

A synopsis of Annonaceae in Indian subcontinent: Its distribution and endemism

SUBIR RANJAN KUNDU

Ex-research fellow, Botanical Survey of India, Indian Botanic Garden, Howrah-711103, India. Present Mailing Address: Subir Ranjan Kundu, 496 Brock Avenue, Toronto, Ontario M6H 3N3, Canada. Email ID: subirranjan25@rediffmail.com, subirranjan25@yahoo.com

KUNDU, S. R. (2006): A synopsis of Annonaceae in Indian subcontinent: Its distribution and endemism. – *Thaiszia – J. Bot.* 16: 63-85. – ISSN 1210-0420.

Abstract: The members of the family Annonaceae are distributed throughout the tropical evergreen forests of America, Asia to Australia mainly centered in old World tropics. In Indian subcontinent (comprising of Bangladesh, Bhutan, Myanmar, Nepal, Pakistan, SriLanka and India), it is well represented (74.50% of the total taxa). The present paper deals with distribution, phytoendemism, possible fossil ancestry, potential survival threat on existing taxa etc. of Annonaceae in Indian subcontinent.

Keywords: Annonaceae, endemism, Indian subcontinent.

Introduction

Annonaceae, with the members of trees, shrubs or climbers ca.122 genera and ca.1200 species (AUBREVILLE 1960, BAKKER 1999, HUTCHINSON 1923, KOEK NORMAN, WESTRA & MASS 1990, KESSLER 1989, 1990, MITRA 1974, 1993) distributed throughout the tropical evergreen forests of America, Asia to Australia mainly concentrated in old World tropics. The economically potential (due to its demand as timber throughout the world, horticultural crave for its fruits) members of Annonaceae should be considered as genetic resource (VAN SETTEN 1987); naturally deserve conservation. The lack of phyto-geographical account of the family members of this family in Indian subcontinent as well as part of South Asia, which is essential data for adopting proper conservation strategies, leads to undertake the present studies.

Material and methods

To prepare a preliminary checklist of Annonaceae in Indian subcontinent, available floristic works of Indian subcontinent and other major regions have been consulted, starting with Index Kewensis. The list of endemic taxa has been prepared from the literature and confirmed from herbaria, viz. ASSAM (BSI, Eastern Circle, Meghalaya), BSIS (ISIM, BSI), CAL (CNH, BSI), BSD (BSI, Northern Circle, DehraDun), DD (FRI, DehraDun), MH (BSI, Southern Circle, Coimbatore), FRC (Institute of Forest Genetics and Tree Breeding, Coimbatore), RRCBL (RRL, Bangalore), RRLB (RRL, Bhubaneswar), RBGT (Tropical Botanic Garden, Research Institute, Trivandrum) and K (Royal Bot. Gard., Kew). The microfiches of C. Linnaeus two European herbaria, studied in CAL, Viz. Herbarium, London (LINN) and Herbarium, Stockholm (S). In search of endemic and threatened taxa, field surveys have been undertaken in Eastern Ghat regions and Western Ghat regions of India. The required data on threatened taxa of Annonaceae were partially accumulated from World Conservation Monitoring Centre, Cambridge; U.K. The assortment of endemic taxa of Annonaceae in different phytocorias has been made following the phytocorial classification of KUNDU (2001).

Results and discussion

In India, the family is represented by ca.24 genera and ca.123 species (KING 1893, DEB 1981, PRAKASH & MEHROTRA 1990, GOEL, MEHROTRA & VASUDEVA RAO 1991, SIVARAJAN & SUNIL 1993, MITRA 1974, 1993, 1995, DUTTA & ALMEDIA 1998, SASIDHARAN 1998). Present investigation reveals that number of taxa in India is ca.130 (comprising 118 species and 12 sub species); the checklist of Annonaceae in Indian subcontinent is presented in Tab. 1.

Tab. 1. Checklist of Annonaceae in Indian subcontinent and other places.

Name of taxa	Place of occurrence
1. <i>Alphonsea hortensis</i> H. Huber in M. D. Dassanayake and F. R. Fosberg, eds. Revised Handb. Fl. Ceylon, 5 : 28, 1985.	: Sri Lanka.
2. <i>A. lutea</i> (Roxb.) Hook. f. & Thoms., Fl. Ind. 153. 1855.	: India, Myanmar, Sri Lanka.
3. <i>A. madraspatana</i> Beddome, Icon, Pl. Ind. Or. 92. 1868-1874.	: India.
4. <i>A. sclerocarpa</i> Thwaites, Enum. Pl. Zeyl. 11. 1858.	: India, Sri Lanka.
5. <i>A. ventricosa</i> (Roxb.) Hook. f. & Thoms., Fl. Ind. 152. 1855.	: India, Bangladesh.
6. <i>A. zeylanica</i> Hook. f. & Thoms., Fl. Ind. 153. 1855.	: India, Sri Lanka.
7. <i>Annona cherimola</i> Miller, Gard. Dict. ed. 8, no.5. 1768.	: India, C & S America, West Indies.

8. *A. glabra* L., Sp.Pl. 537. 1753. : India, Sri Lanka, Native of tropical America, West Indies, West Africa.
9. *A. muricata* L., Sp. Pl.1. : 536. 1753. : India, Central America, West Indies.
10. *A. reticulata* L., Sp.Pl.1 : 537. 1753. : India, Nepal, Bhutan, Central America, West Indies.
11. *A. squamosa* L., Sp.Pl.1 : 537. 1753. : India, Nepal, Central America, West Indies.
12. *Anaxagorea luzonensis* A. Gray, U.S. Explor. Exped., Phan. 27. 1854. : India, Myanmar, Sri Lanka, Kampuchea, Malacca, Philippines, Malaysia, Indonesia, Thailand, Laos, South America.
13. *Artabotrys caudatus* Hook. f. & Thoms., Fl. Ind.129. 1855. : India, Bhutan, Bangladesh.
14. *A. cubittii* Chatterjee, J.Bombay Nat. Hist.Soc. 19 :1. 1940. : India, Myanmar.
15. *A. hexapetalus* (L.f.) Bhandari, Baileya 12 : 147. 1964. : India, Bhutan, Bangladesh, Myanmar, Sri Lanka, Malaysia, Indonesia, China.
16. *A. nicobarianus* D.Das, Bull. Bot. Surv. India 11 : 194. 1969. : India.
17. *A. speciosus* Kurz ex Hook.f. & Thoms. In Fl.Britt. India 1 : 55. 1872. : India.
18. *A. zeylanicus* Hook. f. & Thoms., Fl. Ind. 128. 1855. : India, Sri Lanka.
19. *Bocagea coriacea* Hook. f. & Thoms. in Fl. Britt.India. 1 : 93. 1872. : Sri Lanka.
20. *B. obliqua* Hook. f. & Thoms. in Fl. Britt. India 1 : 93. 1872. : Sri Lanka.
21. *B. thwaitesii* Hook. f. & Thoms. in Fl. Britt. India 1 : 92. 1872. : Sri Lanka.
22. *Cananga odorata* (Lam.)Hook.f. & Thoms. in Fl. Ind. 130. 1855. : India, Myanmar, Thailand, Malaysia,Indonesia, Philippines, Laos, Australia, New Zealand.
23. *Cyathocalyx martabanicus* Hook.f. & Thoms. in Fl.Britt. India 1 : 53. 1872. : India, Myanmar.
24. *C. zeylanicus* Champ in Hook.f. & Thoms., Fl. Ind. 127. 1855. : India, Sri Lanka.
25. *Cyathostemma micranthum* (DC.) Sinclair in Gard. Bull. Sing. 14 : 225. 1955. : India.
26. *C. viridiflorum* Griffith, Notul. 4 : 707. 1854. : India, Malaysia.
27. *Desmos chinensis* Lour., Fl. Cochinch. 1 : 352. 1790 var. *chinensis* : India, Nepal, Bhutan, Bangladesh, Myanmar, Malaysia, Thailand,Philippines, Vietnam China.
28. *D. chinensis* Lour., var. *laevigata* (Hook. f. & Thoms). D. Mitra, Bull. Bot. Surv. India. 35 : 117.1993. : India, China.
29. *D. chinensis* Lour., var. *pubescens* (Hook. f. & Thoms). Deb in Fl.of Tripura 1 : 83. 1981. : India.

