

FLORA OF INDIA

VOLUME 5

OLACACEAE - CONNARACEAE

BOTANICAL SURVEY OF INDIA

FLORA OF INDIA

VOLUME 5

OLACACEAE - CONNARACEAE



Editors

N.P. SINGH
J.N. VOHRA
P.K. HAJRA
and
D.K. SINGH



BOTANICAL SURVEY OF INDIA
CALCUTTA

© Government of India

Date of publication, October, 2000

No part of this publication can be reproduced, stored in a retrieval system, or transmitted, in any form or means by electronic, mechanical, photocopying, recording, or otherwise, without prior written permission of the Director, Botanical Survey of India.

Price :

Published by the Director, Botanical Survey of India, P-8 Brabourne Road, Calcutta-700 001; composed at Computer Unit, Botanical Survey of India, Northern Circle, Dehra Dun-248 195 and printed at M/s Deep Printers, A-8, Mayapuri Industrial Area, Phase-I, New Delhi 110 064.

CONTENTS

Acknowledgements	i
Contributors	iii
Abbreviations	v
List of Illustrations	vii
OLACACEAE	1
ICACINACEAE	17
OPILIACEAE	39
CARDIOPTERIDACEAE	47
AQUIFOLIACEAE	50
CELASTRACEAE	75
HIPPOCRATEACEAE	138
RHAMNACEAE	163
VITACEAE	246
LEEACEAE	325
SAPINDACEAE	343
HIPPOCASTANACEAE	388
ACERACEAE	392
MELIANTHACEAE	411
STAPHYLEACEAE	413
SABIACEAE	419



ANACARDIACEAE	435
CORIARIACEAE	511
MORINGACEAE	515
CONNARACEAE	519
Index to botanical names	541
Index to common names	563

ACKNOWLEDGEMENTS

The editors are pleased to record their thanks to all the contributors of this volume of Flora of India. They also express their thanks to Dr. R.L. Mitra, Scientist-SE (Retd.), Central National Herbarium, and to Shri U. Chatterjee, Scientist-in-Charge, Publication Section, Botanical Survey of India and all his associated staff members for their help and general assistance during the finalisation of this volume.

The editors also acknowledge the efficient work done by Shri Sanjay Uniyal, Data Entry Operator, Botanical Survey of India, Northern Circle, Dehra Dun for computer typesetting, scanning of illustrations and formatting of the manuscript. We also thank Shri Bhola Ram, Ex-chief Artist, Botanical Survey of India and Shri A.T. Durgadas, Artist, Northern Circle BSI, Dehra Dun for making some of the illustrations, and Shri Dev Raj Agarwal, Photographer, Northern Circle, BSI, Dehra Dun for photographic assistance. Hard work and whole hearted cooperation rendered by all the present and retired staff members of Botanical Survey of India in general, and those of Northern Circle, Dehra Dun in particular, during the course of this entire work, is also thankfully acknowledged.

Finally, we acknowledge the quick printing of this volume in final form by Mr. M.L. Jain of Deep Printers, New Delhi.

CONTRIBUTORS AND EDITORS

BHANDARI, M.M. 39, Bhagat ki Kothi Extension Scheme, New Pali Road,
Jodhpur 342 001.

BHANSALI, A.K. Agriculture Research Station, University of Udaipur, Mandore,
Jodhpur 342 040.

BASU, DEBJANI. Botanical Survey of India, Central National Herbarium, P.O.
Botanic Garden, Howrah 711 103.

CHANDRA, DALI. Teara Bagan, Udairaspur, North 24 Parganas 743 275.

DUTTA, A. 2/2 Rajani Mukherjee Lane, Calcutta 700 032.

HAJRA, P.K. "Orchid", 29/6 Inder Road, Dehra Dun 248 001.

MAJUMDAR, S.C. Botanical Survey of India, Indian Botanic Garden, P.O.
Botanic Garden, Howrah 711 103.

MATHUR, RESHMA. Botanical Survey of India, Northern Circle, 192 Kaulagarh
Road, Dehra Dun 248 195.

MONDAL, M.S. Botanical Survey of India, P-8, Brabourne Road, Calcutta
700 001.

MUKHERJEE, S.K. 21/2, Dover Road, Calcutta 700 019.

NAITHANI, B.D. 7/2, Arya Nagar, Dehra Dun 248 001.

NAYAR, M.P. "The Greens", 19/315 Vattavila, Thiruvananthapuram 695 006.

PANT, P.C. 161, Mandir Marg, Banasthali, South Ballupur, Dehra Dun
248 001.

RAMAMURTHY, K. 9-A, Ashok Nagar, Ganapati, Coimbatore 641 006.

RAU, M.A. 962, Third Main Road, Lakshmiपुरam, Mysore 570 004.

SHETTY, B.V. Department of Applied Botany Mangalore University,
Mangalagangothri 5/4 199.

SINGH, D.K. Botanical Survey of India, Northern Circle, 192, Kaulagarh Road,
Dehra Dun 248 195.

SINGH, N.P. Botanical Survey of India, P-8, Brabourne Road, Calcutta
700 001.

SINGH, P., Botanical Survey of India, Sikkim Himalayan Circle, Chief Justice
Road, Gangtok 737 101.

UNIYAL, B.P. Botanical Survey of India, Northern Circle, 192, Kaulagarh
Raod, Dehra Dun 248 195.

VOHRA, J.N. 289, Old Housing Board Colony, Karnal 248 001.

ABBREVIATIONS
of
INDIAN LANGUAGES

Abor	:	Abor	Kum.	:	Kumaonese
And.	:	Andaman	Lep.	:	Lepcha
Asm.	:	Assamese	Lus.	:	Lushai
Beng.	:	Bengali	Mal.	:	Malayalam
Bhoj.	:	Bhojpuri	Mani.	:	Manipuri
Bhut.	:	Bhutia	Mar.	:	Marathi
Cachar	:	Cachar	Mikir	:	Mikir
Coorgi	:	Coorgi	Miri	:	Miri
Eng.	:	English	Naga	:	Naga
Garo	:	Garo	Nep.	:	Nepali
Garh.	:	Garhwali	Or.	:	Oriya
Goa.	:	Goanese	Port.	:	Portuguese
Guj.	:	Gujarati	Punj.	:	Punjabi
Hindi	:	Hindi	Raj.	:	Rajasthani
Jain.	:	Jaintea	Sans.	:	Sanskrit
Jaun.	:	Jaunsar	Sant.	:	Santal
Kang.	:	Kangri	Sind.	:	Sindhi
Kan.	:	Kannada	Tam.	:	Tamil
Kash.	:	Kashmiri	Tel.	:	Telugu
Kh.	:	Khasi	Tipp.	:	Tippera (Tripura)
Kon.	:	Konkani	Urdu	:	Urdu

LIST OF ILLUSTRATIONS

OLACACEAE

- | | | |
|----|-------------------------------------|----|
| 1. | Anacolosia frutescens (Blume) Blume | 4 |
| 2. | Olax nana Wallich ex Benth. | 8 |
| 3. | Olax scandens Roxb. | 10 |

ICACINACEAE

- | | | |
|----|--|----|
| 4. | Codiocarpus andamanicus (Kurz) Howard | 21 |
| 5. | Gomphandra comosa King | 23 |
| 6. | Gomphandra coriacea Wight | 24 |
| 7. | Nothapodytes nimmoniana (Garham) Mabb. | 32 |
| 8. | Stemonurus secundiflorus Blume | 37 |

OPILIAEAE

- | | | |
|-----|------------------------------------|----|
| 9. | Champereia manillana (Blume) Merr. | 42 |
| 10. | Opilia amentacea Roxb. | 45 |

CARDIOPTERIDACEAE

- | | | |
|-----|--|----|
| 11. | Cardiopteris quinqueloba (Hassk.) Hassk. | 48 |
|-----|--|----|

AQUIFOLIACEAE

- | | | |
|-----|-----------------------------------|----|
| 12. | Ilex insignis Hook.f. | 60 |
| 13. | Ilex khasiana Purakayastha | 62 |
| 14. | Ilex odorata Buch.-Ham. ex D. Don | 65 |
| 15. | Ilex pseudo-odorata Loes. | 67 |

CELASTRACEAE

- | | | |
|-----|-----------------------------------|-----|
| 16. | Bhesa indica (Beddome) Ding Hou | 78 |
| 17. | Cassine albens (Retz.) Kosterm. | 81 |
| 18. | Celastrus paniculatus Willd. | 88 |
| 19. | Euonymus indicus Wallich ex Heyne | 103 |
| 20. | Glyptopetalum lawsonii Gamble | 113 |
| 21. | Lophopetalum wightianum Arn. | 117 |
| 22. | Microtropis ramiflora Wight | 132 |

23.	<i>Pleurostyliia opposita</i> (Wallich) Alston	135
24.	<i>Siphonodon celastrineus</i> Griffith	136
HIPPOCRATEACEAE		
25.	<i>Loeseneriella cumingii</i> (M. Lawson) Ding Hou	142
26.	<i>Loeseneriella obtusifolia</i> (Roxb.) A.C. Smith	143
27.	<i>Loeseneriella parkinsonii</i> (T. Chakrab. & Gang.) B.D. Naithani	145
28.	<i>Reissantia grahamii</i> (Wight) Ding Hou	148
29.	<i>Salacia fruticosa</i> Heyne ex M. Lawson	154
30.	<i>Salacia majumdarii</i> (T. Chakrab. & Gang.) B.D. Naithani	159
RHAMNACEAE		
31.	<i>Berchemia floribunda</i> (Wallich) Brongn.	166
32.	<i>Colubrina asiatica</i> (L.) Brongn.	170
33.	<i>Colubrina travancorica</i> Beddome	172
34.	<i>Gouania leptostachya</i> DC. var. <i>leptostachya</i>	175
35.	<i>Gouania microcarpa</i> DC.	177
36.	<i>Hovenia dulcis</i> Thunb.	181
37.	<i>Rhamnus dahuricus</i> Pallas	186
38.	<i>Rhamnus nepalensis</i> (Wallich) M. Lawson	188
39.	<i>Rhamnus persica</i> Boiss.	191
40.	<i>Rhamnus purpurea</i> Edgew.	194
41.	<i>Rhamnus triqueter</i> (Wallich) Brandis	196
42.	<i>Sageretia hamosa</i> (Wallich) Brongn.	201
43.	<i>Sageretia parviflora</i> (Roemer & Schultes) G. Don	203
44.	<i>Sageretia thea</i> (Osbeck) Johnst.	205
45.	<i>Scutia myrtina</i> (Burm.f.) Kurz var. <i>myrtina</i>	209
46.	<i>Smythea bombaiensis</i> (Dalz.) Banerjee & Mukherjee	211
47.	<i>Smythea calpicarpa</i> Kurz	213
48.	<i>Smythea lanceata</i> (Tul.) Summerh.	215
49.	<i>Ziziphus andamanica</i> Bhandari & Bhansali	224
50.	<i>Ziziphus apetala</i> Hook.f.	226
51.	<i>Ziziphus caracutta</i> Roxb.	228
52.	<i>Ziziphus incurva</i> Roxb.	231

53.	<i>Ziziphus oenoplia</i> (L.) Miller	237
54.	<i>Ziziphus xylocarpa</i> (Retz) Willd.	244

VITACEAE

55.	<i>Ampelocissus araneosa</i> (Dalz.) Planchon ex Gamble	250
56.	<i>Ampelocissus barbata</i> (Wallich) Planchon	252
57.	<i>Ampelocissus indica</i> (L.) Planchon	255
58.	<i>Ampelocissus latifolia</i> (Roxb.) Planchon	257
59.	<i>Ampelocissus sikkimensis</i> (M. Lawson) Planchon	260
60.	<i>Ampelopsis glandulosa</i> (Wallich) Momiy.	264
61.	<i>Cayratia roxburghii</i> Gagnepain	274
62.	<i>Cissus glyptocarpa</i> Thwaites	280
63.	<i>Cissus repens</i> Lam.	291
64.	<i>Cissus trilobata</i> Lam.	295
65.	<i>Cyphostemma auriculatum</i> (Roxb.) P. Singh & Shetty	299
66.	<i>Cyphostemma setosum</i> (Roxb.) Alston	301
67.	<i>Parthenocissus semicordata</i> (Wallich) Planchon var. <i>roylei</i> (King) Raizada & Saxena	304
68.	<i>Vitis Jacquemontii</i> R. Parker	323

LEEACEAE

69.	<i>Leea aequata</i> L.	327
70.	<i>Leea alata</i> Edgew.	329
71.	<i>Leea angulata</i> Korth. ex Miq	331
72.	<i>Leea asiatica</i> (L.) Ridsdale	333
73.	<i>Leea compactiflora</i> Kurz	335
74.	<i>Leea indica</i> (Burm.f.) Merr.	338
75.	<i>Leea macrophylla</i> Roxb. ex Hornem.	340

SAPINDACEAE

76.	<i>Allophylus cobbe</i> (L.) Raeusch.	347
77.	<i>Allophylus serratus</i> (Roxb.) Kurz	350
78.	<i>Dodonaea viscosa</i> Jacq.	362
79.	<i>Harpullia arborea</i> (Blanco) Radlk.	366

80.	<i>Lepisanthes rubiginosa</i> (Roxb.) Leenh.	370
81.	<i>Lepisanthes tetraphylla</i> (Vahl) Radlk.	373
82.	<i>Sapindus mukorossi</i> Gaertner	383
HIPPOCASTANACEAE		
83.	<i>Aesculus indica</i> (Wallich ex Cambess.) Hook.f.	390
ACERACEAE		
84.	<i>Acer caesium</i> Wallich ex Brandis	395
85.	<i>Acer capadocicum</i> Gleditsch	398
86.	<i>Acer oblongum</i> Wallich ex DC. var. <i>oblongum</i>	404
87.	<i>Acer thomsonii</i> Miq.	409
STAPHYLEACEAE		
88.	<i>Turpinia malabarica</i> Gamble	417
SABIACEAE		
89.	<i>Meliosma dilleniifolia</i> (Wallich ex Wight & Arn.) Walp.	421
90.	<i>Meliosma pinnata</i> (Roxb.) Maxim. ssp. <i>pinnata</i>	425
91.	<i>Meliosma simplicifolia</i> (Roxb.) Walp.	426
ANACARDIACEAE		
92.	<i>Anacardium occidentale</i> L.	438
93.	<i>Buchanania lanzan</i> Sprengel	444
94.	<i>Choerospondias auriculata</i> D. Chandra	447
95.	<i>Cotinus coggygria</i> Scop.	450
96.	<i>Dracontomelon dao</i> (Blanco) Merr. & Rolfe	453
97.	<i>Drimycarpus racemosus</i> (Roxb.) Hook.f.	455
98.	<i>Holigarna arnottiana</i> Hook.f.	458
99.	<i>Lannea coromandelica</i> (Houtt.) Merr.	464
100.	<i>Mangifera indica</i> L.	467
101.	<i>Melanorrhoea usitata</i> Wallich	471
102.	<i>Nothopegia colebrookiana</i> (Wight) Blume	475
103.	<i>Parishia insignis</i> Hook.f.	480
104.	<i>Pistacia atlantica</i> Desf. ssp. <i>cabulica</i> (Stocks) Reichb.f.	483

105.	<i>Pistacia khinjuk</i> Stocks	484
106.	<i>Rhus chinensis</i> Miller	487
107.	<i>Rhus parviflora</i> Roxb.	491
108.	<i>Rhus punjabensis</i> Stewart	493
109.	<i>Rhus wallichii</i> Hook.f.	497
110.	<i>Schinus terebinthifolius</i> Raddi	499
111.	<i>Semecarpus anacardium</i> L.f.	501
112.	<i>Solenocarpus indica</i> Wight & Arn.	506
113.	<i>Spondias pinnata</i> (L.f.) Kurz	508
CORIARIACEAE		
114.	<i>Coriaria nepalensis</i> Wallich	513
MORINGACEAE		
115.	<i>Moringa oleifera</i> Lam.	517
CONNARACEAE		
116.	<i>Cnestis palala</i> (Lour.) Merr. ssp. <i>palala</i> var. <i>brevistylis</i> Mondal	522
117.	<i>Connarus andamanicus</i> Mondal	525
118.	<i>Connarus nicobaricus</i> King	528
119.	<i>Ellipanthus calophyllus</i> Kurz	534
120.	<i>Ellipanthus tomentosus</i> Kurz ssp. <i>tomentosus</i> var. <i>gibbosus</i> (King) Leenh.	536
121.	<i>Rourea minor</i> (Gaertner) Leenh.	539



Nothapodytes nimmoniana (Garham) Mabb. (BSI, WC, Pune)



Cansjera rheedii J. Gmelin (BSI, WC, Pune)



Maytenus emarginata (Willd.) Ding Hou (BSI, WC, Pune)



Maytenus rothiana (M. Lawson) Bennet & Sahni (BSI, WC, Pune)



Reissantia grahamii (Wight) Ding Hou (BSI, ANC, Port Blair)



Salacia chinensis L. (BSI, ANC, Port Blair)



Salacia oblonga Wallich ex Wight & Arn. (Courtesy : R. Gopalan)



Ziziphus oenoplia (L.) Miller (Courtesy : D.K. Singh)



Ziziphus xylopyra (Retz.) Willd. (BSI, WC, Pune)



Ampelocissus wightiana Shetty & P. Singh (Courtesy : R. Gopalan)



Cissus discolor Blume (Courtesy : P. Singh)



Cissus elongata Roxb. ssp. *littoralis* (W.A. Talbot) Shetty & P. Singh
(Courtesy : P. Singh)



Cissus glyptocarpa Thwaites (Courtesy : P. Singh)



Parthenocissus semicordata (Wallich) Planchon var. *roylei* (King) Raiz. & Saxena
(Courtesy : P. Singh)



Tetrastigma rumicispermum (M. Lawson) Planchon (Courtesy : P. Singh)



Leea asiatica (L.) Ridsdale (BSI, NC, Dehradun)



Cardiospermum canescens Wallich (BSI, SC, Coimbatore)



Cardiospermum halicacabum L. (Courtesy : P.S. Sivaprasad)



Dimocarpus longan Lour. (Courtesy : P.S. Sivaprasad)



Filicium decipiens (Wight & Arn.) Thwaites
(Courtesy : R. Gopalan & P.S. Sivaprasad)



Harpullia arborea (Blanco) Radlk. (Courtesy : P.S. Sivaprasad)



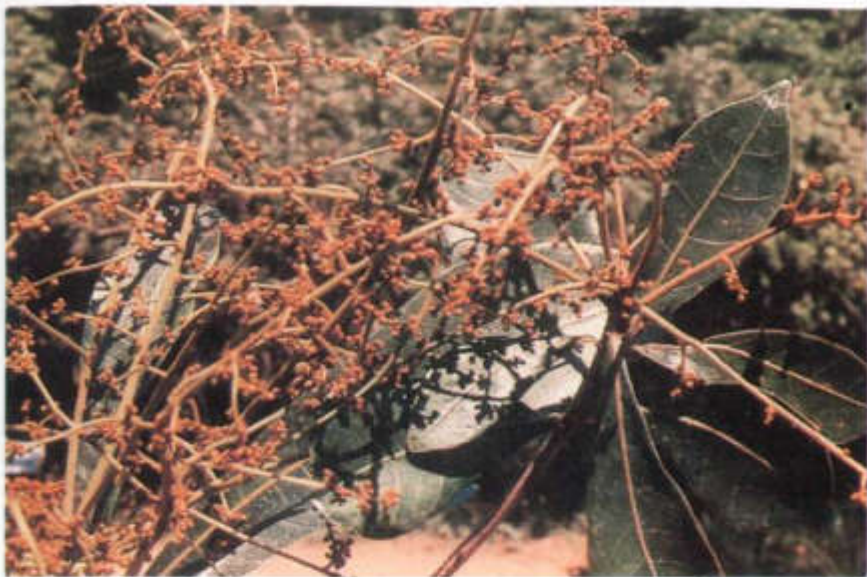
Sapindus emarginatus Vahl (Courtesy : P.S. Sivaprasad).



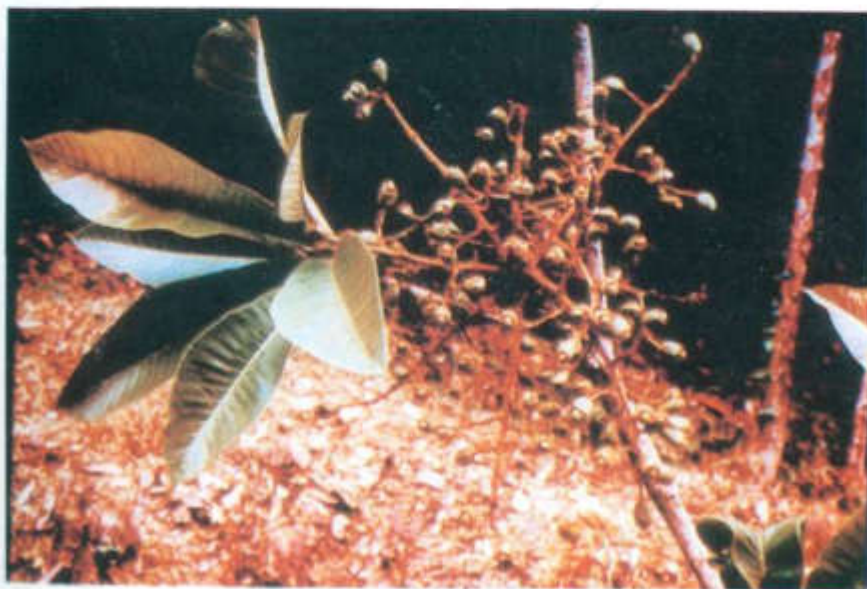
Sapindus trifoliatus L. (BSI, WC, Pune)



Aesculus indica (Wallich ex Cambess.) Hook.f. (Courtesy : D.K. Singh)



Holigarna arnottiana Hook.f. (Courtesy : R. Gopalan)



Holigarna grahamii (Wight) Kurz (Courtesy : K. Ravikumar)



Nothopegia vajravelui Ravikumar & Lakshmanan (Courtesy : K. Ravikumar)



Semecarpus prainii King (BSI, ANC, Port Blair)



Semecarpus travancorica Beddome (Courtesy : K. Ravikumar)



Coriaria nepalensis Wallich (BSI, NC, Dehradun)



Moringa concanensis Nimmo (Courtesy : K.K. Khanna)



Moringa oleifera Lam. (BSI, NC, Dehradun)



Cnestis palala (Lour.) Merr. ssp. *palala* (Courtesy : M.S. Mondal)



Connarus wightii Hook.f. (Courtesy : K. Ravikumar)

OLACACEAE

(B.P. Uniyal)

Shrubs or trees, erect, scandent or climbing, unarmed or occasionally armed. Leaves alternate, simple, entire, exstipulate. Flowers bisexual, rarely unisexual (the plants then dioecious), bracteate, in axillary racemes, panicles, spikes, cymes, fascicles or solitary in the axils. Sepals 3-6, forming a cupular calyx, 3-6 toothed or lobed, rarely absent. Petals 3-6, free or connate at base, occasionally tubular. Disc intrastaminal or extrastaminal, annular or consisting of glands, alternating with the petals. Stamens as many as or 2-5 times the number of petals, some of them staminodial. Staminodial filaments distinct or adnate to the sepals or petals or connate into a sheath around the style; anthers tetrasporangiate, opening by longitudinal slits or seldom by terminal valves. Carpels (2-) 3 (-5), united to form a superior or inferior ovary; ovary 2-5-loculed at the base, 1-loculed above; style 1; stigma 2-5-lobed; ovule solitary in each locule. Fruit drupaceous or a nut, 1-seeded, often included in an accrescent calyx.

Pantropical; 25 genera and 250 species, 6 genera and 16 species in India.

Literature. SLEUMER, H. (1935). Olacaceae. In: Engl. & Prantl, Pflanzenfam. ed. 2. 16b: 5-32. SLEUMER, H. (1980). A taxonomic account of Olacaceae of Asia, Malesia and the adjacent areas. *Blumea* 26: 145-168. SLEUMER, H. (1984) Olacaceae. *Fl. Males.* Ser. 1, 10: 1-29.

KEY TO THE GENERA

- | | |
|---|------------------------|
| 1a. Climbing tendrillar shrubs; leaves palmatinerved at base; base subpeltate | 2. <i>Erythropalum</i> |
| b. Plants non tendrillar; leaves penninerved; base not subpeltate | 2 |
| 2a. Staminodes present | 3. <i>Olax</i> |
| b. Staminodes absent | 3 |
| 3a. Stamens 8 or 10; half episepalous, half epipetalous; plants often armed | 6. <i>Ximenia</i> |
| b. Stamens all epipetalous; plants not armed | 4 |
| 4a. Petals entirely free; calyx accrescent, almost covering the fruit | 5. <i>Strombosia</i> |
| b. Petals connate at least at base; calyx not accrescent | 5 |
| 5a. Calyx cupular; petals thick, fleshy; anthers penicillate distally | 1. <i>Anacolosa</i> |
| b. Calyx indistinct; petals thin; anthers not penicillate | 4. <i>Schoepfia</i> |

1. *Anacolosa* Blume

Shrubs or trees. Leaves alternate, simple, entire. Flowers in axillary cymes. Calyx cup-shaped, 5-7-lobed. Petals 5-6, free, valvate, hairy within. Stamens equal to the number of petals; filaments slender; anthers very small, globose. Staminodes absent. Ovary 1-loculed; style conical; stigma shortly lobed. Drupes surrounded by accrescent disc.

Tropical Africa, Indo-Malaya and Pacific; about 21 species, 4 in India.

KEY TO THE SPECIES

- | | |
|---|-------------------------|
| 1a. Inflorescence pedunculate for 6-10 mm; peduncle without numerous bracteoles or scales | 4. <i>A. ilicoides</i> |
| b. Inflorescence nearly sessile, with numerous bracts or scales | 2 |
| 2a. Calyx puberulous | 2. <i>A. frutescens</i> |
| b. Calyx glabrous | 3 |
| 3a. Leaves oblong, smooth in dried specimens; cymes many-flowered | 1. <i>A. densiflora</i> |
| b. Leaves lanceolate or ovate-lanceolate, tubercled at least on the undersurface in dried specimens; cymes few-flowered | 3. <i>A. griffithii</i> |

1. *Anacolosa densiflora* Beddome in Madras J. Lit. Sci. Ser. 3. 1: 38. 1864; Masters in Fl. Brit. India 1: 580. 1875.

Mal.: *Kal manikkam*; Tam.: *Katta ockkali*.

Trees. Leaves oblong, up to 12 x 5 cm, acuminate, entire, glabrous, shining; petiole ca 5 mm long. Flowers in cymes, fragrant, yellow; pedicels equal to flowers in length. Calyx cup-shaped, glabrous, 4-6-toothed. Petals 4-6, ovate-lanceolate, reflexed at tips, hispid within. Filaments included, glabrous. Ovary surrounded by a broad disc, 3-loculed; stigma 3-lobed.

Distrib. India: In evergreen forests of Western Ghats, ascending up to 800 m. Tamil Nadu and Kerala. Rare.

2. *Anacolosa frutescens* (Blume) Blume, Mus. Bot. Lugd. Bat. 1. 251. f. 46. 1850. *Stemonurus frutescens* Blume, Bijdr. 649. 1826. *Anacolosa puberula* Kurz in J. Asiat. Soc. Bengal 41(2): 297. 1872; Masters in Fl. Brit. India 1:

581. 1875. *A. puberula* Kurz var. *andamanica* King in J. Asiat. Soc. Bengal 64(2): 110. 1895. **Fig. 1.**

Evergreen shrubs or trees, up to 12 m tall. Leaves oblong or ovate-oblong, up to 22 x 8.5 cm, acuminate-bluntish, entire, coriaceous, glabrous, shortly petioled. Flowers axillary; peduncle short, thick, with minute bracts; pedicels puberulous. Calyx tawny puberulous. Drupes obovoid, scarlet, minutely velvety.

Distrib. India : Andaman & Nicobar Islands.

Myanmar, Malay Peninsula, Thailand, Philippines and Celebes.

3. *Anacolosa griffithii* Masters in Fl. Brit. India 1: 580. 1875.

Evergreen shrubs or trees. Leaves oblong-lanceolate, up to 7.5 x 2.7 cm, blunt or bluntish-acuminate, entire, glabrous, coriaceous; petiole ca 6 mm long. Flowers in almost sessile, axillary cymes, small; pedicels short, glabrous. Calyx glabrous.

Distrib. India : Andamans.

Myanmar, Indo-China and Thailand.

Note. Anjali Chakravarty (Bull. Bot. Surv. India 14: 171-72. 1972) studied the specimens at CAL and opined that *A. griffithii* Masters does not occur in India. It is included here on the basis of Herb. Helfer 821 (DD) bearing label "Tenasserin and Andaman" and also quoted by Sleumer (Blumea 26: 147. 1980).

4. *Anacolosa ilicoides* Masters in Fl. Brit. India 1: 580. 1875.

Trees, up to 10 m tall. Leaves elliptic to oblong-lanceolate, up to 22 x 6 cm, acute to cuneate at base, acute-acuminate at tip; lateral nerves 6-8 pairs; petioles 5-10 mm. Flowers 3-8, in axillary, subumbellate cymes, greenish white, 4-5 mm across. Calyx cupular, 5-6, toothed. Petals 5-6, much exceeding the calyx. Stamens opposite to petals; filaments broad, glabrous. Ovary imperfectly 3-celled. Drupes oblong-ellipsoid, ca 3 x 2 cm, included by enlarged disc.

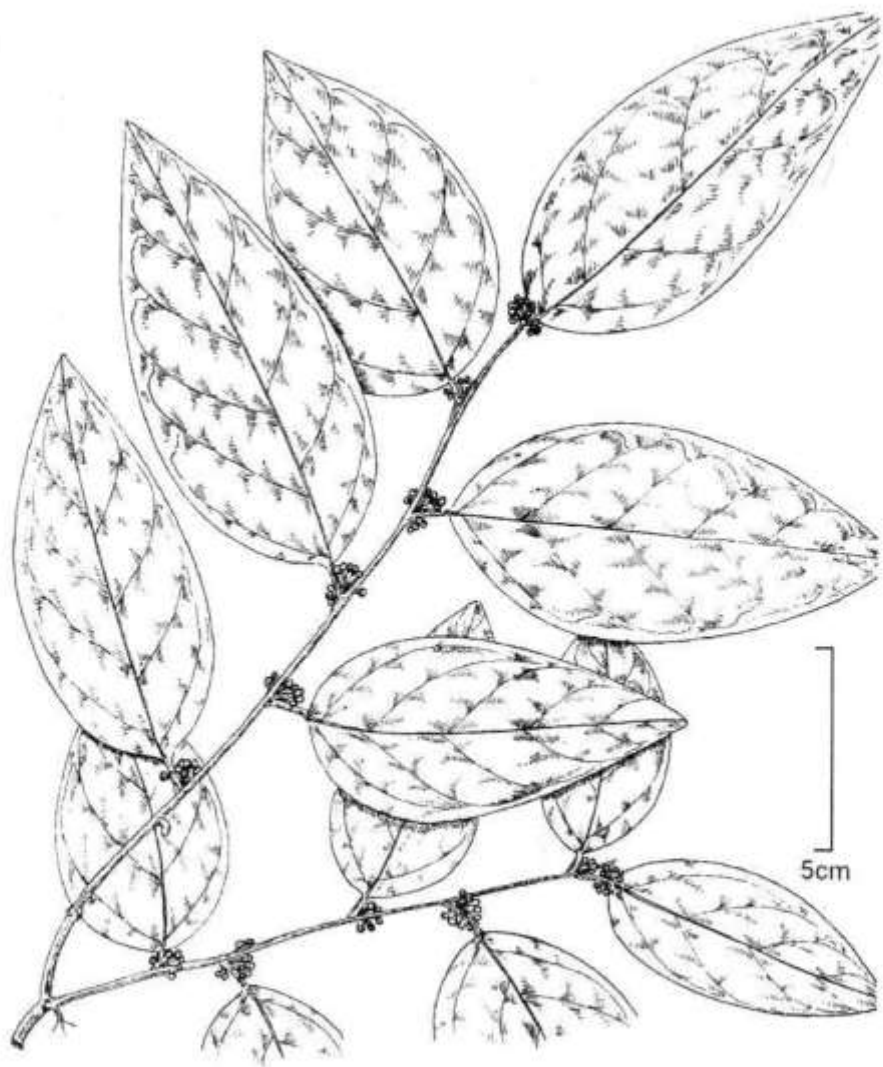


Fig. 1. *Anacolosa frutescens* (Blume) Blume

Fl. & Fr. : May - Dec.

Distrib. India : Meghalaya.

Indo-China, Thailand.

2. *Erythropalum* Blume

Climbing shrubs. Leaves alternate, entire, peltate, palmatinerved; tendrils axillary. Flowers in axillary cymes; peduncles and pedicels somewhat filiform. Calyx 4-5-lobed. Petals 5, valvate. Stamens 5, opposite to petals, epipetalous; filaments very short; anthers incurved, 2-celled, opening longitudinally. Staminodes 5, alternating with stamens. Ovary half immersed in the disc, 1-celled; style short, conical; stigma minute, 3-lobed. Drupes oblong or ellipsoid, crowned by remains of calyx, 1-seeded.

Eastern Himalaya to Celebes - India, Myanmar, Indonesia, Malacca; 2-3 species, 1 in India.

Erythropalum scandens Blume, Bijdr. 921. 1826; Masters in Fl. Brit. India 1: 578. 1875. *E. populifolium* Masters in Fl. Brit. India 1: 578. 1875. *E. vagum* (Griffith) Masters in Fl. Brit. India 1: 578. 1875; *Modeccopsis vaga* Griffith, Notul. 4: 633. 1854.

Climbers or lianas; tendrils axillary, shortly bifid. Leaves lanceolate, ovate-lanceolate or ovate-oblong, 7-21 x 4-13 cm, rounded and narrowly peltate at base, acute or short acuminate, palmately 3-5 nerved; petiole up to 5 cm long. Cymes axillary, subsessile or peduncled. Flowers white or yellow or greenish, minute, ca 3 mm long. Calyx tube 1.5-2 mm. Petals ovate, with a tuft of short, white hairs on either side at the base of filaments. Stamens 5. Drupe ellipsoid or oblong-ovoid, ca 3.5 x 1 cm, obtuse, pendulous, yellowish-red becoming bright red on maturity.

Fl. & Fr. : Aug. - March.

Distrib. India : In forest undergrowth and along margins of evergreen forests. West Bengal, Arunachal Pradesh, Assam, Nagaland, Manipur, Tripura, Meghalaya, Sikkim, Karnataka, Tamil Nadu, Kerala and Andamans.

Bangladesh, Nepal, Indo-China, Malay Peninsula, Philippines, Thailand, S.W. China and Celebes.

Note. The cirrhose nature of leaves as mentioned by Masters (*l.c.*) was not observed in the specimens studied.

3. *Olax* L.

Shrubs or small trees, sometimes scandent. Leaves simple, alternate. Flowers in axillary racemes, panicles or solitary. Bracts minute. Calyx cup-shaped, accrescent in fruit. Petals 3, 5 or 6, more or less cohering. Fertile stamens usually 3, rarely 4-5. Stamines 5-6, usually bifid; rarely undivided anthers versatile. Ovary half immersed in the disc, 3-loculed at base, 1-loculed above; style simple; stigma 3-lobed. Fruit drupaceous, more or less covered by accrescent calyx. Seed 1.

Tropical Africa, Madagascar, Indo-Malaya and Australia; about 55 species, 6 in India.

KEY TO THE SPECIES

- | | |
|--|------------------------|
| 1a. Plants armed | 4. <i>O. scandens</i> |
| b. Plants unarmed | 2 |
| 2a. Flowers solitary, axillary | 3. <i>O. nana</i> |
| b. Flowers in axillary racemes | 3 |
| 3a. Petals 3 | 1. <i>O. acuminata</i> |
| b. Petals 5 or 6 | 4 |
| 4a. Petals 6 combined in 3 pairs | 2. <i>O. imbricata</i> |
| b. Petals 5 | 5 |
| 5a. Young branches transversely wrinkled; peduncles ascending, scarcely exceeding the bracts | 6. <i>O. zeylanica</i> |
| b. Young branches not wrinkled transversely; peduncles drooping, longer than the bracts | 5. <i>O. wightiana</i> |

1. *Olax acuminata* Wallich ex Benth. in Trans. Linn. Soc. 18: 678. 1841; Masters in Fl. Brit. India 1: 576. 1875.

Shrubs or small trees, up to 10 m tall; branchlets vertically ridged. Leaves ovate-lanceolate to oblong-lanceolate, up to 16 x 6 cm, acute or acuminate,

entire, membranous; petiole 4-7 mm long, margined. Flowers white or greenish yellow in axillary, solitary or fasciculate racemes, 3-4 mm across. Calyx 3-toothed. Petals 3, oblong. Stamens 3. Drupes ellipsoid or ovoid, 15-20 x 10-12 mm, orange-red when ripe.

Fl. & Fr. : Most Part of the year.

Distrib. India : In forests from 1000-1500 m. West Bengal, Assam, Arunachal Pradesh, Tripura and Meghalaya.

Bhutan, Bangladesh and Myanmar.

2. *Olex imbricata* Roxb., Fl. Ind. 1: 164. 1820; Masters in Fl. Brit. India 1: 575. 1875. *O. imbricata* Roxb. var. *membranifolia* Kurz in J. As. Soc. Bengal 44(2): 123. 1876.

Arboreus climbers, unarmed. Leaves oblong or ovate-oblong to narrowly elliptic, up to 15 x 7.5 cm, acute, entire, coriaceous, nerves prominent beneath; petiole up to 1 cm long. Flowers white, in axillary, dense racemes, racemes hardly exceeding the petiole. Bracts up to 0.5 mm long, broadly ovate, sparsely tomentose when young, becoming glabrescent later. Calyx glabrous dorsally. Petals ca 9 mm long, glabrous on dorsal surface. Drupes ovoid-globose, enclosed by the accrescent, leathery calyx.

Fl. & Fr. : Oct. - May.

Distrib. India: Along slopes and in dense mixed forest. West Bengal, Maharashtra, Tamil Nadu and Andaman & Nicobar Islands.

Myanmar, Sri Lanka, Indo-China, Thailand, Malay Peninsula, S.W. China, Taiwan, New Guinea, Solomon island and Micronesia.

3. *Olex nana* Wallich ex Benth. in Proc. Linn. Soc. 1: 88. 1840 *et* in Trans. Linn. Soc. 18: 678. 1841; Masters in Fl. Brit. India 1: 576. 1875.

Fig. 2.

Low undershrubs; rootstock woody. Leaves oblong-lanceolate, up to 6 x 1.5 cm, entire, glabrous, deep green above, glaucous beneath, recurved at



Fig. 2. *Olax nana* Wallich ex Benth.

the margin, subsessile. Flowers axillary, solitary, creamy or whitish; pedicels slender, up to 1.2 cm long. Calyx minute, cupular, accrescent in fruit. Petals 3, oblong-obovate, rounded at tip, cohering about half way. Stamens 3. Staminodes 6. Ovary ovoid; style shorter than the stamens. Drupes globose, ca 6 mm across, apiculate, nearly covered by the accrescent calyx, deep yellow when mature.

Fl. & Fr. : April - May.

Distrib. India: In drier places, ascending to 1600 m in to Himalaya and Shiwaliks. Punjab, Uttar Pradesh, Bihar, West Bengal, Assam, Arunachal Pradesh, Meghalaya, Gujarat and Andhra Pradesh.

Pakistan, Nepal and Thailand.

Note. A fire resistant species.

4. *Olex scandens* Roxb., Pl. Corom. 2: 2.t. 102. 1798; Masters in Fl. Brit. India 1:575. 1875. Fig. 3.

Beng.: *Koko-am*; Hindi: *Dhehiani*; Tam.: *Koelalranchi*; Or.: *Bodo-Bodoria*.

Large rambling or climbing shrubs; branches fulvous pubescent, old branches armed; thorns blunt. Leaves elliptic or ovate-oblong, up to 9.5 x 3.4 cm, obtuse, entire, glabrous above, glabrous or puberulous beneath; petiole ca 0.8 cm long, pubescent. Flowers white in short, axillary, solitary pubescent-densely short hairy racemes, sweet scented. Bracts ovate-oblong, ca 2 mm long, equalling the pedicels, caducous. Calyx cup shaped, finely ciliate. Petals usually 5, rarely 6, more or less connate, linear, cleft, 7-9 mm long. Stamens 3. Staminodes 2-cleft at apex. Ovary ovoid, glabrous; style linear, half as long as the petals; stigma 3-lobed. Drupes globose, yellow, enclosed by accrescent calyx except at tip, apiculate.

Fl. & Fr. : April - Dec.

Distrib. India: Along edges of forests, roadsides near streams and in damp, shady forests. Uttar Pradesh, Bihar, West Bengal, Orissa, Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.

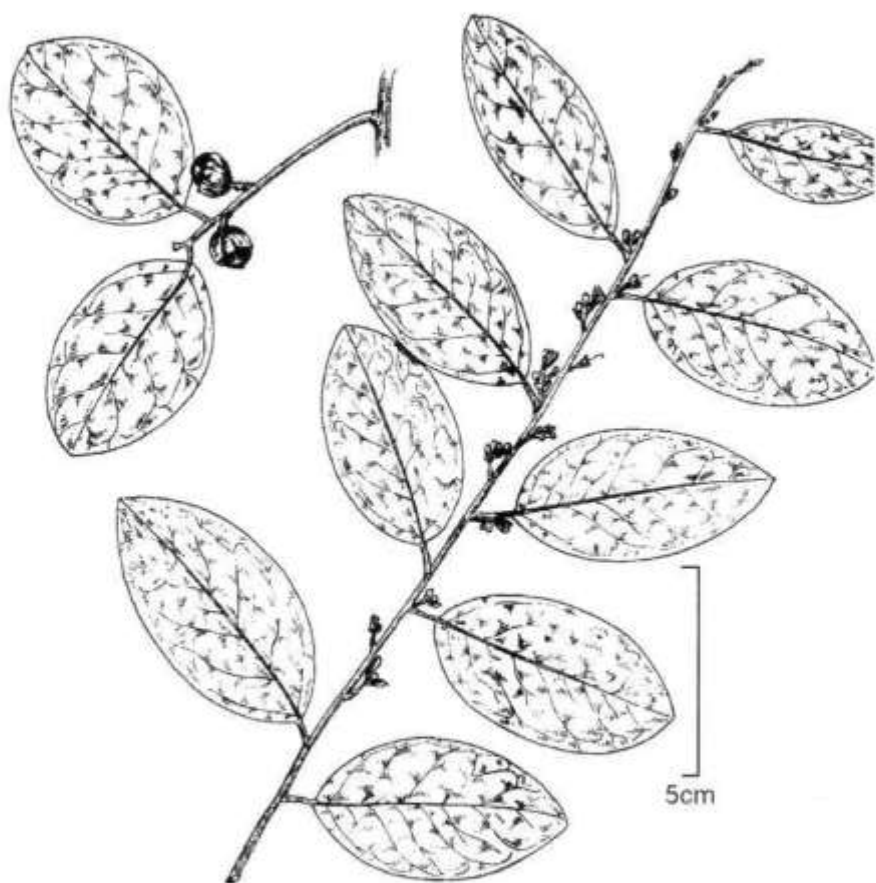


Fig. 3. *Olax scandens* Roxb.

Bangladesh, Myanmar, Sri Lanka, Indo-China, Thailand, Malay Peninsula and Mauritius.

Note. Fruits are edible.

5. *Olex wightiana* Wallich ex Wight & Arn., Prodr. Fl. Penins. Ind. Orient. 89. 1834; Masters in Fl. Brit. India 1: 575. 1875. *O. wightiana* Wallich ex & Arn. var. *bracteata* Masters in Fl. Brit. India 1: 576. 1875. *O. wightiana* Wallich ex Wight & Arn. var. *nigrescens* Gamble, Fl. Madras 1: 90. 1915.

Kan.: *Gandgisa*; Mar.: *Kukarbit, Harduli, Urchirri*.

Large climbing shrubs. Leaves oblong-oval, up to 12 x 4.5 cm, acuminate, subacute or obtuse, entire, glabrous and shining; petiole *ca* 1 cm long. Flowers white, in axillary panicles; panicles exceeding the petiole. Bracts oblong, 2.5 mm long, densely brown tomentose on dorsal surface. Calyx dorsally brownish tomentose. Petals sparsely to densely brownish tomentose on dorsal surface. Stamens and staminodes equalling the petals. Drupes oblong or oval, *ca* 2 cm long, apiculate, orange yellow, enclosed by calyx except at the top.

Fl. & Fr. : Dec. - May.

Distrib. India : In moist deciduous forests. Uttar Pradesh, Maharashtra, Goa, Karnataka, Tamil Nadu, and Kerala.

Sri Lanka.

Note. The fruit is eaten and is also said to be used in "Sharbet". The leaves are used in skin diseases and the root in backache and jaundice.

6. *Olex zeylanica* L., Sp. Pl. 34. 1753; Masters in Fl. Brit. India 1: 576. 1875.

Large shrubs or small trees; branchlets angular, giving a winged appearance, transversely ridged. Leaves ovate-lanceolate or oblong, up to 10 cm long, acuminate or subacute, entire, margins revolute, glabrous, often black-dotted beneath, prominently nerved; petiole 6 mm long. Flowers in short, axillary glabrous racemes, white. Petals oblong. Stamines 2-cleft. Ovary ovoid.

Drupes broadly ovoid, apiculate, about half covered by accrescent, membranous calyx.

Fl. & Fr. : April.

Distrib. Peninsular India.

Sri Lanka.

Uses. Leaves are eaten as salad.

4. *Schoepfia* Schreb.

Trees; branches terete or angled. Leaves simple, alternate, petioled. Flowers in axillary racemes or spikes, yellow, fragrant. Calyx adherent to the ovary. Corolla tubular, perigynous; limb 4-5 parted. Stamens 4-5, epipetalous. Staminodes absent. Ovary inferior or half superior, surmounted by a fleshy, epigynous disc, 3-loculed below, 1-loculed at the top; style cylindric; stigma capitate, 3-lobed. Drupes surrounded at the base by epicalyx, crowned by remains of calyx and corolla. Stone striated, 1-seeded.

Native of Himalaya and tropical south America, also distributed in Myanmar, Indo-China, China, Japan, Thailand and Sumatra; about 35 species, 3 in India.

Literature : VAN STEENIS, C.G.G.J. (1952) Miscellaneous Botanical Notes-IV. Notes on Asiatic species of *Schoepfia* (Olacaceae). *Reinwardtia* 1: 467-472.

KEY TO THE SPECIES

- | | |
|--|--------------------------|
| 1a. Flowers in axillary racemes; bract and bracteoles, connate into a 3-lobed epicalyx | 1. <i>S. fragrans</i> |
| b. Flowers in fascicled, axillary spikes; bracts connate with the apex of each pedicel | 2 |
| 2a. Flowers more or less urceolate; corolla tube broadest below ovary | 2. <i>S. griffithii</i> |
| b. Flowers more or less tubular; corolla tube slightly broadened towards throat | 3. <i>S. jasminodora</i> |

1. *Schoepfia fragrans* Wallich in Roxb., Fl. Ind. ed. 2: 188. 1824; Masters in Fl. Brit. India 1: 581. 1875. *S. acuminata* Wallich ex DC., Prodr. 4: 320. 1830; Masters in Fl. Brit. India 1: 582. 1875.

Kh.: *Dieng-Khao-Khorai, Dieng-shlong-khlaw, Dieng sa Niriang.*

Trees, up to 15 m tall. Leaves ovate-lanceolate or elliptic, up to 10 x 3 cm, acuminate, glabrous, entire, thinly coriaceous, petioled; petiole *ca* 8 mm long, margined. Flowers yellowish white or golden yellow, 3-9; pedicels slender, 5-7 mm long, each supported by an epicalyx of 3 ciliate bracts united into a cup. Calyx accrescent. Petals usually 5, united to 3/4 of their length, 7-8 mm long with a tuft of hairs inside about the middle, recurved at tip. Stamens epipetalous, included. Ovary half superior, loculed above, 3-loculed below, surmounted by a fleshy disc. Drupes ellipsoid, nearly covered by accrescent calyx.

Fl. & Fr. : Aug. - Jan.

Distrib. India : In primary forests between 300-800 m. Arunachal Pradesh, Assam, Nagaland, Manipur and Meghalaya.

Nepal, Bhutan, Bangla Desh, Thailand, S.W. China, Indo-China, Myanmar and Indonesia.

Note. Wood is used for making guitars.

2. *Schoepfia griffithii* Tiegh. ex Steenis in Reinwardtia 1: 472. 1952.

Middle sized trees; branches elongated, often clustered. Leaves alternate, ovate acuminate, entire; petiole 1-3 mm. Flowers in axillary spikes, many, cream coloured, tinged with purple, fragrant; bracts minute, scale-like. Calyx ring-like. Corolla tube ochraceous, 6-8 mm long. Stamens 5: filaments short, filiform; anthers 2-celled, dehiscing longitudinally. Ovary inferior; style included; stigma 3-lobed. Fruit red or orange, turning black on maturity.

Distrib. India : Arunachal Pradesh (Delei Valley).

Bhutan.

3. *Schoepfia jasminodora* Sieb. & Zucc., Abh. Akad. Wiss. Munchen IV. 3: 135. 1846; Deb in Bull. Bot. Surv. India 3: 298. 1961.

Small trees, up to 15 m tall; branches yellowish grey. Leaves ovate, lanceolate or broadly deltoid, up to 6 x 4 cm, cordately acuminate, obtuse at base, coriaceous, entire; petioles broad, up to 7 mm long. Flowers sessile, in long racemes or 3-4-flowered spikes, orange-brown or yellowish, fragrant. Corolla tubular, 6-7 mm long. Ovary inferior. Drupes up to 1.2 cm long, 1-seeded.

Distrib. India : In tropical forests, up to 1000 m. Manipur and Arunachal Pradesh.

Tibet, Myanmar, China, Japan and Macao.

5. *Strombosia* Blume

Shrubs or trees. Leaves simple, alternate. Flowers in cymes or axillary fascicles, small, regular, bisexual. Calyx cup-shaped, inferior or partly superior. Petals 5, valvate, hairy within. Stamens 5, opposite to petals and adnate to them. Staminodes absent. Ovary partly inferior or superior, 5-loculed; ovules pendulous from central placenta. Disc large, fleshy. Fruit a drupe, crowned by remains of calyx lobes and style; stone crustaceous, 1-loculed, 1-seeded.

Tropical Africa, India, Sri Lanka, Myanmar and Malesia; about 17 species, 1 in India.

Strombosia ceylanica Gardn. in Calc. J. Nat. Hist. 6: 350. 1845; Masters in Fl. Brit. India 1: 579. 1875. *S. leprosa* Talbot in J. Bombay Nat. Hist. Soc. 11(2): 235. 1897.

Medium or large, evergreen trees with white scaly bark. Leaves ovate or oblong-elliptic, up to 17 x 7.5 cm, glabrous, shining, rounded at tip; petiole ca 1.5 cm long, glabrous. Flowers small, in axillary fascicles or on woody tubercles. Calyx tube glabrous, campanulate; lobes ovate, obtuse, ciliate. Petals oblong, hairy; lobes ovate, obtuse, ciliate within at tips. Drupes globose, pyriform or oblong-ovoid, 3 x 2.5 cm, pink. Seeds globose, finely tuberculate.

Fl. & Fr. : Major part of the year.

Distrib. India : Western Ghats, in evergreen forests. Maharashtra, Karnataka and Kerala.

Sri Lanka, Myanmar, Malay Peninsula and Indonesia.

6. *Ximenia* L.

Straggling shrubs or small trees, often armed. Leaves simple, alternate. Flowers in axillary or terminal cymes or racemes, bisexual or polygamous. Calyx persistent, 4-5-toothed, non accrescent in fruit. Petals 4-5, valvate, revolute, bearded within. Stamens double the number of petals. Staminodes absent. Ovary sessile; ovule solitary in each locule, pendulous; style columnar. Drupes ovoid, ca 3 x 2.5 cm, 1-seeded, smooth.

Distributed in tropical America, tropical and South Africa, tropical Asia and Australia; about 15 species, 1 in India.

Ximenia americana L., Sp. Pl. 1193. 1753; Masters in Fl. Brit. India 1: 574. 1875.

And.: *Pinle-zi*; Eng.: *False sandal wood*; Tam.: *Chiru Illanthai*; Tel.: *Ucanechra*.

Climbing or erect, spinous shrubs or small trees; spines sharp. Leaves ovate or ovate-elliptic, up to 7 x 5 cm, apex rounded, coriaceous, entire or shortly crenulate, glabrous, 1-nerved; petiole 3-5 mm long. Flowers in short, axillary racemes or terminating the thickened shoots, ca 8 mm across, fragrant. Bracts minute. Calyx cupular, glabrous, deeply divided; lobes 5, ovate-triangular, acute, reflexed at length. Petals linear, ca 10 mm long, much exceeding the calyx, hairy within. Stamens as long as the petals. Drupes ovoid-globose, 3 x 2.5 cm, greenish-red, turning yellow or orange-red when ripe.

Fl. & Fr. : Jan.-July.

Distrib. India: In scrub and mangrove swamps along coasts. Gujarat, Andhra Pradesh, Karnataka, Tamil Nadu and Andaman & Nicobar Islands.

Myanmar, Sri Lanka, China, Indo-China, Australia, Malesia, Tropical America and Africa.

Note. Ripe fruits are edible.

DOUBTFUL SPECIES

Ochanostachys amentacea Masters in Fl. Brit. India 1: 577. 1875; Vasud. in J. Econ. Tax. Bot. 8: 118. 1986; Lakshmin. in Hajra *et al.*, Fl. Andaman - Nicobar Isls. 1: 251. 1999.

The species described by Masters (*l.c.*) from Malesian islands is considered endemic to the region by Sleumer (*l.c.*). Recently Vasudeva Rao (*l.c.*) recorded it from Andaman & Nicobar Islands. Lakshminasimhan (*l.c.*), however, considers its occurrence in Andaman & Nicobar islands as doubtful.

