B	-	-	-	-	-	-	+	1200- 2350	#
<i>M. oblonga</i> Wall. ex Hook. f. & Thoms. ^B	+	-	-	-	+	-	-	1200	Feb.
<i>M. punduana</i> Hook. f. & Thoms. ^B	+	-	-	+	+	-	-	1000- 1600	Oct.- Mar.
<i>Pachylarnax pleiocarpa</i> Dandy ^N	+	-	-	-	-	-	-	1000- 1700	Sept.
	(P-4,P-5)								
<i>Schisandra gracilis</i> A. C. Smith ^N	-	-	-	-	-	+	-	#	#
<i>Schisandra propinqua</i> (Wall.) Baill. ex A. C. Smith var. <i>intermedia</i> A. C. Smith. ^B	+	-	-	-	-	+	-	1500	Aug.- Sept.

^B Broad Range Endemics (KUNDU 2005)

^N Narrow Range Endemics (KUNDU 2005)

(+) Presence, (-) Absence, (#) Data are not available.

Tab. 3. The species composition and representation of endemic Magnoliaceae in India.

Genera	Total taxa in India	Endemics		Total endemic taxa	% of endemism
		Species	Subspecies		
<i>Kadsura</i> Kaemp f. ex Juss.	2	1	0	1	50
<i>Magnolia</i> L.	13	3	0	3	23.07
<i>Michelia</i> L.	10	0	0	0	0
<i>Pachylarnax</i> Dandy	1	1	0	1	100

Tab. 4. The ratio of N.R.E.: B.R.E. of Magnoliaceae in Indian subcontinent.

Genera	N.R.E.	B.R.E.	Total
<i>Illicium</i> L.	0	1	1
<i>Kadsura</i> Kaemp f. ex Juss.	1	1	2
<i>Magnolia</i> L.	3	3	6
<i>Michelia</i> L.	0	7	7
<i>Pachylarnax</i> Dandy	1	0	1
<i>Schisandra</i> Michx.	0	2	2

Tab. 5. Plants facing survival threat belonging to the family Magnoliaceae in India.

Name of taxa	Frequency index	Biotic pressure	Parts used	Flowering period	Altitude (m)
<i>Magnolia cathcartii</i> Hook.f. & Thoms.	I.	Tm.	woody stem	Mar.-Aug.	1500-2200
<i>Magnolia griffithii</i> Hook.f & Thoms.	I.	#	#	Mar.-Sept.	1500-2000
<i>Magnolia gustavi</i> King.	I./ R.	I. S.P.	#	May-Jan.	300-1000
<i>Magnolia insignis</i> Wall.	I.	Tm., Hort.	woody stem/FI.	May-July	400-1500
<i>Magnolia pterocarpa</i> Roxb.	I.	Tm.	woody stem	Apr.-Nov.	1500-2000
<i>Michelia kisopa</i> Buch.-Ham. ex DC.	I.	#	#	July-Sept.	1400-1800
<i>Michelia punduana</i> Hook.f. & Thoms.	R.	I. S. P.	#	Oct-Mar	1000-1600
<i>Michelia velutina</i> DC.	I.	Tm.	woody stem	July-Dec	1200-2000
<i>Pachylarnax pleiocarpa</i> Dandy	I.	Tm.	woody stem	Aug-Oct.	100-1000
<i>Schisandra neglecta</i> A.C.Smith	I.	I.S.P.	-	Sept.	2200
<i>Schisandra propinqua</i> (Wall.)Baill. ex A.C. Smith var. <i>intermedia</i> A.C. Smith	I.	habitat disturbance, clearing of forests.	-	Aug.-Sept.	#

: Data are not available I : Indeterminate
 I. S. P. : Isolated Small Population R : Rare
 Ec : Economic Hort. : Horticultural (Ornamental)

Fl. : Flower

Tm. : Timber Yielding

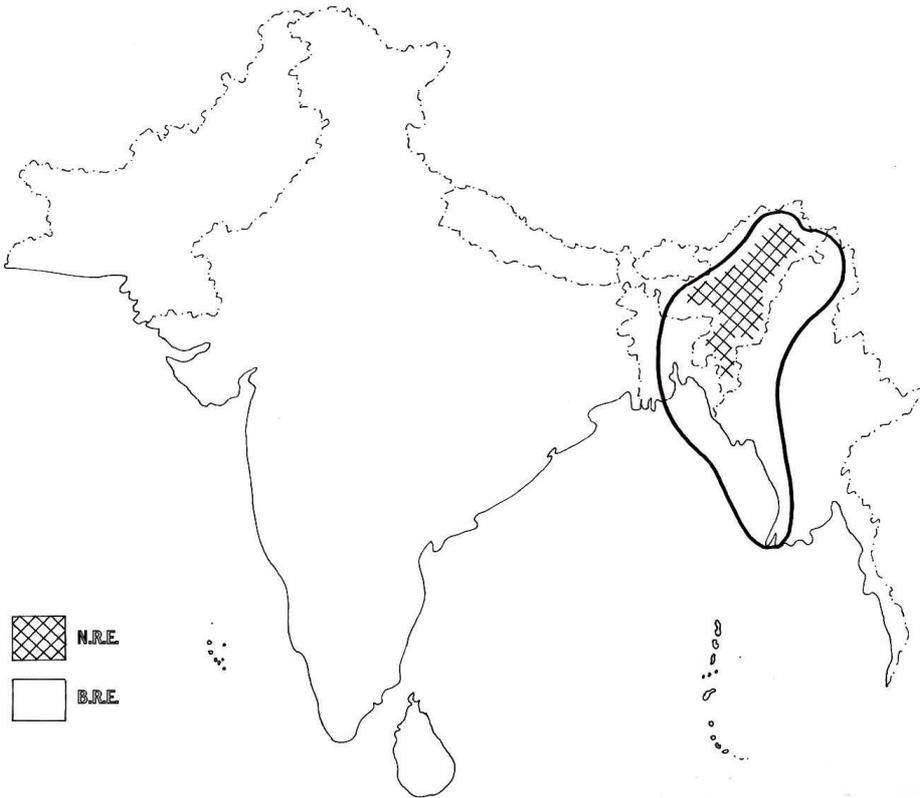


Fig. 1. An outline of endemism of Magnoliaceae s. l. in Indian Subcontinent

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