30. *D. cochinchinensis* Lour., Fl.Cochinch.1 : 352. 1790. : India, Myanmar, Kampuchea, Thailand, Malaysia.
31. *D. dasymaschaulus* (Blume) Safford, Bull.Torrey Bot. Club 39 : 507. 1912. : India, Myanmar, Kampuchea, Thailand, Indonesia.
32. *D. dumosus* (Roxb.) Safford, Bull. Torrey Bot.Club. 39:506. 1912. : India, Bhutan, Bangladesh, Myanmar, Thailand, Malaysia, Laos, Singapore,Vietnam.
33. *D. lawii* (Hook.f. & Thoms). Safford, Bull. Torrey Bot.Club. 39:506. 1912. : India, Sri Lanka.
34. *D. longiflorus* (Roxb.) Safford, Bull. Torrey Bot.Club. 39:507. 1912. : India, Bhutan, Bangladesh, Myanmar.
35. *D. praecox* (Hook.f. & Thoms). Safford, Bull. Torrey Bot.Club. 39:507. 1912. : India, Bhutan.
36. *D. viridiflorus* (Beddome) Safford, Bull. Torrey Bot.Club. 39:506. 1912. : India.
37. *Fissistigma bicolor* (Roxb.) Merr. Philip. J. Sci (Bot.) 15 : 131. 1919. : India, Myanmar.
38. *F.bracteolatum* Chatterjee, *Kew Bull.* 1948:58.1948. : Myanmar.
39. *F. ellipticum* (King.) D. Mitra, Bull. Bot. Surv. India.35 : 117. 1993. : India, Bangladesh.
40. *F. polyanthoides* (A. DeCandolle) Merr., Philip. J. Sci. (Bot.)15: 135.1919. Myanmar, Laos, Vietnam.
41. *F.polyanthum* (Hook. f. & Thoms). Merr., Philip. J. Sci. (Bot.) 15 :135. 1919. : India, Bhutan, Bangladesh, Myanmar, Vietnam.
42. *F. rubiginosum* (DC.) Merr., Philip. J. Sci. (Bot.) 15 :135. 1919. : India, Bangladesh, Myanmar, Thailand, Kampuchea, Malaysia, Indonesia.
43. *F. rufinerve* (Hook. f. & Thoms). Merr., Philip. J. Sci.(Bot.) 15 :136. 1919. : India, Bangladesh.
44. *F. santapau* D. Das, Bull. Bot.Surv.India 10 : 263. 1969. : India.
45. *F. verrucosum* (Hook. f. & Thoms). Merr., Philip. J. Sci. (Bot.) 15 :137. 1919. : India, Bangladesh, Myanmar.
46. *F. wallichii* (Hook. F. & Thoms). Merr., Philip. J.Sci.(Bot.) 15 :137. 1919. : India, Bangladesh.
47. *Friesodielsia khoshooi* Vasud. & T. Chakrab. J. Econ.Tax.Bot.6 : 435. 1985. : India.
48. *Goniothalamus cardiopetalus* (Dalz.) Hook. f. & Thoms., Fl.Ind. 107. 1855. : India.
49. *G. gardneri* Hook. f. & Thoms., Fl.Ind. 107. 1855. : Sri Lanka, Vietnam.
50. *G. hookeri* Thw., Enum.Pl.Zeyl.6. 1864. : Sri Lanka.
51. *G. macranthus* (Kurz.) Boerl., Icon. Bogor. 1 : 137. 1899. var. *brevipetalus*, D. Mitra, Bull. Bot. Surv. India. 35 : 118. 1993. : India.

52. *G. macranthus* (Kurz.) Boerl., Icon. : India.
Bogor. 1: 137. 1899. var. *macranthus*.
53. *G. malayanus* Hook.f. & Thoms., Fl. : India, Malaysia, Indonesia,
Ind. 107. 1855. Borneo.
54. *G. meeboldii* Craib, Fedde, Repert. 12 : India, Myanmar.
: 391. 1913.
55. *G. reticulatus* Thw., Enum. Pl.Zeyl. : Sri Lanka.
7.398. 1864.
56. *G. rhynchantherus* Dunn, Bull. Misc. : India.
Inf. Kew 1914 : 182. 1914.
57. *G. salcinus* Hook.f. & Thoms., : Sri Lanka.
Fl.Ind.1 : 106. 1855.
58. *G. sesquipetalis* (Wall.) Hook. f. & : India, Bhutan, Bangladesh,
Thoms., Fl. Ind. 108. 1855. Myanmar.
59. *G. shraddhae* S. R. Dutta & S. M. : India.
Almeida, Journ. Bombay, Nat. Hist.
Soc. 95.488. 1998.
60. *G. simonsii* Hook.f. & Thoms., Fl.Ind. : India.
108. 1855.
61. *G. thwaitesii* Hook.f. & Thoms., : India, Sri Lanka.
Fl.Ind. 106. 1855.
62. *G. thomsonii* Thw., Enum. Pl.Zeyl. 7. : Sri Lanka.
1864.
63. *G. walkeri* Hook.f. & Thoms., Fl.Ind. 1 : Sri Lanka.
: 106. 1855.
64. *G. wightii* Hook.f. & Thoms., Fl.Ind. : India.
106. 1855.
65. *G. wynaadensis* (Beddome) Beddome. : India.
Icon. Pl.Ind.Or.1:13. 1868-1874.
66. *Meiogyne pannosa* (Dalz.) Sinclair, : India.
Sarawak Mus. J.5 : 604. 1951.
67. *M. ramarowii* (Dunn) Gandhi in : India.
Saldanha & Nicolson, Fl. Hassan.
Dist. 38. 1976.
68. *Mezzettia parviflora* Beccari, Nuovo : India, Malaysia, Indonesia,
Giorn.Bot.Ital.3 : 188. 1871.00 Borneo, Malacca.
69. *Miliusa andamanica* (King) Finet & : India.
Gagnepain, Bull.Soc.Bot.Fr.53 : 151.
1906.
70. *M. dolichantha* Craib, Bull. Misc. Inf. : India.
Kew. 1920 : 108. 1920.
71. *M. eriocarpa* Dunn in Gamble, Fl. : India.
Pres. Madrass 1:21. 1915.
72. *M. globosa* (DC.) Panigr. & S.C. : India, Nepal, Bhutan,
Mishra, Taxon 33 : 713. 1984. Bangladesh, Myanmar.
73. *M. indica* Lescen.ex DC., : India, Sri Lanka.
Mem.Soc.Phys. & Hist.Nat.Geneve
5:213. 1832.
74. *M. longiflora* (Hook. f. & Thoms.) : India, Bhutan, Bangladesh.
Finet & Gagnepain, Bull. Soc. Bot. Fr.
53 (4) : 153. 1906.
75. *M. macrocarpa* Hook.f. & Thoms., : India, Bhutan.
Fl.Ind. 150. 1855.
76. *M. mollis* Pierre var. *sparsior* Craib, : India, Thailand.
Fl.Siam.Eunm. 1 : 59, 1931.