ICACINACEAE

(R. Mathur)

Trees, shrubs or woody climbers. Leaves alternate, rarely opposite, simple, entire, rarely subentire, lobed or toothed, exstipulate. Inflorescence various: axillary, rarely terminal spikes, cymes, corymbose cymes or heads, sometimes flowers fewer and then in fascicles, rarely solitary. Flowers regular, unisexual and then plants dioecious or bisexual, 4-5-merous, rarely 3-6-merous; pedicels when present articulated above. Calyx small, connate below into a tube, 4-6-lobed, lobes imbricate, rarely valvate, generally persistent. Petals 4-6, free or connate below or forming a tube, mostly valvate, rarely absent. Stamens as many as the petals, antisepalous; filaments free or borne on the corolla tube and alternate with its lobes, often hairy below the anthers; anthers basifixed, dehiscent by longitudinal slits or numerous apical pores. Disc absent or rarely present, and then cup-shaped or ringlike. Ovary 1-loculed, rarely 2-loculed; ovules usually 2, pendulous; style short or lacking; stigma entire, crenate or lobed. Fruit drupaceous, 1-seeded, oblong or ellipsoid, often laterally compressed, rarely winged. Seeds with copious endosperm; embryo usually small and straight.

Pantropical, a few species also occurring in subtropical and temperate regions of Asia, Africa, S. America and Australia; ca 58 genera and 400 species, 11 genera and 16 species in India.

Note. It is closely allied to the family Aquifoliaceae, but mainly differs in having 1-loculed ovary (usually the other 2 locules become aborted).

Literature. CHUANG, HSHAN (1981) *Icacinaceae. Fl. Reipubl. Pop. Sinicae* 46: ii-iv, 37-65. HOWARD, R.A. (1940) *Studies of the Icacinaceae. Preliminary Taxonomic notes: Key to Genera. J. Arn. Arb.* 21: 461-488. HOWARD, R.A. (1942) *Studies of the Icacinaceae-II. J. Arn. Arb.* 23: 55-78. SLEUMER, H. (1969). *Materials towards the knowledge of the Icacinaceae of Asia, Malesia and adjacent areas. Blumea* 17: 181-263. SLEUMER, H. (1971). *Icacinaceae, Fl. Males., Ser. 1.* 7(1): 1-87.

KEY TO THE GENERA

- | | |
|---------------------|---|
| 1a. Trees or shrubs | 2 |
| b. Woody climbers | 7 |

2a. Flowers unisexual; plants dioecious	3
b. Flowers bisexual	5
3a. Under surface of leaves and young branches stellately hairy; calyx free or united at base only	8. Platea
b. Leaves and young branches glabrous; calyx united into a cup-shaped structure	4
4a. Filaments thick, flattened and hairy above; drupe ovoid-oblong	3. Gomphandra
b. Filaments filiform, glabrous; drupe laterally compressed	2. Codiocarpus
5a. Disc absent; ovary oblique	1. Apodytes
b. Disc cup-shaped; ovary straight	6
6a. Petals villous within	7. Nothapodytes
b. Petals glabrous within	11. Stemonurus
7a. Leaves opposite	4. Iodes
b. Leaves alternate	8
8a. Leaves entire, glabrous; drupe ellipsoid	10. Sarcostigma
b. Leaves lobed or dentate, pubescent; drupe laterally compressed	9
9a. Leaves penninerved; calyx absent	9. Pyrenacantha
b. Leaves palmately nerved below; calyx present	10
10a. Petals free; anthers minute	6. Natsiatum
b. Petals united to form a tube; anthers oblong, exceeding filaments in length	5. Miquelia

1. Apodytes E. Meyer ex Arn.

Trees or shrubs. Leaves alternate, petiolate, coriaceous, entire, penninerved, nigrescent. Flowers small, bisexual, in terminal or axillary corymbose panicles. Calyx minute, cup-shaped, 5-toothed, persistent. Petals 5, free or connate at the base only, linear, spreading, glabrous, valvate, obscurely keeled, apex inflexed. Stamens 5; filaments attenuated, smooth; anthers oblong, sagittate, dorsifixed, dehiscent longitudinally. Disc absent. Ovary oblique, gibbous; style short, curved and thick; stigma small. Drupe obliquely ovoid, compressed, with lateral appendage. Seed, compressed.

Africa, S.E. Asia, Malesia, Queensland; 2 species, 1 in India.

Apodytes dimidiata E. Meyer ex Arn. in Hook., J. Bot. 3: 155. 1840. *A. beddomei* Masters in Fl. Brit. India 1: 588. 1875. *A. benthamiana* Wight, Icon. Pl. Ind. Orient. t. 1153. 1846; Masters in Fl. Brit. India 1: 588. 1875.

Kh.: *Dreng-laptrijum*; Tam.: *Karunauval*.

Trees, upto 25 m tall, 150 cm in girth; branches terete, glabrous, young shoots pubescent. Leaves elliptic-oblong, 6.5-10 x 2.5-5 cm, acute to shortly acuminate, rarely blunt or obtuse, unequal at base, glabrous, often puberulous along midrib above, coriaceous, black on drying, margins revolute, midrib prominent beneath, sunk above; lateral nerves in 6-10 pairs; petioles 1.5-2.5 cm long. Inflorescence of terminal corymbose cymes or panicles; panicles including the peduncle 6-12 cm long, glabrous or sometimes hairy; pedicels short, puberulous. Flowers bisexual. Calyx cupular, 1 mm, glabrous. Petals white, fragrant, oblong, *ca* 5 mm, inflexed at the apex. Filaments 1.5 mm. Ovary hairy; style 2.5 mm. Drupes *ca* 1.5 cm long, obliquely ellipsoid, compressed, with lateral appendage. Seeds obovate, compressed.

Fl. & Fr. : Apr. - Jan.

Distrib. India : N.E. India and Western Ghats, between 800-1500 m. Assam, Meghalaya, Tamil Nadu, Karnataka and Kerala. Rare.

Myanmar, Sri Lanka, Thailand, Indo-China, Malesia, tropical and subtropical N.E. to S. Africa and Angola.

Note. The species is very rare and is among the threatened plants of Meghalaya. The leaves are bitter in taste and emit unpleasant smell.

Uses. Wood is used in Vietnam for cabinet work.

2. *Codiocarpus* Howard

Dioecious trees. Leaves alternate, entire, penninerved. Inflorescence of axillary, compact, several-flowered cymes, borne distally on dichotomous branches arising from the peduncle. Flowers sessile, small, unisexual, articulated at the base of the calyx. Calyx cupular, shortly 5-6-toothed. Petals 5, valvate. *Male flowers*: Stamens 5, exserted; filaments filiform, glabrous; anthers versatile. Ovary rudimentary. *Female flowers*: Staminodes 5; filaments shorter than ovary; anthers very minute. Ovary subcylindric; stigma disc-like, obscurely 3-lobed. Drupes oblong, gradually narrowed upwards, slightly curved, laterally

compressed; endocarp hard, ridged. Seeds 1, with abundant endosperm and small embryo.

Malesia, Philippines and India; 2 species, 1 in India (endemic to Andamans).

Codiocarpus andamanicus (Kurz) Howard in Brittonia 5: 57. 1943. *Apodytes andamanica* Kurz, Prel. Rep. For. & Veg. Pegu. 37. 1875; Masters in Fl. Brit. India 1: 588. 1875. *Gomphandra andamanica* (Kurz.) King in J. As. Soc. Bengal 64(2): 115. 1895; Parkinson, Forest Fl. Andaman Isls. 126. 1923.

Fig. 4.

Small trees, 6 to 12 m tall; branches pubescent or glabrous, terete. Leaves oblong to oblong-lanceolate, 14-20 x 4-7 cm, shortly acuminate, base obtuse or acute; penninerved, entire, glabrous, dark-green above, paler and pubescent beneath; midrib depressed above, prominent beneath; nerves 8-10 pairs; petioles 1-1.5 cm long. Inflorescence in compact cymes, borne on dichotomously branched peduncles; peduncles stout, 1-2.5 cm long, strigose. Flowers sessile, unisexual. Calyx cup-shaped, hairy, 1.5 mm long, obscurely lobed. Petals externally puberulous, oblong, acute, white, 4-5 mm in male and 3 mm in female flowers. *Male flowers*: Filaments 5 mm long; anthers short, 1 mm long; rudimentary ovary 2 mm long, oval-oblong. *Female flowers*: Staminodes present. Ovary oblong-cylindrical, smooth. Drupes 1.5-1.8 cm long, longitudinally ribbed.

Fl. & Fr. : Dec. - May.

Distrib. India : Andaman Islands. Endemic.

3. *Gomphandra* Wallich ex Lindley

Dioecious. Shrubs or small trees; branches smooth. Leaves alternate, entire, penninerved, petiolate. Flowers in axillary or in leaf-opposed cymes, unisexual, on short pedicels, usually many in male and fewer in female inflorescence, bracteate; bracts small. Calyx minute, cup-shaped, 4-5-lobed to entire. Petals 4-5, connate below and cupular or tubular or entirely free, lobes inflexed at apex, valvate. *Male flowers* : Stamens 4-5; filaments free, exerted, thick and flattened, usually with a tuft of club-shaped hairs at the apex; anthers ovoid. Disc absent. Rudimentary ovary present. *Female flowers*:

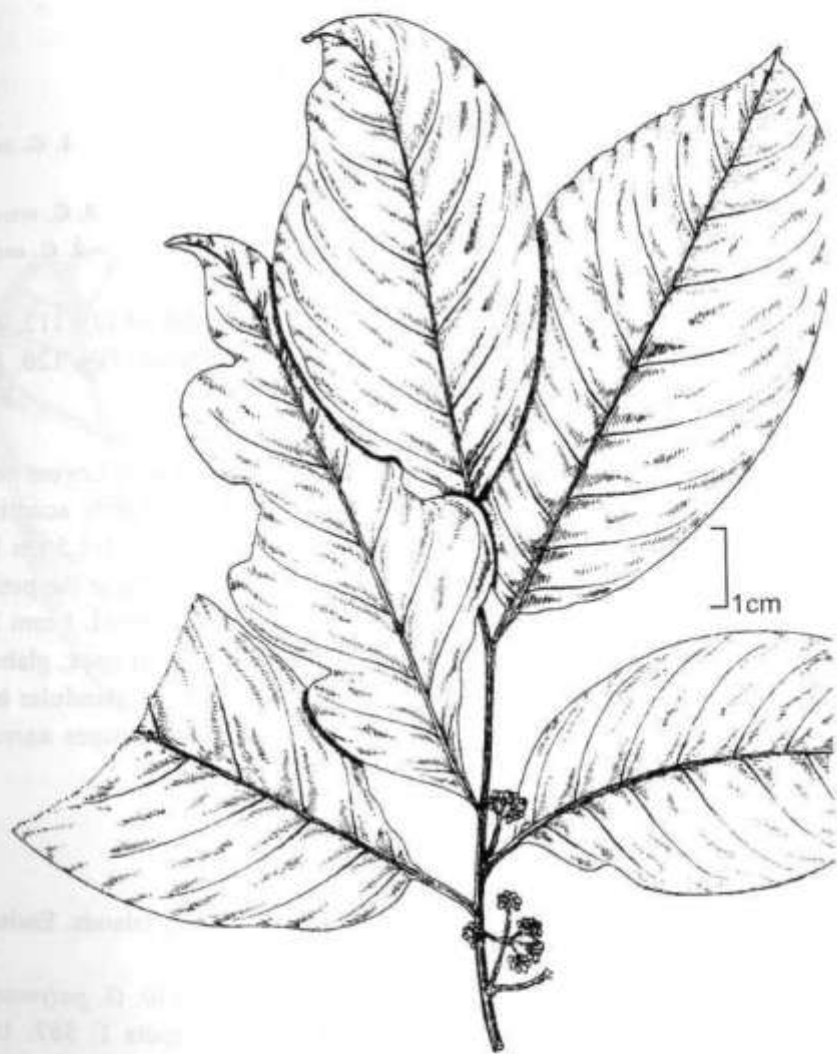


Fig. 4. *Codiocarpus andamanicus* (Kurz) Howard

Petals sometimes absent. Staminodes present or absent. Ovary oblong; stigma discoid, large, persistent in fruit. Drupes ellipsoid to ovoid, oblique at base, usually grooved.

South East Asia; *ca* 33 species, 3 in India.

KEY TO THE SPECIES

- | | |
|---|------------------------|
| 1a. Drupes 2.5-3, rarely 4 cm long | 1. <i>G. comosa</i> |
| b. Drupes 1-2 cm long | 2 |
| 2a. Leaves chartaceous; filaments bearded below the anthers | 3. <i>G. tetrandra</i> |
| b. Leaves coriaceous; filaments glabrous | 2. <i>G. coriacea</i> |

1. ***Gomphandra comosa*** King in J. As. Soc. Bengal 64 (2): 112. 1895; Brandis, Indian Trees 151. 1906; Parkinson, For. Fl. Andaman Isls. 126. 1923.

Fig. 5

Shrubs or small trees, glabrous; young branches cinereous. Leaves oblong to elliptic-oblong, 8-12 x 2.5-4 cm, narrowed at the base, shortly acuminate, thinly coriaceous; main nerves in 6-8 pairs, obscure; petioles 1-1.5 cm long. Inflorescence compact umbellate cymes; peduncles about as long as the petioles. Flowers sessile, unisexual. Calyx wavy and obscurely 4-5-toothed, 1 mm long. Petals 4-5 mm long; lobes broadly oblong, obtuse, inflexed at apex, glabrous. In male flowers filaments densely covered with long, white, glandular hairs. In female flowers ovary short, ovoid, conic; style short. Drupes narrowly ellipsoid, glabrous, vertically grooved, 2.5-4 cm long.

Fl. & Fr. : June - Oct.

Distrib. India : In coastal or inland forests. Andaman Islands. Endemic.

2. ***Gomphandra coriacea*** Wight, Illustr. 1: 103. 1840. *G. polymorpha* Wight, Illustr. 1: 103. 1840 (*p.p.*); Masters in Fl. Brit. India 1: 587. 1875. (*p.p.*).

Fig. 6.

Shrubs or small trees, *ca* 5 m tall. Leaves coriaceous, aromatic, variable in shape and size, elliptic or obovate, 3-10 x 2-4.5 cm, glabrous; midrib prominent on both the surfaces; petioles 0.5-1.5 cm long. Inflorescence leaf-

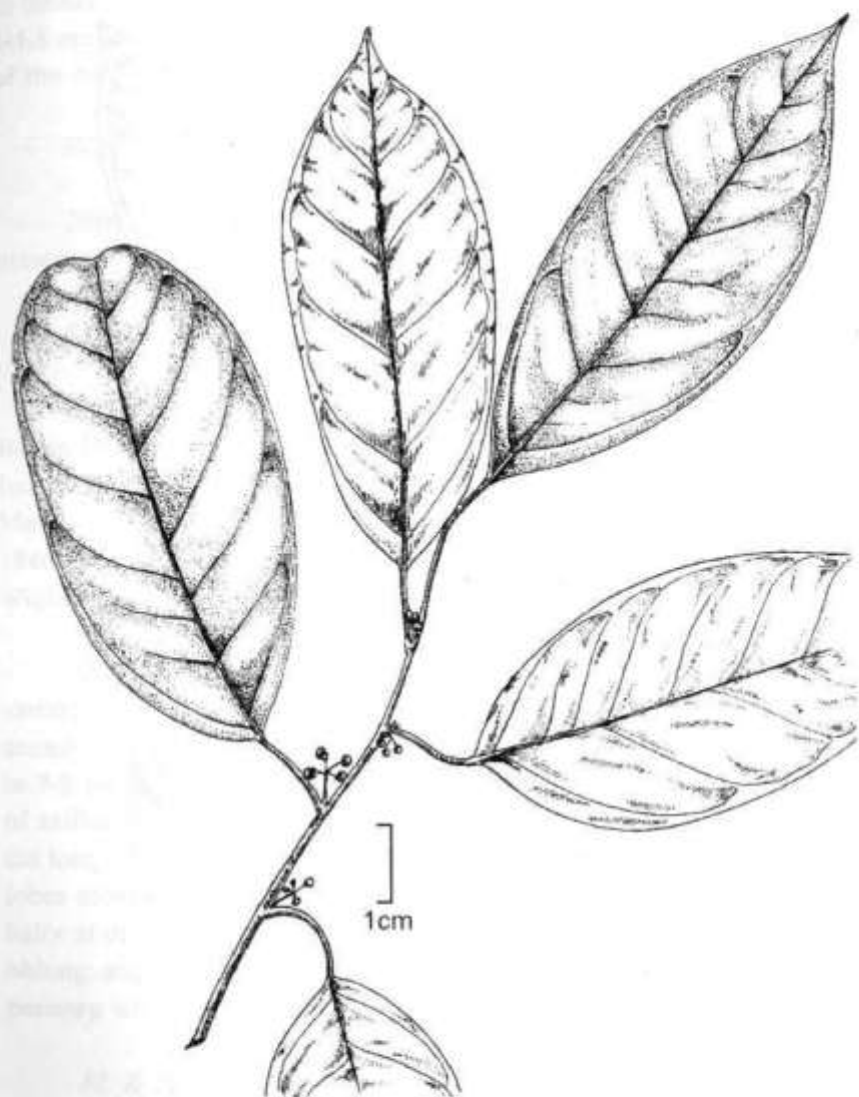


Fig. 5. *Gomphandra comosa* King



Fig. 6. *Gomphandra coriacea* Wight

opposed or terminal, rarely axillary, few-flowered cymes, flowers rarely solitary; peduncles longer than the petiole. Flowers unisexual, greenish white. Calyx minute. Petals erect, 4-5 mm long, connate into a tube, lobes inflexed at apex. In male flowers stamens exerted, free; filaments glabrous or nearly so, linear. In female flowers ovary oblong, glabrous; stigma large, 5-lobed, sessile. Drupes 1-1.5 cm long; pericarp pale-yellow; endocarp wrinkled, crowned with remains of the persistent stigma.

Fl. & Fr. : Feb. - June.

Distrib. India : Usually occurring in shola forests of Western Ghats, between 900-1800 m. Tamil Nadu and Kerala (Nilgiris, Anamalais).

Sri Lanka.

3. Gomphandra tetrandra (Wallich ex Roxb.) Sleumer in Notizbl. Berlin-Dahlem 15: 238. 1940. *Lasianthera tetrandra* Wallich ex Roxb., Fl. Ind. 2: 328. 1824. *Gomphandra axillaris* Wallich, Cat. 3718. 1831 *nom. nud.*; Masters in Fl. Brit. India 1: 586. 1875. *G. polymorpha* Wight, Illustr. 1: 103. 1840: (*p.p.*) incl vars. *acuminata*, *oblongifolia*, *angustifolia*, *longifolia*, *ovalifolia* Wight (*l.c.*); Masters in Fl. Brit. India 1: 586. 1875.

Shrubs, evergreen, erect, upto 3.5 m tall; branches smooth. Leaves variable, from broadly elliptic-oblong to narrowly lanceolate, *ca* 15 x 6.2 cm, acuminate, glabrous on both sides, blades chartaceous to membranous; nerves in 7-9 pairs, raised on under surface; petioles 0.5-1 cm long. Inflorescence of axillary, crowded, paniculate cymes. Flowers unisexual, very small, *ca* 0.3 cm long. Calyx 5-toothed, tomentose on the outer surfaces. Corolla 5-lobed; lobes elongate, spreading. In male flowers stamens free, exerted; filaments hairy at the apex. Rudimentary ovary present. In female flowers ovary small, oblong; stigma discoid. Drupes *ca* 1-1.5 cm long, 0.5-0.8 cm broad, oblong; pericarp white, fleshy; endocarp hard, crowned by the remains of the stigma.

Fl. & Fr. : March - Dec.

Distrib. India: North Eastern region and Western Ghats, usually occurring in evergreen forests up to 1000 m. Assam, Meghalaya, Arunachal Pradesh, Maharashtra, Karnataka, Tamil Nadu and Kerala.

Bangladesh, Sri Lanka, Myanmar, Thailand, Vietnam and China.

4. *Iodes* Blume

Dioecious climbing shrubs; tendrils present on branches; young branches covered with bristly hairs. Leaves opposite, petiolate, entire, cuspidate, penninerved, coarsely hairy along the midrib and nerves exstipulate. Inflorescence pedunculate, of axillary or extra-axillary cymes or paniculate cymes, rarely solitary and terminal. Flowers unisexual, small, white to yellow, fragrant, bracteate, pedicelled; bracteole usually present. Calyx cup-shaped, 4-5-toothed or lobed 1/2 way down, united at base only. Petals 4-5, lobes valvate, persistent, sometimes absent in female flowers. Stamens in male flowers 4 or 5, alternating with the petals; filaments fixed at the base of the petals or the corolla tube or upwards, short or long; anthers basifixed; rudimentary ovary present. In female flowers staminodes present or absent. Ovary cylindrical; stigma sessile. Drupe oblong-ellipsoid or almond-like, somewhat flattened; exocarp fleshy, endocarp crustaceous, furrowed.

Tropical Africa, Madagascar, S.E. Asia (China to Malesia); ca 30 species, 3 in India.

Literature : CHAKRABARTY, T. & VASUDEV RAO, M.K. (1985): *Iodes* (Icacinaceae) A new generic record for Andaman & Nicobar Islands. *J. Econ. Tax. Bot.* 6(2): 455.

KEY TO THE SPECIES

- | | |
|---|--------------------------------|
| 1a. Leaves coriaceous; petals united in lower 3/4 part; drupes
2.5-4 cm long | 2. <i>I. hookeriana</i> |
| b. Leaves chartaceous or membranous; petals free; drupes
2 cm long | 2 |
| 2a. Pedicels not swollen distally; leaves broadly ovate | 1. <i>I. cirrhosa</i> |
| b. Pedicels swollen distally; leaves oblanceolate | 3. <i>I. ovalis</i> |

1. *Iodes cirrhosa* Turcz. in Bull. Soc. Nat. Moscow 27(2): 281. 1854; Sleumer in Blumea 17: 221. 1969.

Sturdy climbers, 5-10 m; branches yellowish pubescent. Leaves chartaceous, broadly ovate to elliptic or suborbicular, rarely oblong-elliptic,

mucronate or shortly acuminate at apex, base rounded or subcordate, margin entire glabrescent above, densely pilose or tomentose beneath; venation prominent below; nerves in 4-6 pairs; petioles 0.8-2.2 cm long, densely tomentose. Inflorescence densely hairy cymes. Male inflorescence 5-15 cm long, including 1.5-5 cm long peduncle, many-flowered. Female inflorescence 2-12 cm long, including 1-4 cm long peduncles. Flowers unisexual; pedicels 1-2 mm long. Calyx 5-parted, nearly to the base, triangular to subulate, *ca* 0.5 mm long, pubescent outside. Petals 5, free to shortly connate at base oblong to lanceolate, 2.2-3 mm long, white, fragrant, pubescent outside, absent in female flowers, cirrhose. Stamens 5; anthers sessile, oblong, 0.7-1 mm long. Ovary cylindric, *ca* 1.2 mm long, hairy; stigma bilobed, pubescent. Drupes oblong-ellipsoid or ovoid, 2 x 1.2 cm.

Fl. & Fr. : April - Oct.

Distrib. India : Meghalaya and Andamans.

Myanmar, Thailand, Vietnam, Malaya, Java, Sumatra, Borneo, Philippines and Celebes.

2. *Iodes hookeriana* Baillon in *Adansonia* 10: 268. 1872; Masters in *Fl. Brit. India* 1: 596. 1875. *Mappianthus hookerianus* (Baillon) Sleumer in *Blumea* 17: 225. 1969.

Large climbing shrubs; tendrils often present; young branches beset with bristly hair. Leaves opposite, oblong-ovate, lanceolate or obovate, 6-13 x 3-6 cm, abruptly acuminate or cuspidate, apex obtuse or blunt, rounded to subacute at base, entire, coriaceous, margin slightly recurved, lamina glossy on both sides, pilose along midrib and nerves underneath; nerves in 7-9 pairs, midrib and nerves raised beneath; petiole 1-1.5 cm, densely hairy. Cymes axillary or extra axillary; peduncles 4-10 cm, lower ones modified into tendrils; pedicels 1 mm long. Flowers unisexual. *Male flowers* : Calyx cupular, 1 mm long, margin entire to 5-toothed. Petals whitish, 3 mm long, oblong, basal 3/4 united into a tube, pubescent outside. Filaments 2 mm long, Rudimentary ovary present, pubescent. Female flowers rarely observed. Drupes ellipsoid, ovoid, 2.5-4 x 1.5-2 cm, compressed, red or orange-red; exocarp fleshy; endocarp hard, longitudinally furrowed.

Fls. & Fr. : Feb. - Sept.

Distrib. India : In forests up to 1000 m. Assam, Meghalaya and Arunachal Pradesh.

Bangladesh (Chittagong), Myanmar and Malesia.

3. *Iodes ovalis* Blume, Bijdr. 30. 1825; Sleumer in Fl. Males. 7(2): 68. 1971; Chowdhery *et al.* in Hajra *et al.*, Materials Fl. Arunachal Pradesh 1: 290. 1996. *I. oblonga* Planchon ex Masters in Fl. Brit. India 1: 597. 1875.

Climbing shrubs, about 5 m, often with tendrils; young branches hairy. Leaves oblanceolate to elliptic, 7-15 x 3-6 cm, apex acuminate to cuspidate, base rounded, membranous, glabrous or pilose along the midrib on the upper surface, villous beneath; petiole 0.6-1.5 cm long. Inflorescence pubescent, dichotomously branched; male ones many-flowered, upto 10 cm long; female 8-10-flowered, 2-5 cm long; pedicels 2-3 mm long. Flowers 5-merous. *Male flowers* : Calyx lobed to middle or 2/3. Petals oblong, 2.5 mm long, apex incurved. Anthers oblong, 1 mm long, subsessile. Rudimentary ovary pubescent. *Female flowers* : Petals 2 mm long, lanceolate pointed. Staminodes absent. Ovary oblong, hairy; stigma sessile, discoid, 5-lobed. Drupe ovoid, 1.5-2 cm long; endocarp faintly furrowed.

Fl. & Fr. : Jan. - May.

Distrib. India : Arunachal Pradesh (Changlang).

Malaya, Sumatra and Java.

5. *Miquelia* Meissner

Dioecious. Climbing shrubs; wood with large porous vessels. Leaves alternate, petiolate, crenulate to toothed, chartaceous, often palminerved. Inflorescence in axillary racems, panicles or fascicles. Flowers unisexual, in heads or umbels, arranged distally on thick peduncles, sessile. Calyx minute, 4-5-lobed. Petals 4-5, united into a long tube; lobes valvate, apex inflexed. *Male flowers* : Stamens 4-5; filaments short; anthers dorsifixed. Rudimentary ovary small. *Female flowers* : Staminodes very short. Ovary cylindrical, pubescent;

style short; stigma sessile, cupular. Drupe oblong-elliptic, laterally compressed; mesocarp thin; endocarp crustaceous, rugose; albumen fleshy; cotyledons elliptic, foliaceous.

South East Asia; 8 species, 2 in India.

KEY TO THE SPECIES

- | | |
|---|----------------------|
| 1a. Leaves lanceolate, 10-20 x 5-6 cm; margin entire to crenulate | 2. <i>M. kleinii</i> |
| b. Leaves broadly ovate-lanceolate, 20-22 x 9-10 cm; margin dentate | 1. <i>M. dentata</i> |

1. ***Miquelia dentata*** Beddome in Trans. Linn. Soc. London 25. 211. t. 23. 1865-1866; Masters in Fl. Brit. India 1: 593. 1875.

Climbing shrubs; branches terete, glabrous. Leaves chartaceous, ovate-oblong to ovate-lanceolate, 20-22 x 9-10 cm, acuminate, truncate-cordate at base, margin dentate, glabrous; petioles 4-5 cm long. Flowers unisexual, sessile, arranged in heads on supra axillary peduncled racemes, which are solitary in female flowers. Calyx 4-lobed. Corolla lobes lanceolate. *Male flowers* : Stamens 4; anthers oblong, sagittate. Rudimentary ovary minute. *Female flowers* : Ovary obovoid; style very short; stigma subsessile, depressed in the centre. Drupes oblong, laterally compressed.

Fl. & Fr. : April - Nov.

Distrib. India: Western Ghats, up to ca 900 m. Tamil Nadu and Kerala. Rare.

2. ***Miquelia kleinii*** Meissner, Gen. Gorn. 109 1838; Masters in Fl. Brit. India 1: 593. 1875.

Large woody climbers; branches strigose when young. Leaves alternate, lanceolate to ovate-lanceolate, 10-20 x 5-6 cm, abruptly acuminate, narrowed at base, subentire to crenulate; petioles 4-5 cm long. Male inflorescence on slender, 2.5-5 cm long peduncles and in 15-20-flowered heads. Female inflorescence on 1-2 cm long, thick peduncles and in 10-15-flowered heads. Flowers unisexual, on 2-4 mm long pedicels. Calyx minute, 3-5-lobed. Petals 4-5-lobed; lobes oblong, valvate. *Male flowers* : Filaments short. Rudimentary

ovary present. *Female flowers* : Staminodes minute. Ovary ovoid; stigma sessile, 4-lobed. Drupes obliquely ovoid, 1.5-2 x 1 cm, laterally compressed, yellowish, rugose.

Fl & Fr. : Apr. - Nov.

Distrib. India: Assam, Meghalaya and Arunachal Pradesh.

Thailand.

6. *Natsiatum* Buch.-Ham.

Climbing shrubs. Leaves alternate, petiolate, dentate, palmately nerved. Inflorescence in axillary or supra axillary spikes or spike-like racemes. Flowers sessile or on short pedicels, unisexual. Calyx deeply 5-lobed, persistent. Petals 5, free or united only at the base. *Male flowers* : Stamens 5, alternating with the petals; filaments short, anthers sagittate, apiculate, dehiscing by longitudinal slits. Rudimentary ovary present. *Female flowers* : Staminodes present. Ovary hairy; style short, 2-3-lobed at apex; stigmas capitate. Drupes ovoid, laterally compressed; exocarp fleshy, black on maturity; endocarp crustaceous. Seed 1; albumen fleshy; cotyledons foliaceous.

A monotypic genus, distributed in India, Bangladesh, Myanmar, Thailand and Indo-China.

Natsiatum herpeticum Buch.-Ham. ex Arn. in Edinb. New Philos. J. 16: 314. 1834; Masters in Fl. Brit. India 1: 595. 1875.

Asm.: *Target-rinbe*, *Miri*.

Dioecious. Climbing shrubs; roots tuberous; stems and branches densely strigose. Leaves broadly ovate, 6.5-15 x 4.5-10 cm, acute or acuminate, cordate to truncate or abruptly cuneate at base, dentate, chartaceous, rough due to stiff, white hairs, palmately 7-9-nerved; petioles 5-15 cm long, densely strigose. Inflorescence pendulous, in supra axillary hirsute, slender, spike-like racemes, ca 10-12 cm long. Flowers unisexual; bracts linear; pedicels 2-3 mm long. Calyx lobes valvate, linear-lanceolate, outer surface densely covered with coarse hairs. Petals 5, lanceolate, up to 2.5 mm long, hairy inside. *Male flowers* : Filaments short; anthers sagittate. *Female flowers* : Staminodes subulate.

Ovary hairy; style 2-3-lobed, laterally compressed, ovate, rugose. Drupe 8 x 6 mm.

Fl. & Fr. : Dec. - Feb.

Distrib. India: Sikkim, Arunachal Pradesh, Assam, Nagaland, Tripura and Meghalaya.

Nepal, Myanmar, Bangladesh, N. Thailand and Vietnam.

Uses. The leaves and tender shoots are eaten by the Miris. It is cooked as a pot herb, especially with fish.

7. *Nothapodytes* Blume

Medium sized to small trees. Leaves alternate or subopposite, entire, penninerved, petiolate, simple. Flowers bisexual, small, in terminal corymbose cymes, ebracteate, pedicellate. Calyx 5-toothed, or crenate, persistent. Petals 5, free or slightly connate at base, linear-oblong, externally pubescent, valvate, hairy to glabrous, within. Stamens 5, free, flattened below, slender above, smooth, as long as the petals; anther lobes separated below, dorsifixed. Disc cup shaped crenulate, glabrous, margin usually hairy. Ovary superior, straight, pubescent, tapering into a short style, 1-celled; style hairy or glabrous. Drupe oblong.

South East Asia; ca 5 species, 1 in India.

Nothapodytes nimmoniana (Graham) Mabb. in Manilal, Bot. Hist. Malab. 88. 1980. *Premna nimmoniana* Graham, Cat. Pl. Bombay 155. 1839. *Stemonurus foetidus* Wight, Ic. 3. t. 955. 1845. *Nothapodytes foetida* (Wight) Sleumer, Notizbl. Berlin-Dahlem 15: 247. 1940. *Mappia foetida* (Wight) Miers in Ann. Mag. Nat. Hist. Ser. II 9: 395. 1852; Masters in Fl. Brit. India 1: 589. 1875. *M. oblonga* Miers in Ann. Mag. Nat. Hist. Ser. II. 9. 396. 1852; Masters in Fl. Brit. India 1: 589, 1875. *M. wightiana* Miers in Ann. Mag. Nat. Hist. Ser. II. 9. 396. 1852; Gamble, Fl. Pres. Madras 1: 197. 1915. *M. tomentosa* Miers in Ann. Mag. Nat. Hist. Ser. II. 10. 397. 1852; Masters in Fl. Brit. India 1: 589, 1875. *M. ovata* Miers in Ann. Mag. Nat. Hist. Ser. II: 10.396. 1852; Masters in Fl. Brit. India 1: 589. 1875.

Fig. 7.

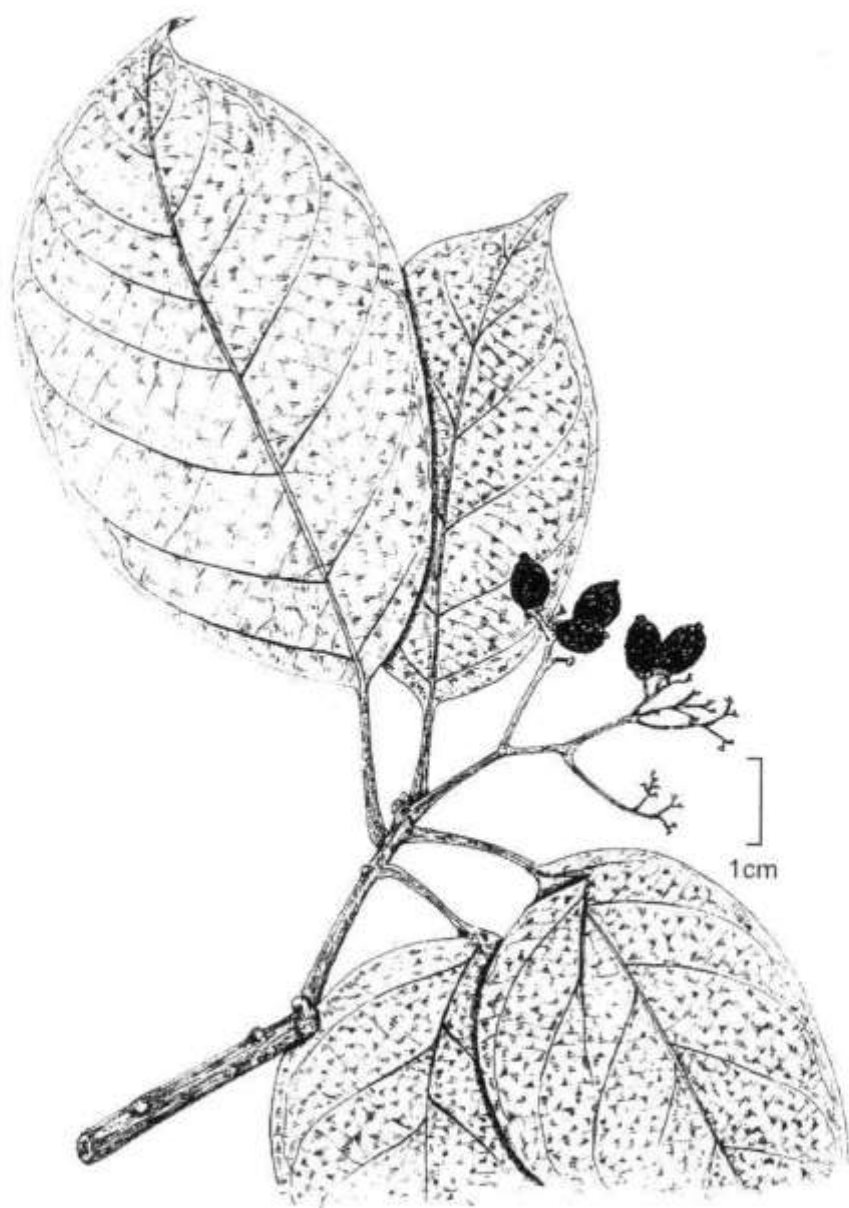


Fig. 7. *Nothapodytes nimmoniana* (Garham) Mabb.

Kan.: *Hedara*, *Kodsa*; Mar.: *Amruta*, *Arali*, *Kalgur*; Tam.: *Chorla*.

Small trees, 5-10, rarely up to 15 m tall; bark yellowish, wrinkled. Leaves ovate-oblong or elliptic-oblong, 7-14 x 4-7 cm, apex acute or acuminate, base rounded or acute, unequal, dark green and glabrous above, pale and pubescent beneath, subcoriaceous or membranous; nerves 6-10 pairs, raised on under surface; petioles 3-6 cm, grooved, pubescent. Inflorescence of terminal corymbose cymes or panicles, on long, pubescent peduncles. Flowers bisexual; pedicels 1-2 mm long, strigose. Calyx 1.5 mm, shortly lobed. Petals 4-5 mm, oblong, acute, white, pubescent within. Filaments 3-4 mm. Ovary ovoid, hairy; style up to 3 mm long. Drupes ellipsoid-oblong, 1.5-1.8 cm long, blackish purple when ripe.

Fl. & Fr. : Nov. - March.

Distrib. India : up to 2300 m. Sikkim, West Bengal (Darjeeling), Maharashtra (Mahabaleshwar), Goa, Karnataka, Tamil Nadu and Kerala.

Uses. The fruits resemble *Syzygium cumini* in taste and appearance.

8. *Platea* Blume

Dioecious. Generally tall trees. Leaves alternate, petiolate, initially stellately hairy or covered with silvery scales, entire, penninerved. Flowers unisexual. Male flowers bracteate, in axillary spikes, sessile. Calyx minute, 4-5-lobed, imbricate, persistent. Petals united at base, inflexed above, glabrous, valvate. Stamens 4-5, attached to the corolla tube. Female flowers in few-flowered, cymes, bracteate, shortly pedicellate. Petals lacking. Ovary obconical, rarely cylindrical. Stigma sessile, discoid, persistent in fruit. Drupe ovoid-oblong, shortly stalked, orange yellow when young, purple-black on ageing.

South East Asia; 5 species, 1 in India.

Platea latifolia Blume, Bijdr. 647. 1826; Sleumer in Blumea 17(1): 243. 1969. *Platystigma myristiceum* R. Br. in Wallich, Cat. n. 7523. 1832. *nom. nud.*; Hook.f., Fl. Brit. India 5: 381. 1887.

Trees, 25-30 m tall; young branches, leaves and inflorescence rusty tomentose. Leaves ovate-elliptic or elliptic-oblong, 12-20 x 5-10 cm, apex

acute to acuminate, dull brown below, smooth and glossy on the upper surface; venation prominent on the lower surface; petiole 2-4 cm long, slightly woolly. *Male flowers* : in 4-6 cm long spikes or panicles. Sepals deeply lobed; lobes broadly ovate, slightly imbricate. Petals connate at base, 1.5 mm long, inflexed at tips. Filaments very short; anthers ovoid. Rudimentary ovary absent. *Female flowers* : Calyx deeply lobed, persistent, pubescent on dorsal surface. Petals absent. Ovary obconical, woolly or glabrous; stigma sessile, discoid, broader than ovary, persistent in fruit. Drupes ovoid-ellipsoid, 3-4.5 x 2-2.5 cm, yellow-orange to red, pruplish black on drying.

Fl. & Fr. : Feb. - March.

Distrib. India: In evergreen forests or swamps and around wetlands, up to an elevation of 560 m. Sikkim and Mizoram.

Bangladesh, China, Thailand, Indo-China, Malaya, Indonesia, Philippines and New Guinea.

9. *Pyrenacantha* Wight

Dioecious. Woody climbers. Leaves alternate, margin glandular, repand, dentate or coarsely toothed, penninerved. Inflorescence in filiform, axillary or supra axillary spikes. Flowers unisexual, minute, sessile, bracteate. Calyx absent. Petals 4, oblong, united at the base, inflexed at the tip. *Male flowers* : Stamens 4; filaments short; anthers small. Rudimentary ovary villous. *Female flowers* : staminodes present or absent. Ovary oblong; stigma sessile, rounded or truncate. Drupe flattened; exocarp fleshy; endocarp hard, warty outside, verrucose inside. Seeds solitary; albumen ruminant; cotyledons large, foliaceous.

Mostly tropical and subtropical Africa and Madagascar, a few species in South East Asia; *ca* 20 species, 1 in India.

Pyrenacantha volubilis Wight in Hook., Bot. Misc. 2: 107: 1831, et Illustr. Suppl. t. 9 & 10. 1831; Gamble, Fl. Pres. Madras 1: 198. 1915.

Climbing shrubs, much branched; branchlets slender, pubescent. Leaves narrowly elliptic-lanceolate, 7-12.5 cm long, dark green above, pale beneath with a pair of glands at the base; venation prominent; petioles *ca* 5 mm long,

densely pubescent. Male flowers in filiform spikes. Female flowers in pedunculate, capitate heads. Drupes ovoid, orange-red.

Fl. & Fr. : Sept. - Oct.

Distrib. India : Maharashtra, Karnataka and Tamil Nadu.

Sri Lanka, Indo-China and Hainan.

10. *Sarcostigma* Wight & Arn.

Dioecious. Much branched woody climbers. Leaves alternate, entire, coriaceous to subcoriaceous; petiole striate, curved. Inflorescence in axillary or terminal spikes, spike-like racemes, panicles or interrupted fascicles, usually pendulous. Flowers unisexual, sessile or female sometimes pedicellate. Calyx cup shaped, 4-6-toothed, persistent. Petals 4-6, free or connate at base, valvate, reflexed, persistent in male flowers. Stamens 4-6; filaments slender; anthers dorsifixed. Rudimentary ovary hairy. Staminoides present or absent in female flowers. Ovary hairy; stigma sessile. Drupe oblong, flattened; exocarp thin, yellow to orange red; endocarp hard, smooth to warty. Seed-1.

Tropical South East Asia; 2 species, 1 in India.

Sarcostigma kleinii Wight & Arn. in Edinb. New Philos J. 14: 299. 1833; Masters in Fl. Brit. India 1: 594. 1875. *S. wallichii* Baillon in Adansonia 10. 282. 1872; Masters in Fl. Brit. India 1: 594. 1875. *S. edule* Kurz in J. As. Soc. Bengal 41 (2): 298. 1872; Masters in Fl. Brit. India 1: 594. 1875.

Woody climbers, ca 20 m; branches grey. Leaves oblong-elliptic, 10-25 x 5-10 cm, obtusely acuminate, base narrowed, glabrous on both sides, shining, dark green above, pale beneath, coriaceous; mid rib raised on the lower surface; nerves in 6-8 pairs; petiole 1-1.5 cm long. Spikes 15-20 cm long; rachis angular, with brownish, strigose hairs. Flowers unisexual. *Male flowers* : Calyx 1-2 mm long, pilose, cup shaped, 4-5-lobed. Petals dark yellow, glabrous inside, hairy outside, oblong, 3-4 mm long, acute. Filaments 4-5 mm long, glabrous, flat, strap shaped. Rudimentary ovary conical. *Female flowers* : Ovary obovoid, pilose; stigma sessile, conical. Drupes oblong, 3.5 x 1.5 cm; exocarp bright orange-red, pubescent; endocarp hard, smooth to reticulate.

Fl. & Fr. : July - Dec.

Distrib. India : Western Ghats, at ca 1000 m. Maharashtra (Concan), Karnataka, Tamil Nadu, Kerala and Andamans.

Myanmar, Thailand, Malaya, Java and Borneo.

Uses. Oil is extracted from the seeds, which is used in the treatment of rheumatism.

11. *Stemonurus* Blume.

Trees, sometimes with buttresses or pneumatophores. Leaves entire, dark and glossy above, pale beneath, alternate, coriaceous, petiolate; petioles stout. Inflorescence axillary, solitary, peduncled, umbels or cymes, bearing flowers in groups distally on each branch. Flowers sessile, bisexual; bracteoles at the base of umbels, sometimes persistent. Calyx cup shaped, margin entire or 4-5-lobed, persistent. Petals 4-5, white, fragrant, free or connate at base, oblong, apex inflexed. Stamens 5, free, fleshy; filaments flat, dilated above, hairy below the anthers; anthers 2-lobed, oval-elliptic, basifixed, parted below. Disc cup shaped, lobed. Ovary ovoid, tapering into a short style, 1-chambered, with 2 pendant ovules; stigma very small. Drupes ovoid-ellipsoid or oblong, dark red to purple below, whitish yellow to green above.

Sri Lanka, Indo-China, Malesia; 12 species, 1 in India.

Stemonurus secundiflorus Blume, Bijdr. 649. 1826. Sleumer in Blumea 17: 258. 1969; Thothatri & Banerjee in Indian For. 103: 708. 1977. *Lasianthera secundiflora* (Blume) Miq., Fl. Ind. Bat. 1(1): 792. 1856. **Fig. 8.**

Medium sized trees, 10-15 m tall, often with pneumatophores; branches horizontal; bark smooth, greyish outside, orange-brown inside. Leaves alternate, obovate-oblong, 15-20 x 5.5-7.5 cm, obtusely apiculate or short acuminate, narrowed at the base, entire, coriaceous; midrib grooved above; nerves in 10-12 pairs; venation ± obscure; petioles 1.5-2 cm long. Inflorescence axillary, solitary umbellate cymes, 5-6.5 cm long, including 3 cm long peduncle; branchlets of umbels 3-5-flowered; bracts small, caducous. Flowers bisexual. Calyx cup shaped, 2-2.5 mm long, obscurely lobed up to the middle, glabrous.

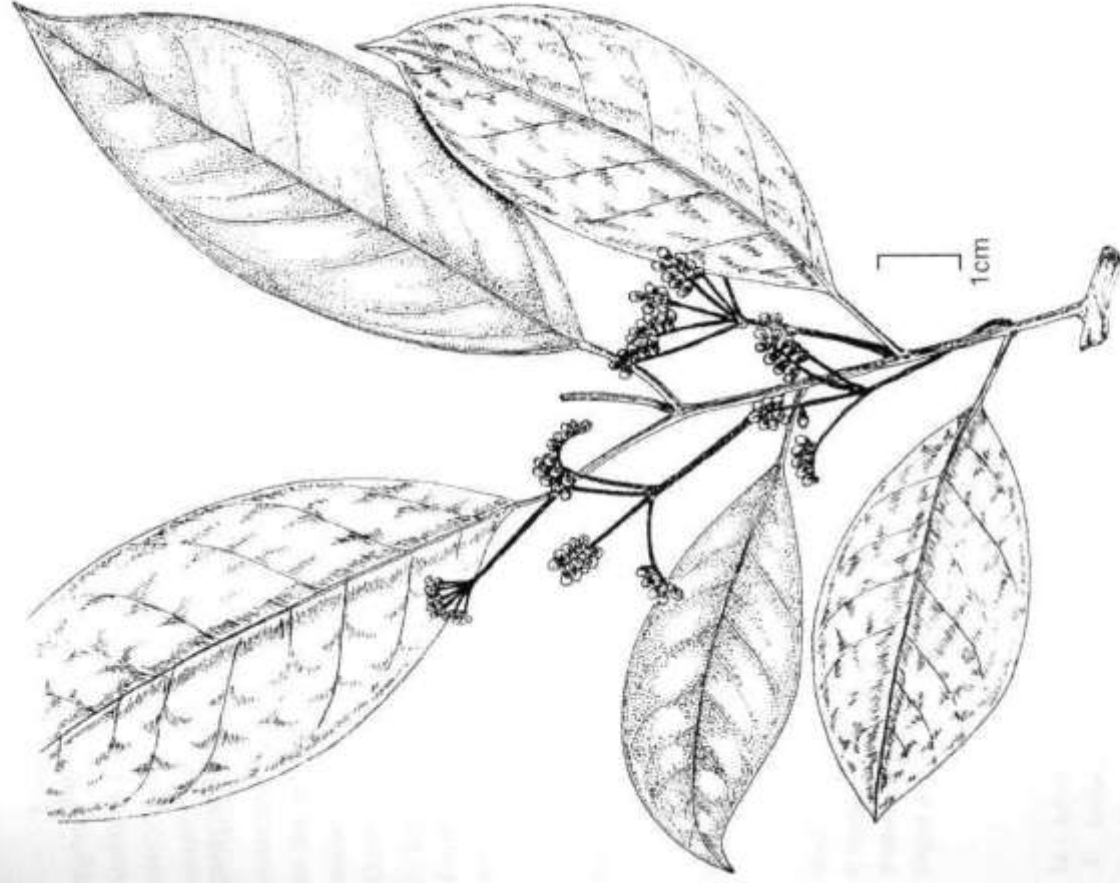


Fig. 8. *Stemonurus secundiflorus* Blume

Petals 4 mm long, white, fragrant, almost free. Filaments flat. Ovary ovoid, tapering to a subulate style. Drupes ellipsoid, 4-5 x 1-1.5 cm, narrower upwards.

Fl. & Fr. : Feb. - March.

Distrib. India: In swampy places or in forests. Nicobar Islands.

Sri Lanka and Malesia.

Note. A very handsome pyramidal tree with laurel like foliage. The young leaves are coppery red.

O P I L I A C E A E

(R. Mathur)

Evergreen trees, shrubs or woody climbers, often root parasites. Branches zig-zag in internodal regions. Leaves simple, alternate, entire, exstipulate, both surfaces usually pustulate. Inflorescence axillary racemes, spikes, or panicles, rarely umbellate or subumbellate. Flowers pedicelled or sessile, small, regular usually bisexual, sometimes unisexual or polygamous, 4-5-merous, with a single perianth whorl. Perianth lobes free or united at base, entire or 4-5-lobed, sometimes urceolate, petaloid or sepaloid. Stamens as many as and opposite to the perianth lobes. Filaments free or attached to the base of the perianth, anthers opening by longitudinal slits; disc glands alternating with the stamens. Ovary superior or partially inferior, 2-5 carpellary, syncarpous, 1-loculed; ovule 1, pendulous or erect; stigma small or expanded, sessile or on a short style. Fruit a single seeded drupe, often fleshy; seeds with small, narrow, cylindric embryo and thick endosperm.

Tropical Asia and Africa, rarely in tropical America; 9 genera and 60 species, 4 genera and 4 species in India.

Note. Opiliaceae was established by Valetton in 1886. It was earlier treated as tribe Opilieae under Olacaceae by Masters (*l.c.*) and various other authors.

Literature : HIEPKO, P. (1979) A revision of Opiliaceae 1. Genera of the Eastern Old World excluding *Opilia*. *Willdenowia* 9: 13-56. HIEPKO, P. (1982). A revision of Opiliaceae 2. *Opilia* Roxb. *Willdenowia* 12(2): 161-182. KUMAR, A. (1988) The family Opiliaceae in Madhya Pradesh, India. *J. Econ. Tax. Bot.* 12(2): 430. SLEUMER, H. (1935) Olacaceae - Opiliaceae. In Engler & Prantl, *Pflanzenfam.* ed. 2. 16b: 5-41.

KEY TO THE GENERA

- | | |
|--|----------------------|
| 1a. Inflorescence a panicle; flowers unisexual or polygamous | 2. <i>Champercia</i> |
| b. Inflorescence a raceme or a spike; flowers bisexual | 2 |
| 2a. Perianth free; stigma sessile | 4. <i>Opilia</i> |
| b. Perianth united into a tube; stigma on a short style | 3 |
| 3a. Flowers sessile; filaments filiform; perianth persistent in fruit | 1. <i>Cansjera</i> |
| b. Flowers pedicelled; filaments flattened; perianth non-persistent in fruit | 3. <i>Lepionurus</i> |

1. *Cansjera* A.L. Juss.

Erect shrubs, woody climbers or small trees, often root parasites. Branches densely pubescent and with scattered stout spines. Leaves slightly coriaceous or membranous, glabrous or hairy. Flowers bisexual, in axillary spikes, greenish yellow, in the axils of small persistent bracts; rachis and bracts densely hairy. Perianth pilose, urceolate or campanulate with 4 or rarely 5 recurved lobes, persistent in fruit. Stamens not exceeding the perianth tube; filaments filiform. Disc scales alternating with the stamens. Ovary ovoid to cylindrical; style short sometimes slightly exceeding the perianth tube; stigma globose to 4-lobed. Drupes almost ellipsoid.

Tropical Asia, Australia; 5 species, 1 in India.

Cansjera rheedii J. Gmelin in L., Syst. Nat. ed. 13, 2(1): 280. 1791; Masters in Fl. Brit. India 1: 582. 1875.

Kan.: *Bodbakka*; Mar.: *Jarar*; Or.: *Badalia*, *Jhantika*; Tam.: *Kalmanakherai*, *Mannaikkali*.

Climbing shrubs or small trees, upto 5 m tall; young branches pubescent, beset with scattered stout spines. Leaves elliptic-oblong, to ovate-lanceolate, 4-9 x 2.5-3.2 cm, acuminate, base acute, minutely pimpled on both surfaces, on drying somewhat wrinkled; petioles 2-4 mm, pubescent. Flowers greenish white or yellow, sessile, 2.5-3.5 x 1.5-2.5 mm, in axillary, 1.5-2.5 cm long spikes, 1-2 together, occurring singly or in pairs. Drupes ellipsoid, 1.2-1.5 x 0.6-0.8 cm, red when ripe.

Fl. & Fr. : Dec. - Nov.

Distrib. India: Scattered in moist deciduous forests and in scrub jungles along coasts, ravines and near water. Uttar Pradesh, Bihar, Orissa, Madhya Pradesh, Maharashtra, Tamil Nadu and Andamans.

Nepal, Sri Lanka, Myanmar, Thailand, China, Vietnam, Cambodia, Laos, Malay Peninsula, Sumatra, Borneo, Philippines and Australia.