77. *M. montana* Gard. ex Hook.f. & Thoms., Fl.Ind. 148. 1855. : India, Sri Lanka.
78. *M. mukerjeeana* D.Mitra & P.Charab., Fl.Ind. 1 : 200. 1993. : India.
79. *M. nilagirica* Bedd., Icon.Ind.Or.88. 1868-1874. : India.
80. *M. tectona* Hutch. ex C.E. Parkrison, Foe. Fl. Andaman Isl. M75. 1923. : India, Indonesia.
81. *M. tomentosa* (Roxb.) Finet & Gagnepain, Bull.Soc.Bot.Fr.53 : 153. 1906. : India, Nepal, Sri Lanka.
82. *M. velutina* (Dunal) Hook.f. & Thoms., Fl.Ind. 151. 1855. : India, Nepal, Myanmar, Kampuchea, Laos Vietnam, Thailand.
83. *M. wightiana* Hook.f. & Thoms., Fl.Ind. 149. 1855. : India.
84. *M. zeylanica* Gardn.ex. Hook.f. & Thoms., Fl.Ind. 151. 1855. : Sri Lanka.
85. *Mitrephora andamanica* Thoth. & D. Das, Jour. Bombay. Nat. Hist. Soc. 54 : 430. 1968. : India.
86. *M. grandiflora* Beddome, Fl,Sylv.1 : 75. 1869-1873. : India.
87. *M. harae* Ohashi in Hara, Fl. E.Himalaya 97. 1966. : India, Bhutan.
88. *M. heyneana* (Hook. f. & Thoms.) Thwaites, Enum, Pl.Zeyl.8. 1864. : India, Sri Lanka.
89. *M. tomentosa* Hook. f. & Thoms., Fl. Ind. 113. 1855. : India, Bangladesh, Myanmar.
90. *Orophea erythrocarpa* Beddome, Trans. Linn.Soc.Lond. 20:5. 1846. : India.
91. *O. hexandra* Blume, Bijdr. 1 : 18. 1825. : India, Myanmar, Malaysia, Indo-China.
92. *O. katschallica* Kurz., J.Bot. 4 : 323. 1875. : India.
93. *O. malabarica* N. Sasidharan & V. V. Sivarajan, Blumea 35.369. 1990. : India.
94. *O. monosperma* (Kurz.) Craib, Bull. Misc. Inf. Kew. 1915 : 434. 1915. : India.
95. *O. polycarpa* DC., Mem.Soc.Phys.Geneve 5 : 39. 1832. : India, Myanmar, Bangladesh, Sri Lanka, Malaysia, Laos, Thailand, Kampuchea.
96. *O. salacifolia* Hutch., Bull.Misc.Inf.Kew. 1923 : 371. 1923. : India.
97. *O. sivarajanii* Sasidharan, Nordic J.Bot. 19 : 301. 1998. : India.
98. *O. thomsonii* Beddome, Trans. Linn. Soc. Lond. 20 : 5. 1846. : India.
99. *O. torulosa* Hutch., Bull.Misc.Inf.Kew. 1923 : 115. 1923. : India.
100. *O. uniflora* Hook.f. & Thoms., Fl.Ind. 111. 1855. : India.
101. *O. zeylanica* Hook.f. & Thoms., Fl.Ind. III. 1855. : India, Sri Lanka.

102. *Phaeanthus malabaricus* Beddome, : India.
Icon. Pl. Ind. Or.76. 1868-1874.
103. *Polyalthia acuminata* Thw., Enum. Pl. : Sri Lanka.
Zeyl. 399. 1864.
104. *P. cauliflora* Hook. F. & Thoms. var. : India, Thailand, Singapore.
desmantha (Hook. f. & Thoms.).
Sinclair, Gard. Bull. Sing. 15 :295.
1955.
105. *P. cerasoides* (Roxb.) Beddome, : India, Myanmar, Thailand,
Fl.Sylv. 1 : 1869. Kampuchea, Vietnam, Laos.
106. *P. coffeoides* (Hook. f. & Thoms.) : India, Sri Lanka.
Thw, Enum.PI.Zeyl. 398. 1864.
107. *P. crassa* R. Parker, Indian For. 55 : : India.
375. 1929.
108. *P. fragrans* (Dalzell.) Beddome, : India.
Fl.Sylv. 74. 1871.
109. *P. jenkinsii* (Hook.f. & Thoms.) : India, Malaysia, Philippines,
Hook.f. & Thoms. In Fl.Britt. India 1 : Indo-China.
64. 1872.
110. *P. korintii* (Dunal) Thw., Enum. Pl. : India, Sri Lanka.
Zeyl. 398. 1864.
111. *P. lateriflora* (Blume) Kurz., J. Asiat. : India, Myanmar.
Soc. Beng. 43(2) : 52. 1874.
112. *P. longiflora* (Sonner.) Thw., Enum. : India, Bhutan, Sri Lanka.
Pl. Zeyl. 398. 1864.
113. *P. meghalayensis* Prakash & : India.
Mehrotra, Nord.J.Bot. 10:45. 1990.
114. *P. mooni* Thw., Enum.PI.Zeyl.9. 1864. : Sri Lanka.
115. *P. parkinsonii* Hutch., : India.
Bull.Misc.Inf.Kew. 1917.25. 1917.
116. *P. persicifolia* Benth. & Hook.f. in : Sri Lanka.
Fl.Britt. India 1 : 66. 1872.
117. *P. rufescens* Hook.f. & Thoms. in : India.
Fl.Britt. India 1 : 66. 1872.
118. *P. simiarum* (Hook.f. & Thoms.) : India, Bhutan Bangladesh,
Hook.f. & Thoms. in Fl.Britt. India 1 : Myanmar, Sri Lanka,
63. 1872. Philippines, Singapore,
Thailand, Kampuchea,
Vietnam, Laos.
119. *P. suberosa* (Roxb.) Thw, Enum. Pl. : India, Myanmar, Sri Lanka,
Zeyl. 398. 1864. Indonesia, Thailand, Malaysia,
Philippines, Singapore, Laos,
Vietnam.
120. *Popowia beddomeana* Hook.f. & : India.
Thoms. in Fl.Britt. India 1 : 68. 1872.
121. *P. helferi* Hook.f. & Thoms. in Fl.Britt. : India.
India 1 : 69. 1872.
122. *P. parvifolia* Kurz., J.Bot. 13 : 324. : India.
1875.
123. *P. pisocarpa* (Blume)Endlicher in : Myanmar,Indonesia,
Walpers, Repert.Bot.Syst.1:74.1872. Malaysia,Philippines, Thailand,
Vietnam.
124. *Pseuduvaria prainii* (King) Merr., : India.
Philip J.Sci.(Bot.) 10 : 255. 1915.
125. *Sageraea dalzelli* Beddome, Icon. Pl. : India.
Ind. Or 9 : 42. 1868-1874.

126. *S. elliptica* (DC.) Hook.f. & Thoms. In : India.
Fl.Ind 1 : 93. 1855.
127. *S. grandiflora* Dunn in : India.
Bull.Misc.Inf.Kew. 1914 : 182. 1914.
128. *S. laurifolia* (Graham) Blatter, J. : India.
Bombay, Nat. Soc. 34 : 294. 1931.
129. *S. listeri* King, Ann. R. Bot. Gard. : India, Myanmar.
Calc. 4 : 7. 1893 var. *andamanica*
Chatterjee & Mukherjee, Proc. Linn.
Soc. 154 : 268. 1941-1942.
130. *S. listeri* King Ann. R. Bot. Gard. : Bangladesh.
Galg. 4:7.1893. var. *listeri*
131. *Trivalvaria argentea* (Hook.f.& Thoms. : India, Bangladesh.
) Sinclair, Sarawak Mus.J. 5 : 603.
1951.
132. *T. dubia* (Kurz.) Sinclair, Grad. Bull. : India, Myanmar.
Singapore 14:47. 1955.
133. *T. kanjilalii* D.Das., Bull. Bot. Surv. : India.
India 10:263. 1968.
134. *Unona elegans* Thw., Enum. Pl.Zey1. : Sri Lanka.
398.1864.
135. *U. zeylanica* Hook.f. & Thoms., Fl.Ind. : Sri Lanka.
1:132. 1855.
136. *Uvaria andamanica* King, : India.
J.Asiat.Soc.Beng. 61 : 21. 1892.
137. *U. cordata* (Dunal) Alston, Handb. Fl. : India, Bangladesh, Myanmar,
Ceylon, Suppl. 6:4. 1931. Sri Lanka, Thailand, Laos,
Vietnam, Malaysia, Indonesia,
Philippines, New-Guinea.
138. *U. eucineta* Beddome ex Dunn. Bull. : India.
Inf. Kew. 1914 : 182. 1814.
139. *U. hamiltonii* Hook.f. & Thoms., : India, Nepal, Myanmar,
Fl.Ind. 96. 1855. var. *hamiltonii*. Thailand,Vietnam.
140. *U. hamiltonii* Hook. f. & Thoms. var. : India.
kurzii King. Ann.R.Bot.Calc. 4:17.
1893.
141. *U. hookeri* King. Ann. R. Bot. Gard. : India.
Calc. 4 : 28. 1893.
142. *U. lurida* Hook. f. & Thoms., Fl.Ind. : India.
101. 1855. var. *lurida*.
143. *U. lurida* Hook. f. & Thoms., var. : India.
sikkimensis King. Ann. R. Bot, Gard.
Calc.4 : 29. 1893.
144. *U. macropoda* Hook.f. & Thoms., : Sri Lanka.
Fl.Ind. 1 : 101. 1855.
145. *U. narum* (Dunal) Blume, Fl.Java. : India, Sri Lanka.
5.1828.
146. *U. nicobarica* Raizada & Sahni, Indian : India.
For. 87 : 101. 1961.
147. *U. purpurea* Blume, Bijdr. 1: 18.1825. : Myanmar,SriLanka, Indonesia,
Malaysia,Philippines,
Thailand,Vietnam.
148. *U. rufa* Blume, Fl.Java. 19. 1828. : India, Kampuchea, Laos,
Vietnam, Thailand, Singapore
Malaysia, Indonesia,
Philippines, New Guinea.

149. *U. semecarpifolia* Hook.f. & Thoms., : Sri Lanka, Malacca.
Fl.Ind. 1 : 97. 1855.
150. *U. zeylanica* L. Sp.Pl. 536. 1753. : India, Sri Lanka.
151. *Xylopiya championii* Hook.f. & Thoms., : Sri Lanka.
Fl.Ind. 1 : 125. 1855.
152. *X. nigricans* Hook.f. & Thoms., Fl.Ind. : Sri Lanka.
1 : 125. 1855.
153. *X. parvifolia* (Wight) Hook.f. & : India, Sri Lanka.
Thoms., Fl.Ind. 1 : 125. 1855.
-

Endemism of Annonaceae in India

Of the total representative taxa, ca.55 are strictly confined i.e. endemic in India, which are presented in Tab. 2.

Of the ca.56 taxa, 20 are strictly confined in Andaman & Nicobar Islands (p-17), followed by Southern Western Ghat (p-24) having ca.13 endemic taxa; ca.5 taxa are confined in Central and Southern Western Ghat (p-13, 14); ca.2 are restricted in entire Western Ghat; One taxon is restricted in Northern and Southern Western Ghat (p-12, p-14); Northern (p-10) and Southern Eastern Ghat (p-11) has one endemic taxon each; four are confined in N. E. India, two are restricted in Eastern Himalayas and N. E. India (p-4, p-5); one is restricted in Central Himalayas (p-3); only one endemic taxon is found in Central Deccan Plateau (p-9), adjacent to Southern Eastern Ghat (p-11) region. From the distributional pattern of endemic species belonging to this family, it may be concluded that Andaman and Nicobar Islands (p-17) is "Hot Spot" for Annonaceae, followed by (p-14) i.e. 'Southern Western Ghat'. From the viewpoint of distributional concentration, it has been found that ca.21 endemic taxa are confined in Western Ghat (p-12, 13, 14) region. Himalayan region, Indian Desert and the Gangetic Plains are poorly represented with endemic species belongs to Annonaceae. The species composition and representation of endemic taxa of Annonaceae in India is presented in Tab. 3.

Among ca.23 genera, *Miliusa* shows high number, of endemic taxa, but in relation to percentage of endemic taxa in India, *Phaeanthus*, *Popowia*, *Pseuduvaria*, *Friesodielsia*, *Meiogyne* shows high rate of endemism (100%), though represented with few taxa but shows absolute endemism (i.e. absolute confinement).

The phenological and ecological data and distributional pattern of 55 taxa, partially helps to trace out the pattern of endemism or confinement of them in particular region. It has been found that *Alphonsea*, *Pseuduvaria*, *Artabotrys*, *Friesodielsia*, *Fissistigma*, *Goniothalamus*, *Popowia*, *Trivalvaria*, flowers during March-May; whenever *Miliusa*, *Orophea*, *Phaeanthus*, *Meiogyne*, *Polyalthia*, *Cyathostemma*, *Sageraea* flowers in different times of year. From the available data, it has been found that almost all the endemic species are restricted in the varied altitudinal range from ranges sea level to 1500 m.

Tab. 2. Checklist of endemic taxa of Annonaceae in India.

Name of taxa	Phytogeographic regions of India																	
	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9	P-10	P-11	P-12	P-13	P-14	P-15	P-16	P-17	P-18
<i>Alphonsea madraspatana</i> Beddome	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-
<i>Artabotrys nicobarianus</i> D. Das	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
<i>Artabotrys speciosus</i> Kurz ex Hook. f. & Thoms.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
<i>Cyathostemma micranthum</i> (DC.) Sinclair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
<i>Desmos chinensis</i> Lour. var. <i>pubescens</i> (Hook. f. Thoms) Deb.	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Desmos viridiflorus</i> (Beddome) Safford.	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Fissistigma santapau</i> D. Das.	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Friesodielsia khoshonii</i> Vasud. & T. Chakrab.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
<i>Goniothalamus cardiopetalus</i> (Dalz) Hook. f. Thoms.	-	-	-	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-
<i>Goniothalamus macranthus</i> var. <i>brevipetalus</i> D. Mitra.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
<i>Goniothalamus macranthus</i> var. <i>macranthus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-
<i>Goniothalamus rhynacanthus</i> Dunn.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Goniothalamus shraddhae</i> S. R. Dutta & S. M. Almeida	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
<i>Goniothalamus simonsii</i> Hook. f. & Thoms.	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Goniothalamus wightii</i> Hook. f. & Thoms.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Goniothalamus wyanaadensis</i> Beddome	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Meiogyne pannosa</i> (Dalz.) Sinclair	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-
<i>Meiogyne ramarowii</i> (Dunn) Gandhi	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-