2. *Champereia* Griffith

Small trees or shrubs; branches, glabrous. Leaves coriaceous. Inflorescence much branched axillary panicles; rachis puberulous. Flowers unisexual or polygamous. Male and female flowers borne on separate inflorescences; female flowers in more dense and stout inflorescence; sometimes male flowers lacking, instead bisexual and female flowers occurring on separate inflorescence. Male flowers pedicelled, 5, or 4-6-merous; bracts minute, fugacious. Filaments filiform. In female flowers perianth reflexed. Ovary small, conical; stigma sessile. Disc lobed. Drupes shortly ellipsoid.

Myanmar, Thailand, Vietnam, Taiwan, Malesia, Sumatra and New Guinea; 6 species, 1 in India.

Champereia manillana (Blume) Merr. in Philipp. J. Sci. Bot. 7: 233. 1912. *Cansjera manillana* Blume, Mus. Bot. Lugd. Bat. 1: 246. 1850. *Opilia manillana* Baillon in Adansonia 3: 124. 1862. *Champereia griffithiana* Planchon ex Kurz in J. As. Soc. Bengal 44-(2): 154. 1875; Hook.f., Fl. Brit. India 5: 236. 1886.

Fig. 9.

Shrubs or small trees, 4-8 m tall, rarely up to 20 m. Leaves ovate, oblong, or lanceolate, 4.5-25 x 1.5-11 cm, acuminate or acute, glabrous, venation prominent beneath, 5-8 lateral nerves on each side of the mid rib; petioles 3-8 mm long. Inflorescence of panicles; panicles solitary or in groups of 2-4, main rachis up to 20 cm long. In male flowers bracts ovate, acute, 0.5-1 mm long. Perianth 5, free, yellowish green, petaloid, oblong, 1-1.5 mm, acute; pedicels 3-10 mm. Stamens as long as the perianth; anthers yellow, oval, 0.3 mm long. Disc green, crenulate. Female flowers ebracteate; pedicels short, ca 0.5 mm. Perianth 2-5, free, sepeloid, green, acute, ca 0.5 mm. Staminodes and disc absent. Ovary cylindrical to ovoid, ca 0.5 mm long; stigma cushion-shaped, sessile. Drupes orange-red, 0.8-1.6 x 0.7-0.9 cm, on 0.15-0.4 cm long pedicels.

Fl. & Fr. : Jan. - Dec.

Distrib. India : Andamans.



Fig. 9. *Champereia manillana* (Blume) Merr.

Myanmar, Thailand, Vietnam, Taiwan, Malaya Peninsula, Sumatra, Java, Borneo, Lesser Sunda Islands, Philippines, Celebes and Moluccas.

Note. The species is extremely variable in vegetative characters, especially in form and size of leaves.

Uses. Young leaves and young fruits are eaten as vegetable. Leaves and roots are pounded to make a poultice for ulcers and the boiled roots are used for rheumatism in Malaya.

3. *Lepionurus* Blume

Shrubs or small trees, usually glabrous or sometimes young twigs with short hairs. Leaves glabrous or minutely pimpled on both surfaces, thinly coriaceous. Flowers in axillary racemes, bisexual, 3-5-merous, usually three flowers per bract; rachis slender, glabrous; bracts densely imbricate, broad, scaly, pale green, with membranous, shortly ciliated margins, caducous before anthesis; lower most bracts smaller and persistent. Perianth united, deeply lobed. Stamens not exceeding the perianth; filaments flattened. Disc cupular with irregularly lobed margins. Ovary ovoid, conical; stigma on a short style, entire or indistinctly lobed. Drupes ellipsoid-ovoid or obovoid.

Chiefly Indo-Malayan: Nepal, Assam to W. Malesia; 6 species, 1 in India.

Lepionurus sylvestris Blume, Bijdr. 1148. 1826. *L. oblongifolius* Masters in Fl. Brit. India 1: 583. 1875.

Hindi: *Impai-Kelok*, *Kharsani*; Lus.: *Anpangthuam*.

Shrubs, ca 2 m high, rarely a small tree up to 6 m tall. Leaves very variable in shape, lanceolate or ovate, rarely obovate, 5.5-2.5 x 1.5-9 cm, apex acute or acuminate, base acute, venation prominent beneath; petioles 1-8 mm long. Inflorescence of 1-8 racemes in each axil; rachis erect, drooping or pendulous, 2-5 cm long; bracts broadly ovate, acuminate or apiculate, 4-7.5 x 3-8 mm. Flowers usually 3 per bract, without bracteoles; pedicels 1-2 mm. Perianth yellowish, 2-4.5 mm in diam.; lobes 3-4, ovate, acute spreading, united below into a small tube. Stamens inserted below the margins of the

disc, as long as the perianth tube; anthers ovate, 0.5 mm long. Ovary *ca* 1 mm long. Drupes 0.9-1.6 x 0.6-1 cm, on 0.2-0.25 cm long, orange, on red, thick pedicels.

Fl. & Fr. : Throughout the year.

Distrib. India : Eastern Himalaya, in evergreen forests between 500-1800 m. Sikkim, West Bengal, Assam, Arunachal Pradesh and Meghalaya.

Nepal, Myanmar, S. China, Thailand, Vietnam, Malay Peninsula, Sumatra, Java and Borneo.

Note. Locally common as an undergrowth. In peninsular Thailand, the roots are locally used for a medicine against fever. In Pahang (Malay peninsula) a poultice of the plant or of the root is applied for headache.

4. *Opilia* Roxb.

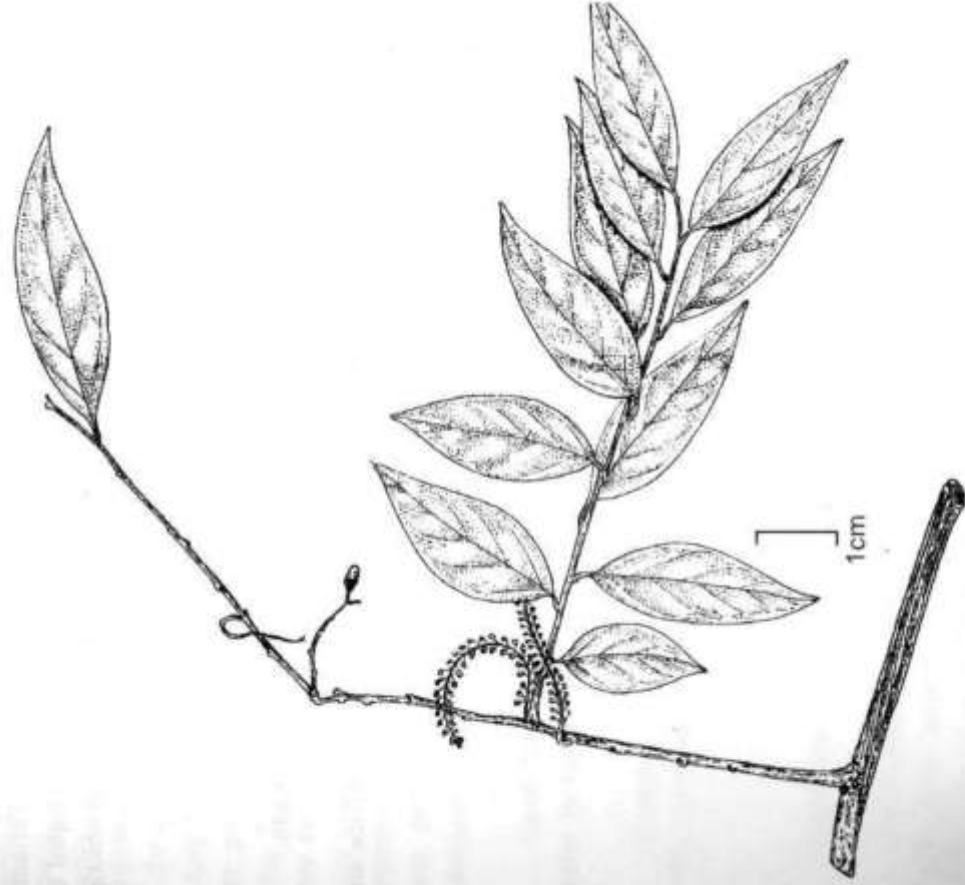
Small trees, shrubs, woody climbers; or root parasites; young branchlets glabrous, puberulous or tomentose. Leaves alternate, coriaceous, glabrous, puberulous or tomentose, entire, penninerved. Inflorescence short, in axillary racemes. Flowers bisexual, fragrant, small, 1-3 together in the axils of deciduous bracts; bracts broadly ovate or orbicular, peltate, densely imbricate, caducous. Perianth 5, free, oblong, valvate. Disc 5-lobed, lobes alternating with the stamens. Stamens 5, opposite petals; filaments slender; anthers small, 2-celled. Ovary superior, cylindrical to ellipsoid; stigma sessile, ovate; ovule solitary, pendulous. Drupes ellipsoid, puberulous.

Tropical Africa to tropical Asia, Solomon Island and Australia; *ca* 22 species, 1 in India.

Literature : HIEPKO, P. (1982) A revision of Opiliaceae 2. *Opilia* Roxb. *Willdenowia* 12 (2): 161-182.

***Opilia amentacea* Roxb., Pl. Corom. 2: 31. t. 158. 1802; Masters in Fl. Brit. India 1: 583. 1875.**

Fig. 10.

Fig. 10. *Opilia amentacea* Roxb.

Bhoj.: *Kara Badalia*; Or.: *Dweaikali*; Tam.: *Manjandamaran*.

Shrubs or woody climbers, up to 15 m tall, also known to occur as a root parasite, branches brownish, terete, faintly striate. Leaves elliptic or ovate, 5-16 x 1.5-6.5 cm, acuminate, acute at the base, penninerved, pimpled; petioles 8-9 mm long. Inflorescence axillary racemes, *ca* 4 cm long. Flowers greenish, small; bracts 2-3 mm wide, peltate, ciliate; pedicels 1-2 mm long. Perianth 1-2 mm long, ovate, faintly cucullate at the apex. Disc lobes club shaped to ovoid. Stamens 5, antipetalous; filaments filiform. Ovary ellipsoid. Drupes oblong, *ca* 2.7 x 1.5 cm, oblong, glaucous. Seed 1, blackish.

Fl. & Fr. : March - July.

Distrib. India : Bihar, Orissa, Andhra Pradesh and Tamil Nadu.

Sri Lanka, Myanmar, Malaya, Thailand, Vietnam, Tropical Africa and Australia.

CARDIOPTERIDACEAE

(R. Mathur)

Glabrous, climbing herbs, with milky juice. Leaves alternate, petiolate, broadly cordate, entire or lobed, palmately 3-7-nerved, membranous or chartaceous, exstipulate. Inflorescence axillary branched cymes; branches secund. Flowers minute, regular, bisexual or polygamous, ebracteate. Calyx deeply 5-lobed, lobes imbricate, persistent or not. Petals 5, caducous, sympetalous, infundibuliform, lobes spreading, imbricate, thin. Stamens 5, inserted on the corolla tube and alternate with the lobes; filaments very short, glabrous, as long as the anthers; anthers oblong, dorsifixed, dehiscing through longitudinal slits; pollen grains tricolporate. Disc absent. Ovary oblong-ovoid, 1-loculed; styles 2, dissimilar, one elongated and columnar and persistent in fruit, the other short, with capitate stigma; ovules 2, pendulous from the apex of the cavity or one of them aborted. Fruit indehiscent, obovate-oblong to globose, compressed, emarginate, 2-winged samara; wings striolate. Seeds pendulous, linear, grooved; testa thin; embryo very small, at the apex of granular, fleshy endosperm.

South East Asia, New Guinea to Australia; 1 genus and 3 species, 1 species in India.

Literature : BULLOCK, A.A. (1957) Nomenclature. *Notes. Kew Bull.* 12: 356 & (1962), 15: 392. SLEUMER, H. (1972) *Cardiopteridaceae. Fl. Thailand* 2(2): 93-94.

Cardiopteris Wallich

Description and distribution same as that of the family.

Cardiopteris quinqueloba (Hassk.) Hassk., *Nat. Tijd. N.* 10. 64. 1855.
Peripterygium quinquelobum Hassk., *Tijd. Nat. Gesch Phys.* 10: 142. 1843.
Cardiopteris lobata R. Br. in Benn & Br., *Pl. Jav. Rar.* 246.t. 49. 1852. *nom. illeg.*; Masters in *Fl. Brit. India* 1: 597. 1875. Fig. 11.

Lus.: *Lalaunga-bupfiari thup.*

Climbing herbs. Stems terete, twining and striate. Leaves polymorphous, broadly ovate, 6-12 x 6-8.5 cm, pale green, glabrous, membranous, cordate

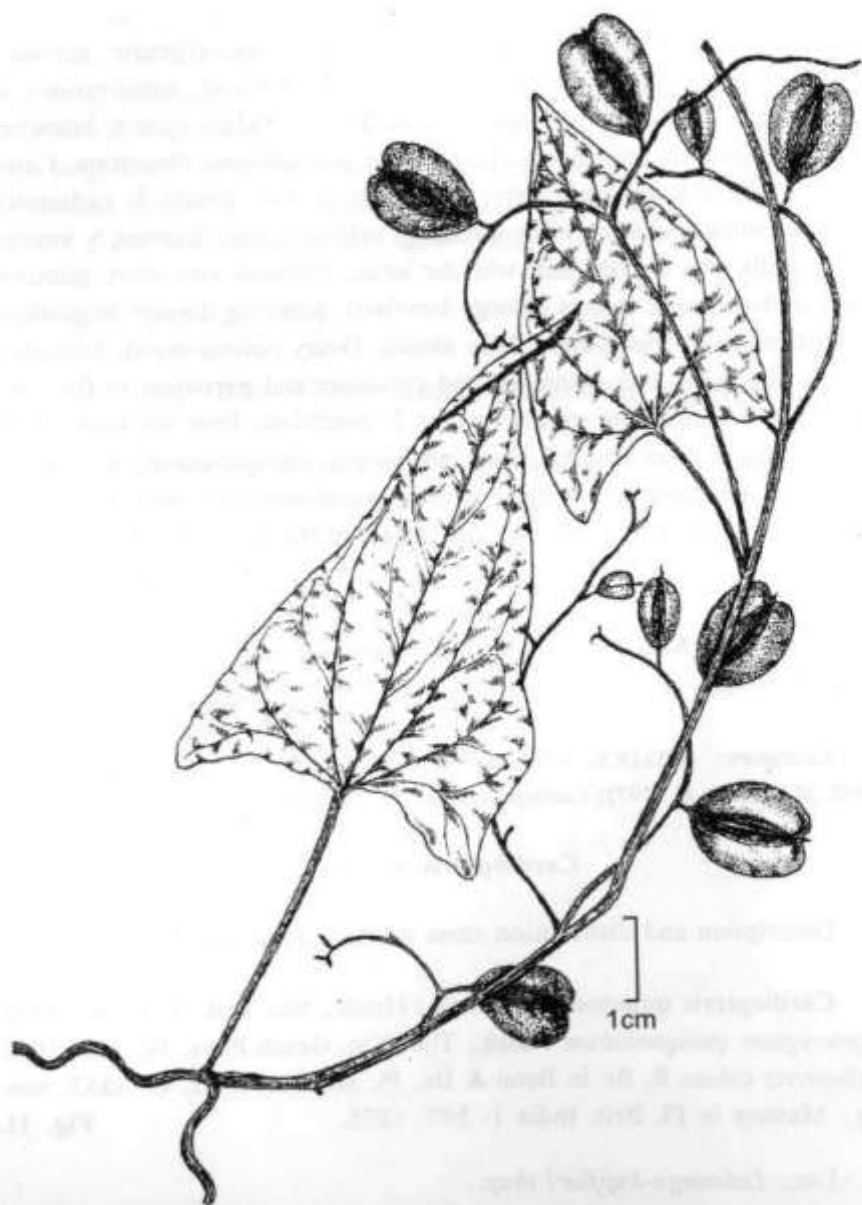


Fig. 11. *Cardiopteris quinqueloba* (Hassk.) Hassk.

at base, deeply 3-5-lobed; lobes acute or obtuse, apex acute or acuminate, 7-9-nerved from base; nerves raised on the under surface; petioles 7.5-12 cm. Inflorescence on 4.5-9 cm long, solitary, axillary peduncles. Flowers bisexual, ebracteate, subsessile or on 1 mm long, pubescent pedicels. Calyx persistent, puberulous; lobes 2 mm long. Corolla 2.5 mm long, whitish, caducous. Fruits obovate orbicular, 2.5-3.5 x 2.7 cm including the wings; emarginate, cuneate at base and with accrescent style at the top; wings yellowish.

Fl. & Fr. : Nov. - Dec.

Distrib. India: West Bengal, Assam and Arunachal Pradesh.

Bangladesh, Myanmar, Thailand, Vietnam, Yunnan, Malaya, Indonesia, Celebes and Moluccas.

Note. The species varies much in the form of leaves. This variation can be seen even on a single specimen.

Uses. The leaves are used as vegetable.

AQUIFOLIACEAE

(D. Basu)

Small trees or shrubs, evergreen or deciduous. Leaves simple, alternate, rarely opposite, entire or serrate, coriaceous, chartaceous or membranous; stipules minute, persistent or caducous or absent. Inflorescence solitary or fasciculate, in axillary cymes, racemes or pseudumbels. Flowers unisexual (in case of dioecious plants) or bisexual, usually 4-merous, rarely 4-8-merous or up to 16-merous, small, regular, white. Sepals united at base, rarely free, imbricate, caducous or persistent, lacking in female flowers. Petals white, rotate, united at base in male flowers, free in female flowers. Stamens alternate with and adnate to the base of petals; filaments slender; anthers dorsifixed, dehiscent by longitudinal slits; pollen 3-4 calporate. Disc absent. Carpels 4-8, rarely more, united; ovary superior; locules as many as carpels; ovules 1-2 in each locule, pendulous; style absent or very short; stigma lobed, capitate or discoid. Fruit a drupe, with stones as many as carpels, 1-seeded.

Mostly in tropical, subtropical and warm temperate regions of both the hemispheres; 4 genera and *ca* 450 species; 1 genus and 26 species in India.

Literature : HU, SHIU - YING (1949). The genus *Ilex* in China. *J. Arn. Arb.* 30: 233-344; 348-387. HU, SHIU-YING (1950). The genus *Ilex* in China. *J. Arn. Arb.* 31: 38-39; 214-263. LOESENER, T. (1901). Monographia Aquifoliacearum. *Nov. Acta Abh. Kais. Leop.-Carol. Deuts. Akad. Naturf.* 78: 1-599. 15t. NASIR, Y.J. (1978). Aquifoliaceae. In: Nasir, E. & S.I. Ali, *Fl. W. Pak.* 124: 1-4.

Ilex L.

Dioecious. Trees or shrubs, evergreen or deciduous. Leaves alternate, entire, serrated or spinose; stipules persistent or caducous. Inflorescence cymose, simple or much branched, solitary, axillary or fascicled. Flowers white, small, regular, heteromerous, unisexual, rarely bisexual. Male flowers pedunculate. Calyx patelliform, 4-6-lobed. Petals 4-8, connate at base. Stamens shorter, equal to or longer than petals, epipetalous; anthers oblong-ovate. Rudimentary ovary subglobose, with a beak, glabrous or ciliate. Female flowers 4-8-merous (sometimes 1-16-merous). Calyx 4-8-lobed, persistent. Petals connate at base or free. Staminodes epipetalous, small; sterile anthers cordate or sagittate. Ovary

ovoid, 4-8, rarely 1-10-loculed, glabrous or pubescent; style absent; stigma discoid, capitate. Fruit a drupe, globose; exocarp membranous or chartaceous; mesocarp fleshy; endocarp stony. Pyrenes 4-12 (rarely 1-16), smooth, striate or rugose, pitted, 1-seeded.

America; Europe, Asia; ca 400 species, 26 in India.

KEY TO THE SPECIES

- | | |
|---|-------------------------------|
| 1a. Margins of leaves entire or with few teeth near the tip only | 2 |
| b. Margins of leaves spinous, crenate, dentate throughout | 10 |
| 2a. Flowers bisexual | 20. <i>I. tadiandamolense</i> |
| b. Flowers unisexual | 3 |
| 3a. Stamens shorter than the petals | 4 |
| b. Stamens equal or longer than the petals | 6 |
| 4a. Lateral nerves faint; flowers 6-merous | 15. <i>I. malabarica</i> |
| b. Lateral nerves distinct; flowers 1-6-merous | 5 |
| 5a. Leaves 6 x 2-2.5 cm; petioles 0.6-1.2 cm long | 14. <i>I. longicaudata</i> |
| b. Leaves 10-20 x 3-6.5 cm; petioles 1.3-2 cm long | 23. <i>I. venulosa</i> |
| 6a. Stamens equal to the petals in length | 7 |
| b. Stamens longer than the petals | 9 |
| 7a. Lateral nerves distinct, 8-10 pairs | 9. <i>I. godajam</i> |
| b. Lateral nerves faint | 8 |
| 8a. Flowers 5-merous | 7. <i>I. gardneriana</i> |
| b. Flowers 4-merous | 4. <i>I. embelioides</i> |
| 9a. Lateral nerves 7-8 pairs; inflorescence usually 3-7-flowered cyme (rarely up to 15 flowered) | 5. <i>I. excelsa</i> |
| b. Lateral nerves 9-12 pairs; inflorescence usually 12-20-flowered cymes | 22. <i>I. umbellulata</i> |
| 10a. Flowers 6-16-merous | 6. <i>I. fragilis</i> |
| b. Flowers 4-5-merous | 11 |
| 11a. Stamens longer than petals | 12 |
| b. Stamens equal to or shorter than petals | 15 |
| 12a. Leaves up to 3 cm long; petioles 1-2 mm long | 8. <i>I. georgei</i> |
| b. Leaves more than 3 cm long; petioles more than 3 mm long | 13 |
| 13a. Petioles 1-1.3 cm long; leaves mucronate; calyx 1.5 mm across | 13. <i>I. khasiana</i> |
| b. Petioles not more than 0.7 cm long; leaves acuminate; calyx 1.75-2 mm across | 14 |
| 14a. Leaf base acute, cuneate, narrowed; peduncle present; drupe pedicellate; pyrenes 2.75-4 x 1.8-2 mm | 17. <i>I. odorata</i> |

- b. Leaf base rounded; peduncle absent; drupes subsessile; pyrenes
5.7 x 5 mm 3. *I. dipyrena*
- 15a. Stamens equal to petals 16
- b. Stamens shorter than petals 20
- 16a. Lateral nerves below 10 pairs 17
- b. Lateral nerves above 10 pairs 18
- 17a. Lateral nerves 4-6 pairs; petioles 0.2-0.3 cm long 1. *I. crenata* var. *thomsonii*
- b. Lateral nerves 6-9 pairs; petioles 1-1.3 cm long 2. *I. denticulata*
- 18a. Lateral nerves 13-15 pairs; petioles 3 cm long 11. *I. insignis*
- b. Lateral nerves within 10-12 pairs; petioles less than
3 cm long 19
- 19a. Pedicels 1-2 cm long in male inflorescence; leaves
6-11 x 2-2.5 cm 25. *I. wattii*
- b. Pedicels 2-3 mm long in male inflorescence; leaves 13-20 x
3-6.2 cm 19. *I. sikkimensis*
- 20a. Lateral nerves indistinct 26. *I. wightiana*
- b. Lateral nerves distinct 21
- 21a. Lateral nerves within 4 pairs 22
- b. Lateral nerves more than 4 pairs 24
- 22a. Prostrate shrubs; petioles 1-2 mm long 12. *I. intricata*
- b. Trees; petioles more than 2 mm long 23
- 23a. Petioles 0.4-0.5 cm long; leaves 0.7-1.4 x 0.6-1 cm 16. *I. nothofagifolia*
- b. Petioles 0.25 cm long; leaves 1.5-2.5 x 3 cm 24. *I. walkeri*
- 24a. Male inflorescence 7-flowered fascicle; stipules
0.8-1.8 cm long 18. *I. pseudo-odorata*
- b. Male inflorescence 1-3-flowered fascicle; stipules minute
or caducous 25
- 25a. Petioles 1.2-2 cm long; stipules persistent; peduncles up to
0.1 cm long 10. *I. hookeri*
- b. Petioles 0.4 cm long; stipules caducous; peduncles up to
0.2 cm long 21. *I. triflora*

1. *Ilex crenata* Thunb., Fl. Jap. 78. 1784. var. ***thomsonii*** (Hook.f.)
Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 202. t. 4 2C. 1901.
I. thomsonii Hook.f., Fl. Brit. India 1: 602. 1875.

Small, evergreen shrubs, 2-5 m tall; branchlets puberulous. Leaves obovate or oblanceolate, 1-2.5 x 0.5-1.5 cm, acute, mucronate, crenate or serrate, coriaceous, puberulous, gland dotted below; base narrowed into petiole; lateral nerves 4-6 pairs; petioles 0.2-0.3 cm long, pubescent; stipules 1 mm long,

persistent. Male inflorescence 3-7-flowered axillary cyme; peduncles 4-9 mm long; pedicels 2-3 mm long; basal prophylla 2. Flowers 4-merous, white; pedicels 4-8 mm long. Sepals orbicular, 2 mm across, ovate. Petals elliptic, 2 x 1.4 mm, united at base in both sexes. Stamens equal to petals, inserted at the base of petals; anthers ellipsoid, 0.7 mm long. Rudimentary ovary conical, apiculate. Female flowers usually solitary or sometimes in 2-3-flowered axillary cymes; pedicels 4-6 mm long, club shaped; basal prophylla 1-2. Sepals 3 mm across, persistent; lobes rounded. Petals 3 mm long, ovate. Staminodes 1 mm long; sterile anthers sagittate. Ovary 2 mm long, ovoid; style absent or sometimes visible and short; stigma discoid, 4-lobed. Drupes globose or oblong-elliptic, 5 x 3-3.5 mm, purple. Pyrenes 2, 5.5 x 4 mm, smooth, slightly grooved; endocarp coriaceous.

Fl. & Fr. : June - Oct.

Distrib. India : Sikkim, Manipur and Meghalaya.

Bhutan.

2. ***Ilex denticulata*** Wallich ex Wight, *Illustr. Ind. Bot.* t. 149. 1850; Hook.f., *Fl. Brit. India* 1: 600. 1875.

Evergreen trees, up to 15 m tall; branchlets glabrous, smooth, lenticels lacking. Leaves ovate-elliptic, elliptic or oblong, 5-10 x 2.5-3 cm, acuminate, acumen 3-8 mm long, margin serrate, coriaceous, base obtuse or cuneate; lateral nerves 6-9 pairs; petioles 1-1.3 cm long. Male inflorescence a sessile or subsessile cyme. Flowers 4-merous. Sepals patelliform, 2.5 mm across; lobes 0.5 x 1 mm, deltoid, entire, acute. Petals 3 x 1.5 mm, oblong, united at base. Stamens as long as petals; anthers 0.75 mm long, ovoid. Rudimentary ovary globose. Female inflorescences fasciculate. Drupes globose, 6-7 mm across, brown, smooth, with persistent calyx and 4-lobed stigma. Pyrenes 4, oblong-elliptic, 4-5 x 3 mm, striate or rugose.

Fl. & Fr. : Jan. - Feb.

Distrib. India: Western Ghats, 1600-2500 m. Tamil Nadu.

China and Sri Lanka.

Uses : Wood yields an inferior quality timber.

3. *Ilex diphyrena* Wallich in Roxb., Fl. Ind. 1: 473. 1820; Hook. f., Fl. Brit. India 1: 599. 1875.

Jaun.: *Kanderu, Kulucho*; Punj.: *Diusa, Dodru, Drunda, Katucho, Krucho*.

Evergreen trees, 10 to 14 m tall; bark dark grey; branchlets glabrescent or pilose, striate, rugose or smooth. Leaves elliptic-oblong or ovate-lanceolate, 4-10 x 2-4 cm, subcuneate; acumens 3-10 mm, often ending in a spine, margin spinose, becoming entire or subentire with age, thick coriaceous, shining above, base rounded; lateral nerves 7-9 pairs, elevated beneath; petioles 4-6 mm long, pubescent, grooved; stipules 2, minute. Inflorescence fasciculate. Flowers bisexual, 4-merous, whitish green; pedicels 2-3 mm long in male flowers, 1-3 mm long in female flowers, pubescent. Sepals patelliform, 3 mm across; lobes membranous, ciliate. Petals ovate, 3 mm long, ciliate, united at the base. Stamens 4, longer than petals; anthers 0.75 mm long, oblong, ovoid. Rudimentary ovary present, subglobose-ovoid. Staminodes shorter than the petals. Ovary ovoid; stigma discoid. Drupes globose, 6-9 mm across, red, subsessile. Pyrenes 2, rarely 3-4, globose, 5-7 x 5 mm, longitudinally grooved.

Fl. & Fr. : April - Oct.

Distrib. India : In temperate forests, 1500-2900 m. Himachal Pradesh, Uttar Pradesh, Sikkim and Arunachal Pradesh.

Nepal, Pakistan, Bhutan, Myanmar and N. China.

Uses. The attractive scarlet-red fruits, along with the twigs, are sometimes sold as decoratives during the Christmas season. Leaves are used as fodder. Wood yields an inferior quality timber.

4. *Ilex embelioides* Hook.f., Fl. Brit. India 1: 601. 1875.

Trees, 9-10 m tall; bark greenish grey, smooth or warty, obscurely wrinkled; branchlets finely puberulous. Leaves elliptic-oblong or elliptic-lanceolate, 3-8 x 1.5-2.5 cm, caudate-acuminate with obtuse tip, entire or with

scattered spinous teeth along margins, coriaceous, base acute or cuneate; lateral nerves not prominent; petioles 0.6-0.8 cm long, grooved. Male inflorescence in peduncled umbellules; axillary or terminal on the branches; peduncles 5-15 mm long. Flowers 4-merous, white 2-3, mm long; pedicels 2-4 mm across. Calyx lobes obtuse. Petals oblong-orbicular, 1-2 mm long, slightly united at base. Stamens equal to petals. Rudimentary ovary globose. Female inflorescence fascicled; peduncles shorter. Flowers ca 3 mm across. Calyx lobes ovate, acute or obtuse, ciliolate. Petals obovate-oblong, slightly united at base. Ovary globose-ovoid, 1 mm across; stigma flat. Drupes globose, 4-6 mm across, brown. Pyrenes 1-3.

Fl. & Fr. : April - Nov.

Disrtib. India : 1000-1500 m. West Bengal, Assam and Meghalaya.

Bangladesh.

5. *Ilex excelsa* (Wallich) Hook.f., Fl. Brit. India 1: 603. 1875. *Cassine excelsa* Wallich, Fl. Ind. 2: 376, 1824. *Ilex doniana* DC., Prodr. 2: 644. 1824; Kanjilal *et al.*, Fl. Assam 1: 257. 1936.

Garo: *Bol-ai*; Hindi: *Tumari*; Kh.: *Dieng-Soh-Syrtate*, *Dieng-sph-lali*, *Dieng-Soh-tyrland*, *Dieng-lali*.

Evergreen trees, up to 10 m tall; bark whitish grey, wrinkled; branchlets glabrous-glabrescent. Leaves ovate, elliptic or elliptic-oblong, 5-10 x 2-4 cm, acuminate, acumen 5-12 mm long, entire, membranous or chartaceous, pubescent below, base cuneate; lateral nerves 7-8 pairs; petioles 11-12 mm long, glabrous, grooved; stipules 1-1.5 mm long, acute. Inflorescence 3-7-flowered cyme or solitary. Flowers 4-6-merous. Peduncles in male inflorescence 4-8 mm long; pedicels 2-5 mm long, puberulous; basal prophylla 1-2; lobes 1 mm long; calyx 4-5-lobed, rounded. Petals oblong, 2 mm long, united at base. Stamens 4, free, longer than petals; anthers oblong, 1 mm long. Rudimentary ovary 1 mm long, 5-cleft at apex. Peduncles of female inflorescence 5-12 mm long, puberulous; pedicels 3-4 mm long. Calyx 2.5 mm broad, 5-6-lobed, persistent. Petals ovate, 2 mm long. Staminodes shorter than petals; anthers sagittate. Ovary 1.5 mm across, ovoid; stigma discoid,

persistent. Drupes ovoid-globose, 5 mm across, bright red. Pyrenes 5, elliptic, 2.5-1.25 mm, smooth or 2-3-striate; endocarp coriaceous.

Fl. & Fr. : Dec. - June.

Distrib. India: In subtropical and temperate forests, 1300-3000 m. Jammu & Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh, Sikkim, Arunachal Pradesh, Assam and Meghalaya.

Pakistan, Nepal, Bhutan and China.

6. *Ilex fragilis* Hook.f., Fl. Brit. India 1: 602. 1875.

Kh.: *Dieng-lali-long*.

Deciduous shrubs or trees, up to 5 m tall; bark greyish white, warty; branches brittle, glabrous. Leaves elliptic, ovate, 5-10 x 2.5-6.5 cm, acuminate, acumen 3-20 mm long, margins serrate, membranous or chartaceous, base cuneate or rounded; lateral nerves 8-10 pairs, prominent below; petioles 0.6-1.6 cm long, grooved. Male inflorescence fasciculate or solitary, axillary; pedicels 3-4 mm long, glabrous; flowers 6-8-merous. Calyx patelliform, 3 mm across, glabrous; lobes 6-8, 1 mm long, ciliate, acute. Petals oblong, 2 mm long, ciliate, slightly connate at base. Stamens half the length of petals; anthers ovoid-oblong, 1 mm long. Rudimentary ovary present. Female inflorescence solitary, axillary; pedicels 2-6 mm long, glabrous. Flowers 6-16-merous. Calyx patelliform, 4 mm in diam., 6-8 lobed; lobes 1 mm long, ciliate, persistent. Petals oblong, 2 mm long, united at base. Staminodes shorter than petals; sterile anthers cordate. Ovary pulvinate, globose; style distinct, up to 1.5 mm long, glabrous or puberulous; stigma fleshy, cristate or lobed, persistent. Drupes globose, 5-6 mm across, red. Pyrenes 5-13, elliptic or globose, 2-2.5 x 1 mm, longitudinally striate.

Fl. & Fr. : June - Oct.

Distrib. India : Eastern Himalaya and N.E. India, 1500-3000 m. West Bengal, Sikkim and Meghalaya.

Bhutan, Myanmar and China.

7. *Ilex gardneriana* Wight, Ic. t. 1217. 1831; Hook.f., Fl. Brit. India 1: 603. 1875.

Small trees or shrubs; branchlets glabrous. Leaves ovate-lanceolate, 5-7.5 x 2-2.5 cm, acuminate, margin entire, coriaceous, base rounded; lateral nerves faint below; petioles 1-2 cm long, slender. Inflorescence solitary or fascicled. Peduncles of male flowers *ca* 1.2 cm long; pedicels 0.6 cm long, slender. Flowers 5-merous. Calyx lobes wide, ciliolate. Petals oblong, obtuse, slightly united at base. Stamens as long as petals. Female flowers and fruit not seen.

Fl. & Fr. : March - April.

Distrib. India : Tamil Nadu (Nilgiri hills, Sisparaghat). Rare, possibly extinct.

8. *Ilex georgei* Comber in Notes Roy. Bot. Gard. Edinb. 18: 50. 1933. *I. pernyi* Franch. var. *manipurensis* Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 279. 1901.

Evergreen shrubs, up to 6 m tall; bark light brown; branchlets pubescent, lenticels lacking. Leaves lanceolate, ovate-lanceolate or ovate, 2-4.5 x 0.7-1.5 cm, acuminate, acumen 1 cm, margin, spiny, base rounded or cordate; lateral nerves 5-7 pairs; petioles 1-2 mm long; stipules ovate-acute. Inflorescence fasciculate, axillary. Male inflorescence 1-3-flowered; peduncles 1 mm long; uniflorous; pedicels 2-4 mm long; bracts membranous, ovate, ciliate; basal prophylla 2, membranous, pubescent. Flowers 4-merous. Calyx 1.5-2 mm across, 4-lobed; lobes ovate, obtuse-rounded, ciliate, persistent. Petals 2 mm long, ciliate. Stamens longer than petals; anthers oblong. Rudimentary ovary sub-globose; apex 2 lobed. Drupes paired, 4-6 x 3-4 mm, pubescent. Pyrenes 1-2, ovoid-oblong, 4-5 x 2.5 mm, compressed, palmately 7-9-striate, sulcate at back; endocarp thick, hard.

Fl. & Fr. : March - Sept.

Distrib. India : Manipur.

China and Myanmar.

9. *Ilex godajam* Wallich ex Hook.f., Fl. Brit. India 1: 604. 1875; Hu in J. Arn. Arb. 30: 313. 1949.

Asm.: *Hati-kerepa*, *Born-bokul*; Mikir: *Theno-tuni*, *Theng-Sang-Proth-arong*; Tipp.: *Theng-ngoitheh*.

Evergreen trees or shrubs, up to 8 m tall; branches crooked, young shoots pubescent; bark grey, plain, sometimes with warts and wrinkles. Leaves ovate, elliptic or oblong, 5-14 x 1.5-5.5 cm, short acuminate, margin entire, undulate, thinly coriaceous, glabrous, shining above, pale beneath, base acute; lateral nerves 8-10 pairs, thinly pubescent beneath; petioles 1-1.5 cm long, thin pubescent, grooved; stipules 2, minute, acute. Inflorescence pedunculate umbels or panicles. Flowers 4-5-merous, fragrant. Male inflorescence 8-30-flowered, 1.4-1.8 cm long; pedicels slender, 2-4 mm long; basal prophylla 2, subulate. Sepals petelliform, 2.5 mm across, pubescent; lobes 4-5, ovate, obtuse, ciliate. Petals broadly obovate or ovate-oblong, 2.5 mm long, connate at base. Stamens equal to petals; filaments slender; anthers ovoid, 0.6 mm long. Rudimentary ovary globose, 0.75 mm across, rostellate, beak 4-5-cleft. Female inflorescence 4-15-flowered; peduncles 10-13 mm long; pedicels 2-5 mm long; bracts minute, deltoid; basal prophylla acute. Calyx as in male flowers. Ovary ovoid, 1.5 mm across; stigma capitate. Drupes globose 3.5 mm across. Pyrenes 4-6, 2 x 1.5 mm, 3-striate, 2 sulcate; endocarp hard.

Fl. & Fr. : Feb. - April.

Distrib. India : West Bengal, Sikkim, Assam, Arunachal Pradesh, Nagaland, Mizoram, Tripura and Meghalaya.

Bangladesh, Indo-China and China.

Note. Some authors treat this species as conspecific with *I. umbellulata* (Wallich) Loes. but it can be distinguished by pubescent branchlets, petioles and mid-ribs which are glabrous in latter. Also fruits and pyrenes are smaller in the present species.

Uses. Decoctions of bark used in diarrhoea and as a diuretic. Wood yields inferior quality of timber and is also used as firewood.

10. *Ilex hookeri* King in J. As. Soc. Bengal 55: 266. pl. 14. 1886.

Evergreen trees, 6-18 m tall; bark smooth, without lenticels. Leaves elliptic or obovate-elliptic, 5-10 x 2-4.5 cm, apex acute or shortly acuminate, acumen 5 mm long, margin serrate, base obtuse; lateral nerves 11-15 pairs; petioles 1.2-2 cm long; stipules persistent, deltoid. Inflorescence fasciculate. Flowers 4-merous; bracts ovate-orbicular, glabrous. Male inflorescence cymose, 1-3-flowered; peduncles 1 mm long; pedicels 2-3 mm long, glabrous. Calyx patelliform, 2.5 mm across; lobes 4, 1.3 x 1.3 mm, persistent. Petals oblong-ovate, 2.5 x 2 mm, united at base. Stamens shorter than petals; anthers oblong, 1 mm long. Rudimentary ovary globose, 1 mm across, papillose, apex 4-lobed. Female inflorescence uniflorous; pedicels 6-8 mm long. Sepals and petals as in male flowers. Staminodes half the length of petals; sterile anthers sagittate. Ovary 2 x 1.5 mm, apex truncate; stigma discoid, 4-lobed. Drupes globose, 6 mm across. Pyrenes 4, elliptic, 5 x 2 mm, striate, grooved; endocarp coriaceous.

Fl. & Fr. : April - Oct.

Distrib. India : Sikkim, West Bengal (Darjeeling) and Assam.

China and Myanmar.

11. *Ilex insignis* Hook.f., Fl. Brit. India 1: 599. 1875. **Fig. 12.**

Evergreen trees; young branchlets longitudinally striate, grooved. Leaves elliptic, elliptic-lanceolate or oblong-lanceolate, 10-23 x 4-8 cm, acute to shorter acuminate, serrulate, spinous or denticulate, coriaceous, base cuneate, or obtuse; lateral nerves 13-15 pairs; petioles 3 cm long; stipules deltoid, 0.75 mm long. Inflorescence uniflorous or in dense clusters. Male inflorescence rarely 3-flowered; flowers 4-merous, green, sessile; bracts minute. Calyx 3-4 mm across, glabrous; lobes broad, ovate, obtuse or rounded, 1.5-2 mm long, entire. Petals orbicular-obovate, 4-5 x 2-3 mm, united below in both sexes. Stamens as long as petals; anthers ovoid, shorter than filaments. Rudimentary ovary globose, apex shorter. Staminodes in female flowers shorter than petals. Ovary globose, 1-1.75 mm across; style sessile; stigma obscurely 4-lobed. Drupes globose, 8-11 mm across. Pyrenes 4, ellipsoid or globose, 6-9 mm across, striate, sulcate.

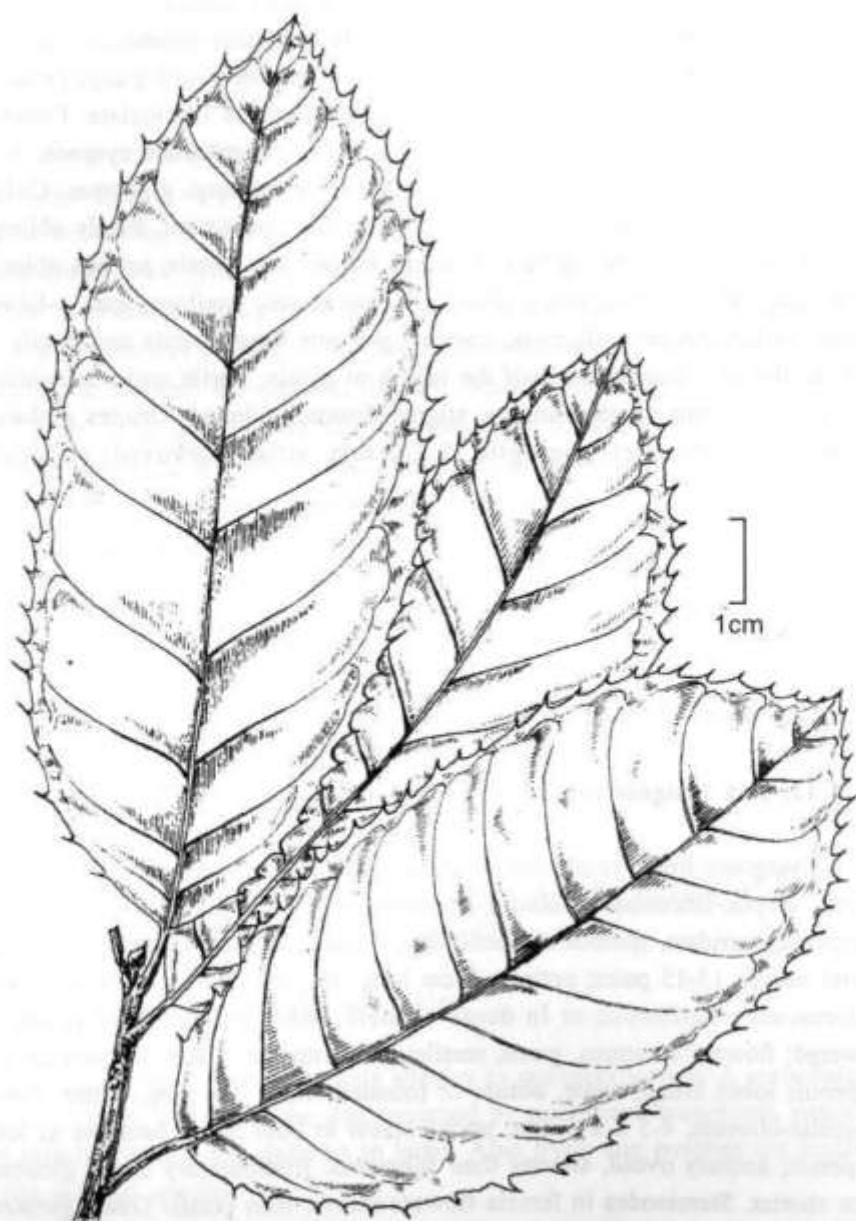


Fig. 12. *Ilex insignis* Hook.f.

Fl. & Fr. : April - Oct.

Distrib. India : In temperate forests ascending to 2,300 m. West Bengal (Darjeeling), Arunachal Pradesh and Sikkim.

12. *Ilex intricata* Hook.f., Fl. Brit. India 1: 602. 1875.

Prostrate, evergreen shrubs, up to 1 m high; bark warty; branchlets rugose-verruculose. Leaves obovate-elliptic, 5-15 x 3-8 mm, apex obtuse or rounded, margin serrate, coriaceous, base cuneate; lateral nerves 2-4 pairs; petioles 1-2 mm long, winged; stipules subulate. Inflorescence axillary, 1-3-flowered fascicle. Flowers 4-merous. Pedicels in male inflorescence 2 mm long, glabrous. Calyx glabrous, patelliform, 2 mm across; lobes 4, ovate. Petals oblong, 2 mm long free or adhering at base only. Stamens shorter than petals; anthers ovoid, 0.5 mm long. Rudimentary ovary subglobose, apex rounded. Pedicels in female inflorescence up to 1 mm long, glabrous. Calyx patelliform, 2.5 mm across, lobes free, obtuse. Petals ovate, 2 mm long. Stamines shorter than petals; sterile anthers cordate. Ovary ovoid, 2 x 1.5 mm; style evident; stigma capitate, 4-lobed, persistent. Drupes globose, 5 mm across, red to brownish red. Pyrenes 4, oblong, 4 x 2 mm, black, striate and sulcate or rugose; endocarp hard.

Fl. & Fr. : June - Oct.

Distrib. India : West Bengal and Sikkim.

Myanmar, China and E. Nepal

13. *Ilex khasiana* Purakayastha in Indian For. 64: 280. Pl. 24. 1938.

Fig. 13.

Evergreen trees, up to 8 m tall; bark brown, pubescent, covered by lenticels and leaf scars. Leaves elliptic-oblong, 6-12.5 x 3-4.5 cm, apex apiculate or mucronate, margin serrate-crenate, membranous, pubescent, base rounded; lateral nerves 8-12 pairs; petioles 1-1.3 cm long, grooved. Inflorescence simple or fasciculate, peduncles 1.5 cm long, pubescent in both the sexes. Flowers 4-merous (rarely 3-merous). Pedicels in male inflorescence 2 mm long. Sepals 1.5 mm long, united at the base, ciliate, persistent. Petals 0.5-10 x 1.5-2 mm,



Fig. 13. *Ilex khasiana* Purakayastha

united at base in both sexes; lobes 4 (rarely 3). Stamens longer than petals; anthers 1-1.25 mm; filaments as long as anthers. Rudimentary ovary bifid at tip. Pedicels in female inflorescence 7 mm long, pubescent. Stamynodes as many as petals. Ovary ovoid, 2 x 1.5 mm, purplish red. Pyrenes 4, trigonous, 4.5 mm long, crustaceous.

Fl. & Fr. : May - Dec.

Distrib. India : Manipur and Meghalaya. Rare.

14. *Ilex longicaudata* Comber in Notes Roy. Bot. Gard. Edinb. 18: 54. 1933; Hu in J. Arn. Arb. 31: 248. 1950; Chandra in Bull. Bot. Surv. India 17: 199. 1975.

Evergreen trees, up to 9 m tall; bark light brown; mature branchlets plicate-sulcate, covered by lenticels. Leaves lanceolate or elliptic, 6 x 2-2.5 cm, apex caudate, acumen 2 cm long, margin entire, coriaceous, shining above, pale below, base cuneate or obtuse; lateral nerves 9-12 pairs; petioles 0.6-1.2 cm long, grooved; stipules subulate, persistent. Male inflorescence pseudo-paniculate, 3-flowered cymes. Flowers 3-5(-6)-merous; unisexual by abortion, green-yellow; peduncles 4 mm long; pedicels 2 mm long. Calyx 4-6-lobed, 2.5 mm across; lobes orbicular, ciliate. Petals 4-5, obovate, 2.5 mm long, shortly united at base in both the sexes. Stamens shorter than petals; filaments 1.2 mm long, stout; anthers ovate. Rudimentary ovary subglobose. Female inflorescence fasciculate or a pseudo-raceme; pedicels 2-3 mm long. Calyx 4-5(-6)-lobed, 3 mm across; lobes deltoid, ciliate. Petals ovate 2 mm long. Stamynodes 2 mm long; sterile anthers ovoid. Ovary subglobose; 2 mm across; style distinct; stigma discoid, 4-5-lobed, persistent in fruit. Drupes globose, 3-4 mm across, pyrenes 5, elliptic, 2.5 x 1.25 mm, smooth, 3-striate, esulcate on back; endocarp coriaceous.

Fl. & Fr. : April - June.

Distrib. India : Nagaland. Rare.

China.

15. *Ilex malabarica* Beddome, Fl. Sylv. t. 143. 1869-74; Hook.f., Fl. Brit. India 1: 600. 1875.

Trees, about 5 m tall; branchlets glabrous. Leaves elliptic-oblong, 3-8 cm long, apex acute, margin entire or with 5-6 minute teeth, subcoriaceous, dark green, shining above, pale below, base rounded; lateral nerves faint; petioles 0.65-1.5 cm long. Male inflorescence in paniced cymes; peduncles and pedicels 6-8 mm long, slender, puberulous. Flowers 6-merous. Calyx 6-lobed; lobes broad acute, ciliate. Petals 4-6, orbicular, 2 mm across, ciliate, united at base both in male and female flowers. Stamens 4-6, shorter than petals. Rudimentary ovary with 4 minute stigmas. Female inflorescence solitary or fascicled; pedicels 6-8 mm long. Stigmas 6. Drupes globose, 3-4 mm across, red, crowned with a distinct style.

Fl. & Fr. : Feb. - April.

Distrib. India : Maharashtra, Karnataka and Tamil Nadu. Endemic.

Uses. Wood is used for making planks, platters, bowls, tea boxes, packing cases and cabinets.

16. *Ilex nothofagifolia* Ward in Gard. Chron. Ser. 3, 81: 194. 1927.

Evergreen-trees, up to 6 m tall; branchlets longitudinally plicate, covered with warts. Leaves elliptic, ovate or obovate, 0.7-1.4 x 0.6-1 cm, apex cuspidate, margin serrate, chartaceous, base obtuse; lateral nerves 3-4 pairs; petioles 0.4-0.5 cm long, slender; stipules minute. Male inflorescence 1-3-flowered fascicle or uniflorous. Flowers 4-merous; pedicels 4 mm long. Calyx 2 mm across; lobes 4, suborbicular, glabrous. Petals ovate, 2 mm long, slightly united at base. Stamens shorter than petals; anthers ovoid. Rudimentary ovary globose, apex rounded. Style distinct stigma 4-lobed. Drupes globose, 3 x 4 mm; pyrenes 4, elliptic, 3 x 1.5-2 mm, 3-4 striate, smooth; endocarp coriaceous.

Fl. & Fr. : Aug. - Nov.

Distrib. India : Assam.

China and Myanmar.

17. *Ilex odorata* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 189. 1825.
I. theaeifolia Hook.f., Fl. Brit. India 1: 601. 1875. **Fig. 14.**

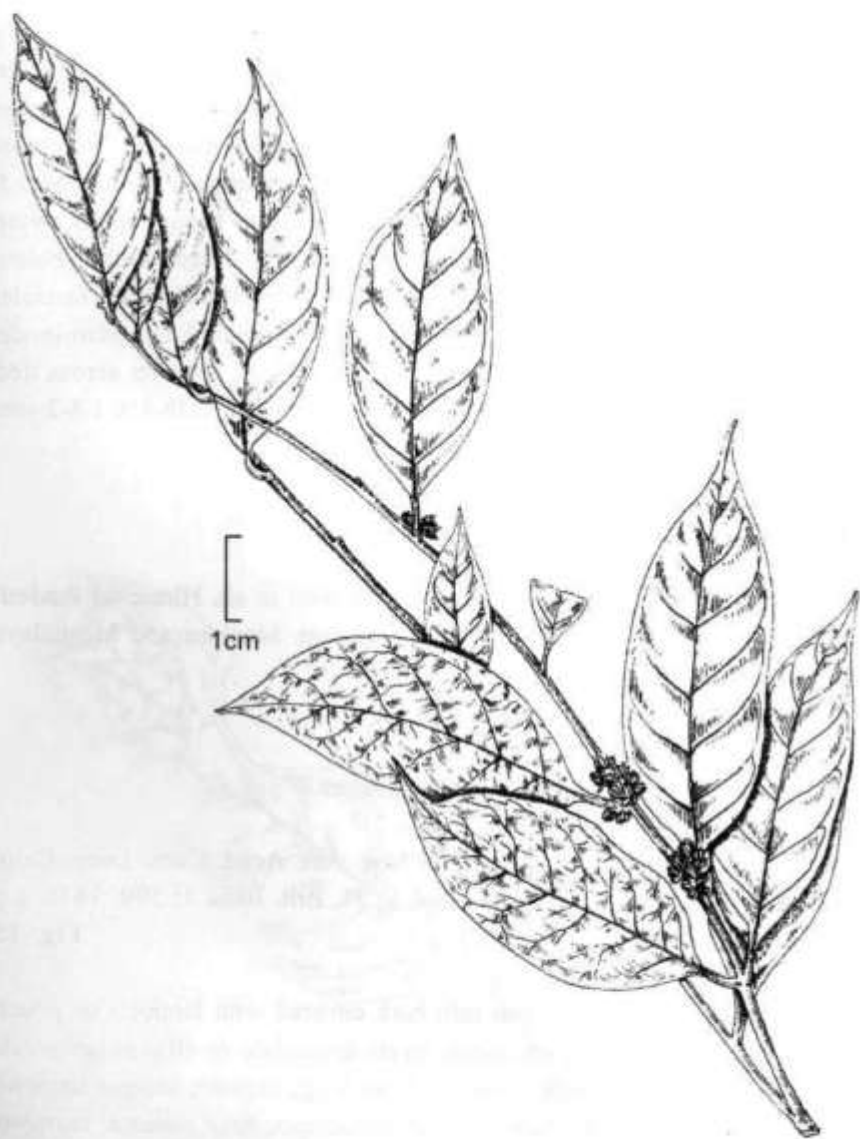


Fig. 14. *Ilex odorata* Buch.-Ham. ex D. Don

Kh.: *Dieno-soh-tyrlong-kynthi*, *Dieng-Shieng*.