<i>Milisia andamanica</i> (King.) Finet & Gagnepain	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	
<i>Milisia dolichantha</i> Craib.	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Milisia eriocarpa</i> Dunn.	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-
<i>Milisia mookerjæana</i> D. Mitra & Chakraborty	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
<i>Milisia nilagirica</i> Beddome	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
<i>Milisia wightiana</i> Hook. f. & T.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
<i>Mitrephora andaminaca</i> Thoth. & D. Das	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-
<i>Mitrephora grandiflora</i> Beddome	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-
<i>Orophea erythrocarpa</i> Beddome	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+
<i>Orophea katschallica</i> Kurz.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
<i>Orophea monsperma</i> (Kurz.) Craib.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
<i>Orophea salacifolia</i> Hutch.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
<i>Orophea sivarajanii</i> Sasidharan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
<i>Orophea thomsonii</i> Beddome	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
<i>Orophea torulosa</i> Hutch.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
<i>Orophea uniflora</i> Hook. f. & T	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-
<i>Phaeanthus malabaricus</i> Beddome	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-
<i>Polyalthia crassa</i> R. Parkaer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
<i>Polyalthia fragrans</i> (Dalz.) Beddome	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-
<i>Polyalthia parkinsonii</i> Hutch.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
<i>Polyalthia rufescens</i> Hook. f. & Thoms.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-
<i>Polyalthias meghalayensis</i> Prakash & Mehrotra	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Popowia beddomeana</i> Hook. f. & Thoms.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
<i>Popowia parvifolia</i> Kurz.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
<i>Popowia helferi</i> Hook. f. & Thoms.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
<i>Pseuduvaria prainii</i> (King) Merr.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
<i>Sageraea dalzelli</i> Beddome	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
<i>Sageraea elliptica</i> (DC.) Hook. F. & Thoms.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-
<i>Sageraea grandiflora</i> Dunn.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-

<i>Sageraea laurifolia</i> (Graham) Blatter	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-
<i>Trivalvaria kanjilalii</i> D. Das	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Uvaria andamanica</i> King.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
<i>Uvaria eucinata</i> Beddome ex Dunn.	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-
<i>Uvaria hamiltonii</i> var. <i>kurzi</i> King.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
<i>Uvaria hookeri</i> King.	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-
<i>Uvaria lurida</i> Hook. f. & Thoms. var. <i>lurida</i>	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-
<i>Uvaria lurida</i> var. <i>sikkimensis</i> King.	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Uvaria nicobarica</i> Raizada & Sahni	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-

(+) Presence

(-) Absence

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).

Tab. 3. Species composition and representation of endemic taxa of Annonaceae in India.

Genera	Total taxa in India	Endemics		Total endemic taxa	Percentage
		Species	Subspecies		
<i>Annona</i>	6	-	-	-	-
<i>Alphonsea</i>	5	1	-	1	20
<i>Miliusa</i>	15	7	-	7	56.6
<i>Orophea</i>	12	8	-	8	66.6
<i>Phaeanthus</i>	1	1	-	1	100
<i>Goniothalamus</i>	13	6	2	8	61.53
<i>Mitrephora</i>	5	2	-	2	40
<i>Popowia</i>	3	3	-	3	100
<i>Pseuduvaria</i>	1	1	-	1	100
<i>Cananga</i>	1	-	-	-	-
<i>Artabotrys</i>	6	2	-	2	33.3
<i>Cyathocalyx</i>	2	-	-	-	-
<i>Desmos</i>	8	1	1	2	25
<i>Friesodielsia</i>	1	1	-	1	100
<i>Meiogyne</i>	2	2	-	2	100
<i>Mezzettia</i>	1	0	0	-	-
<i>Polyalyhia</i>	5	5	-	5	35.7
<i>Cyathostemma</i>	2	1	-	1	50
<i>Sageraea</i>	6	4	-	4	66.6
<i>Trivalvaria</i>	3	1	-	1	33.3
<i>Uvaria</i>	14	4	3	7	50
<i>Anaxagorea</i>	1	-	-	-	-
<i>Fissistigma</i>	8	-	-	-	-
<i>Xylopia</i>	1	-	-	-	-

Endemism of Annonaceae in Indian subcontinent

In the broader aspect, extent of endemism of Annonaceae in Indian subcontinent is shown Tab. 4.

From Tab. 4, it is recorded that there are ca.58 taxa confined in Indian subcontinent. Out of ca.58 taxa, ca.32 taxa are confined in India-Sri Lankan region followed by ca.8 taxa confined in Indo-Myanmar region followed by ca.4 taxa in Indo-Bangladesh region. One each is confined in Indo-Bangla-Myanmar region and in Indo-Bhutan-Myanmar region, respectively. Comparatively Indo-Nepal and Indo-Pakistan region is poorly represented with endemic representatives of Annonaceae, which are concentrated in the S.E. Asia. Hence, Peninsular Indian region, particularly Indo-Sri Lankan region the gateway of S.E. Asia, should be regarded as endemic resort for Annonaceae and endemic taxa of Indian subcontinent regarded here as Broad Range Endemics or B.R.E. On the contrary, the ca.56 taxa, which are restricted in India, should be regarded as Narrow Range Endemics or N.R.E. The trend and extent of endemism of a particular genus (whether tends to disperse or confined may be better understood from the ratio of Narrow Range Endemics : Broad Range Endemics, which has been presented in Tab. 5.

Out of 114 taxa, *Goniothalamus* shows highest number of endemics: 16 taxa, followed by *Miliusa* : 14 taxa, *Polyalthia* : 11 taxa, *Uvaria* : 10 taxa, *Orophea* : 9 taxa so on. Though there are some Himalayan elements, but major taxa are spatially distributed in N.E. India, Myanmar and Bangladesh region and in Andaman & Nicobar Islands – Western Ghats of India to Sri Lankan region. Abundance of endemic species in Islands (in India and Sri Lanka) helps to come in conclusion that most of the endemic members of Annonaceae are “Island endemics” (GENTRY, 1986).

Total taxa in Indian subcontinent:	153	
Total taxa in India	: 129,	$(129/153) \times 100 = 84.31 \%$
E. I. S.	: 114,	$(114/153) \times 100 = 74.50 \%$
N. R. E.	: 56,	$(56/153) \times 100 = 36.60 \%$
B. R. E.	: 58,	$(58/153) \times 100 = 37.90 \%$

The distributional pattern of endemic taxa of Annonaceae in Indian subcontinent is presented in Fig. 1.

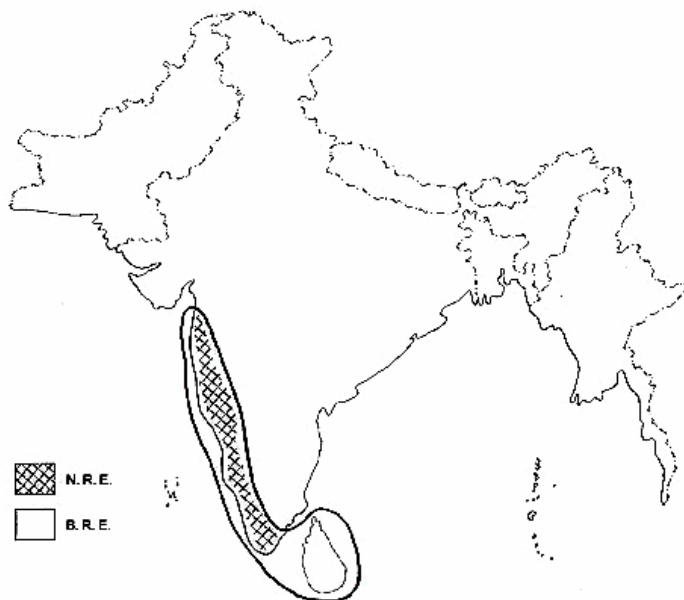


Fig. 1: An outline of endemism of Annonaceae in Indian subcontinent

Threatened taxa belonging to Annonaceae of India

A number of endemics of Annonaceae are restricted in distribution for physical barrier along which drastic human interference and habitat destruction. There are some instances of narrow range endemism, remain under exploited, having

promising economic potentiality. Eventually there are some taxa of cosmopolitan distribution but narrowly distributed in India. Both groups of members should be regarded as threatened taxa, which are remain unexploited as well as under exploited and to be conserved for further scientific exploitation. It has been estimated that there are ca. 52 taxa of Annonaceae facing survival threat presented in (Tab. 6).

Out of ca.52 taxa, 7-8 are *Uvaria* spp. Ca.5 are *Orophea* spp, ca.5 are *Goniothalamus* spp. Ca.4 are *Polyalthia* spp. Ca.5-*Sageraea* ssp. so on. Most of the members of Annonaceae have promising economic potentiality either as edible wild fruit plants or as timber yielding plants. Due to their timber yielding capacity the entire plants or its reproductive parts are over exploited from their natural habitat. On the other hand, wild fruits are collected and taken by local people for consumption. Normally dispersal of seeds is indirectly related with anthropogenic interference. But that effort is affected by habitat destruction by indiscriminate depletion for tropical forests. Naturally, Shrinkage of population size has effected reproductive biology as well as enhanced reproductive incompatibility and finally leads to shrinkage of gene-pool. The arborescent, wild, edible fruit bearing taxa of Annonaceae should be conserved for further scientific exploitation of its gene pool. The endemic arborescent taxa which are concentrated in different Islands, should be considered as mainly "Island endemics" and partially 'Palaeoendemics' (AHMEDULLAH & NAYAR 1986, GENTRY 1986). The germplasm of edible as well as wild fruit bearing taxa of Annonaceae should be conserved.

Possible fossil evidence in relation to endemics of Annonaceae in India

MORLEY (2000) in his recent work of global evaluation of the biogeography and the fossil records of flowering plants within a plate tectonic framework has found that diversification of Annonaceae occurred during Late Cretaceous and Early Tertiary in Equatorial centre (Western Gondwana). The possible evidences of endemism of Annonaceae is represented by fossiliferous seeds of *Artabotrys hexapetalus* (L. f.) BHANDARI of early tertiary era, from Worli and Malabar hills, Maharashtra and this fossil ancestor has living successor of present day, said to be native of Southern India (CARTER 1852). Though, *A. hexapetalus* (L. f.) BAHNDARI is not belonging under endemic category but its fossil records helps to predict its past existence. The fossil remnant of *Fissistigma seni* LAKHANPAL has been reported from Kangra district, Himachal Pradesh of Miocene period, Tertiary era. It is an important matter to notice that all living representatives of *Fissistigma* sp. have been spatially distributed in N. E. India whereas the fossil representative has been reported from N. W. Himalayas, it helps to predict that once *Fissistigma* sp. were predominately distributed in N. W. Himalayan region during Miocene period of Tertiary era (LAKHANPAL 1969). However, there is no fossil representative, so far, reported from India, having living, endemic successor belonging to this family.

Tab. 4. Checklist of endemic taxa of Annonaceae in Indian subcontinent.

Name of Taxa	India	Pakistan	Nepal	Bhutan	Bangladesh	Myanmar	Sri Lanka	Alt. (m)	Fl. Time
<i>Alphonsea hortensis</i> H. Huber	-	-	-	-	-	-	+	#	#
<i>Alphonsea lutea</i> (Roxb.) Hook. f. & Thoms.	+	-	-	-	-	+	+	200-600	Apr.-May
<i>Alphonsea sclerocarpa</i> Thw.	+	-	-	-	-	-	+	#	March
<i>Alphonsea ventricosa</i> (Roxb.) Hook. f. & Thoms.	+	-	-	-	+	-	-	100-1000	March
<i>Alphonsea zeylanica</i> Hook. f. & Thoms.	+	-	-	-	-	-	+	#	#
<i>Artabotrys caudatus</i> Hook. f. & Thoms.	+	-	-	+	+	-	-	Up to 1200	Mar.-May
<i>Artabotrys cubittii</i> Chatterjee	+	-	-	-	-	+	-	#	March
<i>Artabotrys zeylanicus</i> Hook. f. & Thoms.	+	-	-	-	-	-	+	#	Oct.-Feb.
<i>Bocagea coriacea</i> Hook. f. & Thoms.	-	-	-	-	-	-	+	1500	April
<i>Bocagea obliqua</i> Hook. f. & Thoms.	-	-	-	-	-	-	+	#	Mar.-Apr.
<i>Bocagea thwaitesii</i> Hook. f. & Thoms.	-	-	-	-	-	-	+	#	#
<i>Cyathocalyx martabanicus</i> Hook. f. & Thoms.	+	-	-	-	-	+	-	#	Apr.-May
<i>Cyathocalyx zeylanicus</i> Champ.	+	-	-	-	-	-	+	400-1000	Apr.-June
<i>Desmos lawii</i> (Hook. f. & Thoms.) Safford.	+	-	-	-	-	-	+	#	Feb.-May
<i>Desmos longiflorus</i> (Roxb.) Safford.	+	-	-	+	+	+	-	1000-1200	Mar.-June
<i>Desmos praecox</i> (Hook. f. & Thoms.) Safford.	+	-	-	+	-	-	-	500-1200	Feb.-May
<i>Fissistigma bicolor</i> (Roxb.) Merr.	+	-	-	-	-	+	-	300-800	Mar.-Apr.
<i>Fissistigma ellipticum</i> (King) D. Mitra	+	-	-	-	+	-	-	#	March
<i>Fissistigma rufinerve</i> (Hook. f. & Thoms.) Meer.	+	-	-	-	+	-	-	#	#
<i>Fissistigma verrucosum</i> (Hook. f. & Thoms.) Merr.	+	-	-	-	+	+	-	1000-2000	Apr.-July

<i>Fissistigma wallichii</i> (Hook. f. & Thoms.) Merr.	+	-	-	-	+	+	-	400-700	Nov.-Feb.
<i>Goniothalamus hookeri</i> Thw.	-	-	-	-	-	-	-	#	April
<i>Goniothalamus meeboldia</i> Craib	+	-	-	-	-	+	-	#	Nov-Dec.
<i>Goniothalamus reticulatus</i> Thw.	-	-	-	-	-	-	+	#	Sept.
<i>Goniothalamus salcinus</i> Hook. f. & Thoms.	-	-	-	-	-	-	+	#	Feb.-Mar.
<i>Goniothalamus sesquipedalis</i> (Wall.) Hook. f. & Thoms.	+	-	-	+	+	+	-	300-1200	Apr.-June
<i>Goniothalamus thomsonii</i> Thw.	-	-	-	-	-	-	+	#	May
<i>Goniothalamus thwaitesii</i> Hook. f. & Thoms.	+	-	-	-	-	-	+	800	Aug.-Oct.
<i>Goniothalamus walkeri</i> Hook. f. & Thoms.	-	-	-	-	-	-	+	#	Sept.
<i>Miliusa globosa</i> (DC.) Panigr. & S. C. Mishra	+	-	-	+	+	-	-	800	Dec.-May
<i>Miliusa indica</i> Leschen ex DC.	+	-	-	-	-	-	+	#	June-July
<i>Miliusa longiflora</i> (Hook. f. & Thoms.) Finet & Gagnepain.	-	-	-	+	+	-	-	#	March
<i>Miliusa macrocarpa</i> Hook. f. & Thoms.	+	-	-	+	-	+	-	1200-1700	Apr.-May
<i>Miliusa montana</i> Gard. Ex.. Hook. f. & Thoms.	+	-	-	-	-	-	+	#	Apr.-June
<i>Miliusa tomentosa</i> (Roxb.) Finet and Gagnepain	+	-	+	-	-	-	+	#	Mar.-May
<i>Miliusa zeylanica</i> Gard. ex. Hook. f. & Thoms.	-	-	-	-	-	-	+	350	Aug.-Sept.
<i>Mitrephora hareae</i> Ohashai	+	-	-	+	-	-	-	300-1200	Mar.-Apr.
<i>Mitrephora heyneana</i> (Hook. f. & Thoms.) Thw.	+	-	-	-	-	-	+	#	Mar.-July
<i>Mitrephora tomentosa</i> Hook. f. & Thoms.	+	-	-	-	+	+	-	#	Mar.-May
<i>Orophea zeylanica</i> Hook. f. & Thoms.	+	-	-	-	-	-	+	800	May
<i>Polyalthia acuminata</i> Thw.	-	-	-	-	-	-	+	#	June-July
<i>Polyalthia coffeoids</i> (Hook. f. & Thoms.) Thw.	+	-	-	-	-	-	+	500-1300	Mar.-Nov.