Evergreen trees, 5-7 m tall; bark brownish grey, smooth, covered with white streaks. Leaves elliptic-oblong, lanceolate or oblong-lanceolate, 3-8 x 1.5-3 cm, apex acute to shortly caudate-acuminate, acumen 5-17 mm long, margin serrate, coriaceous, shining above, pale below, base acute, cuneate; lateral nerves 7-9 pairs, slender; petioles *ca* 0.7 cm long, channelled; stipules 2, 0.5-0.75 mm long, caducous. Male inflorescence in axillary corymbose cymes. Flowers 4-5-merous, white; bracts small, caducous. Peduncles 0.5-3 mm long, pedicels 1-4 mm long. Calyx 1.75-2 mm broad; lobes ovate, rounded, deltoid. Petals oblong-lanceolate, 2.5-3 x 1-2 mm, united below. Stamens longer than petals; anthers ellipsoid. Female inflorescence fascicled or crowded on short axillary branches; pedicels 2-6 mm long, Staminodes shorter than petals. Drupes pedicellate, globose or ovoid, 4-6 mm across, red-brown to black when ripe, rugose. Pyrenes 4-5, trigonous, 2.75-4 x 1.8-2 mm, 3-costate.

Fls. & Frts. : April - June.

Distrib. India : Himalaya, between 1000-2000 m alt. Himachal Pradesh, Uttar Pradesh, Sikkim, Arunachal Pradesh, Assam, Manipur and Meghalaya.

Nepal, Myanmar and Bangladesh.

Uses. Wood yields inferior quality timber.

18. *Ilex pseudo-odorata* Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 285. 1901. *I. odorata* Hook.f., Fl. Brit. India 1: 599. 1875. p.p. (*non* Buch.-Ham ex D. Don, 1825). **Fig. 15.**

Evergreen trees, up to 15 m tall; bark covered with lenticels or pouch-like swellings, glabrous. Leaves ovate, ovate-lanceolate or elliptic-lanceolate, 9-20 x 3.5-7.5 cm, acuminate, acumen 1 cm long, crenate, margin narrowly recurved, densely serrulate, glabrous, thin coriaceous, base cuneate, narrowed into petiole; lateral nerves in 8-12 pairs; petioles 0.8-1.8 cm long; stipules caducous. Inflorescence densely fasciculate; flowers 4-merous. Male inflorescence 7-flowered, on single or short, dichotomous peduncles; peduncles 1-4 mm long, puberulous or glabrescent; pedicels 1.5-3 mm long; bracts



Fig. 15. *Ilex pseudo-odorata* Loes.

0.3 mm long; prophylla similar to bracts. Calyx 1.5-2 mm across; lobes obtuse, or rounded, glabrous. Petals obovate-elliptic, 3 mm long, ciliate. Stamens shorter than petals. Rudimentary ovary subovoid, 0.75 x 0.55 mm, apex 4 lobed. Female inflorescence in cymes or clusters, dichotmous, 3-flowered or uniflorous. Calyx longer than male flowers, margin ciliolate. Petals 3-3.8 x 1.5 mm, rotate, free, margin obscurely ciliolate. Staminodes subovoid, 0.75 x 0.5 mm, lobed. Ovary subellipsoid; stigma 4-lobed. Drupes not seen.

Fl. & Fr. : April - July.

Distrib. India : In Himalaya between 800-2000 m. Himachal Pradesh, Uttar Pradesh, Sikkim and Arunachal Pradesh.

Nepal.

19. *Ilex sikkimensis* Kurz in J. As. Soc. Bengal 44 (2): 202. 1875. *I. odorata* Hook.f., Fl. Brit. India 1: 599. 1875. *p.p.* (*non* Buch.-Ham. ex D. Don, 1825).

Eng.: *Holly sikkimensis*

Evergreen trees, 10-17 m tall; bark covered with lenticels; branchlets longitudinally striate-sulcate. Leaves elliptic, narrowly obovate-elliptic or oblanceolate, 13-20 x 3-6.2 cm, apex acute to shortly acuminate, margin minutely denticulate to serrate, coriaceous, pubescent below, base cuneate to rounded; lateral nerves 10-12, pairs; petioles 2-3 cm long, grooved. Inflorescence, fasciculate, axillary. Flowers 4-merous; bracts 1 mm long. Male inflorescence 3-7-flowered, on solitary or dichotomous peduncles; pedicels 2-3 mm long. Calyx 1.5-2.5 mm across; lobes ovate-elliptic, 1 x 0.8 mm, ciliolate, obtuse to rotundate. Petals ovate, 2 x 1.5 mm, rotate, united at base. Stamens shorter than petal lobes; anthers ovate-ellipsoid. Rudimentary ovary depressed. Female inflorescence 1-3-flowered, on 2 mm long peduncles, puberulous; pedicels 3-4 mm long. Calyx and petals as in male flowers. Staminodes minute. Ovary 4 locular; ovule 1, pendulous. Drupes globose, 4-4.5 mm across, yellow; pyrenes obscurely trigonous, 2.5-3 x 1.5-1.75 mm, dorsally convex, sulcate, coriaceous.

Fl. & Fr. : April - Oct.

Distrib. : India: Sikkim, Assam, Arunachal Pradesh and Manipur.

Nepal, Bhutan, S. Tibet and W. China.

20. *Ilex tadiandamolense* Murty *et al.* in Curr. Sci. 56: 270. 1987.

Evergreen trees, up to 10 m tall; young branchlets minutely pubescent, glabrous when mature. Leaves elliptic-lanceolate, 3.5-9 x 1.2-3 cm, acute or emarginate at apex, entire, glabrous, base attenuate; lateral nerves 5-7 pairs, faint; petioles 1.3-0.8 cm long, grooved, puberulous. Inflorescence axillary paniced cymes. Flowers bisexual, 6-merous, 5-6 mm across; pedicels 3-5 mm long. Calyx 6-lobed; lobes, triangular, ovate, 1 mm long, acute or blunt at apex, margins toothed. Petals 6, oblong, 1-2 mm long, united at base. Stamens 6, 1.5-2 mm long; filaments glabrous; anthers dorsifixed. Ovary ovoid, 1.5-2 mm across, glabrous; style minute; stigma 6-lobed. Drupes and pyrenes not

Fl. & Fr. : March - April.

Distrib. India : Karnataka. Rare.

21. *Ilex triflora* Blume, Bijdr. 1150. 1826. *I. griffithii* Hook.f., Fl. Brit. India 1: 601. 1875.

Kh.: *Kynja-jakrai*.

Evergreen shrubs or small trees; bark grey or dark brown, lenticellate; branches smooth, pubescent or glabrescent. Leaves obovate or elliptic, 3-9 x 1.5-4 cm, apex-acute or shortly acuminate, acumen 3-5 mm long, minutely serrate, subcoriaceous, shining above, pale below, base rounded or obtuse; lateral nerves 7-11 pairs; midrib grooved above, pubescent on both sides; petioles 0.4 cm long, grooved; stipules 1 mm long, persistent. Inflorescence fasciculate, axillary, pubescent. Flowers 4-merous. Male inflorescence 1-3- flowered fascicle; peduncles 2 mm long; pedicels 2-3 mm long. Calyx patelliform, 3 mm across, pubescent or ciliate. Petals rotate, ovate, 5 mm across, united at base. Stamens shorter than petals; anthers elliptic. Rudimentary ovary pyramidal, apex beaked, cleft. Female inflorescence solitary; pedicels 6-14 (-18) mm long. Calyx as in male flowers. Petals ovate. Staminodes shorter than petals; sterile anthers

cordate. Ovary ovoid, 1.5 mm across; stigma discoid, sessile, inconspicuously 4-lobed. Drupes globose or ellipsoid, 7-8 x 7 mm. Pyrenes 4, oval-elliptic, 6 x 4 mm, smooth, striate; endocarp coriaceous.

Fl. & Fr. : March - April.

Distrib. India : Assam, Meghalaya and Arunachal Pradesh.

Bangladesh, China, Indo-China, Java, Malaya and Indonesia.

22. *Ilex umbellulata* (Wallich) Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 99. 1901. *Ehretia umbellulata* Wallich in Roxb., Fl. Ind. 2: 344. 1824. *Ilex sulcata* Wallich ex Hook.f., Fl. Brit. India 1: 604. 1875. *I. godajam* Wallich ex Hook.f. var. *sulcata* (Wallich ex Hook.f.) Kurz in J. As. Soc. Bengal 44(2): 158. 1875.

Asm.: *Bikha-kulia*, *Kotoki*; Garo: *Bol-thajong*, *Bol-Mickciobnak*; Kh.: *Eieng-jali*; Mikir: *Chekna-theng-pisuni*.

Evergreen or deciduous trees, up to 18 m tall; bark grey-brown, plain or with wriksles; branchlets glabrous. Leaves elliptic, elliptic-oblong or ovate, 10-15 x 5-6 cm, acute or acuminate, acumen 5 mm long, entire, undulate, membranous, base rounded or obtuse; lateral nerves 9-12 pairs; petioles 1-2 cm long, rugose beneath; stipules subulate, 1.3 mm long. Inflorescence subumbelliform. Flowers 4-5-merous, unisexual. Male pseudoumbel 6-16-flowered; peduncles 2-3 cm long, puberulous; pedicels 3-5 mm long; prophylla deltoid, acute. Calyx patelliform, 2-3 mm across; lobes 4-5, semi-orbicular, 1 mm long, pubescent and ciliate outside. Petals oblong, 2 x 1.5 mm, united at base. Stamens longer than petals, glabrous; anthers ovoid, 0.75 mm across. Rudimentary ovary 1 mm across, 4-5 cleft at apex. Drupes globose, 6 mm in diam., red, fleshy, 1-2 sulcate. Pyrenes 6-10, trigonous or laterally compressed, 2.5-4 x 1.5-2.5 mm, 3-striate 1-2 sulcate; endocarp woody.

Fl. & Fr. : April - Sept.

Distrib. India : Assam, Arunachal Pradesh, Meghalaya and Andaman & Nicobar Islands.

Bangladesh, Myanmar and China.

Uses. Wood used for making scabbers, platters and toys. It is also used as fire wood.

23. *Ilex venulosa* Hook.f., Fl. Brit. India 1: 602. 1875.

Kh.: *Dieng-lalih, Dieng-Soh-Saw.*

Evergreen trees or shrubs, up to 8 m tall; bark grey, smooth, covered with white lenticels; branchlets glabrous. Leaves oblong or elliptic-oblong, 10-20 x 3-6.5 cm, apex caudate-acuminate, acumen 2-3 cm long, entire, glabrous, coriaceous; lateral nerves 10-14 pairs; petioles 1.5-2 cm long, stout, channelled; stipule-like appendages 2. Inflorescence pedunculate, umbellulate. Flowers 4-6-merous, unisexual or polygamous. Male cymes 2-4-chotomous; peduncles 1-1.7 cm long; bracts 2, warty, acute, deltoid; secondary axis 3-5 mm long; pedicels 2 mm long; basal prophylla 2. Calyx patelliform, 3 mm across; lobes ovate, ciliate. Petals oblong or obovate, 2.5 x 1.8 mm, united at base in both sexes. Stamens shorter than petals, oblong, ovoid, 1 mm long. Rudimentary ovary subglobose-ovoid, apex obtuse. Female inflorescence 3-chotomous cymes or subumbelliform; peduncles 0.7-1.2 cm long; pedicels 2-3 mm long. Calyx 2-3 mm across; lobes 6-8, deltoid, ciliate. Petals oblong, obovate, 3-4 mm, united at base; staminodes present; sterile anthers cordiform. Ovary ovoid-globose, 1.5 mm across; stigma capitate, 5-7 lobed, subsessile. Drupes globose, red when mature. Pyrenes 4-6, 2 x 1 mm, 3-striate; endocarp coriaceous.

KEY TO THE VARIETIES

- | | |
|--|--|
| 1a. Inflorescence trichotomous cymes; peduncles 10-17 mm long | 23.2. var. <i>venulosa</i> |
| b. Inflorescence dichotomous or compact head like; peduncles 2 mm long | 23.1. var. <i>simplicifrons</i> |

23.1. var. *simplicifrons* Hu in J. Arn. Arb. 31: 217. 1950.

Fl. & Fr. : April - Oct.

Distrib. : India : Assam.

China.

23.2. var. venulosa

Fl. & Fr. : Feb. - Sept.

Distrib. India : 1300-2000 m. Meghalaya and Arunachal Pradesh.

Bangladesh.

Uses. Wood is used as firewood.

24. *Ilex walkeri* Wight & Gard. ex Thwaites, Enum. Pl. Zeyl. 184. 1858; Hook.f, Fl. Brit. India 1: 600. 1875.

Small, bushy trees; branchlets glabrous. Leaves elliptic-obovate, 3 x 1.5-2.5 cm, apex mucronate or retuse, margin subentire, recurved, with 3-4 teeth at tip, coriaceous or membranous, glabrous; lateral nerves 2-3 pairs; petioles 0.25 cm long. Inflorescence umbellulate; peduncles and pedicels short in both sexes. Flowers 4-5-merous, white. Calyx lobes subacute. Petals orbicular, united at base in both sexes. Stamens 4-5. Drupes globose, ca 0.4 cm across. Pyrenes 4-5, trigonous, hard.

Fl. & Fr. : Feb. - May.

Distrib. India : Western Ghats at ca 2000 m. Maharashtra and Tamil Nadu.

Sri Lanka.

25. *Ilex wattii* Loes. in Nov. Act. Acad. Caes. Leop.-Carol. Nat. Cur. 78: 322. 1901.

Trees, up to 8 m tall; branchlets glabrous, lenticels lacking. Leaves elliptic or elliptic-lanceolate, 6-11 x 2-2.5 cm, apex acuminate, acumen 1-2 cm long, margin serrate, subcoriaceous or chartaceous, base obtuse or rounded; lateral nerves 10-11 pairs, elevated on both sides, reticulatinous distinct; petioles 1-1.5 cm long; stipules minute or lacking. Inflorescence axillary, fasciculate. Flowers 4-merous. Male fascicles 1-3-flowered; peduncles almost lacking; pedicels 1-2 cm long, glabrous. Calyx patelliform, 2.5 mm across, 4-lobed; lobes ovate, acute, ciliate. Petals oblong-obovate, slightly united at base. Stamens

as long as petals; anthers oblong. Rudimentary ovary subglobose, 4-lobed, flat at apex. Female inflorescence uniflorous; pedicels 2-3 mm long; prophylla 1-2, attached in the middle. Drupes subglobose, 6 x 7 mm. Pyrenes 4, obovate-oblong, globose, 4 x 3 mm, 5-striate dorsally, sulcate and striate on lateral surface; endocarp stoney.

Fl. & Fr. : March - Sept.

Distrib. India : Manipur.

China (Yunnan)

26. *Ilex wightiana* Wallich ex Wight, Ic. Pl. Ind. Orient. t. 1216. 1848; Hook.f., Fl. Brit. India 1: 603. 1875.

Tam.: *Badaga*.

Trees, 15-20 m tall; branchlets glabrous. Leaves elliptic or oblanceolate, 2.5-5.8 x 2 cm, acuminate, margins subentire, or serrulate, base rounded, glabrescent; lateral nerves obscure or distinct; petioles 0.7 cm long. Inflorescence in umbellules. Flowers 5-merous. Peduncles in male inflorescence 0.8-1.25 cm long. Calyx lobes 5, ovate, 0.5 mm long, ciliate. Petals 5, oblong, 2 mm long, white, united below. Stamens shorter than petals, united with petals; filaments 1 mm long. Female umbels lax; peduncles 1.2 cm long. Calyx and petals as in male flowers. Ovary globose, 2 mm across, 6-celled; ovules 1-2 in each cell, pendulous; style 0.5 mm long; stigma capitate. Drupes globose, 7 mm across, dark red, blue, smooth, apiculate. Pyrenes 5-6, trigonous.

KEY TO THE VARIETIES

- 1a. Leaves 5 cm long; nerves obscure beneath; umbellules pedicellate **26.2. var. *wightiana***
 b. Leaves 2.5-5.8 cm long; nerves distinct beneath; umbellules sessile **26.1. var. *peninsularis***

26.1. var. *peninsularis* Hook.f., Fl. Brit. India 1: 603. 1875.

Fl. & Fr. : March - Sept.

Distrib. India : Tamil Nadu and Kerala. Endemic.

26.2. var. *wightiana*.

Fl. & Fr. : March - Aug.

Distrib. India : Tamil Nadu and Kerala.

Sri Lanka.

CULTIVATED SPECIES

1. *Ilex aquifolium* L., Sp. Pl. 125. 1753.

Eng. : *Holly, English Holly.*

Evergreen shrubs or trees, *ca* 6 m tall, highly branched. Leaves entire or spinous 15.5 x 3.7 cm, glossy, coriaceous, dense green; petioles short. Flowers unisexual, 6-8 mm diam., white, fragrant, densely clustered, axillary; pedicel short. Calyx 4-lobed, green, persistent. Petals 4, white, spreading. *Male flowers* : Stamens 4, alternating with petals; pistillode present. *Female flowers* : Staminodes 4. Ovary superior, 3-celled, 1-2 ovules in each cell; style terminal; stigma capitate. Berry rounded, 1 cm diam., red when ripe. Seeds 2-4, 8 x 4 mm diam., ribbed, yellow.

Fl. & Fr. : Dec. - may.

Distrib. A native of China, Europe and W. Asia, cultivated in S. India.

2. *Ilex opaca* Ait. in Hort. Kew J. 1: 169. 1789.

Common name : *American Holly.*

Trees, up to 10 m tall; branches short spreading. Leaves alternate, ovate, 7 x 4 cm, apex acuminate, spiny, dull green; petioles 7 mm long. Flowers dioecious, white. Calyx 4-lobed, green; lobes ciliate, connate. Petals 4, spatulate, 5 x 3 mm, spreading, white. *Male flowers* : Stamens 4, erect, alternate with petals; filaments 2 mm long; anthers 2-celled. *Female flowers* solitary; staminodes 4, erect. Ovary cylindrical, 4 x 3 mm, superior, green, 4-celled, 1-2 ovules in each cell; stigma 4-lobed, sessile. Berry globose, 9 mm diam., red when ripe. Seeds 2-4, 6 x 3 mm, compressed.

Fl. & Frt. : Dec. - Aug.

Distrib. Cultivated in S. India.

CELASTRACEAE

(K. Ramamurthy)

Tree or shrubs, erect or climbing; stems sometimes producing rootlets, thorny and buttressed at base. Leaves simple, alternate, spiral, opposite or decussate, margins crenate or entire, stipules cauducous. Inflorescence axillary and or terminal, sometimes extra-axillary, cymose, thyrsoïd, paniculate, racemose, fasciculate or solitary, usually bracteate. Flowers small, regular, bisexual or unisexual and then plants dioecious. Sepals 4-5, imbricate or valvate, free or united at base, usually persistent. Petals 4-5, contorted, imbricate, rarely valvate, free, rarely absent. Stamens 4 or 5, in a single whorl alternating with the petals (except in *Nicobariodendron* with 2 stamens); filaments inserted on the disc, on its margin or below it; anthers introrse; pollen grains tricolporate or triporate. Ovary 2-5-loculed, partly or entirely immersed in the disc; style distinct, short; stigma simple or lobed; ovules mostly 2 in each locule. Disc fleshy or membranous, cupular or patelliform, entire. Fruits capsular, or drupaceous. Seeds arillate or exarillate, sometimes winged; endosperm present (except in *Kokoona*).

Tropical and temperate regions of both the hemispheres, 87 genera and ca 780 species; 12 genera and 82 species in India.

Literature : BULLOCK, A.A. (1958). Nomina conservanda proposita. *Taxon* 7: 164. DING HOU (1962). Celastraceae I. In *Fl. Males. Ser. 1*, 6: 277-291. DING HOU (1964). Celastraceae II. In *Fl. Males. Ser. 1*, 6: 389-421. SIDDIQI, M.A. (1977). Celastraceae. In *Fl. W. Pak.* 109: 1-15. LOESENER, L.E.T. (1942). In Engl. & Prantl, *Pflanzenfam.* ed. 2, 20 b. 100-200.

KEY TO THE GENERA

- | | |
|--|-----------------------------|
| 1a. Stamens 2 | 10. <i>Nicobariodendron</i> |
| b. Stamens 4 or 5 | 2 |
| 2a. Pistil not hollow in the apical part | 3 |
| b. Pistil hollow in the apical part | 12. <i>Siphonodon</i> |
| 3a. Leaves spirally arranged or alternate | 4 |
| b. Leaves decussate or opposite | 6 |
| 4a. Venation cross-bar like; petiole thickened at the apex beneath; styles 2 | 1. <i>Bhesa</i> |
| b. Venation reticulate; petiole not thickened at the apex beneath; style 1 | 5 |

- 5a. Scandent shrubs, unarmed; seeds completely enveloped by arils; ovary free from the disc 3. *Celastrus*
- b. Erect shrubs or small trees, armed; seeds partly enveloped by arils; ovary embedded in the disc 8. *Maytenus*
- 6a. petals united at base; disk inconspicuous; fruits splitting on one side, 1-seeded 9. *Microtropis*
- b. Petals free; disk conspicuous; fruits splitting loculicidally, 3 to many-seeded 7
- 7a. Ovary 3-5-loculed; ovules 1-18 in each locule 8
- b. Ovary 2-loculed or one locule by abortion; ovules 2 in each locule 11
- 8a. Ovary 4-5 loculed; fruit 4-5 cornered or lobed; seeds with arils, not winged 9
- b. Ovary 3-loculed; fruit 3-angled, lobed or winged; seeds without arils, winged 10
- 9a. Ovules 2 in each locule; during fruit desiccation the axis splitting completely together with valves 4. *Euonymus*
- b. Ovule one in each locule; during fruit dehiscence the axis not splitting, free from the valves 5. *Glyptopetalum*
- 10a. Petals contorted, without appendage; seeds attached at their base 6. *Kokoona*
- b. Petals imbricate, with appendages; seeds attached laterally or centrally 7. *Lophopetalum*
- 11a. Disc flat; anthers subglobose, connective not distinct; fruits with terminal persistent style 2. *Cassine*
- b. Disc cupular, anthers ovoid, connective conspicuous; fruits with lateral persistent style 11. *Pleurostyliia*

1. *Bhesa* Ham. ex Arn.

Trees. Leaves simple, spirally arranged; coriaceous, entire; midrib and nerves prominent; petioles thickened; stipules convolute in bud, caducous. Flowers bisexual, in paniced spikes or racemes, solitary or paired. Sepals 5-lobed. Petals 5, contorted. Stamens 5, inserted on the disc or just beneath the outer margin; anthers basifixed, obtuse or apiculate. Ovary free, crowned with tuft of hairs at the top, 2-locular; styles 2, filiform, free or united at the base only; ovules 2 in each locule. Disc fleshy, subentire or lobed, glabrous or puberulous. Fruits a capsule, entire or 2-lobed. Seeds 1-2, covered with fleshy aril.

Bangladesh, Myanmar, Sri Lanka and Malesia; 5 species, 3 in India.

Literature. DING HOU (1958) in *Blumea* Suppl. 4: 149-153. DING HOU (1962) in *Fl. Males.* 6(2): 280.

KEY TO THE SPECIES

- | | |
|--|--------------------------------|
| 1a. Flowers in simple racemes | 3. <i>B. robusta</i> |
| b. Flowers in paniced spikes or racemes | 2 |
| 2a. Disc deeply 5-lobed; ovary with tuft of hairs on top | 2. <i>B. paniculata</i> |
| b. Disc entire; ovary glabrous | 1. <i>B. indica</i> |

1. *Bhesa indica* (Beddome) Ding Hou in *Blumea* Suppl. 4: 152. 1958. *Trochisandra indica* Beddome, *Fl. Sylv.* 1: 120. 1871. *Kurrimia bipartita* M. Lawson in *Fl. Brit. India* 1: 622. 1875. *K. indica* Gamble, *Fl. Pres. Madras* 2: 207. 1918. **Fig. 16.**

Tam.: *Kadapla*.

Trees, up to 20 m tall. Leaves oblong, ovate to lanceolate, up to 20 x 10 cm. Inflorescence axillary panicles, up to 15 cm long. Calyx lobes elliptic-lanceolate, 1 mm long. Petals 5, obovate-oblong to elliptic-oblong, obtuse 2.5 mm long. Filaments, inserted on the margin of the disc, continuous with it; anthers introrse. Ovary subglobose, 1 x 2 mm, more or less glabrous; style almost divided to the base. Disc flat, subentire. Fruits 2-lobed, sometimes one lobe abortive, 2.5-3.5 cm long. Seeds more or less ellipsoid, partly arillate.

Fl. & Fr. : Dec. - May.

Distrib. India : Western Ghats, 1000-2000 m. Tamil Nadu and Kerala,

Myanmar, Thailand and Malay Peninsula.

Note. The Fruits are edible. The wood is used as timber.

2. *Bhesa paniculata* Arn. in *Edinb. New Phil. J* 16: 315. 1834. *Kurrimia paniculata* Wallich ex Arn. in *Nov. Act. Caes. Leop. - Car.* 18: 328. 1836; M. Lawson in *Fl. Brit. India* 1: 622. 1875.

Trees, up to 30 m tall. Leaves elliptic to lanceolate, up to 40 x 15 cm, apex obtuse to shortly acuminate, base obtuse; petiole 1-10 cm long. Panicles

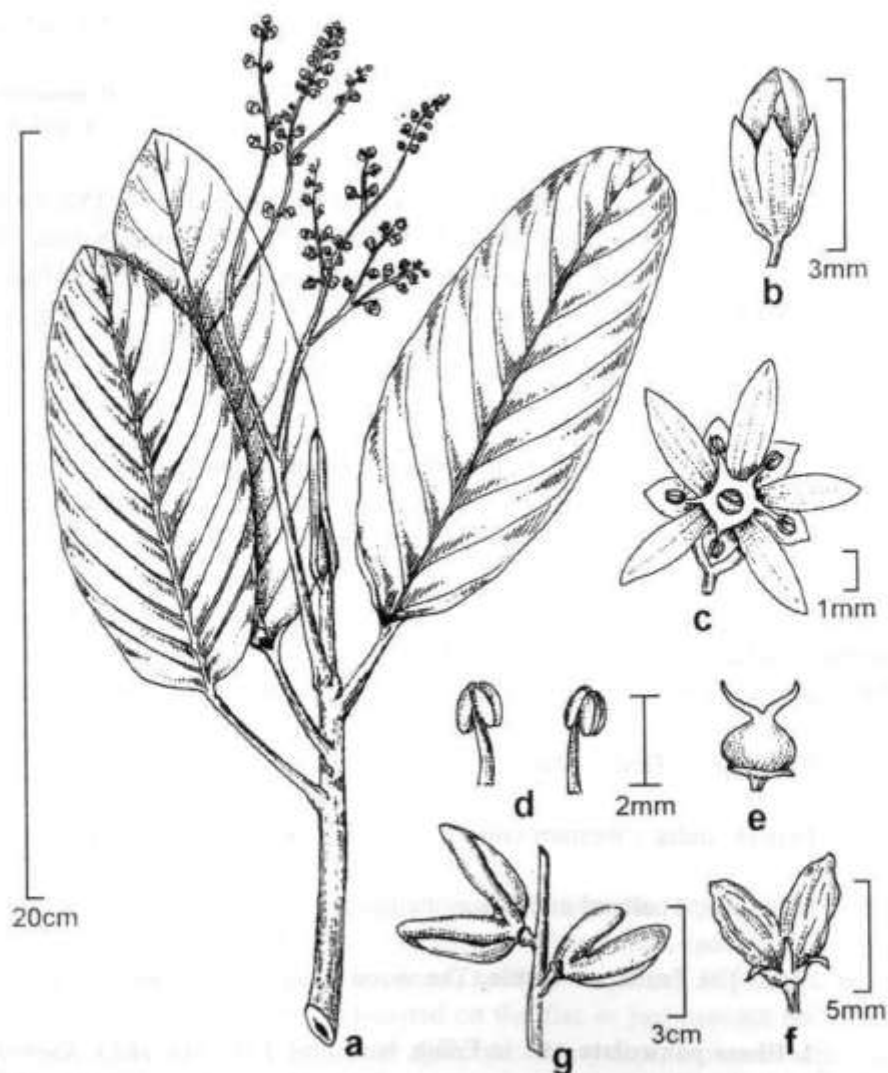


Fig. 16. *Bhesa indica* (Beddome) Ding Hou : a. Habit; b. Flower bud; c. A flower; d. Stamens; e. Gynoecium; f. Young fruits; g. Mature fruits.

crowded at the ends of the branches, up to 30 cm long; rachis puberulous or glabrescent. Calyx lobes deltoid, puberulous outside, ca 1 mm long. Petals ovate - oblong, 1.5-2 mm, obtuse, puberulous outside. Filaments 1-1.5 mm long; anthers deltoid, obtuse. Ovary ellipsoid, pubescent towards apex; styles free, about half as long as the ovary. Disc lobed; lobes broad-oblong. Fruits bilobed. Seeds broad-ellipsoid to subglobose, 9-11 mm long; arils distinct.

Fl. & Fr. : Almost throughout the year.

Distrib. India : Tamil Nadu.

Thailand and Malesia.

3. *Bhesa robusta* (Roxb.) Ding Hou in *Blumea Suppl.* 4: 152. 1958. *Celastrus robustus* Roxb., *Fl. Ind.* 2: 385. 1824. *Kurrimia pulcherrima* Wallich ex M. Lawson in *Fl. Brit. India* 1: 622. 1875. (*nom. illeg.*). *K. maingayi* M. Lawson in *Fl. Brit. India* 1: 622. 1875.

Asm.: *Hinuri, Koliōri*; *Kh.*: *Dien-Mat-wei, Dieng-solignia*; *Mikir* : *Tamser*

Trees, up to 30 m tall. Leaves elliptic or oblong-elliptic, 8-25 x 3-8 cm, shortly acuminate; petiole 1-2.5 cm long, finely grooved above. Inflorescence axillary racemes, 7-12 cm long. Calyx lobes broadly ovate to subrotundate, 2 x 1 mm. Petals obovate-oblong, 2-3 x 1 mm. Stamens 2 mm long, attached beneath the outer margin of the disc; anthers deltoid, obtuse. Ovary subglobose, apex pubescent; styles 2, filiform, free. Disc cupular, usually puberulous. Fruits narrowly ellipsoid, 2-3.5 x 0.8-1.2 cm, with 2 vertical grooves, much tapered to the apex, glabrous, 1-seeded. Seeds oblong, shining, arillate.

Fl. & Fr. : Oct. - March.

Distrib. India : Sikkim, Arunachal Pradesh, Assam, Meghalaya and Andaman Islands.

Bhutan, Bangladesh, Myanmar, Thailand, Indo-China, Malay Peninsula, Sumatra and Borneo.

Note. Wood is considered excellent for cabinet work.

2. Cassine L.

Shrubs or trees. Stipules caducous. Leaves simple, opposite or subopposite, coriaceous or subcoriaceous, entire or crenulate. Inflorescence axillary or extra axillary peduncled cymes. Flowers bisexual, 4-5-merous. Calyx lobes imbricate. Petals imbricate, spreading. Stamens inserted on or slightly under the outer margin of the disc; filaments subulate; anthers subglobose or deltoid, versatile, introrse. Gynoecium short, conical or more or less flask shaped, base slightly united with the disc or partly immersed in it. Ovary 2-loculed; style very short; stigmas obscure or slightly 2-lobed; ovules 2 in each locule, erect, attached at the base. Disc orbicular or lobed, flat, fleshy. Fruits a drupe, indehiscent, 1-2 loculed; exocarps thin or fleshy; endocarps leathery or mostly stony. Seeds 1-2, exarillate.

Mostly in Africa but widely distributed in the tropics of both the hemispheres; *ca* 80 species, 4 in India.

Literature. DING HOU (1962) in *Fl. Males.* 1, 6(2): 284.

KEY TO THE SPECIES

- | | |
|---|---------------------------|
| 1a. Flowers 4-merous; disc thin, wavy | 4. <i>C. viburnifolia</i> |
| b. Flowers 5-merous; disk thick, fleshy | 2 |
| 2a. Bushy shrubs | 2. <i>C. balae</i> |
| b. Trees | 3 |
| 3a. Petals orbicular | 1. <i>C. albens</i> |
| b. Petals spatulate | 3. <i>C. paniculata</i> |

1. *Cassine albens* (Retz.) Kosterm. in *Gard. Bull. Sing.* 39(2): 178. 1986. *Schrebera albens* Retz., *Observ. Bot.* 6: 25. t. 3. 1791. *Elaeodendron glaucum sensu* M. Lawson in *Fl. Brit. India* 1: 623. 1875 (*non Pers.*) *p.p.*

Fig. 17.

Beng.: *Rajjehul*; Guj.: *Alam*; Hindi: *Jamrassi*; Kan.: *Kannira, Mukarti*; Mal.: *Karumiraka*; Mar.: *Arn*; Tam.: *Irgoli, Kannimarum, Karuvali, Kiri, Pirai*; Tel.: *Bira, Kannilu, Nerasi*.

Trees; branchlets subterete. Leaves ovate to elliptic-oblong, 5-15 x 2-6 cm, apex obtuse to rounded, base cuneate-obtuse; petioles up to 3 cm long.

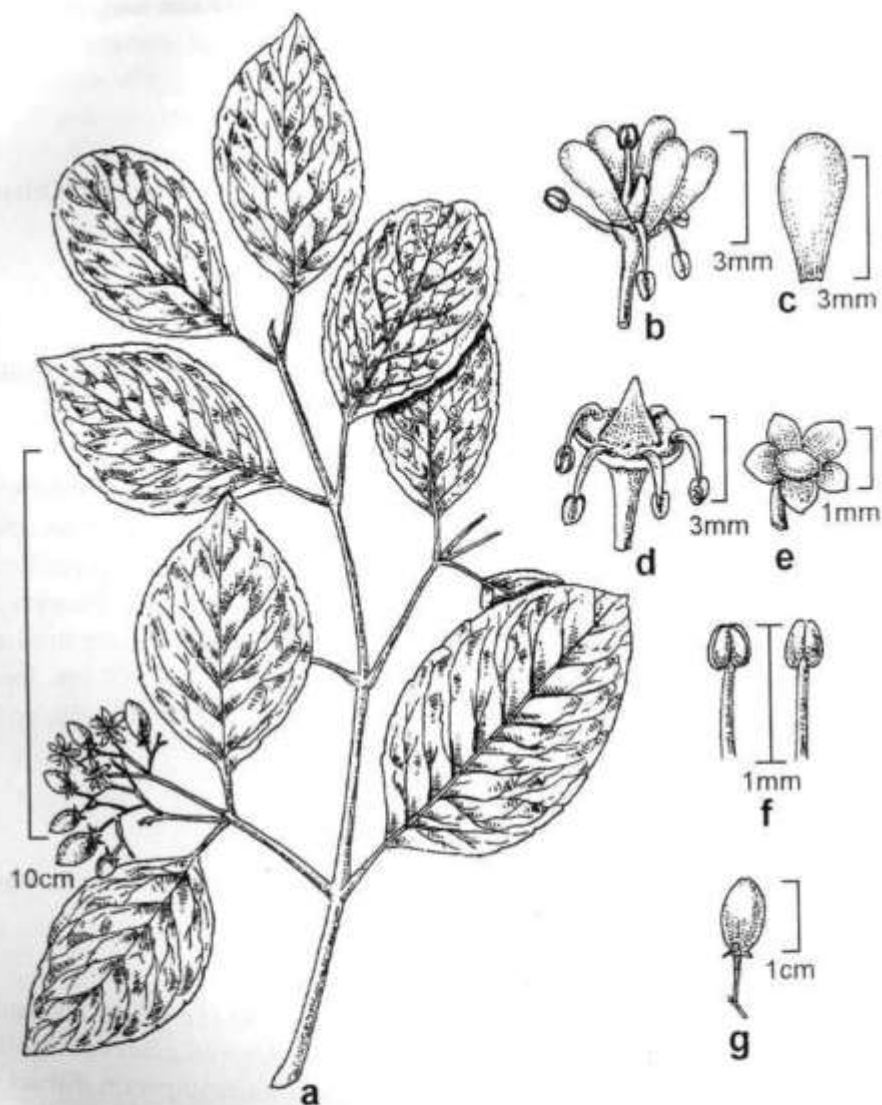


Fig. 17. *Cassine albens* (Retz.) Kosterm. : a. Habit; b. A flower; c. A petal; d. Arrangement of stamens from torus; e. Sepals with torus; f. Stamens; g. A fruit.

Flowers 5-merous, in lax cymes, at the upper part of the branchlets; bracts ovate, acute, small. Calyx lobes unequal, orbicular, margins membranous. Petals orbicular, margins membranous, 5 x 3 mm. Stamens on the lobes of the disc, shorter than the petals; filaments recurved; anthers attached to the connective. Disc thick, fleshy. Fruits drupaceous, ovoid or obovoid, 12-18 mm long, apiculate. Seeds 1, crustaceous.

Fl. & Fr. : March - Dec.

Distrib. India : Himachal Pradesh, Uttar Pradesh, West Bengal, Orissa Madhya Pradesh, Rajasthan, Maharashtra, Karnataka and Kerala.

Sri Lanka.

2. **Cassine balae** Kosterm. in Gard. Bull. Sing. 39: 185. 1986; Daniel *et al.* in J. Bombay Nat. Hist. Soc. 96: 495. 1999.

Bushy shrubs, up to 1.5 tall, glabrous; branches numerous; bark furrowed. Leaves ovate to elliptic-oblong, 3-7 x 1.5-4 cm, coriaceous, base cuneate, apex acute-subacute or obtuse, sharply serrated at margins; lateral nerves in 5-7(-9) pairs; petioles up to 1 cm long. Stipules minute, scale-like. Flowers 5-merous, in axillary, dichotomously cymed panicles; bracts and bracteoles subulate, small. Calyx lobes broadly ovate, valvate. Petals oblong, up to 3 mm long. Stamens up to 1 mm long, inserted in disk. Fruits drupaceous, oblong, up to 2 cm long.

Fl. & Fr. : January.

Distrib. India : In coastal scrub forests on sandy soil. Tamil Nadu. Rare

Sri Lanka.

Note : *Cassine balae* was instituted by Kostermans (*l.c.*) from Sri Lanka on the basis of specimens partly referred to *Elaeodendron glaucum* (Rottb.) Pers. Recently Daniel *et al.* (*l.c.*) reported it from Ramnathpuram district of Tamil Nadu. Though the Sri Lankan plants are usually trees attaining a height of *ca* 20 m, but those growing on dunes and in sterile sandy coastal areas in north-eastern Sri Lanka show many-branched, bushy habit much like the Indian plants recorded from the identical habitat (Daniel *et al.*, *l.c.*).

3. *Cassine paniculata* (Wight & Arn.) Loobr.-Callen in *Adansonia Ser.* 2. 15: 220. 1975. *Elaeodendron paniculatum* Wight & Arn., *Prodr.* 157. 1834. *E. glaucum sensu* M. Lawson in *Fl. Brit. India* 1: 623. 1875 (*non Pers.*) *p.p.*

Large trees. Leaves ovate-lanceolate, 7-8 x 2.5-3.5 cm, base rounded, margins crenate, apex acute. Flowers in cymes, often with a solitary flower at the fork of the inflorescence. Calyx lobes orbicular. Petals spatulate, about 5 x 3 mm, margins membranous. Stamens arising from the lobes of disc. Disc thick, fleshy. Fruits drupaceous, elliptic, apiculate. Seed 2.

Fl. & Fr. : Feb. - Nov.

Distrib. India : Karnataka, Tamil Nadu and Kerala.

Sri Lanka and Malayan Archipelago.

4. *Cassine viburnifolia* (A.L. Juss.) Ding Hou in *Fl. Males.* 1: 6(2): 286. 1962. *Aegiphila viburnifolia* A.L. Juss. in *Ann. Mus. Natl. Hist. Nat.* Paris 7: 76. 1806. *Elaeodendron subrotundum* King in *J. As. Soc. Bengal* 65: 2. 356. 1896; Parkinson, *For. Fl. Andaman Isls.* 127. 1923.

Small trees or shrubs, upto 10 m tall; branchlets subcompressed. Leaves obovate, obovate-oblong, broad elliptic or suborbicular, 4-10.5 x 2-6 cm, apex acute, base cuneate to rounded, subcoriaceous; main nerves 4-6 pairs, spreading obliquely. Cymes up to 11 cm long; peduncles up to 6 cm. Flowers white, 4-merous. Calyx lobes deeply divided, free, broadly ovate to suborbicular, 1 mm long. Petals oblong, obtuse, about 2 x 1 mm. Stamens erect, inserted beneath the disc margin, 1.25 mm long; filaments slender; anthers ovate, basifixed. Ovary ovoid. Disc short, thin, wavy. Fruits drupaceous, obovoid-oblong, 12 x 6 mm, gradually narrowed towards the base. Seed 1, obovate-oblong, 6 x 3 mm.

Fl. & Fr. : March.

Distrib. India : Andaman Islands.

Thailand and Malesia

Note. The husk of the fruit is said to be used to stupefy fish.

3. *Celastrus* L.

Scandent shrubs or small trees. Leaves spirally arranged; petiole elliptic to orbicular, toothed, crenate or subentire, rarely serrulate; stipules caducous. Inflorescence terminal, axillary or lateral racemes or cymes. Flowers 5-merous, minute, unisexual and then plants dioecious or bisexual, pedicellate. Sepals valvate or imbricate, persistent. Petals inserted under the disc. Fertile stamens inserted on or below the margin of the disc; filaments glabrous or papillose; anthers ovoid or oblong-ellipsoid, obtuse or apiculate; sterile stamens smaller; anthers ovate-oblong, acute or acuminate. Ovary free from the disc or slightly confluent with it, 3-locular; sterile ovary in male flowers much smaller than the fertile one; ovules 2 or 1 in each locule. Disc cupular, membranous or fleshy and flat, entire or lobed. Fruits capsular, subglobose, loculicidally 3-valved. Seeds 1-6, arillate.

Mostly in tropical and subtropical East Asia to Australia and Latin America, fewer in N. America and Madagascar; *ca* 31 species, 7 in India.

Literature. DING HOU (1955). A revision of the genus *Celastrus*. *Ann. Missouri Bot. Gard.* 42: 215-302.

KEY TO THE SPECIES

- | | |
|---|------------------------------------|
| 1a. Inflorescence only terminal | 6. <i>C. paniculatus</i> |
| b. Inflorescence both terminal and axillary | 2 |
| 2a. Evergreen shrubs; inflorescence without vegetative buds;
fruits 1 seeded | 3 |
| b. Deciduous shrubs; inflorescence with vegetative buds;
fruits 3-6-seeded | 5 |
| 3a. Leaves densely reticulate; disc membranous, cup-shaped. | 1. <i>C. hindsii</i> |
| b. Leaves not densely reticulate; disc fleshy, flat | 4 |
| 4a. Capsules cylindrical, stipulate; seeds pinkish brown | 5. <i>C. monospermus</i> |
| b. Capsules angular, ovoid; seeds blackish brown | 4. <i>C. monospermoides</i> |
| 5a. Veinlets of leaves elevated on both surfaces; seeds rugose | 3. <i>C. membranifolius</i> |
| b. Veinlets of leaves immersed above and elevated beneath;
seeds smooth | 6 |
| 6a. Filaments glabrous; anthers apiculate; seeds ellipsoid-ovoid | 2. <i>C. hookeri</i> |
| b. Filaments papillose; anthers ovoid; seeds plano-convex | 7. <i>C. stylosus</i> |

1. *Celastrus hindsii* Benth. in Kew J. Bot. 3: 334. 1851; Ding Hou in Ann. Missouri Bot. Gard 42: 249. 1955. *Celastrus venulosus* Wallich, Cat. no. 4321. 1831. *nom. nud.*: M. Lawson in Fl. Brit. India 1: 618. 1875.

Asm. : *Bhumlati*

Scandent shrubs. Leaves elliptic to obovate-oblong, 5-15 x 1.5-6.5 cm, apex acute, coriaceous, glabrous, margin serrate, base cuneate; lateral nerves 6-9 pairs, densely reticulate; stipules laciniate; petiole 5-10 mm long. Inflorescence 3-5-flowered cymes. *Male flowers* : Sepals semi-orbicular, up to 2 mm long, obtuse, short ciliate. Petals white to cream, oblong-obovate, 2-5 x 1-2 mm, obtuse, glandular-ciliate. Stamens arising from the margin of the disc, glabrous. 2 mm long; filaments glabrous; sterile pistil present. *Female flowers* : Ovary flask-shaped, subglobose; style columnar; stigma 3-lobed. Disc cup shaped; lobes deltoid. Fruits capsular, ovoid to subglobose, 8-10 x 6-8 mm, 1-seeded. Seeds cylindrical, smooth, brownish, 6-8 x 4-5 mm.

Fl. & Fr. Jan. - Oct.

Distrib. India : Between 300 to 1500 m. Sikkim, Arunachal Pradesh, Assam, Nagaland and Meghalaya.

Myanmar, Thailand, Vietnam, Central to S. China, Japan (Bonin Island), Sumatra, Borneo and Java.

2. *Celastrus hookeri* Prain. in J. As. Soc. Bengal 73: 197. 1904; Cowan & Cowan, Trees of N. Bengal 35. 1929. *C. stylosa sensu* M. Lawson in Fl. Brit. India 1: 618. 1875. (*non* Wallich ex Roxb.) *p.p.*

Scandent shrubs. Leaves broadly elliptic-ovate, 6-18 x 4-8 cm, apex acute, base obtuse, margin serrate, thin membranous on flowering branches; nerves 4-6 pairs; stipules laciniate; petiole 10-15 mm long. Inflorescence 3-5-flowered panicles; peduncles glabrous. *Male flowers* : Sepals about 2 mm long; lobes deltoid, ciliate. Petals oblong to obovate, 3 x 1.5 mm, green, glandular at the margins. Stamens 5, arising from the margin of the disc, 2 mm long; ovary sterile. Disc cup shaped, lobed. *Female flowers* : Sepals, petals and disc as in the male. Stamens sterile. Ovary globose, 4 mm across, narrowed into a distinct style; stigma 3-lobed, each lobe bifid, linear. Fruits

capsular, subglobose. 3-5 seeded. Seeds ellipsoid or ovoid, 4 x 2 mm, black, areolate.

Fl. & Fr. : April - Aug.

Distrib. India : At altitudes from 1500-3000 m. West Bengal (Darjeeling) Sikkim and Arunachal Pradesh.

3. *Celastrus membranifolius* Prain in J. As. Soc. Bengal 73: 197. 1904.

Shrubs; branchlets terete or slightly angular, glabrous. Leaves ovate-lanceolate or elliptic, 7-14 x 3.5-5.5 cm, apex acuminate, base cuneate, membranous, glabrous, margins serrate; nerves 4-5 pairs, elevated below, immersed above; veinlets preminent on both surfaces; petiole 10-15 mm long. Fruiting inflorescence axillary and terminal, shortly peduncled or fascicled. Fruits capsular, subglobose, 7 x 5 mm, valves broadly elliptic, 3-5-seeded. Seeds elliptic, 2-3 x 1-2 mm, rotund at both ends, wrinkled, black.

Distrib. India : Assam and Meghalaya.

4. *Celastrus monospermoides* Loes. in Nova Guinea 2: 280. 1910. *C. championii* King in J. As. Soc. Bengal 65: 639. 1896 (*non* Benth., 1851).

Trees. Leaves elliptic to elliptic-oblong or ovate, 5-16 x 2.5-8 cm, apex acute to acuminate, margin serrate to almost entire; nerves 4-7 pairs, conspicuous; petioles up to 15 mm long; stipules lacinate. Flowers usually in axillary panicles; bracts deltoid, irregularly erose. *Male flowers* : Sepals suborbicular, 0.5 to 1 mm long, entire, short ciliate. Petals oblong to oblong-elliptic, 2 x 1 mm, obtuse or rounded, entire. Stamens attached below the margin of the disc, 2.5 mm long. Disc lobed, fleshy, flat. *Female flowers* : Sepals, petals and disc as in the male flowers. Sterile stamens shorter in length than male flowers. Ovary globose, flask shaped; stigma discoid. Fruits obovoid, angular-ovoid, up to 20 x 12 mm. Seeds broadly ovoid, 7-12 x 5-10 mm, blackish or brownish, smooth, arillate; arils bright red.

Fl. & Fr. : March - Oct.

Distrib. India : In Desert and semi arid regions, up to 1000 m. Arunachal Pradesh, Manipur, Tripura, Orissa, Punjab and Rajasthan.

Sumatra, Malay Peninsula, Borneo, Philippines, Molluccas and New Guinea.

5. *Celastrus monospermus* Roxb., Fl. Ind. 2: 394. 1824. *Celastrus championii* Benth in Hook., Kew J. Bot. 3: 334. 1851; M. Lawson in Fl. Brit. India 1: 618. 1875.

Asm.: *Bhumlati, Gelomtaru.*

Scandent shrubs. Leaves elliptic to broadly ovate or oblong, 6-18 x 3-9 cm, apex acute to obtuse, base cuneate to obtuse, membranous, glabrous on both sides, margins serrate; nerves about 5-8 pairs, curved towards the apex; stipules lacinate; petioles 5-15 mm long. Inflorescence a laxly branched panicle, up to 20 cm long. Flowers white to greenish yellow. *Male flowers*: Sepals suborbicular, glandular-ciliate, 1 mm long. Petals oblong, up to 3 mm long. Stamens attached just below the margin of the disc, 2.5 mm long; anthers ovoid. Ovary slightly immersed in the disc. Disc fleshy, slightly lobed. *Female flowers*: Sepals, petals and disc as in the male flowers but petals smaller. Stamens sterile. Pistil 3 mm long. Ovary subglobose, narrowed into the style; stigma 3-lobed, reflexed. Fruits capsular, cylindrical, stipitate; valves ovate-oblong. 1-seeded. Seeds 15 x 8 mm, smooth.

Fl. & Fr.: March - Aug.

Distrib. India: Eastern Himalaya and North East India. West Bengal, Sikkim, Arunachal Pradesh, Assam, Manipur, Meghalaya and Nagaland.

Bangladesh and China.

6. *Celastrus paniculatus* Willd., Sp. Pl. 1: 1125. 1797; M. Lawson in Fl. Brit. India 1: 617. 1875. Fig. 18.

Beng.: *Malkangni*; Guj.: *Malkengana*; Hindi: *Kujri*; Kan.: *Karegavena*; Mal.: *Palva, Palulavam*; Mar.: *Kangani*; Miri: *Pokitai*; Sans.: *Aminasha, Amruta, Saraswati*; Tam.: *Velularia, Adibaricham, Kalabam, Tanisi*; Tel.: *Bavanji, Brukata.*

Scandent shrubs. Leaves obovate-orbicular, elliptic to ovate-oblong, 5-15 x 2-10 cm, apex acute, base cuneate, glabrous, pubescent beneath; nerves

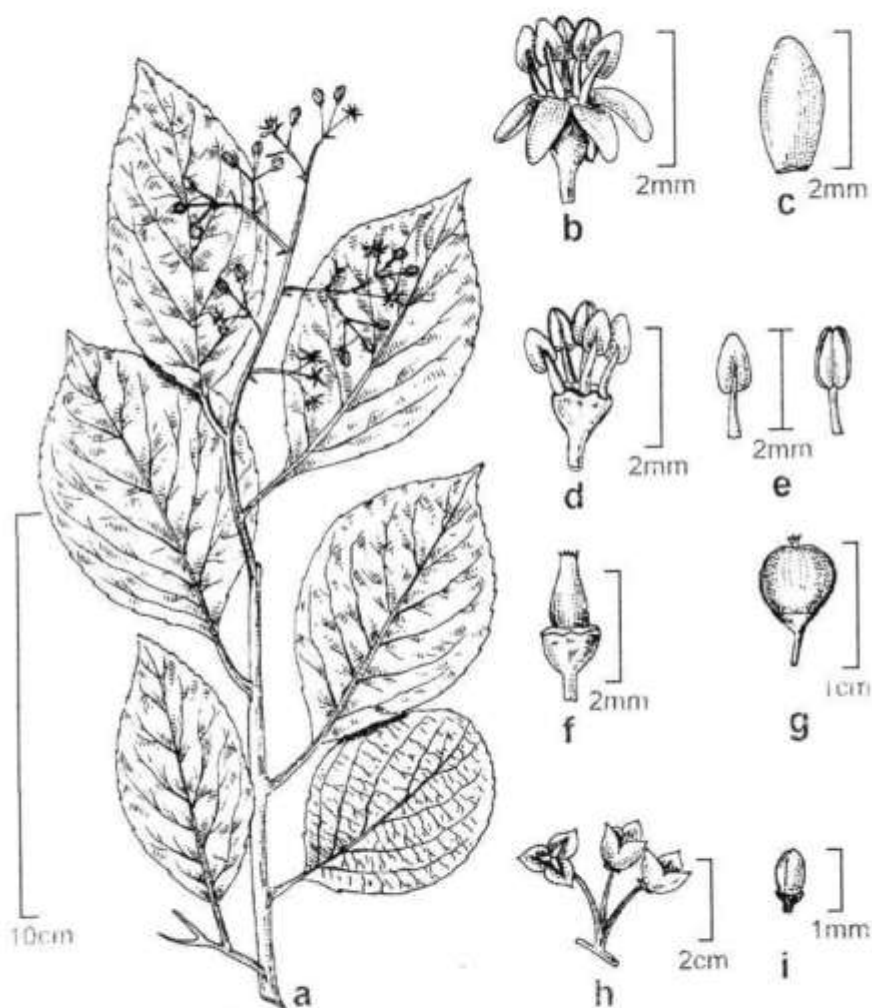


Fig. -18. *Celastrus paniculatus* Willd. : a. Habit; b. A flower; c. A petal; d. Arrangement of stamens in a flower; e. Stamens; f. Gynoecium; g. A fruit; h. Dehiscent fruit; i. Seed.