<i>Polyalthia korintii</i> (Dunal) Thw.	+	-	-	-	-	+	+	#	June-July
<i>Polyalthia laterifolia</i> (Blume) Kurz.	+	-	-	-	-	+	-	#	Mar.-Apr.
<i>Polyalthia longifolia</i> (Sonner.) Thw.	+	-	-	+	-	-	+	#	June-July
<i>Polyalthia moonii</i> Thw.	-	-	-	-	-	-	+	350	Sept.
<i>Sageraea listeri</i> King. var. <i>andamanica</i> Chatterjee & Mukherjee	+	-	-	-	-	+	-	#	Mar.-Apr.
<i>Sageraea listeri</i> King. var. <i>listeri</i>	-	-	-	-	+	-	-	#	#
<i>Trivalvaria argentea</i> (Hook. f. & Thoms.) Sinclair	+	-	-	-	+	-	-	100-1000	June-July
<i>Trivalvaria dubia</i> (Kurz.) Sinclair	+	-	-	-	-	+	-	#	Apr.-July
<i>Unona elegans</i> Thw.	-	-	-	-	-	-	+	#	Sept.
<i>Unona zeylanica</i> Hook. f. & Thoms.	-	-	-	-	-	-	+	#	April
<i>Uvaria macropoda</i> Hook. f. & Thoms.	-	-	-	-	-	-	+	950	Sept.
<i>Uvaria narum</i> (Dunal) Blume	+	-	-	-	-	-	+	#	Dec.-Apr.
<i>Uvaria zeylanica</i> L.	+	-	-	-	-	-	+	#	Oct.-Dec.
<i>Xylopia championii</i> Hook. f. & Thoms.	-	-	-	-	-	-	+	#	Dec.-Mar.
<i>Xylopia nigricans</i> Hook. f. & Thoms.	-	-	-	-	-	-	+	#	Sept.
<i>Xylopia parvifolia</i> (Wight) Hook. f. & Thoms.	-	-	-	-	-	-	+	#	Aug.-Nov.

(+) Presence

(-) Absence

Data is not available

Tab. 5. The ratio of N. R. E. : B. R. E. of Annonaceae in Indian subcontinent.

Genera	N.R.E.	B.R.E.	Total
<i>Annona</i>	-	-	-
<i>Alphonsea</i>	1	5	06
<i>Bocagea</i>	0	3	03
<i>Miliusa</i>	7	7	14
<i>Orophea</i>	8	1	09
<i>Phaeanthus</i>	1	0	01
<i>Goniothalamus</i>	8	8	16
<i>Mitrephora</i>	2	3	05
<i>Popowia</i>	3	0	03
<i>Pseuduvaria</i>	1	0	01
<i>Cananga</i>	0	0	00
<i>Artabotrys</i>	2	3	05
<i>Cyathocalyx</i>	0	2	02
<i>Desmos</i>	2	03	05
<i>Friesodieisia</i>	1	0	01
<i>Meiogyne</i>	2	0	02
<i>Mezzettia</i>	0	0	00
<i>Polyalyhia</i>	5	6	11
<i>Cyathostemma</i>	1	0	01
<i>Sageraea</i>	4	2	06
<i>Trivalvaria</i>	1	2	03
<i>Unona</i>	0	2	02
<i>Uvaria</i>	7	3	10
<i>Anaxagorea</i>	0	0	00
<i>Fissistigma</i>	0	5	05
<i>Xylopia</i>	0	3	03
Total	56	58	114

Tab. 6. Plants facing survival threat of the family Annonaceae in India.

Name Of Taxa	Frequency Index	Biotic Pressure	Parts Used	Flowering Season	Altitude (M)
<i>Alphonsea madraspatana</i> Beddome	I.	I. S. P.	#	May	900
<i>Alphonsea zeylanica</i> Hook. f. & Thoms.	I.	I. S. P.	#	#	#
<i>Artabotrys caudatus</i> Hook. f. & Thoms.	I.	I. S. P.	#	Mar.-May	1200
<i>Artabotrys nicobarianus</i> D. Das	R.	I. S. P.	#	Mar.-Apr.	#
<i>Cyathostemma simiarum</i> Griffith.	I.	I. S. P.	#	June-July	#
<i>Desmos longiflorus</i> (Roxb.) Saffard.	I.	Ec.	Edibl Fr.	Apr.-Oct.	1000-1200

<i>Desmos viridiflorus</i> (Beddome) Safford.	E.	I. S. P.	#	April	#
<i>Fissistigma ellipticum</i> (King) D. Mitra	I.	I. S. P.	#	Mar.	#
<i>Fissistigma parvifolia</i> (Wight) Hook. f. & Thoms.	I.	Ec.	Wood	Aug.-Nov.	#
<i>Fissistigma</i> <i>rubiginosum</i> (DC.) Merr.	I.	#	#	Nov.-June	500- 1000
<i>Fissistigma santapau</i> D. Das	I.	#	#	Mar.	#
<i>Fissistigma</i> <i>verrucosum</i> (Hook. f. & Thoms.) Merr.	I.	#	#	Apr.-July	200- 1000
<i>Goniothalamus</i> <i>cardiopetalus</i> (Dalz.) Hook. f. & Thoms.	I.	Ec.	Wood made for parts	Jan.- March	#
<i>Goniothalamus</i> <i>rhynchantherus</i> Dunn.	R.	I. S. P.	#	June-Oct.	#
<i>Goniothalamus</i> <i>simonsii</i> Hook. f. & Thoms.	I.	I. S. P.	#	May-Nov.	500- 1000
<i>Goniothalamus wightii</i> Hook. f. & Thoms.	I.	Ec.	Fibers from Barks.	Apr.-May	1000- 1500
<i>Goniothalamus</i> <i>wynaadensis</i> (Beddome) Beddome	I.	I. S. P.	#	Jan.-July	500- 1050
<i>Meiogyne pannosa</i> Sinclair	I.	I. S. P.	#	Jan.-May	600- 1400
<i>Miliusa andamanica</i> (King.) Finet & Gagnepain	I.	I. S. P.	#	May-June	100
<i>Miliusa nilagirica</i> Beddome	V.	I. S. P.	#	May-June	1200- 1500
<i>Mitrephora</i> <i>andamanica</i> Thoth. & D. Das	R.	#	#	April	#
<i>Mitrephora grandiflora</i> Beddome	I.	#	#	Jan.-April	600
<i>Mitrephora</i> <i>harae</i> Ohashi	I.	#	#	Mar.-Apr.	300- 1200
<i>Orophea salacifolia</i> Hutch.	I.	#	#	#	#
<i>Orophea thomsonii</i> Beddome	I.	#	#	October	#