5-8 pairs; stipules lacinate; petioles up to 2 cm long. Inflorescence a panicle, 4-8 cm long. Flowers pale-green. *Male flowers* : Sepals 5-lobed; lobes semi-orbicular, ciliate, up to 2 mm long. Petals oblong to obovate-oblong, up to 3 mm long. Stamens 3 mm long; anthers ovoid. Ovary sterile, columnar. Disc cupular; lobes obscure. *Female flowers* : Sepals, petals and disc as in the male flowers. Stamens sterile. Ovary globose; style columnar; stigma 3-lobed. Fruits capsular, subglobose, up to 10 x 8 mm, 3-6-seeded. Seeds ellipsoid, 3-5 x 2-4 mm, smooth, brownish, arillate.

Fl. & Fr. : April - Dec.

Distrib. India : Widely distributed up to an altitude of 1250 m. Himachal Pradesh, Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Arunachal Pradesh, Nagaland, Meghalaya, Orissa, Madhya Pradesh, Rajasthan, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala and Andaman Islands.

Myanmar, Thailand, Vietnam, S. China, Malesia (except Borneo), Australia and New Caledonia.

Note. Seeds yield an oil which is used in certain disorders of the stomach.

7. *Celastrus stylosus* Wallich ex Roxb., Fl. Ind. 2: 401. 1824; M. Lawson in Fl. Brit. India 1: 618. 1875. *p.p.* *Gymnosporia neglecta* Wallich ex M. Lawson in Fl. Brit. India 1: 619. 1875.

Kh.: *Mej-jendru*.

Scandent shrubs; branchlets terete. Leaves elliptic or obovate-oblong, 5-8 x 3-5 cm, apex acute, base obtuse, margin serrate, membranous, nerves about 8 pairs, venation loosely reticulate; stipules filiform; petioles 1.5-2 cm long. Flowers in cymes, green. *Male flowers*: Sepals 5-lobed; lobes ovate to oblong, 2 mm long, crenate to entire. Petals obovate, obtuse, 2-3 mm long, crenulate, papillose on both sides. Disc cupular, membranous, lobed. Stamens 2 mm long; filaments densely papillose, arising between the disc lobes. Ovary sterile. *Female flowers*: Sepals, petals and disc same as in the male flowers. Stamens sterile. Ovary subglobose; style distinctly columnar; stigma 3-lobed,

each lobe bifid. Fruits capsular, subglobose, 7-12 x 5-10 mm, 3-6-seeded. Seeds plano-convex to benate, 4-6 x 1-2 mm; areole distinct.

Fl. & Fr. : March - Jan.

Distrib. India : Eastern and North Eastern region, from 700 to 2500 m. West Bengal, Sikkim, Arunachal Pradesh, Assam, Meghalaya and Orissa.

Nepal, Bangladesh, W. Java and Lesser Sunda Islands.

4. *Euonymus* Tour. ex L.

Shrubs or small trees. Leaves opposite, decussate, alternate, rarely spiral; stipules caducous. Flowers in axillary cymes, rarely in fascicles, bisexual, 5 or 4-merous. Sepals deeply lobed, imbricate, entire-denticulate. Petals spreading or reflexed, entire, crenulate, toothed or fimbriate, imbricate. Stamens inserted on the disc; filaments short; anthers deltoid, dehiscent on the top, lateral or introrse. Ovary immersed in the disc. Ovules 2 in each locule. Fruits capsular, lobed, angular or winged, smooth or spiny, when dehiscent the valves splitting and leaving no central axis. Seeds arillate.

Mainly in tropical and subtropical Asia and C. & N. America, fewer species in Europe and Africa; ca 176 species, 32 in India.

Literature. BLAKELOCK, R.A. (1951). A synopsis of the genus *Euonymus*. *Kew Bull.* 210-290.

KEY TO THE SPECIES

- | | |
|--|--------------------------------|
| 1a. Winter buds ovoid, small; filaments distinct; anthers 2-celled, dehiscing with two distinct slits; capsules of various shapes, if oblate-globose then not winged | 2 |
| b. Winter buds conic, large; filaments obscure; anthers 1-celled, dehiscing by one continuous slit; capsules oblate-globose, winged | 26 |
| 2a. Flowers fascicled or sometimes in fasciculate arranged
1-3-flowered short and obscure peduncles; tall trees | 20. <i>E. javanicus</i> |
| b. Flowers in axillary, usually many flowered, sometimes dichotomous cymes, on conspicuous peduncles (peduncles sometimes short or lacking in <i>E. indicus</i>); small trees or shrubs | 3 |

- 3a. Capsules partite almost to base 4
 b. Capsules not partite or partite up to middle only 5
- 4a. Flowers 5-merous; inflorescence 6-15-flowered; petals fringed, oblong, white 25. *E. pendulus*
 b. Flowers 4-merous; inflorescence 1-7-flowered; petals entire, rounded, green 22. *E. lawsonii*
- 5a. Capsules smooth 6
 b. Capsules echinate 25
- 6a. Capsules lobed, angled or winged, apex retuse, acute or obtuse; small trees or erect shrubs 7
 b. Capsule unlobed or with shallow rounded lobes, apex rounded or nearly so; climbing shrubs 23
- 7a. Flowers 2-2.5 cm across; disc 6-8 mm wide; capsule rounded 16. *E. grandiflorus*
 b. Flowers up to 12 mm in diam. (up to 18 mm in *E. tingens*); disc 2-5 mm wide; capsules turbinate, obconic or clavate, rarely rounded 8
- 8a. Leaves up to 3 cm long; petiole up to 3 mm long 29. *E. tibeticus*
 b. Leaves 5.5-24 cm long; petiole 0.3-3 cm long 9
- 9a. Leaves deciduous; petals oblong-lanceolate, with revolute margins 18. *E. hamiltonianus*
 b. Leaves persistent petals orbicular 10
- 10a. Petals fringed or denticulate; leaves entire 11
 b. Petals entire or crenulate; leaves serrate or entire 13
- 11a. Leaves elliptic or obovate-oblong, petals yellowish to greenish; yellow 8. *E. cochinchinensis*
 b. Leaves lanceolate; petals purple 12
- 12a. Cymes 7 or more-flowered; petiole 1-2 cm long 4. *E. attenuatus*
 b. Cymes 1-3-flowered; petiole 3-8 mm long 19. *E. indicus*
- 13a. Flowers 4-merous 14
 b. Flowers 5-merous 16
- 14a. Leaves bullate, up to 20 cm long 5. *E. bullatus*
 b. Leaves not bullate, less than 13 cm long 15
- 15a. Capsule 8-10 mm long, rounded at base, lobes rounded; leaves serrate to base 32. *E. viburnoides*
 b. Capsule 15-20, mm long, pyriform, lobes angled; leaves serrate in uppr half 21. *E. kachinensis*
- 16a. Capsule 4 mm long 23. *E. macrocarpus*
 b. Capsule up to 2.5 mm long 17
- 17a. Petals with conspicuous black veins; flowers 10-18 mm in diam. 30. *E. tingens*
 b. Petals without black veins; flowers under 12 mm across 18
- 18a. Inflorescence of 1-3-flowered solitary peduncles 10. *E. crenulatus*

- b. Inflorescence 7-or more-flowered dichotomous cymes 19
- 19a. Twigs acutely 4-angled, almost winged 2. *E. angulatus*
- b. Twigs terete 20
- 20a. Leaves 6 cm or below in length, entire; petals entire 11. *E. dichotomus*
- b. Leaves more than 7 cm long, serrate or crenate; petals crenulate, rarely entire 21
- 21a. Leaves sharply serrate to base 27. *E. serratifolius*
- b. Leaves crenate-serrate only towards apex 22
- 22a. Petals white or greenish 15. *E. glaber*
- b. Petals purplish 24. *E. paniculatus*
- 23a. Leaves sessile or sub-sessile petiole not more than 2.5 mm long 17. *E. griffithii*
- b. Leaves distinctly petioled petiole 0.5 - 1.25 cm long 24
- 24a. Veins conspicuously reticulate above in leaves; capsules greenish 28. *E. theifolius*
- b. Veins obscure in leaves; capsules brownish 31. *E. vagans*
- 25a. Capsules greenish when dry; prickles more than 2 mm long 6. *E. cinereus*
- b. Capsules brownish when dry; prickles less than 2 mm long 12. *E. echinatus*
- 26a. Flowers 5-merous 27
- b. Flowers 4-merous 28
- 27a. Leaves deciduous, oblong, elliptic or ovate, entire; petals cream coloured 3. *E. assamicus*
- b. Leaves persistent lanceolate, serrulate; petals purple 7. *E. clivicolus* var. *rongchuensis*
- 28a. Leaves deciduous 29
- b. Leaves persistent or nearly so 30
- 29a. Leaves ovate, biserrate or fringed (uniserrate in *E. fimbriatus* var. *serratus*); peduncles 5-8 cm long; petals white or greenish; capsule wings 6-15 mm long 13. *E. fimbriatus*
- b. Leaves lanceolate, not fringed or biserrate; peduncles 3-4 cm long; petals purple; capsule wings 2-7 mm long 1. *E. amygdalifolius*
- 30a. Capsule wings up to 12 mm long, attached more toward the middle of the capsule; veins arising at an acute angle to the midrib 9. *E. cornutoides*
- b. Capsule wings up to 5 mm long, attached towards the base of the capsule; veins arising at an angle of 45° or more to the midrib 31
- 31a. Leaves up to 30 cm long; apex acuminate; inflorescence 7-15-flowered 14. *E. frigidus*
- b. Leaves up to 8 cm long; apex obtuse; inflorescence 3-7-flowered 26. *E. pygmeus*

1. *Euonymus amygdalifolius* Franch. in Bull. Soc. Bot. France 33: 453. 1866; Blakelock in Kew Bull. 1951. 280. 1951; Hara, Enum. Fl. Pl. Nepal 2: 89. 1979. *E. taliensis* Loes. in Notes Roy. Bot. Gard. Edinb. 8: 3. 1913.

Shrubs. Leaves elliptic, elliptic-oblong, oblong-lanceolate or lanceolate, 11.5-20 x 3.5-6.5 cm, apex acuminate to acute, base obtuse to cuneate, membranous, deciduous, margin serrulate-crenulate, dark-green above, pale beneath; veins prominent on the under surface, reticulations indistinct. Inflorescence axillary cymes, simple or dichotomously branched; peduncles 2-4 cm long; pedicels 1-1.5 cm long. Flowers 4-merous, 4-6 mm in diam. Calyx lobes rounded, wider than long, 0.5 mm long, Petals orbicular, 2.5 mm wide, purple. Capsule wings 2-7 mm long, directed forward or laterally.

Distrib. India : Himalaya. Uttar Pradesh (Kumaon) and Sikkim.

Nepal, Bhutan, Myanmar, S.E. Tibet and China (Yunnan).

2. *Euonymus angulatus* Wight, Ic. t. 1053. 1846; M. Lawson in Fl. Brit. India 1: 610. 1875.

Small trees; branchlets acutely 4-angled, glabrous. Leaves oblong-lanceolate to ovate-lanceolate, up to 8-12 x 4-8 cm, apex acuminate, base tapering, very coriaceous, glabrous, deeply shining above, paler beneath, entire, thickened at margins; veins not conspicuous. Flowers in more than 7-flowered, lax cymes. Sepals 5, margins entire or fimbriate. Petals 5, orbicular, purplish, free. Stamens 5, alternate with petals, inserted on the margins of the disc. Ovary sunk in the disc; styles short, thick. Disc fleshy, 5-lobed. Capsules tuberculate, attenuated downwards, apex obtusely winged.

Fl. & Fr. : Dec. - Jan.

Distrib. India : Western Ghats, in Evergreen forests at ca 1600 m. Karnataka, Tamil Nadu and Kerala.

3. *Euonymus assamicus* Blakelock in Kew Bull. 1949: 242. 1948.

Small trees; branchlets terete, glabrous. Leaves oblong, elliptic or ovate, 6-11.5 x 2.5-6 cm, apex long acuminate, base rounded or cuneate, thinly coriaceous, margins entire; nerves reticulate; petioles 8-13 mm long. Flowers in cymes; peduncles 2.5 to 8 cm long; pedicels 2 to 3 cm long. Petals 5, creamy, minutely red dotted, 2-3 x 2-3 mm, margins entire. Stamens 5, subsessile; anthers broadly reniform, dehiscence by continuous split, after dehiscence patelliform. Ovary sunk in the disc; stigma sessile. Capsules broadly 5-winged.

Fl. & Fr. : March.

Distrib. India : N. Assam (1700 m). Endemic.

4. *Euonymus attenuatus* Wallich ex M. Lawson in Fl. Brit. India 1: 610. 1875.

Small trees or tall shrubs; branchlets spreading, bark greyish. Leaves lanceolate-oblong to elliptic-oblong, 6-14 x 1.5-4.5 cm, base cuneate, coriaceous, glabrous, entire; lateral nerves 8 pairs, not conspicuous; petioles up to 2 cm long. Flowers in dichotomously branched axillary cymes; peduncles thickening in fruit, up to 5.5 cm long. Sepals 5, obtuse, unequal. Petals 5, obovate-orbicular, fringed at margin. Capsule obovoid, 4-5-lobed, red. Seeds 1 in each locule, black, arillate.

Fl. & Fr. : May - Nov.

Distrib. India : Eastern Himalaya, between 700 to 2000 m. West Bengal, Assam, Arunachal Pradesh and Meghalaya.

Bangladesh.

5. *Euonymus bullatus* Wallich *et* Lodd., Bot. Cab. t. 1749. 1831; M. Lawson in Fl. Brit. India 1: 610. 1875.

Trees; branchlets terete, slightly flattened, thick and coarse. Leaves ovate to lanceolate, 7.5-20.5 x 5-9 cm, apex acute, thick, coriaceous when mature, bullate with depressions above, entire or serrulate; lateral nerves 5-8 pairs, prominent beneath; petioles stout, channelled, up to 2 cm long. Inflorescence 13 cm long, in dichotomously branched umbellate cymes. Petals orbicular, crenulate, red. Ovary sessile. Fruits 4-lobed, obconic, 1 cm long. Seeds 1-3.

Fl. & Fr. : April - Dec.

Distrib. India : East and North East India, 1000-1400 m. West Bengal, Assam, Nagaland, Manipur and Meghalaya.

Bangladesh.

6. *Euonymus cinereus* M. Lawson in Fl. Brit. India 1: 611. 1875.

Shrubs; creeping on trees, with adventitious roots; branches 4-gonous, finely tubercled. Leaves obovate or oblanceolate, 4-7 x 2-4 cm, membranous, glabrous, serrate; lateral nerves 3-7 pairs, slender; petioles up to 1 cm long, channelled. Flowers in axillary cymes; pedicels 5 mm long. Sepals 4, ovate, acute. Petals 4, orbicular, toothed, except at base. Fruits Capsular, subglobose, prickly, 1.5 cm long. Seeds subglobose.

Fl. & Fr. : May.

Distrib. India : Assam and Arunachal Pradesh.

Bangladesh

7. *Euonymus clivicolus* W. Smith in Notes Roy. Bot. Gard. Edinb. 10: 31. 1917. var. ***rongchuensis*** (Marq. et Airy Shaw) Blakelock in Kew Bull. 1951. 279. 1951. *E. rongchuensis* Marq. et Airy Shaw in Kew Bull. 1930. 239. 1930.

Deciduous shrubs, 6-9 m tall; branches smooth, angular. Leaves lanceolate, 6-12 x 1.5-3 cm long, acuminate, base cuneate, margin denticulate to serrulate, membranous; nerves indistinct above, conspicuous on under surface; petiole 4-5 mm long. Inflorescence 1-3-flowered; peduncles slender, 3-5 (-7) cm long; pedicels 5 mm long. Flowers 5-merous, 11-16 mm in diam. Sepals reniform, 1.5 mm broad. Petals orbicular to oval, 4-5.5 mm long, purple. Capsule wings 5-10 mm long, tapering, directed forwards.

Fl. & Fr. : July

Distrib. Arunachal Pradesh.

South East Tibet and China (Szechwan, Yunnan).

8. *Euonymus cochinchinensis* Pierre, Fl. For. Cochin. 4. t. 309 A. 1894; Blakelock in Kew Bull. 1951: 255. 1951. Ding Hou in Fl. Males. Ser.

1, 6(2); 248. 1962; Vasud. & T. Chakrab. in J. Econ. Tax. Bot. 6: 266. 1985.

Trees, 5-6 m tall; branchlets terete, slender, brown, glabrous. Leaves elliptic or elliptic-oblong, rarely obovate-oblong, 4.5-10 x 2-5 cm, apex acute to shortly acuminate, base acute, obtuse or rarely rounded, \pm adaxially decurrent on the petiole, margin entire, chartaceous; nerves 5-8 pairs, indistinct; petiole 4-10 mm long. Inflorescence axillary cymes, 4-6 cm long, 2-3 times dichotomously branched; peduncles 1.5-4 cm long; bracts fringed or toothed. Flowers 7-9 mm across, 5-merous; pedicel 4-7 mm long. Calyx lobes broadly ovate, 1.5-2 x 2-3 mm, fringed or denticulate at margin. Petals orbicular, 2-3 x 3-4 mm, narrowed at base, fringed at margin. Disc 5-gonous, 2-2.5 mm across. Stamens inserted on the disc near the margin; filaments 1-2 mm long; anthers \pm deltoid. Ovary partially embedded in the disc, conical, 0.5-0.8 mm, raised above the disc; style 0.5-1 mm long; stigma indistinct. Capsule obovoid, ca 1 cm long, deeply 5-lobed, retuse at apex.

Fl. & Fr. : Jan. - Aug.

Distrib. India : In mangrove or inland forests. Andaman Islands.

Thailand, Cambodia, China and Malesia

9. *Euonymus cornutoides* Loes. in Notes Roy. Bot. Gard. Edinb. 7: 193. 1912 et 8: 2. 1913.

Shrubs; branchlets slender. Leaves lanceolate or elliptic-lanceolate, 4.5-10 x 0.5-1.5 cm, apex acute, base tapering, margins subcrenulate to serrulate, veins reticulate, distinct above; petioles 2-3 mm long. Flowers in slender, dichotomously forked cymes; peduncles slender, 2-4.5 cm long. Sepals 4, densely papillose outside. Stamens inserted on the disc; filaments short; anthers subsessile. Ovary pyramidal, 4-angular, depressed; stigmas capitate, sessile, crowned. Capsules 4-loculed.

Fl. & Fr. : Oct. - May.

Distrib. India : Temperate region, 2700-3000 m. Arunachal Pradesh.

South East Tibet, China, (Yunnan) and Myanmar.

10. *Euonymus crenulatus* Wallich ex Wight & Arn., Prod. Fl. Penin. Ind. Orient. 161. 1834; M. Lawson in Fl. Brit. India 1: 608. 1875.

Trees; branchlets glabrous, young branches slightly compressed. Leaves elliptic-oblong to subovate, 5-8 x 2.5-4 cm, crenate-serrate towards the apex, coriaceous, convex and bullate above; petioles short. Flowers in once or twice dichotomously branched, few-flowered cymes; peduncles stout. Sepals 5-lobed, imbricate. Petals 5, orbicular, entire. Stamens 5, very short; anthers opening transversely. Ovary sunk in the disc; styles very short; stigma blunt. Capsules turbinate, lobed at apex, 5-locular. Seeds solitary in each locule, exarillate.

Fl. & Fr. : Oct. - March.

Distrib. India : Western Ghats, up to 2700 m. Karnataka, Tamil Nadu and Kerala.

11. *Euonymus dichotomus* Heyne ex Wallich in Roxb., Fl. Ind. 2: 410. 1824; M. Lawson in Fl. Brit. India 1: 609. 1875.

Tam.: *Vini*.

Small trees; branchlets terete, very slender, tender portions quadrangular. Leaves oblong-lanceolate to ovate-lanceolate, 4-6 x 2-3 mm, apex acuminate, coriaceous, thin, base tapering, entire or crenate, wavy; petioles channelled. Inflorescence more than 7-flowered cymes. Sepals 5-lobed. Petals 5, orbicular, entire, flat, greenish. Stamens 5, inserted on the margins of the disc. Ovary sunk on the disc; stigma blunt. Disc lobed. Capsules clavate, 1.5 cm long, tapering downwards. Seeds oblong, brownish, glabrous, enclosed in fleshy aril.

Fl. & Fr. : March - Nov.

Distrib. India : Western Ghats, up to 1500 m. Karnataka, Tamil Nadu and Kerala.

Sri Lanka.

Note. Used for wood work, especially in engraving.

12. *Euonymus echinatus* Wallich ex Roxb., Fl. Ind. 2: 410. 1824; M. Lawson in Fl. Brit. India 1: 611. 1875.

Shrubs; branchlets tetragonal, smooth, climbing by means of adventitious rootlets. Leaves oblong-lanceolate, 2.5-8 x 1.5-3.5 cm, apex acuminate, tapering towards base, coriaceous, crenate or obtusely serrate; nerves 6-8, arched. Flowers in axillary cymes; peduncles filiform. Sepals 4, flat, laciniate, rounded, concave, recurved. Petals 4, orbicular, 7-8 mm across, crenulate, faintly veined. Stamens 4, erect, slightly shorter than the petals. Ovary half sunk into the disc; styles short; stigma truncate. Fruits capsular, globose, up to 2.5 cm across, covered with prickles. Seeds oblong, black, covered with arils.

Fl. & Fr. : March - Jan.

Distrib. India : Temperate Himalaya, 1700-3300 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, West Bengal, Sikkim, Arunachal Pradesh, Meghalaya and Assam.

Nepal and Bhutan.

13. *Euonymus fimbriatus* Wallich ex Roxb., Fl. Ind. 2: 408. 1824; M. Lawson in Fl. Brit. India 1: 611. 1875.

Trees; branchlets terete, slender, compressed when young. Leaves ovate, 3.5-8 x 1.4 cm, apex acuminate, membranous, serrulate or sharply denticulate; stipules present. Flowers 4-merous, in umbellate fascicles, on 5-8 cm long peduncles. Petals broadly ovate, 2 mm long, entire. Stamens 4; anthers on short filaments. Ovary sunk in the disc. Capsules turbinate, depressed, furnished with 2-5, lanceolate, longitudinally spreading wings. Seeds ovoid, enclosed within reddish aril.

KEY TO THE VARIETIES

- | | |
|--|-------------------------------------|
| 1a. Leaf margin irregularly biserrate or fringed | 13.1. var. <i>fimbriatus</i> |
| b. Leaf margin uniformly serrate or fringed | 13.2. var. <i>serratus</i> |

13.1 var. fimbriatus

Fl. & Fr. : May - Oct.

Distrib. India : Himalayas, temperate to alpine region, 2000-4000 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh and Sikkim.

Afghanistan, Pakistan and China.

13.2. var serratus Blakelock in Kew Bull. 1951. 279. 1951.

Fl. & Fr. : June.

Distrib. India : Temperate western Himalaya, 2500-2800 m. Jammu & Kashmir and Himachal Pradesh.

14. *Euonymus frigidus* Wallich ex Roxb., Fl. Ind. 2: 409. 1824; M. Lawson in Fl. Brit. India 1: 611. 1875.

Shrubs; sometimes climbing by adventitious roots; branches 4-angled, brownish, lenticellate. Leaves linear-lanceolate, 6-30 x 1-3 cm, apex acuminate, thin, glabrous, tapering at base, serrated; petioles 2-3 mm long; nerves 8-12 pairs, distinct beneath, arcuate, reticulate. Inflorescence few-flowered, axillary or extra axillary cymes; peduncles slender, filiform, 2.5-4 cm long, dichotomously branched. Flowers 4-merous, 3-4 mm across. Sepals suborbicular. Petals orbicular, entire. Ovary sunk in the disc; styles very short. Capsules ovate-rounded, 4-winged at base; wings narrow, triangular, membranous.

KEY TO THE VARIETIES

- | | |
|--|----------------------------|
| 1a. Leaves ca 30 cm long, distantly serrate | 14.1. var elongatus |
| b. Leaves 6-12.5 cm long, sharply serrate | 2 |
| 2a. Flowers very small; nerves distinct beneath | 14.2. var. frigidus |
| b. Flowers ca 10-12 mm across; nerves prominent on both surfaces | 14.3 var. wardtii |

14.1. var. elongatus Cowan & Cowan, Trees of North Bengal 35. 1929.

Fl. & Fr. : April - Nov.

Distrib. India : Temperate to alpine Eastern Himalaya, 2700-4000 m. West Bengal, Sikkim, Arunachal Pradesh and Manipur.

Nepal and Bhutan.

14.2. var. frigidus

Fl. & Fr. : Oct.

Distrib. India : Temperate to alpine Himalaya, Kumaon eastwards between 1400-4000 m. Uttar Pradesh, West Bengal, Sikkim, Arunachal Pradesh and Meghalaya.

Bhutan and Myanmar.

14.3. var. wardtii (W. Smith) Blakelock in Kew Bull. 1948. 237. 1948. *Euonymus wardtii* W. Smith in Notes Roy. Bot. Gard. Edinb 10: 37. 1917.

Fl. & Fr. : May.

Distrib. India : Temperate region, 3000-3400 m. Arunachal Pradesh.

Myanmar and China (Yunnan).

15. *Euonymus glaber* Roxb., Fl. Ind. 2: 403. 1824; M. Lawson in Fl. Brit. India 1: 609. 1875.

Small trees; branchlets terete. Leaves elliptic to elliptic-oblong, 7-8 x 3-4.5 cm, apex acute, cuneate at base, glabrous, shiny, dentate or crenate in upper half; nerves 5-6 pairs, arched; petioles 5-7 mm long. Flowers usually in axillary cymes; bracts ovate, minute, ciliate. Sepals 5, lobes unequal. Petals 5, suborbicular, sometimes broadly ovate, 2-3 x 2-3 mm, margins minutely denticulate. Stamens 5, inserted near the margin of the disc; filaments short; anthers triangular. Ovary sunk in the disc. Disc orbicular. Capsules 5-lobed, depressed-globose, 8-12 x 12-17 mm, concave at apex, narrowed towards base. Seed 1 in each locule.

Fl. & Fr. : May.

Distrib. India : On hill slopes at ca 700 m. West Bengal, Assam, Arunachal Pradesh, Nagaland, Manipur, Mizoram and Orissa.

Bangladesh, Thailand and Malay Peninsula.

16. *Euonymus grandiflorus* Wallich ex Roxb., Fl. Ind. 2: 404. 1824; M. Lawson in Fl. Brit. India 1: 608. 1875.

Kh.: *Dieng-sit-um*, *Jaminrei-dykhari*, *Si-sen*, *Schiongtrong-kynthei*; Nep.: *Goldari*.

Small trees; branchlets terete, greyish. Leaves obovate - oblong or elliptic, 3.5-11.5 x 2-4 cm, apex acute, glabrous, subcoriaceous, serrate; petioles 5-6 cm long; nerves conspicuous, veins reticulate. Flowers 2.5 cm across, 4-merous, in 3, rarely 5-flowered cymes; peduncles flattened, slender, 2-5 cm long. Sepals rounded. Petals, orbicular, margins crispate. Filaments borne on the fleshy disc. Ovary ovate, semi-immersed in the disc; styles short; stigmas obtuse. Capsules globose, 8-12 mm, globose, four cornered, glabrous. Seeds black, shiny, covered with scarlet arils.

Fl. & Fr. : April - Oct.

Distrib. India : Temperate Himalaya, 1000-2000 m. Uttar Pradesh, West Bengal, Assam and Meghalaya.

Nepal, Bhutan, Myanmar and China.

17. *Euonymus griffithii* Kurz in J. As. Soc. Bengal 41: 73. 1872; Chowdhery *et al.*, in Hajra *et al.*, Mat. Fl. Arunachal Pradesh 1: 297. 1996.

Scandent shrubs; branches smooth, 4-angled or winged. Leaves oblong-lanceolate or oblong, 7-10 x 2.5-4 cm, acuminate, base obtuse, margin entire or obscurely serrate, glabrous, chartaceous, sessile or subsessile. Inflorescence axillary dichotomous cymes, shorter than the leaves. Flowers 4-merous. Petals 2 mm long, white, orbicular, entire.

Fl. & Fr. : March - April.

Distrib. India : Arunachal Pradesh.

Myanmar.

18. *Euonymus hamiltonianus* Wallich in Roxb., Fl. Ind. 2: 403. 1824; M. Lawson in Fl. Brit. India 1: 612. 1875.

Guj.: *Ghhui-shakki*; Kh.: *Dien-Son-Set-khia*, *Jaminreidkhar*.

Trees; branchlets terete, glabrous, greyish. Leaves lanceolate to elliptic-oblong, 5-15 x 2.5-6 cm, acuminate, serrulate; nerves 6-12 pairs, prominent, arcuate; petioles 2 cm long. Flowers 4-merous, in dichotomous cymes; bracts minute, caducous. Sepals 2-3 mm long, outer pair smaller, inner subpetaloid, reflexed. Petals lanceolate or cordate-oblong, ca 4 mm long, margins revolute. Stamens as long as the petals. Ovary 4-lobed, superior; styles prominent; stigmas obtuse. Fruits capsular, 8 mm long, turbinate, deeply 3-4-lobed. Seeds enclosed in scarlet aril.

Fl. & Fr. : May - Oct.

Distrib. India: Temperate Himalaya, 1700-2000 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Arunachal Pradesh, Assam, Nagaland, Manipur and Meghalaya.

Afghanistan, Pakistan, China and Japan.

Note. Wood is used for making spoons; branches are lopped for fodder.

19. *Euonymus indicus* Wallich ex Heyne in Roxb., Fl. Ind. 2: 409. 1824; M. Lawson in Fl. Brit. India 1: 608. 1875. **Fig. 19.**

Kan.: *Khanparchi*; Tam.: *Vini*.

Small trees; branchlets terete, slightly quadrangular at tip. Leaves lanceolate to ovate-lanceolate, 6-10 x 3-3.5 cm, acute to sometimes acuminate, base attenuate, glabrous, shining, entire, sometimes obscurely serrulate towards apex; nerves conspicuous; stipules linear-subulate, caducous. Flowers 5-merous, in umbellate cymes, on axillary, usually solitary peduncles. Sepals fleshy, glabrous,

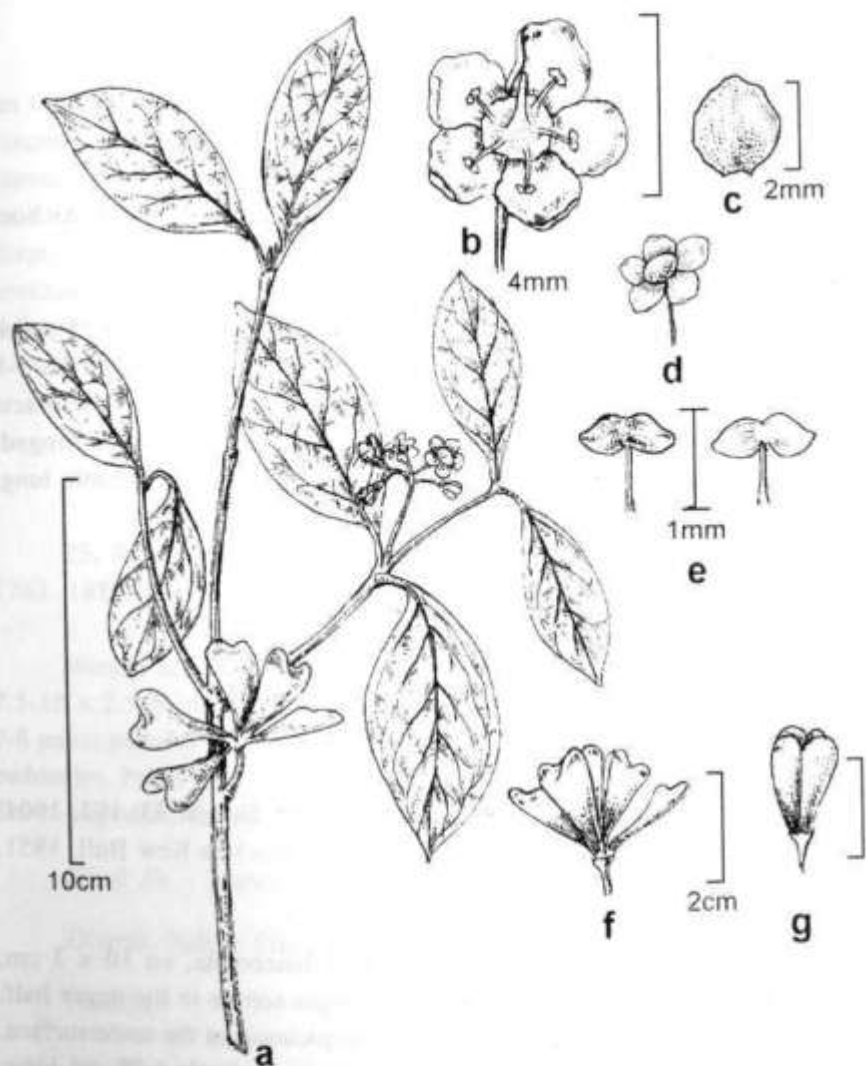


Fig. 19. *Euonymus indicus* Wallich ex Heyne : a. Habit; b. A flower; c. A petal; d. Sepals and torus; e. Stamens; f. A fruit; g. Dehiscent fruit.

entire, persistent. Petals orbicular-oblong, fringed at apex. Stamens inserted on the disc near the margins; filaments short, flattened. Ovary sunken in the disc. Disc lobed, fleshy. Fruits capsular, obovoid-clavate, 2-2.5 cm long, retuse at apex, wings projected.

Fl. & Fr. : Throughout the year.

Distrib. India : Western Ghats as well as in Peninsula, at ca 1000 m. Maharashtra, Karnataka, Tamil Nadu, Kerala and Andaman Islands.

20. *Euonymus javanicus* Blume, Bijdr. 1146. 1827; Kurz in J. As Soc. Bengal 45: 123. 1876; Ding Hou in Fl. Males. 1, 6: 248. 1962.

Trees, up to 20 m tall. Leaves elliptic or elliptic-oblong 10-15 x 5-8 cm, acute or acuminate, base acute or rounded, margin entire; nerves 5-8 pairs; petiole 5-10 mm. Flowers in fascicles, on 1-2 cm long pedicels; bracts oblong, 1 mm long, fringed. Sepals obtusely ovate, 2-3 x 1-3 mm, fringed. Petals greenish-yellow, obovate, 4-5 x 3-5 mm, fringed. Stamens 2 mm long. Fruits clavate or obovoid, 1.5-2.5 cm long, smooth.

Fl. & Fr. : Sept. - April.

Distrib. India : Andaman & Nicobar Islands.

Myanmar, Thailand, Vietnam and Malesia.

21. *Euonymus kachinensis* Prain in J. As. Soc. Bengal 73: 193. 1904; Burkill in Rec. Bot. Surv. India 10: 259. 1924; Blakelock in Kew Bull. 1951. 252. 1951.

Shrubs; branches glabrous, terete. Leaves lanceolate, ca 10 x 3 cm, acuminate, tapering below to a cuneate base, margin serrate in the upper half, entire below, membranous; nerves 8-9 pairs, conspicuous on the undersurface. Peduncles 3-4 cm long, slender. Flowers 4-merous; pedicels 1.25 cm long. Capsules pyriform, deeply 4-lobed, 15-20 cm long, with persistent calyx at base.

Distrib. India : Arunachal Pradesh.

Myanmar.

22. **Euonymus lawsonii** C.B. Clarke ex Prain in J. As. Soc. Bengal 73: 195. 1904; Kanjilal *et al.*, Fl. Assam 1: 263. 1936.

Kh. : *Soh-dadin*.

Small trees; branchlets terete, slender. Leaves elliptic, elliptic-oblong to lanceolate, 5-15 x 2.5-4 cm, acuminate, base cuneate, membranous, serrate; nerves 5-10 pairs, conspicuous. Inflorescence 1-7-flowered, 1-8 cm long, cymes on dichotomously branched, lax peduncles. Flowers 4-merous, 8-11 mm in diam. Sepals broad, obtuse or rounded, concave, entire. Petals, orbicular, revolute at tip, finely veined. Fruits capsular, 6-10 mm long, 4-lobed; lobes compressed. Seeds with orange arils.

Fl. & Fr. : Jan. - Dec.

Distrib. India : 1300-1700 m. Arunachal Pradesh, Assam and Meghalaya.

23. **Euonymus macrocarpus** Gamble ex Oliver in Hook., Icon. Pl. 18: 1763. 1888; Blakelock in Kew Bull. 1951: 252. 1951.

Woody, scandent shrubs; branchlets terete, glabrous. Leaves ovate-oblong, 7.5-10 x 2.5-4 cm, acuminate or obtuse, coriaceous, margins serrate; nerves 7-8 pairs; petioles 1-1.5 cm long. Inflorescence axillary cymes, on 1-3-flowered peduncles. Petals rounded, denticulate. Ovary sunk in the disc. Disc cup shaped. Fruits capsular, 4 x 2.5 cm, 3-5-valved.

Fl. & Fr. : March.

Distrib. India : Sikkim.

Bhutan.

24. **Euonymus paniculatus** Wight ex M. Lawson in Fl. Brit. India 1: 609. 1875.

Shrubs; branchlets terete. Leaves elliptic, up to 8.5 x 3.5 cm, acute, membranous, crenate-serrate. Inflorescence more than 7-flowered, dichotomous

cymes. Peduncles and pedicels slender. Flowers 5-merous. Sepals imbricate, lax, dichotomous. Petals orbicular, entire. Stamens alternate with petals, inserted on the disc; filaments short. Ovary sunk in the disc; style short, thick; stigmas 3-5-lobed. Ovules 2 in each locule. Disc large, fleshy, 4-5 lobed. Fruits capsular. Seeds arillate.

Distrib. India : Tamil Nadu.

25. *Euonymus pendulus* Wallich in Roxb., Fl. Ind. 2: 406. 1824; M. Lawson in Fl. Brit. India 1: 612. 1875.

Small trees; branchlets drooping; bark greyish. Leaves oblong-lanceolate, 5-10.5 x 2-6 cm, sharply serrate, pale below, upper surface shining, glabrous; petioles 2-3 cm long; stipules hairy. Flowers 5-merous, on stout, 1.3 - 6.5 cm long peduncles. Sepals obtuse, fimbriate. Petals, oblong, fimbriate, whitish. Stamens as long as petals; anthers ovate, short. Ovary partly sunk in the disc; styles short, filiform. Fruits capsular, 3-4-lobed, angles sharp, more or less winged. Seeds enclosed in a thin, reddish aril.

Fl. & Fr. : Apr. - Dec.

Distrib. India : Temperate to alpine Himalaya, 2000-3000 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh and N. Assam.

Pakistan, Nepal and Bangladesh.

Note. Wood is used for carving, also sometimes as fuel.

26. *Euonymus pygmeus* W. Smith in Notes Roy. Bot. Gard. Edinb. 10: 35. 1917; Blakelock in Kew Bull. 1948: 239. 1948.

Small shrubs; branchlets rooting below. Leaves elliptic-lanceolate or elliptic-oblong, 6-8 x 2-3 cm, obtuse, base cuneate, membranous, glabrous, margins serrate or serrulate; nerves 8-10 pairs, subconspicuous. Flowers in axillary cymes; peduncles 2-3 cm long. Sepals 5, rounded, 1 mm across. Petals 5, rounded, 3 mm across, whitish at margins. Fruits capsular, subglobose, verrucose, reticulate towards apex, 1-2-loculed. Seeds 6 mm across, flat, arillate; arils orange coloured.

Fl. & Fr. : June.

Distrib. India : Temperate to alpine regions, 3300-3700 m. Arunachal Pradesh.

China (Yunnan).

27. *Euonymus serratifolius* Beddome, For. Man. Bot. t. 64. 1874; M. Lawson in Fl. Brit. India 1: 609. 1875.

Small shrubs; branchlets terete. Leaves lanceolate, 8.5-10.5 x 2-4 cm, apex tapering to an obtuse point, glabrous, coriaceous, margin serrate; petioles 8 mm long. Inflorescence in 3-7-flowered, axillary dichotomous cymes. Flowers 5-merous. Sepals, orbicular, imbricate. Petals orbicular, crenulate, sometimes crispate. Stamens inserted on the disc. Fruits capsular, globose, 5-lobed. Seeds 1-2, arilate.

Fl. & Fr. : May.

Distrib. India : Western Ghats, 1000-1700 m. Tamil Nadu and Kerala.

28. *Euonymus theifolius* Wallich ex M. Lawson in Fl. Brit. India 1: 612. 1875.

Shrubs, sometimes trailing on trees with adventitious roots, rarely epiphytic; branchlets terete. Leaves lanceolate, oblong - elliptic or ovate, 5-12 x 2-5 cm, acuminate, base cuneate, entire or serrulate, glabrous, nerves 7-10 pairs, distinct on both sides, reticulate, arcuate; petioles 1 cm long, channelled. Flowers 4-merous, in dichotomously branched peduncled cymes; peduncles 6-15 mm long; pedicels 2-5 mm long. Sepals, rounded, broader than long. Petals orbicular, short clawed, entire. Stamens smaller than the petals. Ovary sunk in the disc; styles short. Fruits capsular, globose, about 8 mm across, obscurely angled or not. Seeds arilate; aril yellowish.

Fl. & Fr. : March - Dec.

Distrib. India : Temperate Himalaya, 1300-2600 m. Uttar Pradesh, West Bengal, Sikkim, Arunachal Pradesh, Assam, Nagaland, Manipur and Meghalaya.

Nepal.

29. *Euonymus tibeticus* W. Smith in Rec. Bot. Surv. India 4(5): 264. 1911; Blakelock in Kew Bull. 1951: 260. 1951.

Small trees; branches smooth, 4-angled. Leaves lanceolate, about 3 cm long and 7 mm wide, acute to subobtuse, base cuneate, margin obscurely crenate; petiole 3 mm long. Inflorescence 2-3-flowered; peduncles stout, 1-1.5 cm long. Flowers 4-merous, 7 mm wide; pedicels 5-6 mm long. Calyx lobes ovate, 2 mm long, obtuse. Petals suborbicular, 2 mm long, entire crenulate, whitish green. Capsules globose.

Distrib. Temperate to alpine E. Himalaya. Sikkim.

South East Tibet.

30. *Euonymus tingens* Wallich in Roxb., Fl. Ind. 2: 406. 1824; M. Lawson in Fl. Brit. India 1: 610. 1875.

Hindi: *Kunghu*; Mar.: *Kunku*

Small trees; branchlets short, thick, marked with equidistant elevated lines, fresh shoots obscurely 4-cornered; scales of buds lanceolate, fimbriate. Leaves ovate to ovate-lanceolate, 2-7 x 2-3 cm, acute, base cuneate, rugose, dark green above, pale beneath, obtusely serrate; petiole short; stipules subulate, fimbriate. Flowers 5-merous, in 3-7-flowered, dichotomously branched, condensed cymes; bracts linear-lanceolate, fimbriate. Sepals ovate, obtuse, ciliate. Petals ovate, clawed. Stamens, shorter than petals. Ovary sunk in the disc; styles subulate, as long as the stamens. Fruits capsular, globose, 3-5-angled. Seeds oblong, arils cup shaped.

Fl. & Fr. : March - Nov.

Distrib. India : Temperate Himalaya, 2000-3300 m. Himachal Pradesh, Uttar Pradesh, Sikkim, Assam, Arunachal Pradesh, Manipur and Meghalaya.

China.

Note. Bark is considered useful in diseases of the eye; aril and bark is used by the locals as cosmetic.

31. *Euonymus vagans* Wallich in Roxb., Fl. Ind. 2: 412. 1824; M. Lawson in Fl. Brit. India 1: 611. 1875.

Climbing shrubs, with numerous adventitious roots, branchlets quadrangular, glabrous. Leaves ovate, elliptic or oblong, 2.5-16.5 x 1.25-8 cm, acute or acuminate, base cuneate, subcoriaceous, glabrous, margins serrate; nerves 5-7 pairs; petiole 3-12 mm long. Inflorescence more than 7-flowered cymes, on 1-3 times branched peduncles; peduncles 7-15 mm long, branches *ca* 6 mm long. Flowers 4-merous. Sepals spreading, suborbicular. Petals orbicular, crenulate to entire. Filaments short; style short. Fruits capsular, globose, 8-10 mm wide, minutely verrucose, 2-4-lobed. Seeds arilate.

KEY TO SUBSPECIES

- | | |
|---|--------------------------------------|
| 1a. Leaves up to 6 cm long and 1-2.5 cm broad | 31.2 ssp. <i>vagans</i> |
| b. Leaves 7.7-16.5 cm long and 3-8 cm broad | 31.1 ssp. <i>macrophyllus</i> |

31.1 ssp. *macrophyllus* Kanjilal, Fl. Assam 1: 264. 1936; Blakelock in Kew Bull. 1951: 268. 1951.

Fl. & Fr. : Feb. - Dec.

Distrib. India : Assam.

31.2 ssp. *vagans*

Fl. & Fr. : March - April.

Distrib. India : Temperate Eastern Himalaya, *ca* 1700 m. West Bengal, Sikkim, Assam, Manipur and Meghalaya.

Nepal, S.E. Tibet and China.

32. *Euonymus viburnoides* Prain in J. As. Soc. Bengal 73: 194. 1904; Cowan & Cowan, Trees N. Bengal 35. 1929; Blakelock in Kew Bull. 1951: 252. 1951.

Shrubs; branchlets faintly quadrangular. Leaves oblong, 7.5-13 x 3-6 cm, acute, base rounded or cuneate, margins serrate; nerves 6 pairs. Inflorescence in axillary, cymes, many-flowered. Sepals 4, reniform, spreading. Petals 4, orbicular, minutely puberulous, larger than sepals. Fruits slightly 4-ribbed, depressed, 8-10 mm long.

Fl. & Fr. : March - Aug.

Distrib. India : West Bengal, Sikkim and Arunachal Pradesh.

DOUBTFUL SPECIES

Euonymus monbeigii W. Smith in Notes Roy. Bot. Gard. Endinb. 10: 34. 1917; Chowdhery & Wadhwa, Fl. Himachal Pradesh 1: 147. 1984.

It is a chinese species. There is a specimen in D.D. herbarium from Himachal Pradesh, which needs confirmation.

5. *Glyptopetalum* Thwaites

Shrubs or small trees. Leaves decussate or opposite, entire or crenulate; stipules caducous. Inflorescence simple or dichotomous cymes, axillary or extra axillary. Flowers bisexual, 4-merous. Calyx lobes spreading, outer pair smaller. Petals fleshy, smooth or with 2 small appendages or depressions inside. Disc fleshy, flat, 4-angular or cupular, enclosing the ovary and fused with it. Stamens 4, inserted on the disc; filaments very short; anthers divergent, connective thickened, dehiscent at the top. Ovary embedded in the disc, 4-loculed; style obscure; ovule 1 in each locule, pendulus. Fruits capsular; columella persistent; raphe branched, dehiscing loculicidally, 4 or 3-1-seeded, globose. Seeds arillate.

Sri Lanka, Thailand, Myanmar, Vietnam, China, Malesia; ca 20 species, 5 in India.

KEY TO THE SPECIES

- 1a. Cymes 5-7-flowered; capsules 1.5 cm across below; leaves serrulate or crenate at least at apex 2
- b. Cymes 3-flowered; capsules 1.5 cm across above; leaves entire 4
- 2a. Leaves 5-9 cm long, apex obtuse, margin entire or serrate just at apex 4. *G. lawsonii*

- | | |
|--|---------------------------|
| b. Leaves 10-15.5 cm long, apex acute or acuminate, margin serrate | 3 |
| 3a. Leaves membranous; peduncle 2.5-4 cm long | 5. <i>G. zeylanicum</i> |
| b. Leaves coriaceous; peduncle 1 cm long | 3. <i>G. griffithii</i> |
| 4a. Capsules obscurely 4-lobed | 1. <i>G. calocarpum</i> |
| b. Capsules not lobed | 2. <i>G. grandiflorum</i> |

1. *Glyptopetalum calocarpum* (Kurz) Prain in J. As. Soc. Bengal 60(2): 209. 1891; Parkinson, For. Fl. Andaman Isls. 127. 1923. *Euonymus calocarpus* Kurz in J. As. Soc. Bengal 299. 1872; M. Lawson in Fl. Brit. India 1: 609. 1875.

Small trees; branchlets terete, glabrous. Leaves oblong or oblong-lanceolate, 10-15 x 6.5-7.5 cm, acute to shortly acuminate, glabrous, coriaceous, entire; nerves 5-6 pairs; petioles 7-10 cm long. Flowers in axillary or extra axillary cymes, 4-merous, greenish white. Sepals lobed, inner pair longer than outer. Petals with 2 depressions on the inner side. Ovary immersed in the disc, 4-loculed. Ovules 1 in each locule, pendulous. Disc fleshy, lobed. Fruits capsular, globose. Seeds globose, arillate.

Fl. & Fr. : July - Dec.

Distrib. India : Along sea shores. Andaman & Nicobar Islands.

Myanmar.

2. *Glyptopetalum grandiflorum* Beddome, Ic. Pl. Ind. Orient. 21. t. 102. 1874; M. Lawson in Fl. Brit. India 1: 613. 1875.

Shrubs; branchlets terete, tender portions angular. Leaves elliptic-oblong, 10-15.5 x 5-6.5 cm, acute or acuminate, base cuneate or rounded, thinly coriaceous, entire, rarely obscurely serrate towards apex. Inflorescence in 3-flowered cymes; peduncles filiform, slender, 10-16 cm long. Flowers bisexual; pedicels 2.5 cm long, inserted with scale like bracts. Sepals 4-lobed. Petals 4, obovate, 8-10 mm long, yellow, pits inconspicuous or absent. Stamens 4, sessile. Ovary inserted in the disc. Disc more or less rounded. Fruits capsular, rounded, ca 2 cm across, pale, smooth, 4-seeded. Seeds ovate, 1.5 cm across, arillate.

Fl. & Fr. : April.

Distrib. India : In forests, at 600-1000 m. Karnataka, Tamil Nadu and Kerala.

3. *Glyptopetalum griffithii* Prain in J. As. Soc. Bengal 60: 209. 1891; Kanjilal *et al.*, Fl. Assam 1: 266. 1936.

Shrubs, *ca* 3 m tall; branchlets smooth. Leaves elliptic, elliptic-lanceolate to oblong-lanceolate, 9-15 x 3.5-6.8 cm, apex obtusely short acuminate, base cuneate or obtuse, margin serrulate, sometimes crenulate to entire near base, coriaceous, glabrous; nerves 6-8 pairs, conspicuous; petioles 5-10 cm long. Cymes axillary or extra axillary. Flowers with distinct pedicles. Calyx lobes orbicular, *ca* 2.5 mm wide, spreading, persistent. Petals bifoveolate on inner surface. Disc 4-lobed. Ovary embeded in the disc, 4-cornered; stigma and style obscure. Capsule rounded, 8-15 mm in diam., outer surface somewhat grooved.

Fl. & Fr. : Dec.

Distrib. India : Arunachal Pradesh.

4. *Glyptopetalum lawsonii* Gamble in Kew Bull. 1916: 131. 1916. *et* Fl. Pres. Madras 1: 204. 1918; Ramamurthy in Fl. Tamil Nadu 1: 73. 1983.

Fig. 20.

Tam.: *Kodikkuramthu*.

Shrubs or small trees; branchlets terete, young shoots flattened. Leaves elliptic-obovate, 5-9 x 3-6 cm, obtuse, base cuneate, coriaceous, entire or with a few teeth at apex; nerves 7-9 pairs, distinct. Cymes axillary or supra-axillary, 6-7-flowered. Flowers bisexual. Sepals 4-lobed, short, scarious at apex. Petals 4, ovate, 3 mm long, obtuse, 2 oblique pits towards apex. Stamens 4; filaments short, thick. Ovary immersed in the disc; styles short. Fruits capsular, subglobose, 1-1.6 cm across. Seeds subglobose, 10 x 5 mm, covered with fleshy aril.

Fl. & Fr. : Almost throughout the year.

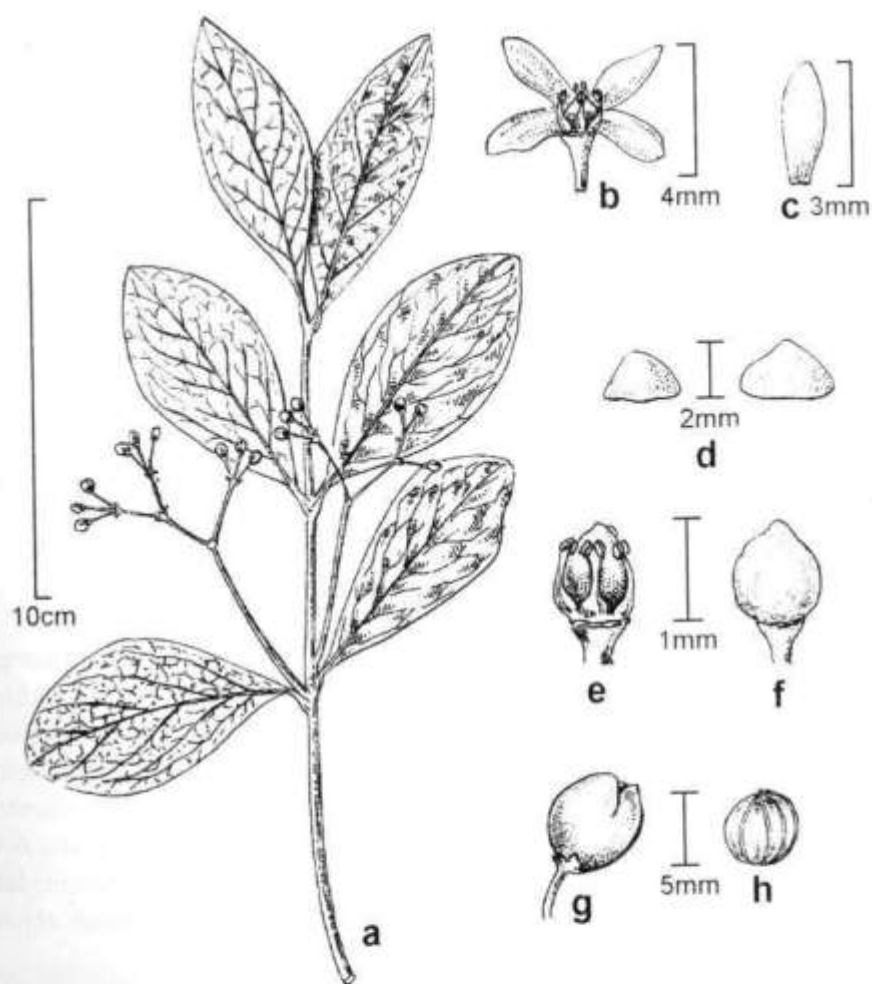


Fig. 20. *Glyptopetalum lawsonii* Gamble : a. Habit; b. A flower; c. A petal; d. Sepals; e. Arrangement of stamens; f. Gynoecium; g. A fruit; h. Seed.

Distrib. India : Tamil Nadu.

5. *Glyptopetalum zeylanicum* Thwaites in Hook., Kew J. Bot. 8: 267. t. 7. B. 1856; M. Lawson in Fl. Brit. India 1: 612. 1875.

Shrubs or small trees, 10-13 m tall; branchlets terete, tip portion flattened. Leaves ovate-lanceolate, 10-15.5 x 3.5-6.5 cm, acute, base cuneate, membranous, margin serrate except at base; nerves inconspicuous; petioles 5 mm long, channelled. Flowers in axillary or supra-axillary cymes; peduncles 2.5-4 cm long; pedicels 10-12 mm long. Sepals 4-lobed, small. Petals 4, oblong, 5 mm long, yellow, pits near the apex. Stamens 4, inserted at the angles of the disc. Ovary immersed in the disc, 4-lobed; styles conical. Fruits capsular, rounded, 1-4 seeded. Seeds 1 cm across, partially covered by reddish arils.

Fl. & Fr. : July - Aug.

Distrib. India : Western Ghats, between 650 - 1000 m. Karnataka, Tamil Nadu and Kerala.

Sri Lanka.

6. *Kokoona* Thwaites

Evergreen trees, often buttressed, with yellow or grey bark; twigs flattened at nodes. Leaves decussate, entire or crenate, petiolate, with small, filiform or linear stipules. Flowers in axillary panicles or racemes, bisexual, 5-merous. Sepals lobed. Petals contorted, slightly concave, sometimes punctate. Disc fleshy, cupular, subentire. Stamens inserted inside the inner edge of the disc; filaments fusiform; anthers with conspicuous connective. Ovary 3-locular; ovules 6-16 in each locule in two series. Fruits capsular, bluntly 3-angular, loculicidally dehiscent, 3-valved. Seeds 6-10 in each locule, winged; wings very broad, oblong-truncate.

Mayanmar, Sri Lanka, Malesia; 8 species, 2 in India.

KEY TO THE SPECIES

- | | |
|--|-------------------------|
| 1a. Leaves entire, apex acuminate | 1. <i>K. littoralis</i> |
| b. Leaves serrate, apex rounded, oblong or acute | 2. <i>K. zeylanica</i> |

1. Kokoona littoralis M. Lawson in Fl. Brit. India 1: 617. 1875

Trees. Leaves elliptic, ovate or lanceolate, 4.5-15.5 x 1.5-7 cm, acuminate, base cuneate, chartaceous to coriaceous, margins entire or slightly recurved; nerves 5-8 pairs; petioles up to 3 cm. Flowers in axillary racemes. Bracteoles deltoid, small, acute, denticulate. Sepals 5-lobed, slightly denticulate. Petals broadly ovate, elliptic. Stamens filamentous; anthers with prominent connective. Ovary triangular; ovules 8-10 in each locule. Fruits capsular, 13-18 x 3-6 cm, loculicidally dehiscent, 3-valved. Seeds 6-10 in each locule, winged.

Fl. & Fr. : Sept. - Jan.

Distrib. India : Meghalaya and Maharashtra.

Sumatra, Malay Peninsula and Borneo.

Note. Wood is considered to be one of the best for chests.

2. Kokoona zeylanica Thwaites in Hook., Kew J. Bot. 5: 380. t. 6. 1853; M. Lawson in Fl. Brit. India 1: 616. 1875.

Trees. Leaves variable, lanceolate, elliptic or obovate, generally 6-10 cm long, apex rounded to pointed, margin crenate to serrate, coriaceous, on drying dark olive green above, grey beneath; petiole *ca* 1 cm long. Calyx lobes semi-orbicular or reniform. Petals broadly ovate, orange-brown, punctate, coriaceous. Capsule oblong, 3-10 cm long, obtusely trigonous.

Distrib. India : Tamil Nadu.

Sri Lanka.

Uses : Bark contain oil which is used in burning lamps, as it catches fire easily.

7. Lophopetalum Wight & Arn.

Evergreen trees. Leaves decussate or opposite, margins entire; stipules caducous. Flowers in axillary or terminal panicles, bisexual, 5-merous. Sepals

dish-shaped. Petals imbricate, inner surface covered with appendages. Disc fleshy, flat, 5-lobed. Stamens inserted on the disc, filaments filiform. Ovary partly immersed in the disc; 3-loculed; ovules arranged in two series. Fruit a capsule, oblong, 3-lobed, loculicidally dehiscent. Seeds oblong, flat, winged.

Myanmar, Thailand, Vietnam, Malesia; 18 species, 2 in India.

KEY TO THE SPECIES

- | | |
|--|-------------------------|
| 1a. Flowers 10-13 mm across; disc smooth | 2. <i>L. wightianum</i> |
| b. Flowers 6-7 mm across; disc with fleshy processes | 1. <i>L. wallichii</i> |

1. *Lophopetalum wallichii* Kurz in J. As. Soc. Bengal 41: 299. 1872; M. Lawson in Fl. Brit. India 1: 615. 1875.

Trees, 16-23 m tall; branchlets glabrous. Leaves ovate-oblong to elliptic-oblong, 15-20 x 7.5-9 cm, acute, obtuse or rounded at apex, rounded at base, margin entire, coriaceous, glaucous green, glossy above, opaque beneath, on drying brown to reddish brown; petiole 2-3.5 mm long. Panicles axillary and terminal, ca 15 cm long, glabrous. Flowers 5-merous 6-7 mm across; pedicels 3-4.5 mm long. Calyx lobes spreading, semi-orbicular. Petals ovate, 2 mm long, whitish-green with small processes inside. Disc yellow, 5-cornered, covered with fleshy, subulate processes. Ovary red or brown. Fruit 10 x 5 cm. Seeds flat, oblong, 5-6.5 cm long, including the wing, completely surrounded by the membranous wing.

Fl. & Fr. : Jan. - April.

Distrib. India : Andaman Islands. Rare.

Myanmar.

2. *Lophopetalum wightianum* Arn. in Ann. Nat. Hist. 3: 151. 1839; M. Lawson in Fl. Brit. India 1: 615. 1875. *L. fimbriatum* Wight, Ic. 31: t 178. 1840; M. Lawson in Fl. Brit. India 1: 615. 1875. Fig. 21.

Asm.: *Sutrong*; Kan.: *Balpale*; Kh.: *Dien-ji-rem*; Mal.: *Venkotta*; Tam.: *Venkottai*.

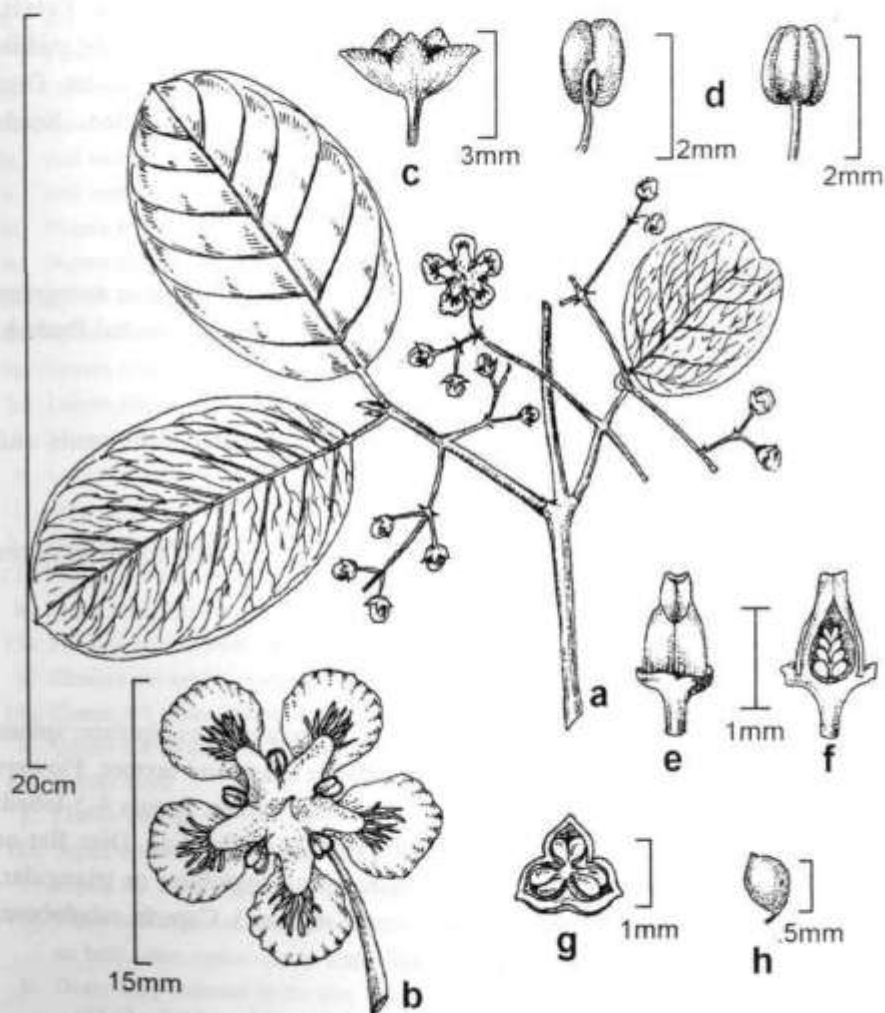


Fig. 21. *Lophopetalum wightianum* Arn. : a. Habit; b. A flower; c. Calyx; d. Stamens; e. Ovary; f. The same in l.s.; g. Fruit in T.S. h. Seed.

Tall trees, attaining a height up to 30 m, sometimes with buttresses; bark grey and fissured outside, orange-brown inside; branchlets terete. Leaves elliptic to elliptic-oblong or ovate to ovate-oblong, rarely obovate, 8-25 x 4-10 cm apex acute or acuminate, base rounded or subacute, subcoriaceous, entire, nerves 6-12 pairs; petiole 1.5-2.5 cm. Panicles axillary, up to 10 cm long. Flowers bisexual. Sepals 5-lobed, triangular, acute, short ciliate. Petals, suborbicular, 3-4 x 3-4 mm, with fimbriate crest. Stamens inserted on the middle of the disc lobes. Ovary gradually narrowed into a short conical styles. Disc 5-lobed; lobes epipetalous. Fruits capsular, 10-15 cm long, 3-angled. Seeds oblong, 6 x 1.5 cm (including the wing), compressed.

Fl. & Fr. : March - May.

Distrib. India : Along river banks, ascending up to 900 m in evergreen forests in Western Ghats and Khasia Hills. Assam, Meghalaya, Arunachal Pradesh, Karnataka, Tamil Nadu and Kerala.

Bangladesh, Myanmar, Cochinchina, Sumatra, Malay Peninsula and Borneo.

Note. Wood is used for carpentry work; considered best for making tea chests.

8. *Maytenus* Molina

Small trees or shrubs; branchlets glabrous; stipulate or exstipulate; spines present or not. Leaves spiral or alternate, variable in shape and texture. Flowers bisexual, rarely unisexual, in axillary or extra-axillary cymes. Sepals 4-5-lobed. Petals 4-5, reflexed. Stamens inserted on the margin of the disc. Disc flat or cupular. Ovary immersed in the disc, emerging part subglobose or triangular, 3-loculed, rarely 2-loculed; ovules 2 in each locule; stigmas 3. Capsule subglobose, loculicidal, 2-6-seeded. Seeds ellipsoid, arillate.

Tropics and subtropics of the world; *ca* 60 species, 18 in India.

KEY TO THE SPECIES

- | | |
|---------------------|----|
| 1a. Branches armed | 2 |
| b. Branches unarmed | 13 |

- | | |
|--|----------------------------|
| 2a. Spines bearing leaves and flowers | 3 |
| b. Spines not bearing leaves and flowers | 5 |
| 3a. Fruits globose; ovary 2-loculed; branchlets not zig zag | 14. <i>M. senegalensis</i> |
| b. Fruits turbinate; ovary 3-loculed; branchlets zig zag | 4 |
| 4a. Aril attached to the base of the seed; leaves crenate; inflorescence 2.5 cm long | 18. <i>M. wallichii</i> |
| b. Aril embracing the seed base; leaves entire; inflorescence 1 cm long | 3. <i>M. emarginata</i> |
| 5a. Flowers in cymes only | 6 |
| b. Flowers in cymes or in fascicles | 12 |
| 6a. Aril embracing about half of the seed | 7 |
| b. Aril embracing the seed base only | 8 |
| 7a. Stigma trilobed; aril thick | 6. <i>M. heyneana</i> |
| b. Stigma simple; aril thin | 4. <i>M. falconeri</i> |
| 8a. Cymes longer than the leaves | 1. <i>M. bailadillana</i> |
| b. Cymes shorter than the leaves | 9 |
| 9a. Leaves ovate-obovate | 10 |
| b. Leaves oblong-lanceolate | 11 |
| 10a. Leaves membranous, obscurely crenate | 5. <i>M. gibsonii</i> |
| b. Leaves coriaceous, serrate | 12. <i>M. royleanus</i> |
| 11a. Inflorescence reddish | 13. <i>M. rufa</i> |
| b. Inflorescence yellowish green | 7. <i>M. hookeri</i> |
| 12a. Fruits obovoid, 6-seeded | 9. <i>M. ovatus</i> |
| b. Fruits broadly-obovate, 2-seeded | 17. <i>M. thomsonii</i> |
| 13a. Flowers arising from the old leaf-scars. | 15. <i>M. sikkimensis</i> |
| b. Flowers not arising from the old leaf-scars | 14 |
| 14a. Cymes 2-3 times forked; leaves narrowly lanceolate | 16. <i>M. simonsii</i> |
| b. Cymes not forked; leaves obovate or ovate | 15 |
| 15a. Leaves ovate | 16 |
| b. Leaves obovate | 17 |
| 16a. Sepals minutely ciliate; leaf margin serrate | 2. <i>M. championii</i> |
| b. Sepals not minutely ciliate; leaf margin entire | 8. <i>M. listeri</i> |
| 17a. Ovary half embedded in the disc; leaves coriaceous, glabrous on both sides; cymes sessile or nearly so | 11. <i>M. rothiana</i> |
| b. Ovary fully embedded in the disc; leaves membranous, pubescent on veins beneath; cymes on 2-5 cm long peduncles | 10. <i>M. puberula</i> |

1. *Maytenus bailadillana* (Narayan. & Mooney) Raju & Babu in Bull. Bot. Surv. India 10(3 & 4): 348. 1968. *Gymnosporia bailadillana* Narayan. & Mooney in J. Indian. Bot. Soc. 20: 4. 1941.

Shrubs or small trees; branches with axillary thorns. Leaves elliptic to elliptic-ovate, 5-9 x 2-2.5 cm, apex acuminate, base cuneate, glandular, margin crenulate, glaucous above, shining below; nerves up to 15 pairs, finely reticulate on both sides. Flowers in cymes; bracts and bracteoles ovate, minute, fimbriate at margins. Sepals 4, ovate, 1 mm long, ciliate at margins. Petals 5, oblong, 3 mm long, tip crenulate-serrulate, inserted below the disc. Ovary 3-loculed, sunk in the fleshy disc; styles 3-lobed; lobes bifid; stigmas simple, minute. Disc lobed. Filaments thick, 2 mm long. Capsule up to 7 x 10 mm, cuneate below, transversely striate, dehiscing loculicidally. Seeds 2 in each locule, ovoid, arillate.

Fl. & Fr. : Nov. - March.

Distrib. India : Madhya Pradesh, Orissa and Andhra Pradesh. Endemic.

2. *Maytenus championii* (Dunn) Raju & Babu in Bull. Bot. Surv. India 10(3 & 4): 348. 1968. *Gymnosporia championii* Dunn in Bull. Misc. Inform. Kew 1921: 308. 1921.

Robust shrubs. Leaves ovate, 5-6 x 3.5-4.5 cm, apex rounded, obtuse or acute, base truncate, thin, margin serrate; lateral nerves 10-14 pairs; petioles 3-4 mm long. Flowers in cymes. Sepals 5, minutely ciliate, 1 mm long. Petals 5, oblong, 3 mm long, obtuse. Stamens shorter than the petals, glabrous. Ovary winged, glabrous, 2 mm across; style short; stigmas 3, spreading. Disc conspicuous, glabrous. Capsule winged, flat, rugose, 3-valved, 5-6 mm long.

Fl. & Fr. : Feb.

Distrib. India : Uttar Pradesh and Manipur.

3. *Maytenus emarginata* (Willd.) Ding Hou in Fl. Males. I. 6(2): 241. 1962. *Celastrus emarginatus* Willd., Sp. Pl. 1. 2: 1128. 1798. *Gymnosporia emarginata* (Willd.) Thwaites, Enum. Pl. Zeyl. 409. 1864; M. Lawson in Fl. Brit. India 1: 621. 1875.

Beng.: *Vaichigachha*; Guj.: *Vikola*; Hindi: *Baikal*; Kan.: *Halumanike*; Sans.: *Babuphala*; Tam.: *Kattanji*; Tel.: *Danti*.

Shrubs with spines or unarmed. Leaves obovate - spatulate, 3.5-14.5 x 2-9 cm, apex rounded or emarginate, base attenuate, chartaceous to coriaceous, margin crenate to entire; petioles 2-12 mm long; nerves 5-6 pairs. Flowers in axillary fascicles; bracts deltoid, fimbriate. Sepals lobed. Petals oblong or ovate-oblong, 2-3 x 1 mm. Stamens 2-3 mm long, inserted beneath the margin of the disc. Ovary partially immersed, 3-loculed; stigmas 3, distinct. Disc fleshy, rounded. Fruits a capsule, obovoid, 10-12 x 8-9 mm. Seeds ellipsoid, 3 x 2 mm, arillate.

Fl. & Fr. : Almost throughout the year.

Distrib. India : In deciduous forests. Uttar Pradesh, Orissa, Andhra Pradesh and Tamil Nadu.

Sri Lanka, S.E. Asia to N. Queensland, Malay Peninsula, Celebes and New Guinea.

4. *Maytenus falconeri* (M. Lawson) M.A. Rau in Bull. Bot. Surv. India 10: 20. 1968. *Gymnosporia falconeri* M. Lawson in Fl. Brit. India 1: 620. 1875.

Shrubs or small trees, usually thorny. Leaves elliptic to elliptic-ovate, 5-9 x 2-5 cm, apex acuminate to acute, base cuneate, margin glandular-crenulate. Flowers in cymes. Sepals 5, broadly ovate, ciliate at margins. Petals 5, oblong. Stamens 5, inserted below the margin of the disc. Ovary 3-loculed, sunk in the disc; style 3-lobed; stigma simple. Fruit a capsule, up to 7-10 mm, 3-lobed, slightly depressed above the centre. Seeds 2 in each locule, ovoid, arillate.

KEY TO THE VARIETIES

- | | |
|--|------------------------------------|
| 1a. Leaves scabrous above, pubescent below; fruit 7-10 mm long | 4.1. var. <i>falconeri</i> |
| b. Leaves glabrous on both sides; fruit 9-14 mm long | 4.2. var. <i>kanjitalii</i> |

4.1. var. *falconeri*

Fl. & Fr. : March - Dec.

Distrib. India : Uttar Pradesh and Orissa.

4.2. var. **kanjilalii** (Raizada) M.A. Rau in Bull. Bot. Surv. India 10: 20. 1968. *Gymnosporia falconeri* var. *kanjilalii* Raizada in J. Bombay Nat. Hist. Soc. 54: 796. 1957.

Fl. & Fr. : April.

Distrib. Eastern Uttar Pradesh.

5. **Maytenus gibsonii** (Kurz) Naithani & Sas Biswas, Fl. Pl. India, Nepal & Bhutan 94: 1990. *Gymnosporia gibsonii* Kurz in J. As. Soc. Bengal 44: 202. 1875.

Shrubs; spines thick; branchlets somewhat zigzag, pubescent when young. Leaves obovate, 2.5-6.5 cm long, apiculate or obtuse, margin obscurely crenate, membranous, glabrous above, pubescent beneath brownish on drying; petiole 3-5 mm long. Cymes axillary, slightly shorter than the leaves, slender, dichotomously branched, puberulus or glabrescent, pedunculate. Capsules obpyriform, trigonous, 3-loculed, 3-valved.

Distrib. Maharashtra.

6. **Maytenus heyneana** (Roth) Raju & Babu in Bull. Bot. Surv. India 10(3 & 4): 348. 1968. *Celastrus heyneana* Roth in Roem. & Schultes, Syst. 5: 421. 1819 *p.p.* *Gymnosporia heyneana* Wight & Arn., Prodr. 159. 1834; M. Lawson in Fl. Brit. India 1: 620. 1875.

Tam.: *Nandunarai*.

Shrubs, with thorns. Leaves ovate-elliptic, 7.5-10.5 x 4.5-6 cm, apex obtuse, base tapering, margins crenate-serrate; nerves reticulate. Flowers in cymes. Sepals 5, margin ciliate. Petals broadly ovate, yellowish. Stamens 5, arising from in-between the petals below the margin of the disc. Ovary immersed in the disc; stigmas trilobed. Capsule obcordate, 12 mm long, 3-loculed, 6-seeded. Seeds covered with fleshy arils.

Fl. & Fr. : July - Feb.

Distrib. India : In deciduous forests. Andhra Pradesh, Tamil Nadu and Kerala.

7. **Maytenus hookeri** Loes. in Engl. & Prantl., Nat. Pflanzenfam. 20b: 140. 1942. *Gymnosporia acuminata* Hook.f. ex M. Lawson in Fl. Brit. India 1: 619. 1875.

Kh.: *Dien-Chandre*

Large shrubs or small trees, up to 10 m tall; branchlets angular, usually thorny. Leaves lanceolate to elliptic-lanceolate, 5-15.5 x 2.5-5.5 cm, apex acuminate, base cuneate, thin, glabrous, margin serrulate, nerves 6-9 pairs; petiole 8 mm long, channelled. Flowers in dichotomous cymes; peduncles 1-1.5 cm long; pedicels up to 3 mm long. Sepals 5-lobed, triangular. Petals 5, oblong-elliptic, larger than sepals. Stamens 5, arising from below the margins of the disc. Ovary sunk in the disc. Capsules obcordate, 8 x 6 mm. Seeds ellipsoid, black; arils fleshy, covering the lower half.

Fl. & Fr. : March - Aug.

Distrib. India : Occurring between 700-1600 m. West Bengal, Sikkim, Arunachal Pradesh, Assam, Mizoram, Meghalaya, Orissa, Andhra Pradesh and Tamil Nadu.

Myanmar and China.

8. **Maytenus listeri** (Prain) Raju & Babu in Bull. Bot. Surv. India 10 (3 & 4): 348. 1968. *Celastrus listeri* Prain in J. As. Soc. Bengal 73: 197. 1904.

Small trees; branches terete, smooth, dark-brown. Leaves ovate or obovate, ca 8 x 3.5 cm, apex rounded, abruptly acuminate, base widely cuneate, glabrous, subcoriaceous, margin entire. Flowers in axillary or terminal cymes. Fruits 3-loculed, 3 seeded, 1.25 cm across. Seeds 8 mm long.

Distrib. India : Arunachal Pradesh.

9. **Maytenus ovatus** (Wallich ex Wight & Arn.) Loes. in Engl. & Prantl., Nat. Pflanzenfam. 20b: 140. 1942. *Celastrus ovatus* Wallich ex Wight & Arn. in Prodr. 159. 1834. *Gymnosporia ovata* Wallich ex M. Lawson in Fl. Brit. India 1: 619. 1875.

Thorny shrubs. Leaves ovate-orbicular, 4.5-8 x 3-4.5 cm, apex rounded, base subcordate or tapering, coriaceous, glabrous, margin crenate or serrulate. Flowers in cymes or fasciculate. Sepals 5, obovate, fimbriate at margin. Petals 5, broadly ovate, margin membranous, white. Stamens 5. Capsule obovoid, 3-loculed, up to 1.4 cm long, 6-seeded. Seeds obovate, 8-10 mm long.

Fl. & Fr. : June - March.

Distrib. India : Karnataka, Tamil Nadu and Kerala. Endemic.

10. *Maytenus puberula* (M. Lawson) Loes. in Engl. & Prantl., Nat. Pflanzenfam. 20b: 136. 1942. *Gymnosporia puberula* M. Lawson in Fl. Brit. India 1: 619. 1875. *Gymnosporia konkanensis* W.S. Talbot, For. Fl. Bombay 208. 1909.

Unarmed shrubs. Leaves obovate, 5-6.5 x 2.5-4 cm, apex shortly acuminate to acute, base tapering, margin serrate-crenate, membranous, glabrous above, hispid near nerves beneath; veins conspicuous, reticulated; petioles 8 mm long. Inflorescence a dichotomous cyme, axillary or at the end of the branchlets, 3-7 cm long; bracts lanceolate. Calyx deeply lobed; lobes suborbicular. Petals, obtuse, elliptic. Capsule obovoid, 1 cm long.

Fl. & Fr. : June - Sept.

Distrib. India : Uttar Pradesh, Maharashtra and Karnataka. Endemic.

11. *Maytenus rothiana* (Wight & Arn.) Bennett & Sahni in Indian For. 103(6): 387. 1977. *Gymnosporia rothiana* Wight & Arn., Prodr. 159. 1834; M. Lawson in Fl. Brit. India 1: 620. 1875.

Kan.: *Yenkli*.

Shrubs or small trees. Leaves elliptic or obovate, 7.5-11.5 x 4.5-6.5 cm, apex acuminate or rounded, base cuneate, margin crenulate, glabrous, shining, nerves prominent above; petiole 1.25 cm long, stout. Flowers in short peduncled or sessile cymes or fascicled on the tubercled branchlets. Calyx deeply lobed; lobes broadly obovate or triangular, membranous, ciliate at margin. Petals ovate-oblong, 3 mm long, obtuse, margin entire or faintly denticulate. Stamens,

shorter than petals, inserted below the margins of the disc; filaments flat. Ovary half sunk in the disc; style short, stout; stigmas 3, spreading. Disc fleshy, lobed. Capsule obovoid, 12 cm long, 3-lobed, 3-loculed, 6-seeded. Seeds ellipsoid, 7 mm long; aril, covering the seed at the base.

Fl. & Fr. : Apr. - Sept.

Distrib. India : 500-1500 m. Uttar Pradesh, Madhya Pradesh, Maharashtra and Karnataka. Endemic.

12. *Maytenus royleanus* (Wallich ex M. Lawson) M.A. Rau in Bull. Bot. Surv. India 10. : 20 1968. *Gymnosporia royleana* Wallich ex M. Lawson in Fl. Brit. India 1: 620. 1875. *Celastrus spinosa* Royle, illust. Bot. Himal. 167. 1835.

Hindi : *Jaliddhar*; Tel.: *Danti*.

Shrubs; branches slightly zig-zag, spines present. Leaves ovate obovate, 2-4.5 x 0.5-2.5 cm, apex acute or obtuse, glabrous, coriaceous, margin serrate; petiole 3-4 mm long. Cymes, dichotomous, shorter than leaves. Sepals 4-5 lobed. Petals oblong-ovate, 3-4 mm long, white. Disc broad, lobed. Style shortly lobed; ovules 2 in each locule. Capsule obovoid or globose 5-10 cm long. Seeds 1-2 in each locule, base enclosed by aril.

Fl. & Fr. : Dec. - May.

Distrib. India : Plains to 1500 m. Jammu & Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh and Karnataka.

Afghanistan and Pakistan.

Note. Seeds are used for toothache; wood is used as a substitute for boxwood for carving and engraving.

13. *Maytenus rufa* (Wallich) Hara in J. Jap. Bot. 40: 327. 1965. *Celastrus rufa* Wallich in Roxb., Fl. Ind. 2: 397. 1824. *Gymnosporia rufa* (Wallich) M. Lawson in Fl. Brit. India 1: 620. 1875.

Trees or shrubs, often with spines. Leaves oblong-lanceolate to elliptic-lanceolate, 5-13 x 1-4 cm, apex acuminate, base narrowed, sub-coriaceous, glabrous, margin serrate; nerves 7-10 pairs. Cymes axillary or below the leaves; peduncles up to 2 cm long. Calyx 5-toothed, triangular. Petals suborbicular. Capsule turbinate, 8 mm in diameter, 1-3-loculed, each locule with one seed. Seeds black, arillate.

KEY TO THE VARIETIES

- | | |
|---|-----------------------------|
| 1a. Leaves elliptic or ovate-elliptic; cymes minutely pubescent | 13.1. var. latifolia |
| b. Leaves lanceolate; cymes glandular | 13.2. var. rufa |

13.1. var. latifolia Haines, Bot. Bihar & Orissa 1: 194. 1961 (Repr. ed.).

Fl. & Fr. : March - Dec.

Distrib. Bihar

13.2. var. rufa

Fl. & Fr. : April - June.

Distrib. India : Himalayas, N.E. Region and E. Ghats, between 650-1900 m. Himachal Pradesh, Uttar Pradesh, Assam, Manipur, Meghalaya, Orissa, Andhra Pradesh and Tamil Nadu.

Bhutan.

14. *Maytenus senegalensis* (Lam.) Exell in Bot. Soc. Brit. Ser. 2. 26: 233. 1952. *Celastrus senegalensis* Lam., Encycl. 1: 661. 1783. *Gymnosporia montana* (Roth) Benth., Fl. Austr. 1: 400. 1863; M. Lawson in Fl. Brit. India 1: 621. 1875. *Catha montana* G. Don, Gen. Syst. 2: 10. 1832.

Tall, armed shrubs; branches straight. Leaves obovate or obovate-oblong, 4-7 cm long, apex obtuse, tapering at the base, margin crenate; petioles 3-6 mm long. Inflorescence in repeatedly forked axillary cymes, 2-3 cm long. Flowers greenish white. Calyx lobes elliptic-oblong, obtuse, fimbriate at the margin. Petals oblong, 3 mm long. Disc fleshy, lobed. Capsule 2-loculed, 5 mm in diameter; aril covering half the seed.

Distrib. India : Throughout the drier parts, ascending up to 1200 m. Punjab, Uttar Pradesh, Bihar, Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu.

Pakistan, Afghanistan and C. Arica.

Note : Decoction of stem is used in Africa for colic pain, dysentery and diarrhoea among children.

15. *Maytenus sikkimensis* (Prain) Raju & Babu in Bull. Bot. Surv. India 10(3 & 4): 348. 1968. *Gymnosporia sikkimensis* Prain in J. As. Soc. Bengal 13: 198. 1905; Cowan & Cowan, Trees N. Bengal 36. 1929.

Small trees; branchlets stout, glabrous, unarmed. Leaves 12-14.5 x 5.5-7.5 cm. Flowers in cymes, arising from old leaf scars; peduncles *ca* 4.5 cm long. Calyx lobes short, obtuse, concave, puberulous. Petals, oblong, obtuse, thrice as long as sepals. Stamens 5, incurved, arising from the margins of the disc; filaments slender. Style short; stigma recurved. Disc thick, corrugated. Capsule turbinate, up to 15 x 0.7 cm, 3-loculed.

Fl. & Fr. : Jan.

Distrib. India : Northern West Bengal and Sikkim. Endemic.

16. *Maytenus simonsii* Raju & Babu in Bull. Bot. Surv. India 10: 348. 1968. *Gymnosporia salicifolia* M. Lawson in Fl. Brit. India 1: 619. 1875.

Shrubs; branches slender, erect, unarmed. Leaves narrowly lanceolate, 7.5-10 x 1-2.5 cm, glabrous, serrate; lateral nerves 12-15 pairs, not distinct; petiole 5 mm long. Cymes dichotomously branched, axillary, 2.5-6.5 cm long. Petals 2-3 mm long, light pink, concave, ovate.

Fl. : March - May.

Distrib. India : Assam and Meghalaya. Endemic.

17. *Maytenus thomsonii* (Kurz) Raju & Babu in Bull. Bot. Surv. India 10: 349. 1968. *Gymnosporia thomsonii* Kurz in J. As. Soc. Bengal 45: 204.

1875; Cowan & Cowan, Trees N. Bengal 36. 1929. *Maytenus kurzii* Bennet & Sahni in Indian For. 103 (6): 383. 1977.

Trees, with spines. Leaves lanceolate to oblong-lanceolate, 7.5 - 12.5 x 5 cm, apex acuminate, base tapering, membranous, crenate-serrate; petioles slender. Flowers in axillary panicles, cymes or fascicles. Capsule broad-obovate, slightly acute, smooth, 2-valved, 2-(-1)-loculed. Seeds 2.

Fl. & Fr. : Apr. - Oct.

Distrib. India : West Bengal, Sikkim, Arunachal Pradesh and Mizoram.

18. *Maytenus wallichii* (G. Don) Bennet & Sahni in Indian For. 103. (6): 387. 1977. *Catha wallichii* G. Don, Gen. Syst. 2: 10. 1832. *Gymnosporia wallichiana* Spreng. ex Wight & Arn., Prodr. 159. 1834; M. Lawson in Fl. Brit. India 1: 621. 1875.

Shrubs; branchlets terete, zig-zag, thorny. Leaves obovate, 2.5-4 x 2-3 cm, apex obtuse or emarginate, base cuneate, coriaceous, glabrous, margins crenate, nerves distinct, reticulate. Flowers in cymes or in fascicles, axillary or on spines. Calyx lobes triangular. Petals oblong, thin. Stamens 5, interpetaloid, inserted below disc. Disc rounded, fleshy. Ovary immersed in the disc; stigmas capitate. Capsule, obcordate, 3-loculed, 6-seeded. Seeds flat, arillate.

Fl. & Fr. : Throughout the year.

Distrib. India : West Bengal, Karnataka, Tamil Nadu and Kerala.

Pakistan and Bangladesh.

9. *Microtropis* Wallich ex Meissner

Shrubs or small trees. Leaves decussate or opposite, elliptic to obovate, entire, exstipulate or stipules caducous. Flowers in peduncled cymes or sessile clusters, axillary or extra axillary, bisexual, sometimes unisexual, 4-5-merous. Calyx deeply lobed; lobes free, imbricate, often unequal. Petals united at base or free, imbricate. Stamens dorsifixed; filaments usually united at base. Disc not distinct. Ovary free, completely or incompletely 2-loculed; ovules 2 in each

locule. Capsule pointed or apiculate, longitudinally furrowed, laterally split along one side with persistent calyx at base. Seed 1, erect, arillate.

Central America, Hawaii, Sri Lanka, China, Taiwan, Japan, Myanmar, Thailand, Vietnam and Malesia; *ca* 70 species, 6 in India.

KEY TO THE SPECIES

- | | |
|--|--------------------------|
| 1a. Flowers in sessile fascicles | 2 |
| b. Flowers in pedunculate cymes | 5 |
| 2a. Leaves obtuse, rounded or sometimes slightly retuse | 4. <i>M. ramiflora</i> |
| b. Leaves acuminate or acute | 3 |
| 3a. Leaves 3 or more times as long as broad; capsule 1 cm long | 6. <i>M. wallichiana</i> |
| b. Leaves less than 3 times as long as broad; capsule 2 cm long | 4 |
| 4a. Leaves acute, nerves distinct on lower surface; capsule oblong | 5. <i>M. stocksii</i> |
| b. Leaves acuminate, nerves obscure; capsule ellipsoid | 2. <i>M. latifolia</i> |
| 5a. Leaves obtuse, rounded or slightly retuse, coriaceous | 3. <i>M. microcarpa</i> |
| b. Leaves acute or acuminate, membranous | 1. <i>M. discolor</i> |

1. *Microtropis discolor* (Wallich) Wallich, Cat. no. 4337, 1830; Arn., *Ann. Nat. Hist.* 3: 152. 1839; M. Lawson in *Fl. Brit. India* 1: 614. 1875. *Cassine discolor* Wallich in Roxb., *Fl. Ind.* 2: 378. 1824.

Shrubs or small trees. Leaves elliptic-obovate or elliptic-oblong, 6-11.5 x 2.5-4.5 cm, apex acute or acuminate, base attenuate, membranous, glabrous, entire; nerves 5-7 pairs; petiole channelled, 1 to 1.5 cm long. Cymes thrice forked, 1-2.5 cm long; peduncles 3-6 mm long; pedicels very short. Flowers greenish white. Sepals suborbicular, 1.5 x 1 mm, edges minutely ciliolate. Petals elliptic or oblong, concave, imbricate. Filaments subulate, 1 mm long; anthers oblong. Ovary longer than stamens, 2-loculed; style very short. Fruit ellipsoid or ovoid, 10-12 x 5-10 mm. Seed 1, ellipsoid, stipitate.

Fl. & Fr. : July - June.

Distrib. India : In Himalaya, Kumaon eastwards between 1300-2300 m and North East India between 300-2300 m. Uttar Pradesh, West Bengal, Sikkim, Arunachal Pradesh, Assam, Nagaland, Manipur, Mizoram and Meghalaya.

Bangladesh, Myanmar, Thailand, Vietnam, S. China and Malesia.

2. *Microtropis latifolia* Wight ex M. Lawson in Hook.f. Fl. Brit. India 1: 613. 1875.

Small trees; branches black. Leaves elliptic, oblong-lanceolate 7-15 x 2.5-6.5 cm, apex acute or shortly acuminate, coriaceous, glabrous, nerves obscure; petioles 6-7 mm long. Flowers in clusters, sessile. Sepals rugose outside, margin membranous, ciliolate above. Petals obovate-cuneate, 2-3 mm long, united at base. Filaments short. Ovary flask shaped, furrowed. Fruit ellipsoid, 1.5-2 cm long, narrowed and acute on both end.

Fl. & Fr. : Oct. - Feb.

Distrib. India : Western ghats, 700-2000 m. Karnataka, Tamil Nadu and Kerala.

3. *Microtropis microcarpa* Wight, Ic. 3: 7. t. 975. 1845; M. Lawson in Fl. Brit. India 1: 614. 1875. *Microtropis ovalifolia* Wight, Ic. 3: 7. t. 976. 1845; M. Lawson in Fl. Brit. India 1: 614. 1875.

Trees or shrubs. Leaves elliptic or oblong-lanceolate, 3.5-5 x 2-2.5 cm, obtuse, attenuate at base, coriaceous, glabrous above, pale beneath; petiole about 5 mm long. Inflorescence axillary or extra axillary, in dense or lax cymes 2-3-chotomous, 1.5-8 cm long; peduncles shorter than the leaves. Sepals persistent in fruit, much imbricate, lower part thick and fleshy, upper part membranous, ciliate, petaloid. Petals, obovate, clawed, veined. Stamens inserted at the base of the petals; filaments short; anthers orbicular to ovoid. Ovary ovoid-conical, ribbed; style short. Fruit ellipsoid or oblong, 1-2 cm long, pointed at both ends or at apex, rugose.

KEY TO THE VARIETIES

- 1a. Cymes lax, 4-8 cm long; capsule oblong, pointed at apex **3.2. var. *microcarpa***
 b. Cymes dense, 1-1.5 cm long; capsule ellipsoid, pointed at both the ends **3.1. var. *densiflora***

3.1. var. *densiflora* (Wight) Meissner & Freem. in Proc. Amer. Acad. Arts. 73: 287. 1940. *Microtropis densiflora* Wight, Ic. 3: 7. t. 1052. 1845; M. Lawson in Fl. Brit. India 1: 614. 1875.

Fl. & Fr. : May.

Distrib. India : Tamil Nadu and Kerala.

3.2. var. microcarpa

Fl. & Fr. : Sept. - Nov.

Distrib. India : Western Ghats, in evergreen forests, between 2000-2700 m. Tamil Nadu and Kerala. Endemic.

4. *Microtropis ramiflora* Wight, Ic. 3: 7. t. 977. 1845; M. Lawson in Fl. Brit. India 1: 613. 1875. **Fig. 22.**

Small trees; branches thick, coarse. Leaves broadly elliptic or obovate, 5-13 x 2.5-6.5 cm, apex rounded or emarginate, base subcordate or rounded, margin revolute; petiole 5 mm long. Flowers in clusters. Sepals imbricate, often thick, unequal, scariose at margin. Petals obovate, 2-3 mm long, pale yellow. Stamens 1 mm long. Fruit ellipsoid or ovoid, 1.5-2 x 0.5-1 cm, striate.

Fl. & Fr. : Feb. - Nov.

Distrib. India : Western Ghats, in evergreen forests between 1600-2700 m. Tamil Nadu and Kerala.

Sri Lanka.

5. *Microtropis stocksii* Gamble in Kew Bull. 1916: 132. 1916 & Fl. Pres. Madras 1: 206. 1918; Ramamurthy in Saldanha & Nicholson, Fl. Hassan Dist. 322. 1976; Ramamurthy in Fl. Tamil Nadu 1: 75. 1983.

Small trees; branchlets black, glabrous. Leaves elliptic to oblanceolate, 7.5-15 x 2.5-6.5 cm, apex acute base cuneate, margin reflexed, coriaceous; nerves distinct on lower surface. Flowers in clusters. Fruit oblong, 1.5-2 cm long.

Fl. & Fr. : March - Dec.

Distrib. India : Western Ghats, at 1600 m. Karnataka and Tamil Nadu.

6. *Microtropis wallichiana* Wight ex Thwaites, Enum. Pl. Zeyl. 71. 1858; M. Lawson in Fl. Brit. India 1: 613. 1875.

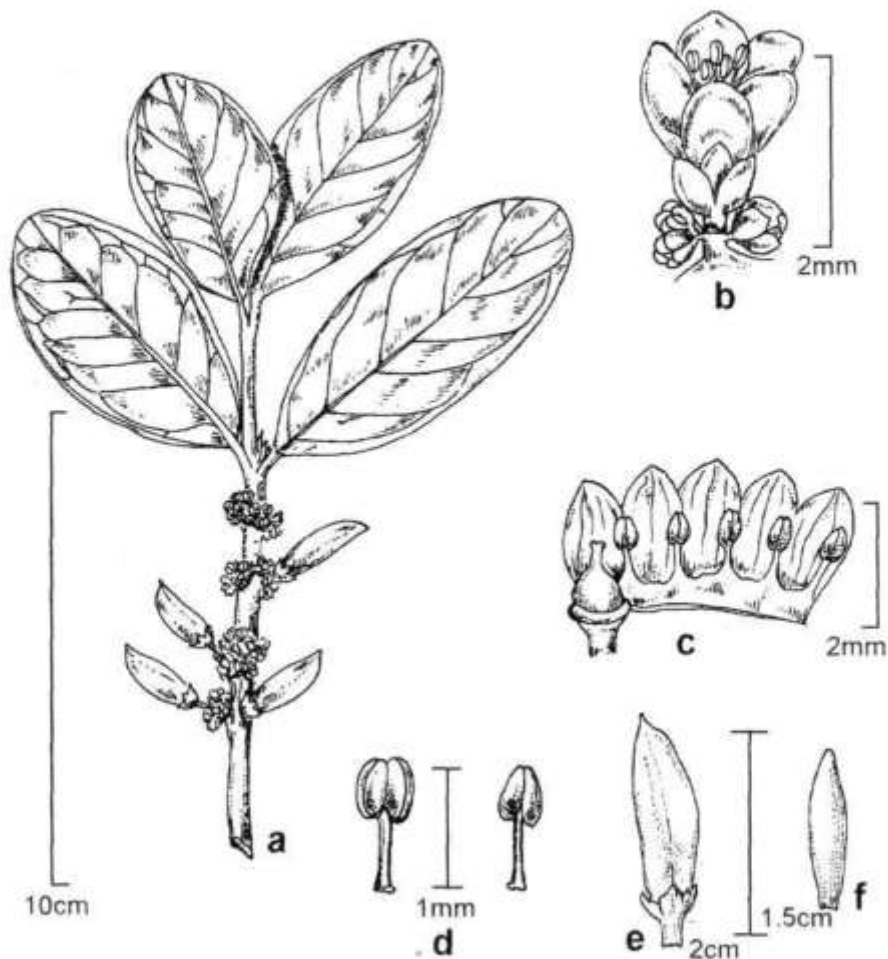


Fig. 22. *Microtropis ramiflora* Wight : a. Habit; b. A flower; c. Flower split open; d. Stamens; e. A fruit; f. Seed.

Shrubs or small trees. Leaves elliptic or oblanceolate, 4-15 x 1.5-5 cm, apex obtusely acute, base attenuate, subcoriaceous; nerves 4-9 pairs; petiole about 1.5 cm long to almost absent. Flowers yellowish, in axillary clusters; bracteoles small, ovate, 1-2 mm long. Sepals subreniform, 1-2 x 2-3 mm, margin fringed. Petals obovate-oblong, 2 mm long, obtuse. Stamens 2-3 mm long. Fruits ellipsoid or oblong-obovoid, 10 x 5 mm with persistent style.

Fl. & Fr. : Feb. - Sept.

Distrib. India : Western Ghats, in forests at ca 1300 m. Karnataka, Tamil Nadu and Kerala.

Sri Lanka and Malesia.

10. *Nicobariodendron* Vasud. & T. Chakrab.

Dioecious. Trees. Leaves simple, distichous, exstipulate, petiolate, penninerved. Inflorescence axillary racemes, simple or compound. Male flowers: bracteate. Calyx 4-5 lobed; lobes imbricate. Petals 4-5, free, imbricate, inserted on the edge of the disc, alternating with calyx lobes. Disc present. Stamens 2, free, exserted, inserted near the base of the petals; anthers dorsifixed, dithecal, longitudinally dehiscent. Pistillode somewhat sunken in receptacle. Drupe 1-loculed, 1-seeded, subtended by persistent calyx

Monotypic genus, distributed in Andaman & Nicobar Islands.

Note : An anomalous genus does not fit in any other existing family.

Nicobariodendron sleumeri Vasud. & T. Chakrab. in *J. Econ. Tax. Bot.* 7(3): 514. 1985.

Dioecious. Trees. 8-35 m tall; branchlets terete, glabrous, lenticellate, greyish to dark-brown. Leaves oblong-elliptic, 5.5-10 x 2-4 cm, abruptly obtusely acuminate at apex, narrowed at base, entire, coriaceous, glabrous, glossy, reddish brown to almost black above (in dried specimens), brown and punctate beneath, penninerved, midrib raised beneath, almost flat above; nerves 5-9 pairs, indistinct above, conspicuous or inconspicuous beneath, anastomose towards margin, veins reticulate, prominent or inconspicuous beneath, indistinct above; petiole 3-8 mm long. Male inflorescence an axillary raceme, solitary or in groups

of 2-3, simple or with 1-2 branches below; rachis 4-11 cm long, slender, striate, sparsely white pilose; bracts, subulate to triangular-ovate, 1-2 x 0.5-1 mm, ciliate at margin, glabrous or sparsely pubescent outside. *Male flowers* : Calyx lobes oblong to ovate, 1-1.5 x 0.6-1.2 mm, obtuse, glabrous. Petals oblong or ovate, 1.2-1.5 x 0.7-1 mm, obtuse, glabrous. Disc concave, slightly fleshy, whitish puberulous. Stamens 2, free, exerted; filaments 1.5-2.5 mm, slender, widened at base; anthers orbicular, 0.5-0.7 mm across; pistillodes small, with short filiform style. Female infructescence axillary, 6-10 cm long. Fruit oblong-ellipsoid or narrowly obovoid, 17-20 x 10 mm, 1-loculed, contracted at base, rounded or flat at apex, brown, glabrous, thin-walled, faintly ridged. Seeds 1 per fruit, attached to the base of the cavity.

Distrib. India : Andaman & Nicobar Islands. Endemic.

11. *Pleurostyli* Wight & Arn.

Shrubs or trees. Leaves decussate, nearly coriaceous, shortly petioled, entire; stipules caducous. Inflorescence few-flowered axillary cymes. Flowers bisexual, 5-merous. Calyx lobes imbricate. Petals imbricate. Disc fleshy, cup shaped, margin crenulate. Stamens inserted below the margin of the disc; anthers introrse, connective dorsal, thick. Ovary free or the base slightly fused with the disc, 2-loculed; style short, slightly dilated at the tip; stigma capitate or peltate; ovules 2 in each locule. Fruit a nut, slightly fleshy, after drying marked with eccentric scar of style. Seeds 1, non arillate.

Africa, Sri Lanka, Madagascar - Malesia, New Caledonia; ca 6 species, 1 in India.

Pleurostyli opposita (Wallich) Alston in Trimen, Fl. Ceylon 6 (Suppl.): 48. 1931. *Celastrus opposita* Wallich in Roxb., Fl. Ind. 2: 398. 1824. *Pleurostyli wightii* Wight & Arn., Prodr. 157. 1834; M. Lawson in Fl. Brit. India 1: 617. 1875.

Fig. 23.

Tam.: *Chirupiyari*, *Karuvali*; Tel.: *Piyari*.

Small trees; branchlets subterete. Leaves ovate to obovate-oblong, 3-8 x 1.5-5.5 cm, apex obtuse to acute, base tapering, margin entire, slightly recurved, nerves about 6 pairs; petiole 2-3 mm long. Flowers in axillary cymes, green; peduncle 2-3 mm long; pedicel up to 2 mm long. Calyx lobes rounded

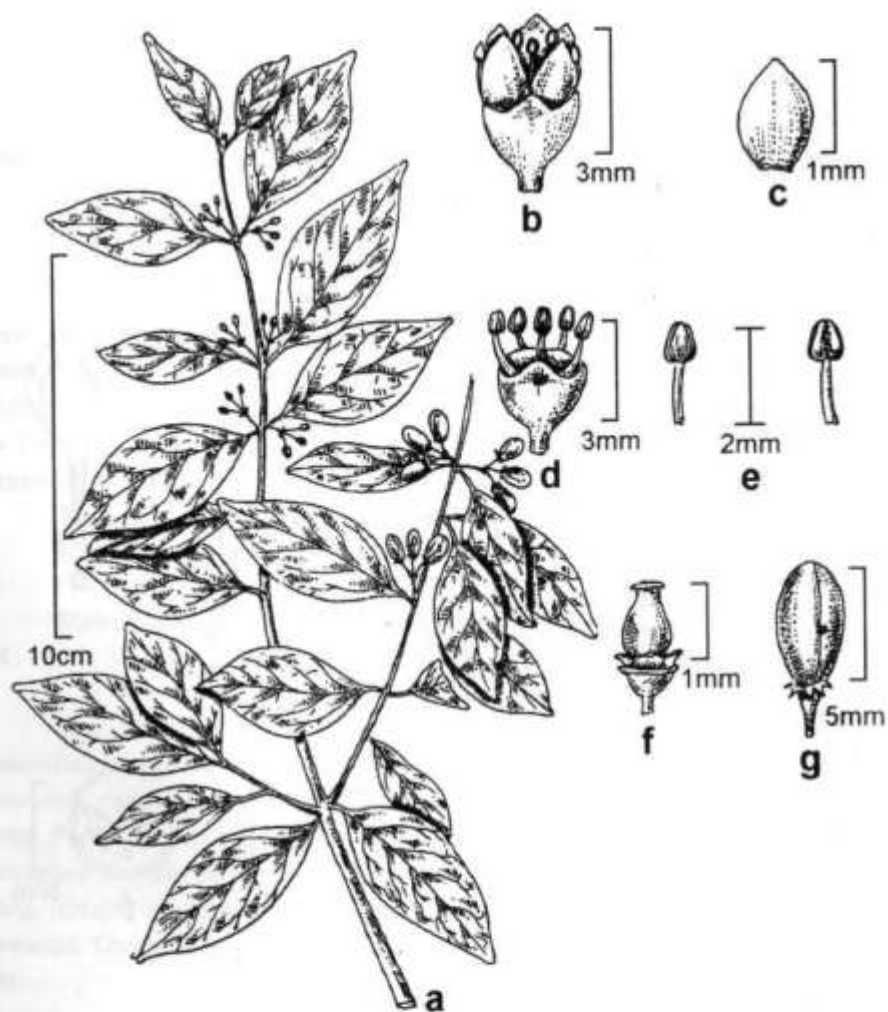


Fig. 23. *Pleurostylia opposita* (Wallich) Alston : a. Habit; b. A flower; c. A petal; d. Arrangement of stamens from torus below; e. Stamens; f. Gynoecium; g. A fruit.