<i>Orophea torulosa</i> Hutch.	I.	#	#	April	#
<i>Orophea uniflora</i> Hook. f. & Thoms.	I.	#	#	Aug.-Oct.	#
<i>Orophea zeylanica</i> Hook. f. & Thoms.	I.	I. S. P.	#	May	800
<i>Phaeanthus</i> <i>malabaricus</i> Beddome	V.	#	#	Feb.-May	#
<i>Polyalthia fragrans</i> (Dalz.) Beddome	I.	Ec.	Wood in Ply wood	Nov.-Jan.	500- 1000
<i>Polyalthia korintii</i> (Dunal) Thwaites	I.	I. S. P.	#	Jan.-Mar.	#
<i>Polyalthia simiarum</i> (Hook. f. & Thoms.)	I.	Ec. (Fibre)	Wood	May-Oct.	100- 1000
<i>Popowia beddomeana</i> Hook. f. & Thoms.	R.	#	#	Mar.-May	900- 1500
<i>Popowia helferi</i> Hook. f. & Thoms.	I.	#	#	April	#
<i>Pseuduvaria prainii</i> (King) Merr.	R.	I. S. P.	#	Mar.-April	#
<i>Sageraea dalzelli</i> Beddome	I.	Ec (Medicine)	L.	Mar.-May	750- 1000
<i>Sageraea elliptica</i> (DC) Hook. f. & Thoms.	I.	Ec.	Wood	Feb.-Mar.	#
<i>Sageraea grandiflora</i> Dunn	Ex/E	Ec, I. S. P.	#	Nov.-Dec.	#
<i>Sageraea laurifolia</i> (Graham) Blatter.	I.	Ec (Timber)	Wood	Oct.-Nov.	#
<i>Sageraea listeri</i> king var. <i>andamanica</i> Mukherjee	I.	Ec. (Medicine)	L., Wood	Mar.-Apr.	#
<i>Trivalvaria kanjilalii</i> D. Das	E.	#	#	June-July	1500
<i>Uvaria andamanica</i> King.	I.	I. S. P.	#	Dec.-Jan.	#
<i>Uvaria eucincta</i> Beddome ex Dunn.	E.	#	#	#	600
<i>Uvaria hamiltonii</i> Hook. f. & Thoms. var. <i>hamiltonii</i>	R.	I. S. P.	#	May-July	#
<i>Uvaria hamiltonii</i> Hook. f. & Thoms. Var. <i>kurzii</i> King.	I.	I. S. P.	#	July	#
<i>Uvaria hookeri</i> King.	I.	Ec.	L. Wood	May-July	#

<i>Uvaria lurida</i> Hook. f. & Thoms. Var. <i>lurida</i> King	I.	#	#	Jan.-May	#
<i>Uvaria nicobarica</i> Raizada & Sahni	R.	I. S. P.	#	#	#
<i>Uvaria zeylanica</i> L.	I.	Ec.	Fr.	Oct.-Dec.	#

●Abbreviations

#	: Data is not available	R	:	Rare
I	: Indeterminate	L	:	Leaves
E	: Endangered	Ex	:	Extinct
V	: Vulnerable	I. S. P.	:	Isolated Small Population
Ec	: Economic	Fr	:	Fruit

References

- AHMEDULLAH M. & NAYAR M. P. (1986): Endemic plants of Indian region (Peninsular India) Vol. 1. - Botanical Survey of India, Calcutta.
- AUBREVILLE A. (1960): Flores du Cambodge du Laos et du Vietnam. - Museum National d'histoire Naturelle, Paris.
- BAKKER M. E. (1999): Annonaceae, Genera Worldwide. ETI CD Rom series, ETI Information Series Ltd. Berkshire, U.K.
- CARTER H. J. (1852): Geology of the Island of Bombay. - J. Bombay Brch. R. Asiat. Soc. 4 : 461.
- DEB D. B. (1981): Flora of Tripura state vol. 1.- Today and Tomorrows, New Delhi.
- Dutta S. R. & Almeida S. M. (1998): A new species of *Goniothalamus* BLUME (Annonaceae). - Journ. Bombay Nat. Hist. Soc. 95 : 488 – 490.
- GENTRY A. H. (1986): Endemism in tropical vs. temperate plant communities In: Soule, M. (ed.) Conservation biology: The science of scarcity and diversity. p. 153-181. - Sinauer Associates, Sunderland, Mass.
- GOEL A. K., MEHROTRA B. N. & VASUDEVA RAO M. K. (1991): *Miliusa mollis* var. *sparsior* (Annonaceae) in Andamans: A new record for India. Higher plants of Indian subcontinent. II: 1-4. - Dehra Dun.
- HUTCHINSON J. (1923): A contribution towards a phylogenetic classification of flowering plants. II. The genera of Annonaceae. - Bull. Misc. Inf. Kew 1923: 241-261.
- KESSLER P. A. (1989): Some interesting distribution patterns in Annonaceae. - Annonaceae Newsl. No.6.14-23(1989).
- KESSLER P.A. (1990): Monographic work on Asiatic Annonaceae with special emphasis on the tribe Saccopetaleae. - Annonaceae Newsl. No.8 45-52 (1990).
- KING G. (1893): The Annonaceae of British India. - Ann. R. Bot. Gard. Calc. 4:1-169.
- KOEK-NORMAN J., WESTRA L. Y. T. & MAAS P. J. M. (1993): Studies in Annonaceae : A comparative Study. - Taxon 39: 16-32.
- KUNDU S. R. (2001): Phytogeographical provinces (Phytocorias) of India: An account. - Geobios 29:69-88.
- LAKHANPAL R. N. (1969): Fossil *Fissistigma* from the lower Siwalik near Jawalamukhi, India. In: J.Sen Memorial volume, Bot.Soc. Bengal, Calcutta. (ed.SANTAPAU, H.et al) pp. 311 – 312. – Botanical Survey of India, Calcutta.
- MITRA D. (1974): Studies on the family Annonaceae in India: some notes on taxonomy, endemism and phytogeography. - Indian Sci. Congr. Assoc. Proc.61. (3): Group B.

- MITRA D. (1993): Annonaceae. In: SHARMA, B. D. BALAKRISHNAN, N. P., RAO, R. R. & HAJRA, P. K. (eds.) Flora of India. 1: 202 – 307. - Botanical Survey of India, Calcutta.
- MITRA D. (1995): Some notes on Indian Annonaceae. - Bull. Bot. Surv. India 35: 117-118.
- MORLEY R. J. (2000): Origin and evolution of tropical rain forests. - John Wiley & Sons, West Sussex.
- PRAKASH V. & MEHROTRA B. N. (1990): A new species of Polyalthia (Annonaceae) from Meghalaya, India.- Nord. J. Bot. 10: 45-47.
- Sasidharan N. (1998): A new species of Orophea (Annonaceae) from Western Ghats, India. - Nord. J.Bot. 19:301-303.
- SIVARAJAN V. V.& SUNIL C. N.(1993): Annona glabra L.(Annonaceae): A new record for India. - Rheedeia. 3:90-93.
- VAN SETTEN A. K. (1987): Some notes on the seeds and fruits of Annonaceae.- Annonaceae newsl. No.3.3-4(1987).

Received: June 20th 2004
Revised: April 18th 2005
Accepted: August 8th 2006