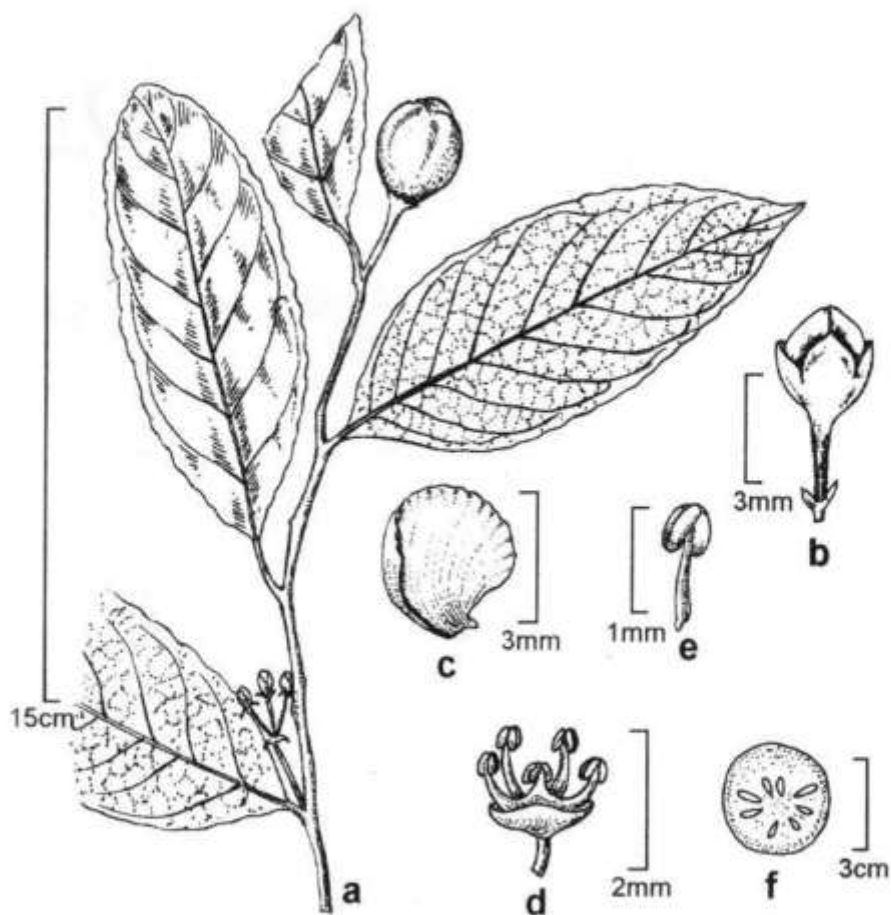


Fig. 24. *Siphonodon celastrineus* Griffith : a. Habit; b. A flower; c. A petal
d. Stamens; e. A stamen; f. T.S. fruit, exposing arrangement of seeds

or subreniform. Petals elliptic to broadly ovate, 1 mm long. Stamens up to 2 mm long; filaments subulate, fleshy; anthers slightly ovoid. Ovary flask shaped; style short; stigma capitate. Disc fleshy, cup shaped, margin slightly crenate. Fruits ellipsoid, 5-7 x 4-5 mm.

Fl. & Fr. : June - Sept.

Distrib. India : Andhra Pradesh, Tamil Nadu, Kerala and Andaman Islands.

Sri Lanka, Thailand, China, New Guinea to New Caledonia, Madagascar and Mauritius.

12. *Siphonodon* Griffith

Trees. Leaves spiral or alternate. Cymes axillary, 3-4-flowered, peduncles short. Flowers 5-merous, cream coloured. Calyx imbricate. Petals imbricate. Stamens connivent round the pistil in the lower half or at base; filaments flattened; anthers with distinct and broad connective. Gynoecium half immersed, adnate to the disc, upper half hollow; ovary many-loculed; style columnar. Fruit drupaceous, hard, 1-seeded. Seeds stony, flat.

Malesia to Australia; 7 species, 1 in India.

Siphonodon celastrineus Griffith in *Calcutta J. Nat. Hist.* 4: 247, t. 14. 1844; M. Lawson in *Fl. Brit. India* 1: 629. 1875. **Fig. 24.**

Trees; branchlets glabrous, bark greyish. Leaves ovate-oblong to elliptic-lanceolate, 10-20.5 x 3.5-9 cm, apex acute to acuminate, base cuneate to rounded, coriaceous, margin crenate; nerves 4-10 pairs; petiole up to 2 cm long. Peduncles and pedicels 5-10 mm long. Flowers in cymes, from the old branches. Sepals lobed, reniform or rounded, 1-2 mm long. Petals 2-3 mm long, obtuse. Stamens 1 mm long; filaments flat, united at base; anthers bent inwards. Ovary semiglobose. Fruit broadly pyriform or ellipsoid, 3-5 x 2-4 cm.

Fl. & Fr. : May - Jan.

Distrib. India : Scattered in distribution in parts of Deccan plateau and Gangetic Plain. West Bengal, Maharashtra and Andhra Pradesh.

Myanmar, Thailand, Vietnam and Malesia.

HIPPOCRATEACEAE *nom. cons.*

(K. Ramamurthy and B.D. Naithani)

Small trees or erect or scandent shrubs, mostly glabrous. Leaves opposite, rarely alternate, simple; stipules caducous or none. Inflorescence axillary, in paniced cymes, sometimes in umbellate clusters; bracts triangular-ovate; bracteoles sometimes in clusters. Flowers bisexual, regular, mostly quite small; disc conical, cupular, thick or expanded. Sepals 5, rarely 2 or 3, minute, ovate, imbricate, united at the base. Petals 5, rarely 2, free, spreading or erect, imbricate, rarely subvalvate. Stamens 3, rarely 2-5, inserted on the top of disc, alternate with petals; filaments flat, connate at base; anthers extrorse, rarely introrse, transversely dehiscent; pollen grains binucleate, tricolporate. Ovary superior, triangular, tricarpellary, rarely 2 or 5-carpellary; locules as many as the carpels, placentation axile; style terminal, subulate; stigmas as many as carpels; ovules 2-10 in each locule. Fruit 1-3 loculed drupe, berry or capsule. Seeds compressed often winged or angular, without endosperm; cotyledons large, connate, thick.

Tropical America, Africa, S.E. Asia and Australia; 3 genera and 223 species, 3 genera and 32 species in India.

Literature : BULLOCK, A.A. (1958) Nomina Familiarum Conservanda Proposita. *Taxon* 7: 175. DING HOU (1963) *Blumea* 12 (1): 32-33. DING HOU (1963) *Fl. Males.*, Ser. 1, 6: 389-449. SMITH, A.C. (1940) Revision of New World Hippocrateaceae. *Brittonia* 3: 341-555. SMITH, A.C. (1945) Notes on Hippocrateaceae in Southern Asia. *J. Arn. Arb.* 26: 169-179.

KEY TO THE GENERA

- | | |
|--|-------------------------|
| 1a. Fruits drupaceous, indehiscent; seeds wingless; flowers usually in fascicles | 3. Salacia |
| b. Fruits capsular, dehiscent; seeds winged; flowers in cymes or panicles | 2 |
| 2a. Disc inconspicuous; inflorescence with supplementary branchlets | 2. Reissantia |
| b. Disc conspicuous; inflorescence without supplementary branchlets | 1. Loeseneriella |

1. *Loeseneriella* A.C. Smith

Climbing or scandent shrubs. Leaves decussate. Flowers in axillary cymes. Calyx 5-lobed. Petals 5, thick, subcoriaceous to coriaceous. Disc conical or

cupular, fleshy, extrastaminal. Stamens 3, attached to the ovary; anthers transversely dehiscent. Ovary partially embedded or superior, 3-loculed; style distinct; stigma obscure; ovules 4-12 in each locule. Fruits capsular, consisting of 3 separate, divergent, flattened follicles, each dehiscent into 2 valves. Seeds with a basal wing.

Tropical Africa and Asia; ca 26 species, 8 in India.

Literature : HALLE, N. (1962). On genus *Loeseneriella*. In *Mem. Inst. Fr. Afr. Noire* 64: 103.

KEY TO THE SPECIES

- | | |
|---|---------------------------|
| 1a. Petals orbicular or rotund | 2. <i>L. arnottiana</i> |
| b. Petals not as above | 2 |
| 2a. Flowers 3.5-6 mm across | 3 |
| b. Flowers 7-12 mm across | 6 |
| 3a. Leaves entire | 4 |
| b. Leaves shallowly crenulate or serrate | 5 |
| 4a. Leaves 4-8 cm broad; fruits oblong; seeds 3-3.5 cm long | 1. <i>L. andamanica</i> |
| b. Leaves 2-4 cm broad; fruits obovoid; seeds ca 6 cm long | 6. <i>L. parkinsonii</i> |
| 5a. Pedicels and calyx glandular-puberulous | 8. <i>L. serrata</i> |
| b. Pedicels and calyx not glandular-puberulent | 7. <i>L. pauciflora</i> |
| 6a. Petals subulate, puberulous outside | 4. <i>L. cumingii</i> |
| b. Petals triangular-lanceolate, not puberulous outside | 7 |
| 7a. Petals mucronate, margins recurved | 3. <i>L. bourdillonii</i> |
| b. Petals not mucronate, margins not recurved | 5. <i>L. obtusifolia</i> |

1. *Loeseneriella andamanica* (King) Naithani et Sas Biswas, Fl. Pl. India Nep. Bhutan: 95. 1990. *Hippocratea andamanica* King in J. As. Soc. Bengal 65 (1): 359. 1896. Parkinson, For. Fl. Andaman Isls. 128. 1923.

Large scandent shrubs. Leaves oblong elliptic, 10-14 x 4-8 cm, apex acute or obtusely cuspidate, cuneate at base, glabrous, entire; petiole 0.8-1.5 cm long; lateral nerves 5-8, ascending. Flowers green, rather small, in axillary and terminal panicles. Fruits oblong, 9-10 x 3.4 cm, flattened, glabrous, striate, obtuse to rounded at apex. Seeds flat, winged, 3-3.5 x 1-1.2 cm.

Fl. & Fr. : Feb. - Sept.

Distrib. India : Andaman Islands. Endemic.

Note : It is used as remedy for ring worm. Decoction of the root is used in post natal treatment and in rheumatism.

2. *Loeseneriella arnottiana* (Wight) A.C. Smith in J. Arn. Arb. 6: 174. 1975. *Hippocratea arnottiana* Wight, Illustr. Ind. Bot. 1: 133, t. 46, 47A. 1839; M. Lawson in Fl. Brit. India 1: 624. 1875.

Climbing shrubs; branchlets terete, glabrous. Leaves ovate-elliptic, 10-18 x 4-7.5 cm, acute at apex, base obtuse, coriaceous, entire or faintly crenate; venation reticulate, conspicuous. Flowers in axillary cymes, *ca* 8 mm across. Calyx 5-lobed; lobes triangular, entire, glabrous. Petals 5, orbicular, with narrow claw, glabrous, fimbriate. Fruit a samara, narrowly oblong, 8 x 2.5 cm, obtuse, striate.

Fl. & Fr. : Throughout the year.

Distrib. India : Western Ghats. Karnataka, Tamil Nadu and Kerala.

Sri Lanka.

3. *Loeseneriella bourdillonii* (Gamble) Raju in J. Biol. ser. 8(2): 56. 1965. *Hippocratea bourdillonii* Gamble in Kew Bull. 1915: 132. 1915 *et* Fl. Pres. Madras 1: 153. 1967 (Repr. ed.).

Climbing shrubs; stems quadrangular. Leaves oblong, 6-10 x 3-4 cm, apex subacute, base rounded, coriaceous, glabrous, margin recurved; nerves conspicuously reticulate, arched at margin. Flowers in *ca* 3 cm long, axillary cymes. Calyx 5-lobed; lobes ovate. Petals lanceolate, 5 mm long, mucronate at apex, puberulous inside. Disc conspicuous, puberulous at apex. Stamens 3, puberulous.

Fl. : Feb. - March.

Disttib. India : Western Ghats, in forests up to 100 m. Karnataka, Tamil Nadu and Kerala.

4. *Loeseneriella cumingii* (M. Lawson) Ding Hou in *Blumea* 12: 32. 1963 *et in* Fl. Males. Ser. 1, 6: 399. 1964; Vasud. in *J. Econ. Tax. Bot.* 13(1): 41. 1989. *Hippocratea cumingii* M. Lawson in *Fl. Brit. India* 1: 624. 1875. *H. ding-houi* T. Chakrab. & Gang. in *J. Econ. Tax. Bot.* 14(1): 119. 1990.

Fig. 25.

Scandent shrubs. Leaves elliptic or rotund, sometimes ovate, 6-10 x 3-5 cm, apex obtuse or base rounded-acute, rounded-obtuse, coriaceous, margin entire or crenulate; nerves 5-8 pairs; petiole 3-5 mm long. Inflorescence 2-4 times branched. Flowers greenish yellow; pedicels 3.5-4.5 mm long. Calyx lobes triangular, 0.5 mm long, puberulous outside. Petals lanceolate, 5-6 x 1-2 mm, hairy inside in upper half, glabrous below. Stamens *ca* 2 mm long; filaments papillose at the apex on the inner surface. Disc hairy at apex. Style 1 mm long, sparsely hairy towards the base. Ovules 8-10 in each locule. Fruit oblong, 6.5 x 2.5 cm. Seeds (incl. wing) lanceolate, 4.5-5 x 1.5 cm.

Fl. : Feb. - April.

Distrib. India : Scarce in littoral forests at sea level. Nicobar Islands.

Malay peninsula, Sumatra and Philippines.

5. *Loeseneriella obtusifolia* (Roxb.) A.C. Smith in *Am. J. Bot.* 28: 440. 1941. *Hippocratea obtusifolia* Roxb., *Fl. Ind.* 1: 170. 1820; M. Lawson in *Fl. Brit. India* 1: 623. 1875.

Fig. 26.

Kan.: *Ainshi*; Mar.: *Danshir*; Tam.: *Menthakkodi*.

Climbing shrubs; branchlets terete; young branches sometimes quadrangular. Leaves elliptic ovate or obovate, 4-11 x 2.5-7 cm, apex rounded, acute or acuminate, base attenuate or rounded, margin entire or crenate-serrate, subcoriaceous, glabrous; nerves 8, prominent reticulate; petiole 3-6 mm long. Flowers in axillary dichotomous cymes, 7-12 mm across. Calyx 5-lobed; lobes triangular-ovate, puberulous. Petals 5, pale green, triangular, 4 mm long, acute, subfleshy, glabrous within, valvate. Stamens 3, filaments short, flat. Fruit a samara, 3.5- 5 cm long, oblong-obovoid, compressed. Seeds 4-6, subfalcate, 1.2 cm long, compressed, with a large membranous wing at the base.



Fig. 25. *Loeseneriella cumingii* (M. Lawson) Ding Hou
(after Chakrabarty & Gangopadhyay, 1990)

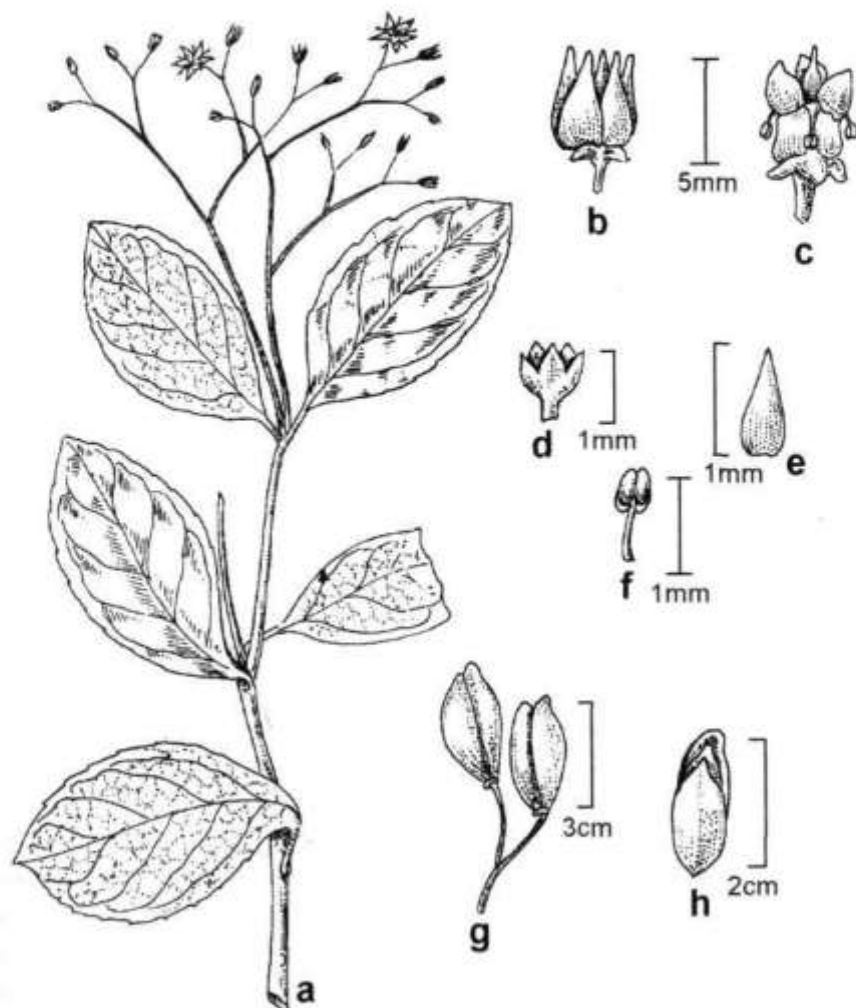


Fig. 26. *Loeseneriella obtusifolia* (Roxb.) A.C. Smith : a. Habit; b. A flower; c. A flower with exposed stamens; d. Calyx; e. A petal; f. A stamen; g. Fruits; h. Seed.

Fl. & Fr. : July - Sept.

Distrib. India : Deccan Plateau, in dry forests at ca 100 m. Western Ghats, Assam, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala. Rare

Myanmar, Malesia, China (Tropical) and Australia.

6. *Loeseneriella parkinsonii* (T. chakrab. & Gang.) B.D. Naithani *Comb. nov.* *Hippocratea parkinsonii* T. Chakrab. & Gang. in J. Econ. Tax. Bot. 14(1): 124. 1990. Fig. 27.

Climbers (?); branchlets blackish, smooth, angular when young, terete on ageing, glabrous. Leaves elliptic or sometimes ovate-elliptic, acute at apex, acute or subacute at base, entire at the margin, coriaceous, glossy above, reddish brown when dry; lateral nerves 6-7 pairs, prominent beneath; petiole 6-13 mm long. Flowers not seen. Infructescence 8-15 cm long. Fruits 2-3 partite, obovoid, 5.5-7.5 x 2.5-3.5 cm, flattened, truncate or sometimes obtuse at apex, blackish brown when dry. Seeds winged, flat, obovate - oblong, ca 6 x 2 cm (incl. wing), obtuse, thin, glabrous, blackish brown.

Fr. : Sept. - Oct.

Distrib. India : South Andaman Islands. Endemic.

7. *Loeseneriella pauciflora* (DC.) A.C. Smith in Am. J. Bot. 28. 440. 1941. *Hippocratea pauciflora* DC., Prodr. 1: 569. 1824.

Woody climbers. Leaves elliptic, oblong or obovate, 3-16 x 2-9 cm, apex acute to acuminate, base obtuse-cuneate, coriaceous, shiny on both sides, crenate; nerves 5-8 pairs, arched, conspicuous; petiole ca 6 mm long. Flowers pale yellow, ca 6 mm across in axillary or extra axillary cymes. Calyx 5-lobed; lobes ovate or deltoid, 1 mm long. Petals 5, ovate-oblong, 3-5 x 2 mm, margin convolute, glabrous within. Disc slightly 5-angular. Stamens 1-2 mm long. Ovary emerging from the disc; ovules 6 in each locule. Fruit 3-7 x 1-3 cm. Seed elliptic to ovate-oblong, 1-2 x 0.5 cm, wing 2-4 x 1-2 cm.

Fl. & Fr. : Nov. - Mar.

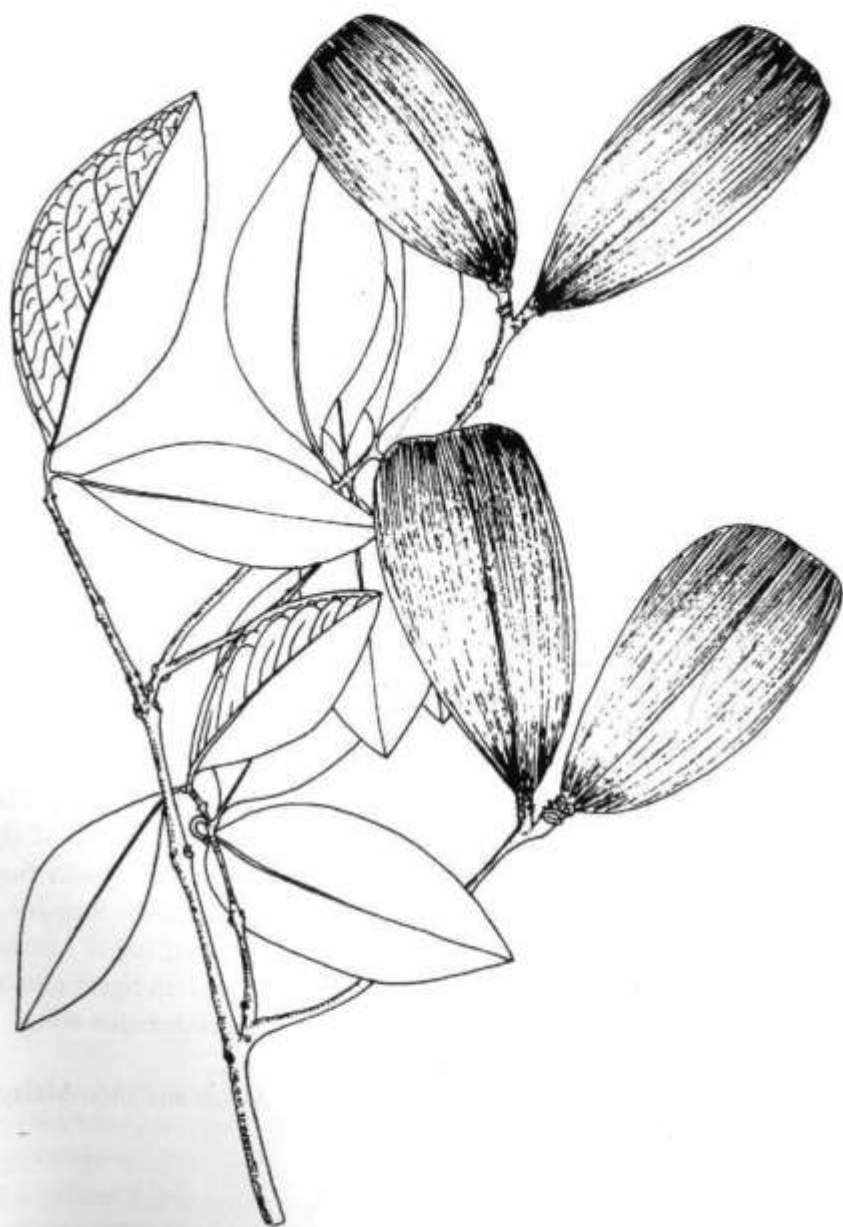


Fig. 27. *Loeseneriella parkinsonii* (T. Chakrab. & Gang.) B.D. Naithani
(after Chakrabarty & Gangopadhyay, 1990)

Distrib. India : West Bengal, Assam, Meghalaya, Manipur, Nagaland and Andaman Islands.

Bangladesh, Thailand, Sri Lanka, Malesia and New Guinea.

8. *Loeseneriella serrata* (Griffith) A.C. Smith in Am. J. Bot. 28: 438-39. 1941. *Hippocratea serrata* Griffith, Not. Pl. As. 4: 473. 1854 et Ic. Pl. As. 4. pl. 582. 1854.

Large scandent shrubs; branches greyish brown, branchlets flattened, greyish. Leaves narrowly oblong-elliptic, ca 10 cm long, apex acute, base cuneate, subopposite, green, serrate; nerves and veins yellow. Flowers subumbellate, golden yellow, sweet smelling; pedicels glandular. Calyx glandular-puberulent. Petals lanceolate-oblong, 3.5-4 mm long. Disc prominent. Filaments ca 1 mm long. Style ca 1 mm long; ovules 6 or 8 per locule.

Fl. : May.

Distrib. India : Assam and Nicobar Islands.

Central Myanmar.

2. *Reissantia* Hallé

Climbing, scandent or erect shrubs. Leaves decussate. Flowers in axillary dichotomous cymes or panicles, sometimes crowded on short shoots. Calyx lobes 5, small, imbricate. Petals 5, imbricate. Disc inconspicuous, mostly fused with the ovary, the uppermost part slightly extended outwards. Stamens 3, inserted at the base of the pistil. Ovary 3-loculed; styles short; stigma obscure; ovules usually 2 in each locule. Fruit capsular, consisting of 3 divergent separate follicles. Seeds with a basal more or less transparent membranous wing.

In the old world tropics of Central and West Africa and Indo-Malaya; 7 species, 3 in India.

KEY TO THE SPECIES

- 1a. Flowers in panicles or thyriform; petals 2.5-3 mm long;
capsules usually 6-seeded

2. *R. grahamii*

- b. Flowers in simple or compound cymes; petals 1 mm long;
capsules 2-seeded 2
- 2a. Leaves ovate to ovate-oblong, membranous 1. *R. arborea*
- b. Leaves ovate to elliptic-oblong, chartaceous 3. *R. indica*

1. *Reissantia arborea* (Roxb.) Hara in J. Jap. Bot. 40: 327. 1965.
Hippocratea arborea Roxb., Pl. Corom. 3: 3, t. 205. 1819; M. Lawson in
Fl. Brit. India 1: 625. 1875.

Hindi: *Kochra*.

Climbing shrubs; branchlets coiled and robust. Leaves ovate, ovate-oblong, 12.5-15.5 x 6-8.5 cm, apex shortly acuminate, base rounded or subacute, glabrous, membranous, margin serrulate; nerves 6-8 pairs; petiole 1.5 cm long. Inflorescence axillary, pedunculate, in dichotomous cymes. Calyx lobes 5. Petals 5. Stamens 3. Ovary partially embedded in the disc. Fruits capsular, obovate-oblong, 7.5 x 4 cm, acute at both ends, thickly coriaceous. Seeds 2, yellowish brown, 2.5 cm long, winged; wings ovate, 4 cm long, smooth, corky.

Fl. & Fr. : Nov. - Sept.

Distrib. India : In subtropical forests, 800 - 1200 m. Uttar Pradesh, Bihar, Arunachal Pradesh, Assam, Tripura and Meghalaya.

Nepal, Bhutan, Myanmar and W. China (S. Yunnan)

2. *Reissantia grahamii* (Wight) Ding Hou in Blumea 12: 33. 1963.
Hippocratea grahamii Wight, Illustr. Ind. Bot. 134. 1839; M. Lawson in Fl.
Brit. India 1: 624. 1875. Fig. 28.

Scandent shrubs; branchlets woody. Leaves elliptic to ovate-oblong, 8-20 x 5-10 cm, apex acuminate, base cuneate or rounded, coriaceous, entire or sometimes crenate; nerves 5-6 pairs; petiole 8-12 mm long. Inflorescence paniculate or thyriform, many-flowered, 10-14 cm long. Flowers white or pale yellow. Calyx lobes suborbicular, up to 1 mm long, margin ciliate. Petals 5, oblanceolate to obovate-oblong, 2-3 x 1 mm, membranous, margin inflexed, erose. Stamens 1-3 mm long; filaments papillose or anthers sessile. Disc 5-angular, angles alternate with petals. Ovary triangular, partially embedded

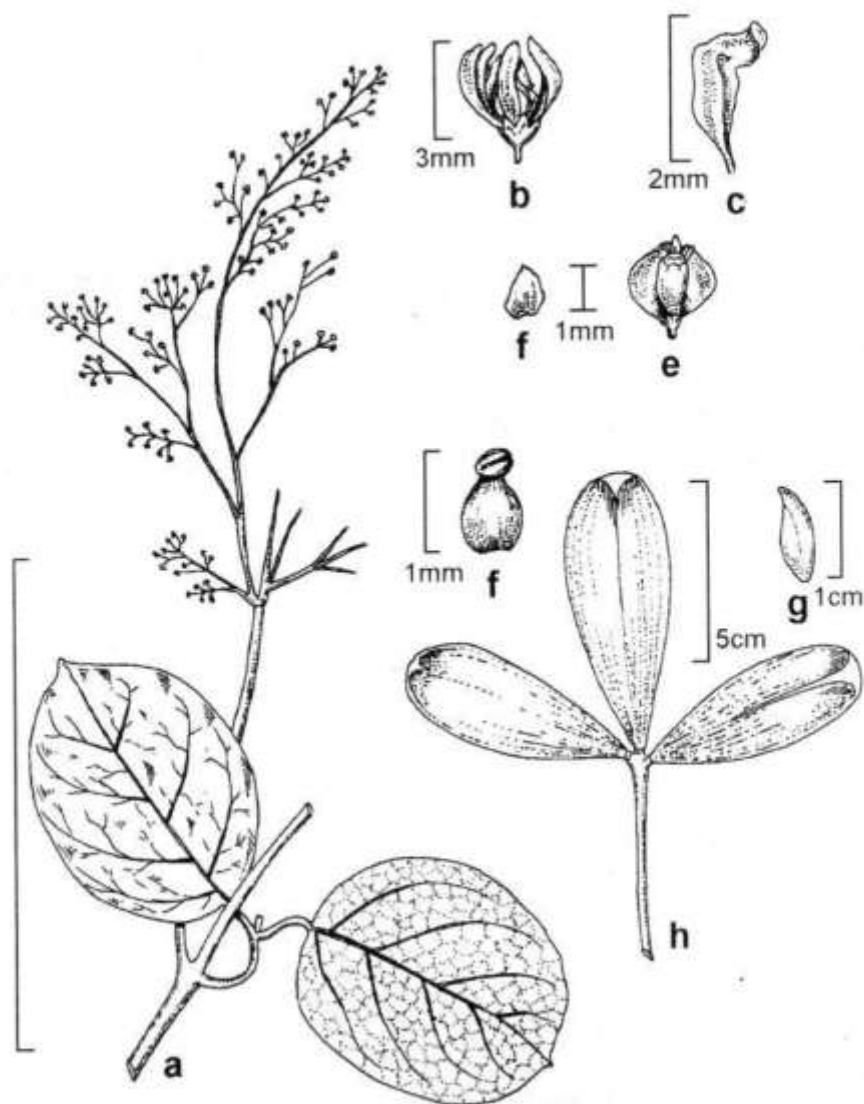


Fig. 28. *Reissantia grahamii* (Wight) Ding Hou : a. Habit; b. A flower; c. A petal; d. A sepal; e. Stamens; f. Ovary; g. Fruit; h. Seed.

in the disc. Fruit obovate-oblong, 9-13 x 3.5-4.5 cm. Seeds ovoid-oblong, 2.5 cm long, basal wing 4.5 x 2 cm; funicle distinct in its centre.

Fl. & Fr. : Feb. - July.

Distrib. India : Western Ghats. Maharashtra, Karnataka, Tamil Nadu, Kerala and Andaman Islands.

Upper Myanmar, Thailand, Indonesia, Malesia, Philippines and New Guinea.

Note : N. Halle in *Adansonia* 6(1): 12. 1984, transferred this species to *Arnicratea*, a new genus created by him, on the basis of paniculate or thyriform inflorescence and entire leaves.

3. *Reissantia indica* (Willd.) Halle in Mem. Dict. Fr. Afr. Noiren. 64: 85. 1962. *Hippocratea indica* Willd., Sp. Pl. 1: 193. 1797; M. Lawson in Fl. Brit. India 1: 624. 1875.

Beng.: *Atari-lata, Kathapahasia*; Bhoj.: *Katha-pahasia*; Kan & Kon.: *Kazurati, Turruli*; Tam.: *Odankodi, Morasavakkodi*.

Climbing shrubs; branchlets woody; stipules 3-lobed, fimbriate. Leaves chartaceous, ovate to elliptic-oblong, 3.5-14 x 2.5-5 cm, apex acuminate, base cuneate, margin crenulate or serrate; nerves up to 8 pairs; petioles 6-8 mm long. Inflorescence dichotomous cymes, 2-6 cm long. Flowers pale yellow. Calyx lobes triangular, 0.5-1 mm long, thin, papillose on both sides. Petals oblong, 1 mm long, papillose on both sides. Stamens 1 mm long; filaments glabrous. Ovary flask shaped; ovules 2 in each locule. Follicles elliptic or obovate-oblong, 3-5 x 1-1.5 cm, pericarp leathery. Seeds broad-elliptic, 2.75-3.5 x 1 cm including wing, winged.

Fl. & Fr. : Apr. - Dec.

Distrib. India : Widely distributed but scattered in forests, from 500-1500 m. Bihar, West Bengal, Assam, Arunachal Pradesh, Orissa, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Bangladesh, Myanmar, Sri Lanka, Vietnam, Thailand, S. China, Malesia, Philippines and Celebes.

Note. The sap of the stem is taken as a remedy for fever. Slightly scorched leaves are eaten by women during child birth and compound with *Alyxia* sp. are used as poultice in treating rheumatism.

3. *Salacia* L.

Scandent or erect, shrubs or small trees. Branchlets often lenticellate. Leaves decussate, sometimes subopposite, rarely spiral. Flowers in axillary fascicles, cymes, thyriform or panicles. Calyx 5-lobed. Petals 5. Stamens 3 or 2, inserted at the base of the pistil, usually wider at base. Ovary partly or totally enclosed in the disc, conical or triangular, 3-or 2-loculed; ovules 2-8 in each locule, axile. Disc intrastaminal, fleshy. Fruits drupaceous, subglobose, 1-3-loculed; pericarp coriaceous when dry. Seeds 1 to many, embedded in mucilaginous pulp.

Tropical America, Africa and Asia; ca 200 species, 21 in India.

KEY TO THE SPECIES

- | | |
|---|---------------------------|
| 1a. Flowers in fascicles from axillary or extra axillary tubercles | 2 |
| b. Flowers in cymes | 15 |
| 2a. Flowers less than 6 in a fascicle | 3 |
| b. Flowers more than 6 in a fascicle | 11 |
| 3a. Leaves membranous | 4 |
| b. Leaves coriaceous | 5 |
| 4a. Leaf margin recurved | 9. <i>S. khasiana</i> |
| b. Leaf margin entire | 15. <i>S. membranacea</i> |
| 5a. Leaves mostly 15-30 cm long | 6 |
| b. Leaves 4-12 cm long or rarely more | 7 |
| 6a. Pedicels 6-10 mm long; fruits 5.5-6.5 (-8) cm across; ovules 4 in each locule | 11. <i>S. macrophylla</i> |
| b. Pedicels 3-6 mm long; fruits 2.5-5 cm across; ovules 2 in each locule | 7. <i>S. grandiflora</i> |
| 7a. Petals clawed at the base; branchlets more or less angled | 3. <i>S. chinensis</i> |
| b. Petals not clawed at the base; branchlets terete | 8 |
| 8a. Branchlets smooth | 20. <i>S. salacioides</i> |

- | | |
|--|----------------------------|
| b. Branchlets lenticellate | 9 |
| 9a. Pedicels more than 6 mm long; petals oblong | 14. <i>S. malabarica</i> |
| b. Pedicels less than 6 mm long; petals ovate | 10 |
| 10a. Flowers 1-2 in each axil | 2. <i>S. brunoniana</i> |
| b. Flowers 6 in each axil | 19. <i>S. reticulata</i> |
| 11a. Leaves chartaceous | 21. <i>S. verrucosa</i> |
| b. Leaves coriaceous | 12 |
| 12a. Petiole more than 8 mm; petals obovate; calyx lobes entire | 18. <i>S. platyphylla</i> |
| b. Petiole less than 8 mm; petals ovate; calyx lobes, toothed or fringed | 13 |
| 13a. Leaves entire at margins | 12. <i>S. macrosperma</i> |
| b. Leaves obscurely undulate at margins | 14 |
| 14a. Leaves oblanceolate; lateral nerves about 8 | 6. <i>S. gambleana</i> |
| b. Leaves elliptic-oblong; lateral nerves 12 | 1. <i>S. beddomei</i> |
| 15a. Flowers in very short pedunculate heads, usually 3 together | 17. <i>S. oblonga</i> |
| b. Flowers in branched cymes; peduncle elongate | 16 |
| 16a. Leaves coriaceous | 17 |
| b. Leaves chartaceous | 19 |
| 17a. Cymes unbranched; sepals entire | 4. <i>S. floribunda</i> |
| b. Cymes dichotomously branched; sepals ciliate | 18 |
| 18a. Style <i>ca</i> 1 mm long; stigma simple | 16. <i>S. nicobarica</i> |
| b. Style <i>ca</i> 2.3 mm long; stigma capitate | 13. <i>S. majumdarii</i> |
| 19a. Calyx lobes deltoid | 5. <i>S. fruticosa</i> |
| b. Calyx lobes ovate-oblong | 20 |
| 20a. Petioles up to 6 mm long | 8. <i>S. jenkinsii</i> |
| b. Petioles 8-10 mm long | 10. <i>S. korthalsiana</i> |

1. *Salacia beddomei* Gamble in Kew Bull. 1916: 133. 1916 *et* Fl. Pres. Madras 1: 155. 1956. (Repr. ed.).

Scandent woody shrubs; branchlets thick, brown, minutely lenticellate. Leaves elliptic-oblong, 12-14 x 5-7 cm, apex acute, base rounded, coriaceous, glabrous, margin undulate, lateral nerves 12 pairs, conspicuously reticulate; petiole 7-8 mm long. Flowers in axillary, fascicles, 4-12-flowered. Calyx minute, lobed; lobes ovate, concave, fimbriate. Petals ovate, 1-5 mm long, glabrous. Disc conspicuous. Stamens 3. Ovary 3-loculed; style exserted. Fruit a berry, globose or depressed globose, 2.5-3.5 x 2-3 cm, tubercled, yellowish green to pale orange. Seeds 3, ellipsoid, 1-1.5 x 0.5-1.2 cm.

Fl. & Fr. : Apr. - Aug.

Distrib. India : Western Ghats, Tamil Nadu and Kerala. Endemic.

2. *Salacia brunoniana* Wight & Arn., Prodr. 105. 1834; M. Lawson in Fl. Brit. India 1: 626. 1875.

Scandent shrubs. Leaves elliptic-oblong, 5-7.5 x 2.5 cm, apex acuminate to subobtuse, base cuneate, coriaceous, glabrous, margin serrulate; petiole 6-8 mm long. Flowers in fascicles, from axillary or extra-axillary tubercles; pedicels 6 mm long. Calyx lobes oblong, much shorter than the petals. Petals ovate. Fruit globose, 1.5-2 cm across, varrucose, orange.

Fl. & Fr. : Jan. - Feb.

Distrib. India : Orissa, Maharashtra, Karnataka and Kerala. Endemic.

3. *Salacia chinensis* L., Mant. Pl. 293. 1771. *S. latifolia* Wallich ex M. Lawson in Fl. Brit. India 1: 629. 1875. *S. prinoides* DC., Prodr. 1: 571. 1824; M. Lawson in Fl. Brit. India 1: 626. 1875.

Beng.: *Madhu-phal*; Mar.: *Misal-bombi*; Konk.: *Misal-bomdi*; Tam.: *Kadelanchi*, *Perumkkattukkodi*.

Straggling or climbing shrubs; branchlets terete, young twigs angular. Leaves oblong-lanceolate to obovate, 4.5-17 x 2.5-9 cm, apex acute or acuminate, sometimes subobtuse, base cuneate or acute, thin, coriaceous, margin entire or slightly crenulate; nerves 5-10 pairs; petiole up to 1 cm long. Flowers 3-6, in axillary fascicles; pedicel 4-8 mm long. Calyx lobes triangular, 0.5 mm long, ciliate. Petals, oblong or obovate, 3-4 mm long, clawed, yellowish. Stamens 3, 1.5 mm long; filaments slender. Ovary conical, triangular, 3-loculed; ovules 2 in each locule. Fruit subglobose, sometimes broad ellipsoid, 1.5 to 2 cm across, bright red, 1-seeded. Seeds subglobose, 1-1.5 cm in diam., brownish.

Fl. & Fr. : Jan. - April.

Distrib. India : Scattered in forests along the sea shores and river banks and in hills up to 450 m. Bihar, West Bengal, Arunachal Pradesh, Assam, Meghalaya, Orissa, Maharashtra, Goa, Daman & Diu, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala and Andaman & Nicobar Islands.

Myanmar, Sri Lanka, Vietnam, Thailand, China and Malesia.

Note. The species, of late, has come into prominence for its high medicinal properties in the treatment of diabetes.

4. *Salacia floribunda* Wight, *Illustr. Ind. Bot.* 1: 134. 1840; M. Lawson in *Fl. Brit. India* 1: 629. 1875.

Scandent shrubs. Leaves elliptic-lanceolate, 7.5-15 x 2-4.5 cm, apex acute, base tapering, shining, subcoriaceous, margins serrate; petiole 7-12 mm long, channelled. Flowers in peduncled, branched cymes. Calyx 5-lobed. Petals 5, orbicular, imbricate. Stamens 3. Ovary 3-loculed; ovules 2 in each locule. Fruit up to 3.5 cm across.

Fl. & Fr. : Aug. - May.

Distrib. India : Assam, Mizoram and Meghalaya.

Bangladesh and Myanmar.

5. *Salacia fruticosa* Heyne ex M. Lawson in *Fl. Brit. India* 1: 628. 1875. **Fig. 29.**

Climbing shrubs; branchlets rough. Leaves ovate to elliptic-lanceolate, 5-12 x 2.5-5 cm, apex acute, base cuneate, chartaceous, margin serrate. Flowers pale yellow, many in an inflorescence; cymes branched, 1.5 cm long. Calyx lobes deltoid, minutely ciliate. Petals orbicular, 2 mm across, margin white. Stamens 3; filaments recurved. Ovary rounded, partly immersed in the disc, 3-loculed; stigma capitate. Fruit a berry, globose or subglobose, ca 2.5 x 2 cm, smooth. Seeds 3, angular, 1.5 x 1 cm.

Fl. & Fr. : Jan. - Aug.

Distrib. India : Western Ghats, in semi - evergreen to evergreen forests, up to 1300 m. Karnataka, Tamil Nadu and Kerala.

6. *Salacia gambleana* Whiting & Kaul in *Kew Bull.* 1940: 300. 1940. *Salacia talbotii* Gamble in *Kew Bull.* 1916: 133. 1916. (*non* E.G. Baker, 1913).

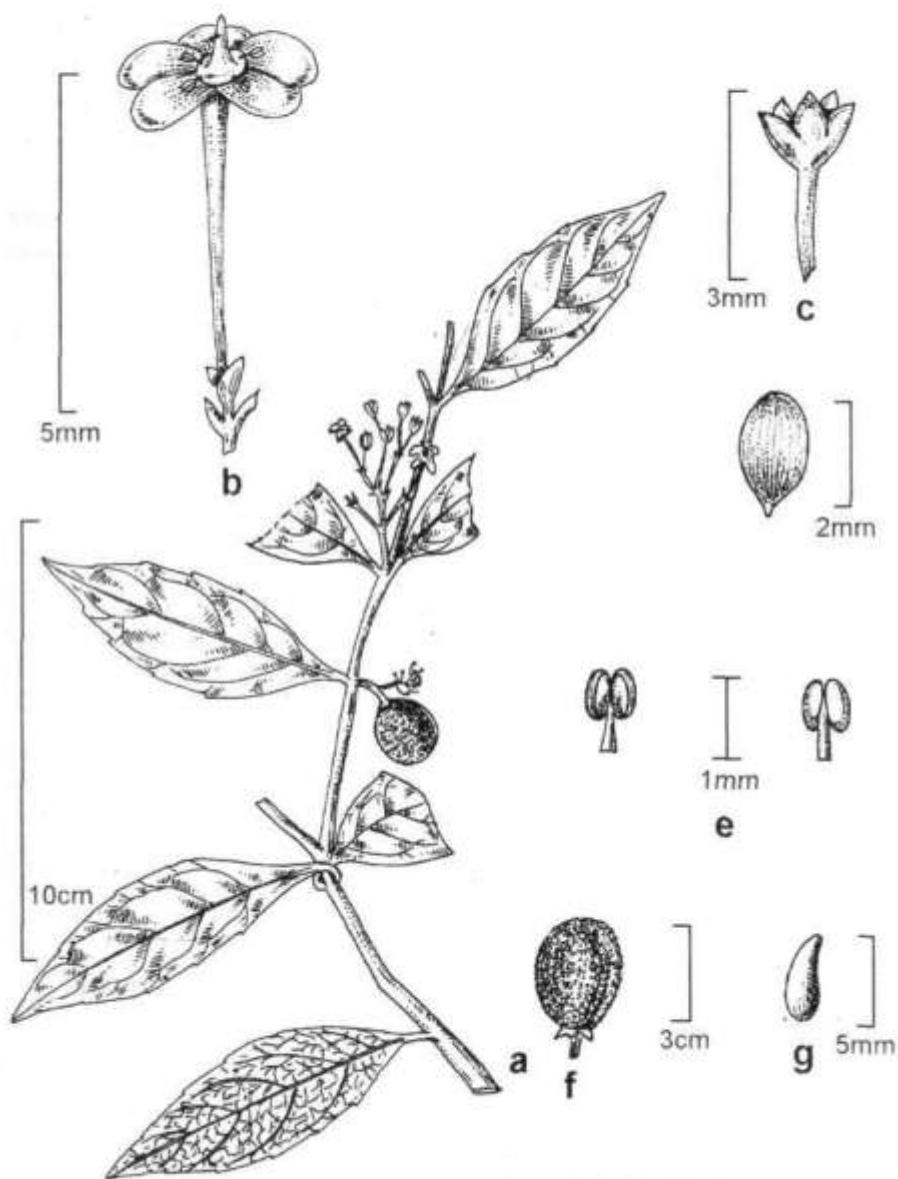


Fig. 29. *Salacia fruticosa* Heyne ex M. Lawson : a. Habit; b. A flower; c. Calyx; d. A petal; e. Stamens; f. Fruits; g. Seed.

Scandent shrubs; branchlets twisted, spreading, lenticellate. Leaves oblanceolate, coriaceous, 6-12 x 3-4 cm, apex acute, base attenuate, margin obscurely undulate, recurved, glabrous; nerves about 8 pairs, reticulate, distinct; petiole 5.7 mm long. Flowers in fascicles; pedicels slender, 5 mm long. Calyx lobes obtuse, margin dentate or fimbriate, rusty. Petals oblong, obtuse, coriaceous margin hyaline. Stamens 3. Disc cushion shaped. Fruits globose, 4 cm across, rugose. Seeds 2 or many, flat, oblong.

Distrib. India : Maharashtra and Karnataka.

7. **Salacia grandiflora** Kurz in J. As. Soc. Bengal 41(2): 300. 1872; M. Lawson in Fl. Brit. India 1: 626. 1875. *S. longifolia* Hook.f. ex M. Lawson in Fl. Brit. India 1: 626. 1875. *nom. illeg.* (*non* Wallich, 1832).

Scandent shrubs or woody climbers, rarely small trees; branchlets usually whitish when dry. Leaves elliptic-oblong to lanceolate or oblong-lanceolate, 7-34.5 x 2.5-11.5 cm, apex acute or acuminate, base cuneate, shining on both surfaces, margin entire; nerves 6-12 pairs; petioles 6-15 mm long. Flowers whitish or yellowish, 3-6 or rarely more on very short, axillary or extra-axillary tubercles. Calyx unequally 5-lobed, 2 outer lobes smaller, detoid or ovate, up to 2 mm long, 3 inner lobes suborbicular, 2-4 mm long, fringed. Petals obovate or obovate-elliptic, 4-7 x 3-6 mm. Disc suborbicular, flat, convex in the middle. Stamens 3, 0.5 mm long. Ovary 3-loculed; ovules 2 in each locule. Fruit rugose, subtended by the persistent calyx lobes and petals, orange pink, 2.5-5 cm across. Seeds 2 or more in each fruit, broad ellipsoid, 1.5-2 x 1-1.5 cm.

Distrib. India : In forests from lowland up to 750 m. Andaman Islands.

Myanmar, Thailand and Malesia.

Note. Roots used medicinally, fruits are edible.

8. **Salacia jenkinsii** Kurz in J. As. Soc. Bengal 45: 203. 1875.

Climbers (?); branchlets glabrous. Leaves oblong to elliptic-oblong, 12.5-18 x 2.5-7 cm, apex apiculate, base obtuse-rounded, papery, glabrous; petiole 5.8 mm long. Flowers in axillary, dichotomous, or in paniced cymes. Calyx

lobes small, broadly ovate, glabrous. Petals obovate, obtuse, linear, glabrous. Stamens 3; filaments subulate, wide at base, distinct, recurved. Disc unshaped.

Distrib. India : Assam.

9. *Salacia khasiana* Purakayastha in Indian For. 64: 276. 1938.

A large woody climber. Leaves elliptic-oblong, 8-15 x 3-6 cm, apex acuminate, tapering towards base, glabrous, subcoriaceous, margin recurved; lateral nerves 7-8 pairs, arcuate; petiole less than 1 cm long, margined. Flowers 1-3, in axillary clusters, bracteate; pedicels 3 mm long. Calyx 5-partite; lobes unequal, thick, orbicular. Petals 5, oblong, 2.5 x 1 mm, thickened in the centre. Stamens 3, continuous with the disc. Ovary 1 x 2 mm, 3-loculed; styles free. Disc fleshy, thick, angular. Berry obovate, 5 x 4 mm, 4-seeded; pericarp wrinkled, warty.

Fl. & Fr. : Jul. - Apr.

Distrib. India : Assam, Arunachal Pradesh, Mizoram and Meghalaya. Endemic.

10. *Salacia korthalsiana* Miq. in Ann. Mus. Bot. Lugd.-Bat 4: 152. 1869; Lakshmin. & Sriv. in Indian J. For. 16: 77. 1999.

Scandant shrubs. Stipules triangular. Leaves elliptic-oblong, ovate or ovate oblong, up to 15 x 7.1 cm, acuminate at apex, cuneate or obtuse at base, margins serrulate-crenate, chartaceous, glabrous; lateral nerves in 5-8 pairs; petioles up to 1 cm long. Flowers in axillary, dichotomously branched, pedunculate cymes, yellowish green. Calyx lobes ovate-oblong. Petals suborbicular-ovoid. Fruits subglobose, up to 2.6 x 2.1 cm, red. Seeds solitary, subglobose.

Fl. & Fr. : October - November.

Distrib. India : Common along forest fringe at ca 20 m alt. North Nicobars.

Thailand, Malesia, Sumatra, Borneo and Philippines.

11. *Salacia macrophylla* Blume, Bijdr. 221. 1825. *S. flavescens* Kurz in J. As. Soc. Bengal 41(2): 300. 1872; M. Lawson in Fl. Brit. India 1: 625. 1875. *S. ovalis* M. Lawson in Fl. Brit. India 1: 627. 1875 (*non* Korth, 1842).

Woody climbers or straggling shrubs. Leaves elliptic to oblong-lanceolate or oblong-obovate, 7.5-34 x 4.5-13.5 cm (up to 43 x 16.5-20 cm), apex acuminate, cuspidate, rarely acute, base cuneate, subcoriaceous, shining, margin entire; nerves 7-14 pairs; petiole 1-2 cm long. Flowers in fascicles, white-yellow or pink red; pedicels 6-10 cm long. Calyx lobes triangular, 1 mm long, margin crenate to fringed. Petals, elliptic oblong or ovate, 1-3 x 1-2 mm. Disc discoid to cupular. Stamens 1 mm long. Ovary 3-loculed; style cylindrical; ovules 4 in each locule. Fruits broad ellipsoid or subglobose, 5.5-6.5 x 5-5.5 cm. Seeds 3, ellipsoid, 2-3 x 1-2 cm.

Fl. & Fr. : Feb. - Mar.

Distrib. India : Scattered in low land forests in coastal areas. Maharashtra, Karnataka and Andaman Islands.

Myanmar, Cambodia, Thailand, Hainan and Malesia.

Note. The decoction of the roots is used after child birth. The ground leaves are internally applied for stomachache and as a poultice against eczema. The flesh around the seeds are sweetish and edible.

12. *Salacia macrosperma* Wight, Ic. t. 962. 1845; M. Lawson in Fl. Brit. India 1: 628. 1875.

Scandent shrubs; branchlets lenticellate. Leaves elliptic-oblong, 5-12.5 x 4 cm, apex subobtuse, base cuneate, coriaceous, margin entire. Flowers numerous in dense fascicles from axillary or extra-axillary branches. Calyx lobes much shorter than the petals, oblong, fringed at the margin. Petals elliptic-oblong, ca 2.5 mm long, obtuse. Disc convex, concave in the middle, margined at the edge. Ovary 3-loculed; ovules 2 in each locule. Fruits globose, ca 4 cm across, smooth or rugulose, orange or black at maturity.

Fl. & Fr. : Jan. - May.

Distrib. India : Western Ghats, up to 1600 m. Goa, Daman & Diu, Karnataka and Tamil Nadu.

13. *Salacia majumdarii* (T. Chakrab. & Gang.) B.D. Naithani *comb. nov.* *Hippocratea majumdarii* T. Chakrab. & Gang. in *J. Econ. Tax. Bot.* 14(1): 122. 1990. **Fig. 30.**

Climber; branchlets initially quadrangular, finally terete, black, smooth, 1-4 mm thick, glabrous. Leaves narrowly oblong, subacuminate or subacute at apex, rounded to subacute at base, glandular-serrate to subentire at margin, coriaceous, glabrous, pale-brown when dry; lateral nerves 5-7 pairs; petiole 5.8 mm long. Flowers 5-7 mm across, in axillary and terminal, slender, branched cymes; pedicels 1-3 mm long, slender. Calyx flattened, 2-2.5 mm across; lobes triangular-ovate. Petals 5, oblong-lanceolate, thick and acute at apex, glabrescent outside. Disc 1.5-2 mm across, slightly angled. Style 2-3 mm long; stigma capitate, minute.

Distrib. India : Andaman Islands. Endemic.

14. *Salacia malabarica* Gamble in *Kew Bull.* 1916: 133. 1916 *et Fl. Pres. Madras* 1: 215. 1918.

Lianas or scandent shrubs; branchlets purplish; lenticels distinct. Leaves oblong, 8-16 x 4-7 cm, apex obtuse, base a little attenuated, papery, glabrous, margin obscurely or distinctly serrate; nerves 7-10, curved at margin, reticulate, not distinct; petiole thick, 1 cm long. Flowers in axillary fascicles; pedicels 1-1.5 cm long, thin. Calyx minute, lobes ovate, entire. Petals oblong, 2.5 mm long, glabrous; margin transparent; filaments short.

Distrib. India : In forests in plains along the west coast. Karnataka, Tamil Nadu and Kerala.

15. *Salacia membranacea* M. Lawson in *Fl. Brit. India* 1: 627. 1875.

Scandent shrubs; branches slender, densely minutely lenticellate. Leaves ovate-elliptic or lanceolate, 8-15 x 2.5-4 cm, more or less caudate or acuminate at apex, abruptly cuneate at base, membranous or thinly coriaceous, margin entire; main lateral nerves ca 8 on either half; petiole 7-8 mm long,



Fig. 30. *Salacia majumdarii* (T. Chakrab. & Gang.) B.D. Naithani
(after Chakrabarty & Gangopadhyay, 1990)

channelled. Flowers small, in axillary fascicles. Fruit *ca* 4 cm across. Seeds yellow, in subfleshy pulp.

Fl. & Fr. : Feb. - June.

Distrib. India : Eastern Himalaya and N.E. India, up to 1000 m. Sikkim, Arunachal Pradesh, Assam and Meghalaya.

Note. Gamble considers it to be a form of *S. roxburghii* (Kanjilal *et al.*, Fl. Assam 1: 275. 1936).

16. *Salacia nicobarica* (King) Raju in J. Biol. Sci. 8(2): 58. 1965.
Hippocratea nicobarica Kurz in J. As. Soc. Bengal 45: 203. 1875.

Scandent shrubs; branchlets glabrous, minutely lenticelled. Leaves elliptic to elliptic-oblong, 12.5-15 cm long, apex apiculate, base obtuse, coriaceous; petiole 7.5-10 mm long. Flowers yellow, in terminal, dichotomous cymes; bracts minute, acute. Calyx lobes ovate, acute, ciliate. Petals rounded, imbricate, scarcely 1.2 mm long. Stamens 3, small, sessile. Ovary nearly fully included in disc. Fruits globose, 2-3 cm across, rough.

Fl. & Fr. : Feb.

Distrib. India : Nicobar Islands. Endemic.

17. *Salacia oblonga* Wallich ex Wight & Arn., Prodr. 106. 1834; M. Lawson in Fl. Brit. India 1: 628. 1875.

Shrubs or small trees; branchlets terete, glabrous, lenticellate. Leaves elliptic-oblong to oblanceolate, 7-15 x 3-5 cm, apex rounded or obtusely acuminate, base obtuse, crenate-serrate, subcoriaceous, glabrous; petiole 6 mm long. Flowers in short, usually up to 5 mm long, axillary, peduncles, sometimes sessile. Calyx lobed nearly to base; lobes orbicular, ciliate. Petals; oblong, 3 mm long, rounded at apex. Ovary half immersed in the disc, conical, tapering to a short style, 3 loculed; ovules 4 in each locule. Fruits globose, 5 cm across. Seeds 8, angular, large, immersed in pulp.

Fl. & Fr. : Dec. - March.

Distrib. India : Western Ghats and Deccan Plateau, in evergreen forests up to 1000 m. Goa, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.

Sri Lanka.

Note. Root bark is used in rheumatism, gonorrhoea and skin diseases.

18. *Salacia platyphylla* Kurz in J. As. Soc. Bengal 44: 203. 1875.

Large glabrous shrubs. Leaves ovate or elliptic-ovate, apex obtusely acuminate, rarely apiculate, base rotund, dull coriaceous, margin entire; petiole 1.6-1.8 cm long. Flowers more or less dark green, many, on axillary tubercles or ramiflorous; pedicels *ca* 1.2 cm. Calyx lobes small, glabrous, broad, entire. Petals subvalvate, obovate, *ca* 4 mm long, glabrescent. Stamens 3; anthers minute; filaments dilated at base. Disc large, glabrous, thick. Fruit more or less globose, cherry-red, extensively large, smooth. Seeds 2, semiconvex, *ca* 2 cm long, sparsely coarse.

Distrib. India : Nicobar Islands.

19. *Salacia reticulata* Wight, Illustr. Ind. Bot. 1: 134. 1840; M. Lawson in Fl. Brit. India 1: 627. 1875; Raju in J. Biol. Sci. 8(2): 59. 1965; Lakshmin. & Sriv. in Indian For. 119(5): 415. 1993.

Scandent shrubs; branches blackish, more or less prominently lenticellate. Leaves lanceolate, elliptic or rarely elliptic-oblong, 4.2-11.8 x 2.3-6.7 cm, acuminate or acute at apex, cuneate or obtuse at base, entire at margin, dark green and shining above, pale and finely reticulate beneath; lateral nerves 5-6 pairs; petioles 0.8-1.3 cm long. Flowers 3-6 in each axil, *ca* 1 mm long; pedicels 2-4 mm long. Calyx lobes short, obtuse. Petals ovate, thick, broad at base. Ovary partially enclosed in disc.

Fl. : Sept.

Distrib. India : Along sea shore. Kerala and Andaman Islands. Rare.

Sri Lanka.

20. *Salacia salacioides* (Roxb.) Rolla Rao & Hemadri in J. Bombay Nat. Hist. Soc. 67 (92): 359. 1970. *Johnia salacioides* Roxb. in Hort. Beng. 5: 1844 & Fl. Ind. 1: 168. 1820. *Salacia roxburghii* Wallich ex Wight & Arn., Prodr. 105. 1834; M. Lawson in Fl. Brit. India 1: 627. 1875.

1814
Asm.: *Ain-kimbel*, *Sebraietam*.

Woody climbers; branchlets terete, bark rough. Leaves oblong to oblong-lanceolate, or elliptic-oblong, 7.5-12.5 x 2.5-5 cm, apex caudate, acuminate, base acute, margin entire, coriaceous, glabrous; nerves 6-8 pairs, arched; petiole 5-8 mm long, thick. Flowers 3-6, rarely solitary, 3-4 mm across; pedicels ca 1 cm long. Calyx lobes orbicular, subciliate. Petals orbicular, 2 mm long, entire. Filaments short, dilated. Fruit a berry, globose, 3-8 cm across. Seeds 1 in each locule.

Distrib. India : North-east India, in evergreen forests up to 300 m. Assam, Arunachal Pradesh, Tripura and Meghalaya.

Bangladesh.

Note. Ripe fruits are edible.

21. *Salacia verrucosa* Wight, Illustr. Ind. Bot. 1: 134. 1840; M. Lawson in Fl. Brit. India 1: 628. 1875.

Straggling shrubs; branchlets with lenticels. Leaves chartaceous, shining above, elliptic to elliptic-lanceolate, 8-20 x 4-6 cm, apex obtuse, base cuneate, margin crenate or subentire; nerves 6-10; petiole, up to 10 mm long. Flowers many, in fascicles from axillary tubercles; pedicels 10-15 mm long. Calyx lobes deltoid, 1 mm long, toothed to fringed. Petals ovate-oblong, 2-3 x 1-2 mm, obtuse. Disc flat, suborbicular, concave in the middle, entire. Stamens, 3, 0.5 mm long. Ovary half immersed, 3-loculed; ovules 2 in each locule. Fruits subglobose, 2.5 cm across, smooth, black. Seeds slightly plano-convex, 1.5-2 x 1-1.5 cm.

Fl. & Fr. : April - Aug.

Distrib. India : In tropical forests, up to 900 m. Assam, Manipur, Meghalaya, Karnataka and Andaman & Nicobar Islands.

Bangladesh, Myanmar, Vietnam, Thailand and Malesia.

RHAMNACEAE

(M.M. Bhandari and A.K. Bhansali)

Trees, shrubs or lianas, unarmed or thorny; branches spinous or aculeate, rarely cirrhose or tendrillar. Leaves simple, alternate, opposite or subopposite, penninerved or 3-5-nerved from the base; stipules deciduous or modified into persistent prickles, free or interpetiolar or intra-axillary. Inflorescence axillary or terminal cyme, rarely raceme or panicle or spicate. Flowers minute, regular, bisexual or less commonly polygamous, hypogynous, perigynous or epigynous, intrastaminal disc cup-like, nectariferous, sometimes thickened near and or produced beyond the rim of the cup. Calyx 4 or 5-lobed, rarely 6, usually carinate within down the middle or with a raised line within, the tube generally more or less united with the ovary or disc and usually persistent. Petals 4-5, sometimes 6, rarely absent, narrowed or clawed at base, cucullate or involute at tip. Stamens 4-5, antipetalous, inserted with petals on edge of disc; filaments filiform, rarely flattened; anthers small, 2 celled or rarely the 2 cells confluent; pollen grains binucleate, tricolporate. Ovary 2-3-loculed, rarely 4 or 1-loculed; ovules solitary in each cell, anatropous, placentation basal; style simple or divided into as many lobes as locules; stigmas capitate or club-shaped. Fruit a capsule, sometimes winged. Seeds solitary, erect, ovoid, angular or compressed, often arillate; testa coriaceous, crustaceous or membranous, often shining; endosperm scanty, fleshy or horny, rarely lacking; embryo large, straight.

Extensively represented throughout the temperate and tropical regions of the world; 70 genera and *ca* 1500 species, 12 genera and 57 species in India.

Literature. BHANDARI, M.M. & A.K. BHANSALI (1990) Rhamnaceae. In M.P. Nayar *et al.* (eds.) *Fasc. Fl. India* 20: 26-114. BHANDARI, M.M. & F. PARVEEN (1976) The bearing of pollen morphology on the taxonomy of Rhamnaceae. *Proc. Symp. Recent Res. in Plant Sciences Patiala*. 22-23. BROWICZ, K. & J. ZIELINSKI (1977) Rhamnaceae. In K.H. Rechinger, *Fl. Iranica* 125: 1-28. MADAN, D. (1988) Gynoecium ontogenesis in the Rhamnaceae. A comparative study. In P. Leins *et al.* (eds.), *Aspects of Floral development* 133-141. QAISER, M. & S. NAZIMUDDIN (1981) Rhamnaceae. In *Fl. Pak.* 140: 1-24.

KEY TO THE GENERA

- 1a. Flowers hypogynous 2
- b. Flowers perigynous or epigynous 7

- | | |
|--|---------------|
| 2a. Leaves prominently 3 or rarely 5-nerved from the base | 3 |
| b. Leaves penninerved | 4 |
| 3a. Peduncle not fleshy in fruits; fruit a drupe | 12. Ziziphus |
| b. Peduncle fleshy in fruits; fruit dry | 5. Hovenia |
| 4a. Secondary nerves numerous, parallel; fruits ellipsoid, 1-2 seeded | 1. Berchemia |
| b. Secondary nerves few, not parallel; fruits globose, 2-4 seeded | 5 |
| 5a. Disc lining the calyx tube not fleshy | 7. Rhamnus |
| b. Disc lining the calyx tube fleshy | 6 |
| 6a. Thorns recurved; flowers in axillary fascicles or cymes or umbels | 9. Scutia |
| b. Thorns straight or absent; flowers in terminal or axillary panicles | 8. Sageretia |
| 7a. Flowers perigynous | 8 |
| b. Flowers epigynous | 11 |
| 8a. Leaves penninerved | 9 |
| b. Leaves 3-5-nerved from the base | 10 |
| 9a. Fruit indehiscent; seed chamber globose, not continued into the upper appressed appendage | 11. Ventilago |
| b. Fruit dehiscent; seed chamber elongated, continued into the compressed upper appendage | 10. Smythea |
| 10a. Fruit winged; epicarp leathery; endocarp woody | 6. Paliurus |
| b. Fruit not winged; epicarp fleshy; endocarp horny or leathery | 12. Ziziphus |
| 11a. Tendrils absent; receptacle not prolonged beyond the ovary; fruit girt at base by the persistent calyx tube | 2. Colubrina |
| b. Tendrils present; receptacle prolonged beyond the ovary; fruit crowned with the persistent calyx | 12 |
| 12a. Inflorescence umbellate; disc entire; fruit wingless | 4. Helinus |
| b. Inflorescence racemose or paniculate; disc lobed; fruit winged. | 3. Gouania |

1. *Berchemia* Necker ex DC., *nom. cons.*

Trees or shrubs, erect or climbing. Leaves opposite, subopposite or alternate, coriaceous, penninerved; nerves parallel, nervules transverse; stipules small, deciduous, often intraxillary or free. Inflorescence axillary, spicate, paniculate or clustered at ends of branches. Flowers 5 or 6-merous, sessile or pedicellate, polygamous. Calyx 5-lobed, rarely 6; tube short, hemispherical or turbinate. Petals 5, rarely 6, obovate, unguiculate, cucullate. Stamens 5, rarely 6; anthers large, ovate, 2-celled; filaments filiform, often flattened. Disc fleshy, annular, margin free, swollen. Ovary superior, sunk in the disc but free from it, ovoid, 2-loculed; style 2-fid or notched; stigma terminal, obtuse, convex. Drupes surrounded at base by the rim of calyx or 5-lobed calyx tube, ellipsoid,

on ripening black, purple or yellow; putamen crustaceous or woody; exocarp fleshy. Seeds 2, linear-oblong; testa membranous; raphe lateral; albumen fleshy; cotyledons narrowly oblong; radicle short.

North America, Africa, but mostly in S. Asia; 22 species, 3 in India.

Note. In India species of *Berchemia* are confined to subtropical N.W. Himalaya and tropical evergreen forests of E. Himalaya.

KEY TO THE SPECIES

- | | |
|---|---------------------------------|
| 1a. Flowers 6-merous | 1. <i>B. edgeworthii</i> |
| b. Flowers 5-merous | 2 |
| 2a. Climbing shrubs; lateral nerves 9-15 pairs; fruits surrounded at base by the rim of calyx | 2. <i>B. floribunda</i> |
| b. Undershrubs; lateral nerves 6-8 pairs; fruits surrounded at base by the 5-lobed calyx tube | 3. <i>B. lineata</i> |

1. *Berchemia edgeworthii* M. Lawson in Fl. Brit. India 1: 638. 1875.

Shrubs; branches glabrous. Leaves elliptic or ovate-lanceolate, 2-2.5 cm long, scarious; petioles 3-6 mm long; stipules 6 mm long. Flowers 6-merous, shortly pedicelled, 2 together in the axil of the leaves; buds almost hidden by the stipules. Calyx lobes 6. Petals 6, broadly ovate. Stamens 6. Drupes 1.6 cm long, surrounded at the base by the persistent entire calyx.

Distrib. India : Himalayas. Uttar Pradesh

Pakistan, Nepal and Afghanistan.

Note. This is a distinct species due to the hexamerous nature of its flowers. Parker (1918) included *B. edgeworthii* under *B. lineata* in his flora of Punjab, but a critical study of the type material supports its distinct identity.

2. *Berchemia floribunda* (Wallich) Brongn., Mem. Fam. Rham. 50. 1826 & Ann. Sci. Nat. Ser. 1. 10: 357. 1827; M. Lawson in Fl. Brit. India 1: 637. 1875. *Ziziphus floribunda* Wallich in Roxb., Fl. Ind. 2: 368. 1824.

Fig. 31.

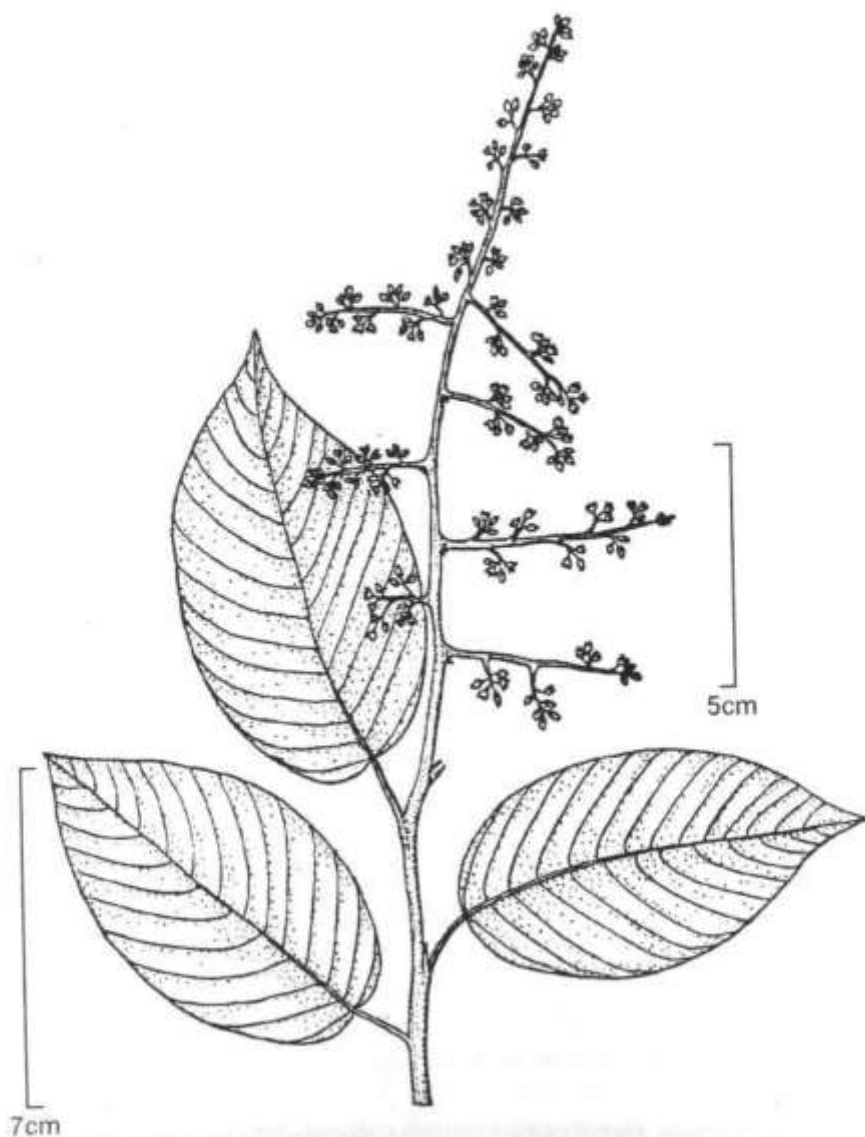


Fig. 31. *Berchemia floribunda* (Wallich) Brongn.

Hindi: *Amili, Kalapag*; Jaun.: *Kouloi, Kauloi*; Lep.: *Rungycony rik*;
Nep.: *Chiaduk*.

Large, climbing shrubs; branches glaucous when young; bark thin, whitish. Leaves alternate, spreading, ovate-oblong or elliptic, 4.0-8.3 x 2.2-4.4 cm, acute to acuminate at apex, obliquely furrowed, rounded or subcordate at base, subcoriaceous, shining, glabrous, margin entire; lateral nerves oblique; petioles 1.3-1.8 cm long, channelled; stipules infra-axillary, 2-4 mm long, subulate, bifid, connate up to middle, early deciduous. Inflorescence 3-8-flowered clusters in terminal panicles. Flowers 5-6 mm across, sessile or shortly pedicellate; pedicels 1-2 mm long. Calyx lobes 5, 2-3 mm long, keeled up to the middle, glabrous. Petals 5, spatulate, 1.5-2.2 mm long. Stamens 5, longer than the petals; anthers dorsifixed; filaments flat. Disc massive, enveloping the ovary, margin notched above the insertion of filaments. Ovary glabrous; style long with 2 stigmata. Drupes ellipsoid or cylindrical, 9-12 x 4-6 mm. Seeds 2, 6-8 x 3-4 mm, compressed, black.

Fl. & Fr. : May - April.

Distrib. India : Kashmir, Himachal Pradesh, Uttar Pradesh, West Bengal and Assam.

Note. Chromosome number $n=12$ (Mehra & Khosla in *Taxon* 18: 213-221. 1969).

Wallich Cat. 4256 consists of 3 sheets, all preserved at Kew. 4256a from Nepal, 4256b from Kumaon and 4256c from Silhet. There are no fruits on the first sheet. The fruits on the specimen from Kumaon are smaller than those from Silhet. M. Johnston (1969) regards 4256a as the probable holotype (ex Nepal). *B. laxa* Wallich Cat. 4257 (K) has larger fruits compared to 4256b or 4256c.

3. *Berchemia lineata* (L.) DC., *Prodr.* 2: 23. 1825; M. Lawson in *Fl. Brit. India* 1: 638. 1875. *Rhamnus lineata* L., *Amoen. Acad.* 5: 308. 1760.

Diffused undershrubs; bark smooth, shining; young branches puberulous. Leaves very variable, ovate-elliptic, 0.7-2.5 x 0.3-1.5 cm, obtuse at apex, rounded at base, glabrous, mucronate, entire, midribs depressed above, prominent beneath; petioles 3-4 mm long; stipules infra-axillary, setaceous, 3-4 mm long. Inflorescence

axillary or terminal fascicles, 2-4-flowered. Flowers 5 mm across, glabrous; pedicels 2-3 mm long. Calyx 2-2.5 mm long, keeled up to base; tube campanulate. Petals 5, 1.5-2 mm long, ensheathing the stamens. Stamens 5, 2-2.5 mm long, inserted below the disc; anthers dorsifixed; filaments flat. Disc massive, glabrous. Ovary glabrous; ovules 1 in each locule; style 2 mm long; stigma emarginate or notched. Drupes ellipsoid or cylindrical, 6-10 x 3-5 mm, bluish when ripe, glabrous. Seeds 2, 6-8 x 2-3 mm, compressed, black.

Fl. & Fr. : May - Nov.

Distrib. India : Western and Eastern Himalaya, often found among rocks at about 2100 m. Kashmir, Himachal Pradesh, Uttar Pradesh and Sikkim.

China.

Note. A pretty small shrub very common in the area.

2. *Colubrina* A. Rich. ex Brongn., *nom. cons.*

Scandent or erect shrubs or trees, unarmed or rarely armed. Leaves alternate or opposite, basally 3-nerved or penninerved, petiolate; stipules small, deciduous. Inflorescence axillary, thyrsoid or cymose fascicles. Flowers small, protandrous, 5-merous; calyx, corolla and androecium attached to the rim of hemispheric or shallow floral cup. Calyx lobes 5, spreading, valvate, deltoid, pubescent without, deciduous along the rim of the cup; tube hemispherical. Petals 5, cucullate, obovate, convolute, clawed at base, inserted below the disc. Stamens 5; filaments filiform; anthers ovate. Disc fleshy, annular, flat, and nearly completely surrounding the ovary, accrescent along the cup and adnate to the lower fifth to half of capsule. Ovary inferior, 3-loculed; style 3-celft; stigmas truncate or obtuse. Capsules nearly globular, slightly 3-lobed, dehiscing septicidally into 3 cocci; exocarp thin. Seeds obovoid, compressed, 3-gonous; albumen fleshy, thin; cotyledons flat or incurved; embryo flat.

Mostly in the warmer parts of America, also occurring in Hawaii, Madagascar and S.E. Asia; 31 species, 2 in India.

Note. In India the genus is characteristic to coastal areas, just above high tide level.

KEY TO THE SPECIES

- 1a. Leaves ovate, basally 3-nerved; lateral nerves 2-3 pairs 1. *C. asiatica*
 b. Leaves elliptic to lanceolate, penninerved; lateral nerves 4-6 pairs 2. *C. travancorica*

1. *Colubrina asiatica* (L.) Brongn., Mem. Fam. Rham. 62. 1826 & in Ann. Sci. Nat. Ser. 1, 10: 369. 1827; M. Lawson in Fl. Brit. India 1: 642. 1875. *Ceanothus asiaticus* L., Sp. Pl. 196. 1753. **Fig. 32.**

Mar.: *Guti.*

Glabrous, straggling, littoral, unarmed shrub, 1-3 m tall; branchlets slender, often zig-zag, internodes 5-45 mm long. Leaves alternate, ovate, 3.0-10.2 x 2.3-6.5 cm, acuminate, broadly rounded to shallowly cordate at base, membranous, crenate, crenatures gland-tipped; petioles 7-22 mm long; stipules 1 mm long, deltoid. Inflorescence a cyme. Flowers yellowish green, 5-6 mm across, fragrant, lower fertile, the upper abortive or staminate; peduncles 2-6 mm long; pedicels 2-5 mm long, elongating. Calyx lobes 5, 2.5-3 mm long, glabrous; tube glabrescent. Petals yellow, 1.8 mm long, emarginate, glabrous; claw slender. Stamens 1.6 mm long; anthers dorsifixed. Disc 5-lobed, glabrous. Ovary globose; style 1.5 mm long; stigma truncate. Capsules globose, 8-10 mm across, slightly depressed at top, dehiscent; cocci thin-walled, radial walls membranous, occasionally adherent to the receptacle after dehiscence. Seeds 3, chocolate brown, 4-7 x 4-5 mm, slightly emarginate at the base.

Fl. & Fr. : Dec. - March.

Distrib. India : Near the coasts and just above the high tide level. Orissa, Maharashtra, Karnataka, Tamil Nadu and Andaman & Nicobar Islands.

Myanmar, Sri Lanka, Indonesia, Australia and S. Africa.

Note. Johnston (1971) recognises two varieties under this species; the Indian plant is *C. asiatica* var. *asiatica*.

Uses. The bark contains saponin, and is reported to be used in Samoa for clearing mats.

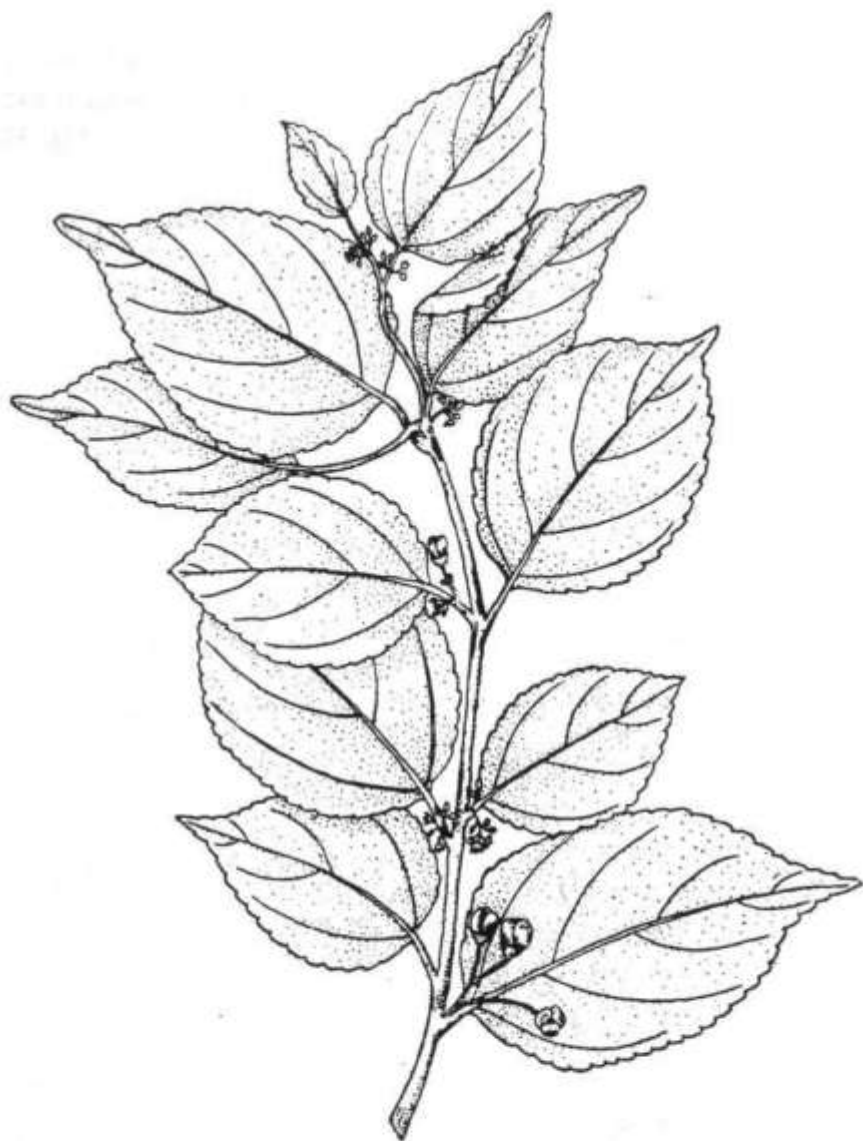


Fig. 32. *Colubrina asiatica* (L.) Brongn.

2. **Colubrina travancorica** Beddome, Ic. Pl. Ind. Orient. 1: 43, t. 188. 1874; M. Lawson, in Fl. Brit. India 1: 643. 1875. **Fig. 33.**

Unarmed shrubs, young branches antrorse, appressed golden silky hairy. Leaves alternate or subopposite towards the lowering region, elliptic to lanceolate, 9.8-12.5 x 3.5-4.4 cm, apex acuminate, mucronate, base rounded, crenate, crenatures black, callous tipped, distal ones more conspicuous than the proximal ones, membranous, when young densely pubescent beneath and costa above; lateral nerves impressed above and raised below; petioles 5-9 mm long, pubescent; stipules 2-3 mm long, subulate, pubescent. Inflorescence thyrses or congested dichasia; peduncles 4-8 mm long, golden silky hairy. Calyx lobes 5, 2-2.5 mm long; tube campanulate, sparsely hispid. Petals 5, 1.5-2 mm long. Stamens shorter than petals; anthers dorsifixed; filaments flat. Disc 10-lobed, pitted. Ovary glabrous; style 3-cleft up to the middle, glabrous. Capsules globose, 6-8 mm in diam., slightly depressed at the top.

Fl. & Fr. : Nov. - March.

Distrib. India : Coastal forests. Kerala. Endemic.

3. **Gouania** Jacq.

Climbing shrubs; branches circinate tendrilar. Leaves alternate, petiolate; stipules free, caducous. Inflorescence terminal or axillary racemes or panicles. Flowers bisexual, epigynous, pentamerous; rachis often cirrhose. Calyx lobes 5, valvate, glabrous or pubescent. Petals 5, cucullate, clawed at base, inserted below the margin of disc. Stamens 5, enclosed in petals; anthers dehisce longitudinally. Disc massive, glabrous or hairy, 5-lobed; lobes opposite to calyx lobes. Ovary connate to the bottom of calyx tube, 3-carpellary, 3-loculed, immersed in the disc, usually urceolate; style 3-cleft, obscurely or deeply 3-lobed; stigma papillose. Schizocarpic capsules trigonous, 3-winged or cocci 3, woody, 3-locular, indehiscent. Seeds 3, obovate, plano-convex; testa shining, horny; albumen thin; cotyledons rotundate; embryo erect, furnished with perisperm.

America, Asia, Africa, Madagascar and other Islands of the Indian ocean and Australia; 70 species, 4 in India.



Fig. 33. *Colubrina travancorica* Beddome

KEY TO THE SPECIES

- | | |
|---|----------------------------------|
| 1a. Leaves entire; fruits rusty tomentose | 1. <i>G. andamanica</i> |
| b. Leaves crenate-serrate; fruits glabrous | 2 |
| 2a. Leaves distantly and minutely serrulate, rounded at base;
flowers sessile; disc villous, lobes rounded, emarginate | 3. <i>G. microcarpa</i> |
| b. Leaves crenate, cordate at base; flowers shortly pedicellate;
disc glabrous, lobes stellately horned | 3 |
| 3a. Inflorescence glabrous; lateral nerves 4-6 pairs | 2. <i>G. leptostachya</i> |
| b. Inflorescence puberulous; lateral nerves 6-8 pairs | 4. <i>G. napalensis</i> |

1. *Gouania andamanica* King in J. As. Soc. Bengal 65: 382. 1897.

Climbing shrubs or lianas, tendrilar; young branches rusty brown pubescent. Leaves oblong or elliptic-ovate, 4.3-7.5 x 2.2-5.6 cm, sometimes rounded at apex, mucronate, glabrous to sparsely pubescent above; lateral nerves 7-9 pairs, conspicuously impressed or not, secondary veins camptodromous, tertiary veins transverse; petioles 1-1.5 cm long, pubescent; stipules 2 mm long, subulate, pubescent. Inflorescence axillary or terminal racemes or 5-6-flowered clusters. Flowers 5-7 mm across, sessile; bracteoles conspicuous, 5 mm long; subulate, pubescent, deciduous. Calyx lobes 2 mm long, deltoid, glabrous within, densely pubescent without, thickened at apex. Petals 1.5 mm long, spatulate. Stamens 1.7 mm long; anthers dorsifixed. Disc glabrous, saucer-shaped; lobes stellately horned, filling the calyx tube. Style 3-cleft, up to half the length. Capsules 0.8-2 x 0.5-1.7 cm, triquetrous, somewhat winged or not, crowned with persistent calyx, tardily dehiscent. Seeds minutely emarginate or retuse at apex; testa hard, gibbous.

KEY TO THE VARIETIES

- | | |
|---|-----------------------------------|
| 1a. Leaves sparsely pubescent above; nerves not conspicuous;
fruits not winged | 1.1 var. <i>andamanica</i> |
| b. Leaves glabrous above; lateral nerves conspicuously impressed;
fruits somewhat winged | 1.2 var. <i>brevialata</i> |

1.1 var. *andamanica*

Fl. & Fr. : Oct. - Sept.

Distrib. India : On the rocky places in thick forests near the streams. Andaman. Islands. Endemic.

1.2 var. breviaolata Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 37. 1990.

Distrib. India : North Andamans. Endemic.

2. Gouania leptostachya DC., Prodr. 2: 40. 1825; M. Lawson in Fl. Brit. India 1: 643. 1875.

Hindi: *Kalalag*; Or.: *Khanta*; Tel.: *Penki tiga*.

Unarmed climbing shrubs or lianas, up to 8 m long; tendrils axillary or extra-axillary; branches glabrous with continuous brown, vertical lines; internodes 2-5 mm long. Leaves ovate, 3.5-8.6 x 2-8.5 cm, acute to acuminate, glabrous above, grey or brown antrorse hairy on veins beneath; primary and secondary veins leptodromous; petioles 1.5-3.4 cm long, glabrous; stipules 4-5 x 0.5-1 mm, subulate. Racemes in 3-7-flowered clusters. Flowers white, 5-6 mm across; pedicels 2 mm long; bracteoles subulate, pubescent at base, caducous. Calyx lobes deltoid, 2.5 x 1.5 mm, thickened at apex, glabrous or sparsely hairy without. Petals spathulate, 1-2 mm long, inserted below the margin of disc. Stamens 1-1.5 mm long; filaments alternating with subulate appendages of disc. Style 3-cleft up to middle; stigma recurved, obtuse. Capsules 7-15 x 6-12 mm, dehiscent or indehiscent, crowned by persistent calyx. Seeds 3-5 x 3-4 mm, black shining.

KEY TO THE VARIETIES

- | | |
|--|-------------------------------|
| 1a. Fruits dehiscent by 3-valves; seeds ca 5 mm long | 2.1 var. leptostachya |
| b. Fruits indehiscent; seeds up to 3.5 mm long | 2.2 var. nainitalensis |

2.1 var. leptostachya

Fig. 34.

Fl. & Fr. : Aug. - Dec.

Distrib. India : Abundant along banks of streams and in hedges. Uttar Pradesh, West Bengal, Assam, Orissa, Maharashtra and Andaman & Nicobar Islands.

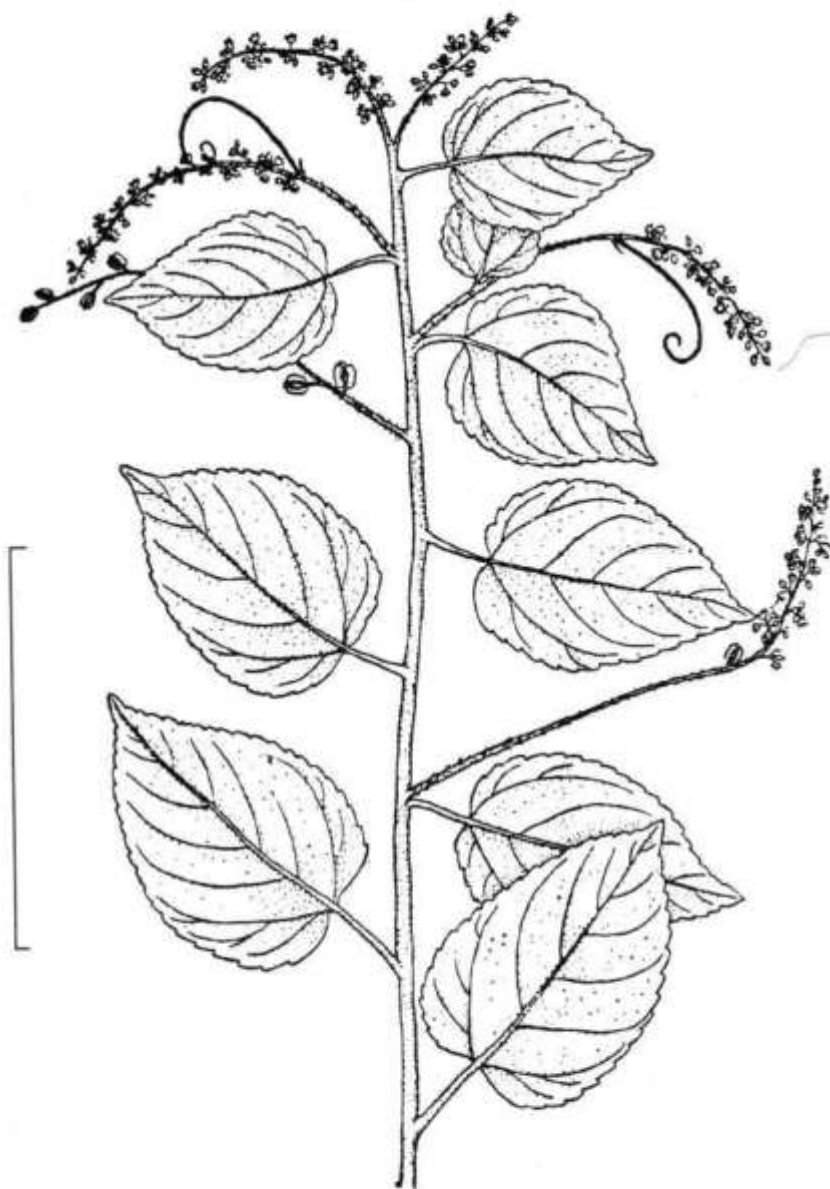


Fig. 34. *Gouania leptostachya* DC. var. *leptostachya*

Nepal, Myanmar, Philippines, Malaysia and Indonesia.

2.2 var. *nainitalensis* Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 38. 1990.

Distrib. India : Uttar Pradesh. Endemic.

3. *Gouania microcarpa* DC., Prodr. 2: 40. 1825; M. Lawson in Fl. Brit. India 1: 643. 1875. **Fig. 35.**

Climbing shrubs; tendrils axillary or extra-axillary; branchlets and tendrils with longitudinal stripes of antrorse, dense brownish hairs. Leaves elliptic-ovate, 2.8-9.5 x 1.5-3.5 mm, acute at apex, rounded at base, serratures tipped by deciduous, glandular mucro; secondary veins camptodromous; petioles 5-16 mm long, villous with antrorse brownish hairs; stipules 3-6 x 0.5-1.2 mm, subulate, pubescent. Racemes 4-8-flowered clusters. Flowers white, 4-5 mm across, sessile; bracteoles conspicuous, 2-3 mm long, lanceolate. Calyx lobes 1.5-2 x 1-1.5 mm, densely pubescent without, glabrous within, deltoid, thickened at apex, keeled inside up to middle. Petals oblanceolate, spatulate, 1-1.5 x 2-2.5 mm. Stamens 1 mm long; filaments filiform. Disc saucer-shaped, glabrous. Style 3-cleft about two-third its length; style arms elongate, hairy, obtuse. Capsules 10-15 x 7-13 mm, glabrescent, polished, green, 3-winged; wings yellow, crowned by persistent calyx. Seeds 5 x 4 mm; cotyledons ovate, cordate at base, retuse at apex.

Fl. & Fr. : June - May.

Distrib. India : Jammu & Kashmir and Punjab.

Myanmar, Sri Lanka, Malaysia and Indonesia.

Note. The fruits are edible and sold in markets for preparing condiments and chutney.

4. *Gouania napalensis* Wallich in Roxb., Fl. Ind. 2: 417. 1824; M. Lawson in Fl. Brit. India 1: 644. 1875.

Asm.: Jwarpat; Kh. Jermei-ja-main, Mei-tein-land; Garo: Dibok-pak-bindu, Dugithang, Dumigong; Lep.: Tungvheong, Mon-rik.

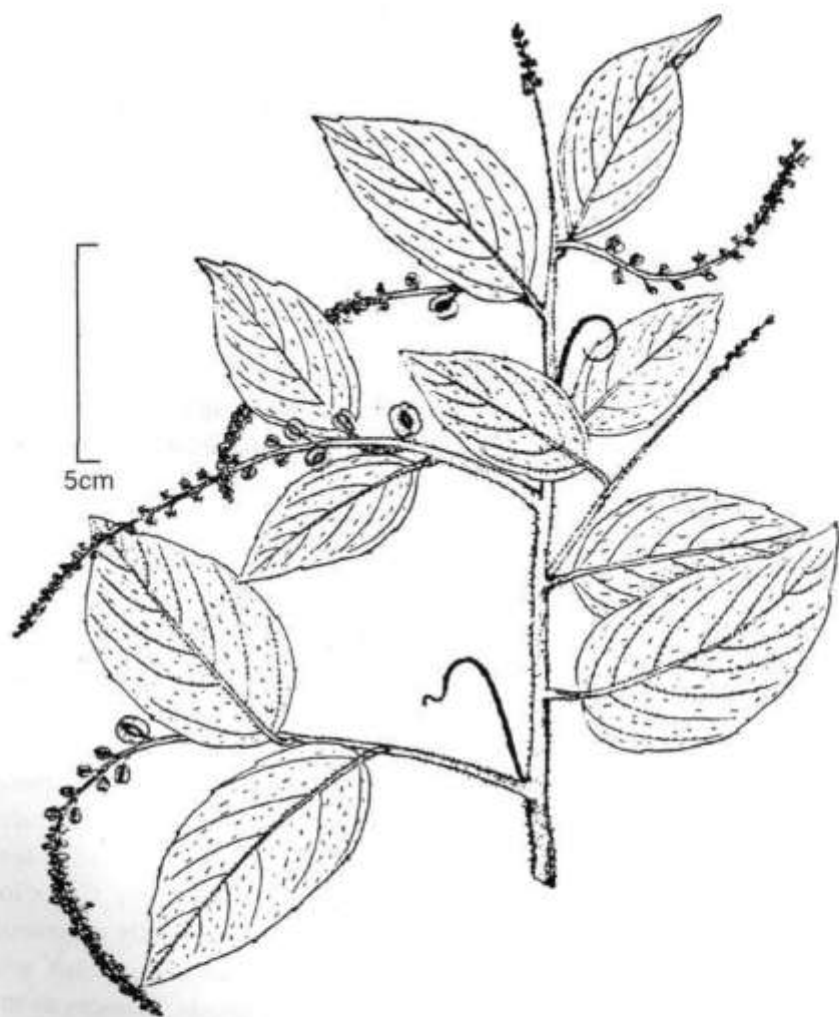


Fig. 35. *Gouania microcarpa* DC.

Extensive climbing shrubs; young branches rusty hairy; tendrils terminal or basal on racemes, simple, slender, villous, spiral. Leaves ovate or cordate, 8-16 x 4.5-5.0 cm, entire, apex acuminate, acumen cuspidate to obtuse, basal serratures glandular, subulate; primary and secondary veins camptodromous; petioles 1-2.8 cm long, pubescent, with a few subulate, evanescent villous glands at base; stipules membranous, lanceolate or falcate, acute, puberulous. Inflorescence terminal, cylindrical, 4-6-flowered racemes or panicles. Flowers 5-6 mm across, white, pubescent; pedicels 2-4 mm long; bracteoles lanceolate, subulate, deciduous. Calyx lobes 2-3 mm long, glabrous within; tube 2 mm wide. Petals 1.5-2 mm long, cuneate, obtuse, glabrous. Stamens 1.2-1.8 mm long; anthers dorsifixed. Disc saucer-shaped; lobes linear. Style 3-cleft, elongate. Capsules 3-winged, semicircular, 1.2 cm long, separating into 3 single-seeded cocci. Seeds 5.5 x 3.5 mm.

Fl. & Fr. : June - Nov.

Distrib. India : Particularly in wooded grassland up to 1800 m and also near the coastal areas. Punjab, Uttar Pradesh, Bihar, West Bengal, Sikkim, Meghalaya and Assam.

Nepal.

Note. Young leaves are eaten in West Bengal.

4. *Helinus* E. Meyer ex Endl., *nom. cons.*

Unarmed, scandent, cirrhose shrubs. Leaves alternate, uppermost sometimes much reduced and bract-like, entire, petiolate; stipules linear, caducous. Inflorescence axillary, solitary or umbellate; peduncles slender, often longer than the subtending leaves; pedicels short to elongate, filiform. Calyx lobes 5, deltoid, often with membranous white margins; tube broadly campanulate or obconic, adnate to the ovary. Petals 5, yellowish or greenish white, oblanceolate, cucullate, arcuate, ascending during anthesis. Stamens as many as petals; anthers 2-loculed, dehiscing longitudinally. Disc flat, filling the calyx tube, massive, thickened, adherent to the ovary. Ovary inferior, 3-carpellary, 3-loculed; style 3-fid. Capsules schizocarpic, coriaceous; endocarp thin, crustaceous, separating into 3 mericarps, each of which releases its seeds by a sudden opening of the ventral suture.

Africa and Indian subcontinent; 6 species, 1 in India.

Note. Grows in thickets and wooded grasslands, forest margins, and in dry open woody vegetation, ascending up to 1200 m. Also found in ravines, bank of streams and shady places, occasionally in valley.

Helinus lanceolatus Brandis, For. Fl. 574. 1874; M. Lawson in Fl. Brit. India 1: 644. 1875.

Bright green, slender, tendrilar shrubs; tendrils usually near the tips of branches or sometimes branchlets ending in short simple tendrils; young branches hairy. Leaves ovate, lanceolate, 1.3-8.1 x 0.3-3.2 cm, apex acute, rounded or usually shallowly cordate at base, glabrous above and tomentose below, membranous, entire, penninerved; lateral nerves 3-5 pairs, secondary nerves camptodromous; petioles 5-10 mm long, pilose or tomentose; stipules 0.5-2 x 0.5-1 mm, subulate. Umbels 2-12-flowered. Flowers 4-8 mm across; peduncles filiform, 1-3.2 cm long; pedicels 4-7 mm long in flowers, 7-15 mm in fruits; bracteoles 1.2 x 0.5 mm long. Calyx 2.5-4 x 1.5-2 mm, glabrous. Petals 5, whitish, 2-3 x 0.5-1 mm, inserted on the margin of disc, margin and apex incurved, enclosing stamens. Stamens 1.5-2.5 mm long; filaments filiform, flat; anthers dorsifixed. Disc glabrous. Ovules solitary; style 3-fid; stigma lobes recurved, glabrous. Fruits pendulous, globose to slightly obovoid, 5-10 mm long, glabrous, reddish-green to dark brown or black when ripe. Seeds 3, 3.5 x 3 mm, plano-convex; testa coriaceous, shining; albumen fleshy; cotyledons large, flat, obtuse; radicle short.

KEY TO THE VARIETIES

- | | |
|--|------------------------------|
| 1a. Leaves glabrous on both surfaces | 1.1. var. lanceolatus |
| b. Leaves tomentose below, slightly pubescent above on nerves only | 1.2. var. tomentella |

1.1. var. **lanceolatus**

Fl. & Fr. : Jan. - May (rarely throughout the year).

Distrib. India : Jammu & Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh, Bihar, West Bengal, Madhya Pradesh and Maharashtra.

Pakistan.

1.2 var. *tomentella* Beddome ex Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 47. 1990.

Distrib. India : Madhya Pradesh (in ravines between Jabalpur and Mandla).

5. *Hovenia* Thunb.

Small, unarmed trees. Leaves alternate, subbifarious, membranous, basally 3-nerved. Inflorescence axillary and terminal, dichotomous, pedunculate cymes, many-flowered. Flowers bisexual, pentamerous. Calyx lobes 5, glabrous, ovate, acute. Petals 5, cucullate, glabrous, unguiculate, inserted below the disc. Stamens 5; filaments embedded in the margins of the 5-lobed disc, filiform; anthers 2-loculed, dehiscence longitudinal. Ovary hypogynous, tricarpellary, trilocular, sunk in the disc, conical; style 3-cléft, branches straight; stigma capitate. Fruits obscurely 3-lobed, indehiscent. Seeds 3, one in each locule; testa coriaceous, separating from inner membranous tegmen.

Asia; 5 species, 1 in India.

Hovenia dulcis Thunb., Nov. Gen. 8. 1781 & Fl. Jap. 101. 1784; M. Lawson in Fl. Brit. India 1: 640. 1875

Fig. 36.

Chamba: *Chamhun*; Ravi : *Chamun* Tam.: *Muralimaram*.

Deciduous trees with straight bole and a broad, rounded crown, 9-24 m tall; young shoots hairy; bark greyish white, smooth. Leaves cordate-ovate, 6-14 x 3-9 cm, often inequilateral, acuminate, deeply and sharply serrate, glabrescent above, hairy beneath on veins when young. Cymes axillary or terminal; peduncles 5 cm long, subcylindrical, hairy when young, becoming thick with sweet red pulp after flowering. Flowers 4-7 mm across; pedicels 2-5 mm long. Calyx lobes 2-2.5 x 1.5-2 mm, whitish; tube conical with raised median ridge inside, somewhat spreading, deciduous. Petals yellowish, obovate, 2-2.5 x 1.5-2 mm, emarginate. Stamens 2-3 mm long, enclosed in petals; anthers dorsifixed. Disc lining the calyx tube, hairy, fleshy, flat. Ovary hairy; ovule one in each locule, basal; style cylindric, 3-fid. Fruits spherical, nearly dry,



Fig. 36. *Hovenia dulcis* Thunb.

calyx tube adhering to the base. Seeds 4-5 x 4 mm; embryo erect, yellowish; cotyledons orbicular; radicle oval.

Fl. & Fr. : April - Oct.

Distrib. India : Kashmir, Himachal Pradesh, Uttar Pradesh, West Bengal, Assam, Meghalaya and Tamil Nadu.

China and Japan.

Note. Chromosome number: $n=12$ (Dolcher in Nov. Gior Bot. Ital. 54: 648. 1947), $2n = 24$ (Gadella *et al.* in Acta. Bot. Nerrl. 18: 74-83, 1969).

In some places it grows as a large handsome tree.

Uses. The fleshy peduncle, which is sweet and aromatic is eaten. The leaves are eaten by cattle. The tree is cultivated for its fleshy peduncles which taste like Bergamot pear.

6. *Paliurus* Miller

Shrubs or trees. Leaves alternate, basally 3-5-nerved, petiolate; stipules prickly, usually persistent. Inflorescence axillary, pedunculate cymes. Calyx lobes 5, green, broad. Petals 5, obovate, yellow, clawed at base. Stamens 5, opposite to petals, inserted on broad, green, fleshy disc; filaments short, greenish. Ovary half immersed into the disc, 3-loculed; style 3-cleft. Fruit dry, indehiscent, hemispherical and 3-celled. Seeds 3.

South Europe, Central and West Asia; 8 species, 1 in India.

Paliurus spina-christi Miller, Gard. Dict. ed. 8. 1768; Safui in J. Bombay Nat. Hist. Soc. 80: 250. 1983.

Shrubs or small trees, 2-3.3 m tall; bark ash coloured; branches numerous, spreading horizontally; branchlets slender, drooping. Leaves alternate, drooping, ovate or elliptic, 1.9-3.2 x 1.2-2.3 cm, apex obtuse or acute, base unequally alternate, shining above, paler or slightly glaucous beneath, serrulate, serratures tipped by a deciduous, glandular mucro; two lateral nerves ending near apex,

campylodromous; secondary nerves diverging from the midvein at an angle of 30°-50°; petiole 5-10 mm long, subcylindrical, slightly hairy; stipular thorns two, unequal, with thickened base, straight one 1.5 cm long, recurved one 6 mm long. Cymes axillary; peduncle 5-7 mm long. Flowers 4 mm across; pedicels 3 mm long, glabrous. Calyx lobes deltoid, 1.5 mm long, acute, thickened at apex, keeled up to middle. Petals 1 mm long, unguiculate, margin recurved. Stamens equal to petals; anthers dorsifixed, ovate, 2-celled, longitudinally dehiscent. Disc 5-lobed, glabrous. Styler branches united up to base; stigma obtuse. Fruits spherical, 1.5-2.0 cm in diam., placed on the persistent calyx, surrounded at the top by a broad, leafy, entire wing. Seeds embedded in and completely concealed by the enlarged disc.

Fl. & Fr. : July - Nov.

Distrib. India : Himachal Pradesh.

South Europe, Central and west Asia.

Note. Chromosome number : $n = 12$ (Dolcher in Nov. Gior. Bot. Ital. 54: 648. 1947). $2n = 24$ (Marková in Taxon 20:609-14, 1971).

7. *Rhamnus* L.

Deciduous or evergreen, armed or unarmed, shrubs or small trees, rarely scandent. Leaves alternate, subopposite or fascicled, petiolate, penninerves, entire or dentate; stipules minute, free, persistent or deciduous. Inflorescence axillary, solitary cymes or fascicles, rarely panicles or thyrses. Flowers 5- or 4-merous, bisexual or polygamo-dioecious. Calyx lobes 4-5, triangular-ovate, erect or spreading; tube urceolate. Petals 4-5 or absent, inserted on the margin of calyx tube, cucullate or flat, shortly clawed. Stamens 4-5; filaments very short; anthers dehiscing longitudinally. Disc thin, filling the calyx tube. Ovary (2-) 3 or 4-celled, ovoid; styles 3-4-cleft, rarely 2-cleft about half the length; stigma obtuse, papillose. Drupes with 2-4, free, 1-seeded stones, globose, encircled at base by calyx tube; pyrenes horny or cartilaginous, indehiscent or dehiscing inwardly. Seeds obovate; testa membranous or crustaceous, smooth or furrowed on the back; raphe dorsal, ventral or lateral; albumen fleshy; cotyledons flat or with recurved margins.

America, Europe, Asia, often rare in tropics; *ca* 150 species, 11 in India.

Note. Most of the Indian species are confined to the Himalayas except *R. purandharensis* and *R. wightii* which are confined to peninsular India.

Indian species are found in wooded or open forests in Himalaya and Western Ghats, usually at altitudes ranging between 600 to 3000 m.

KEY TO THE SPECIES

- | | |
|--|-----------------------------|
| 1a. Erect shrubs or trees, sometimes rambling | 2 |
| b. Prostrate shrubs | 10 |
| 2a. Plants unarmed | 3 |
| b. Plants armed (unarmed in <i>R. procumbens</i>) | 8 |
| 3a. Leaves pubescent or tomentose | 4 |
| b. Leaves glabrous | 6 |
| 4a. Petals absent; fruits surrounded at base only by rim of the calyx | 9. <i>R. purpurea</i> |
| b. Petals present; fruits surrounded at base by persistent, 5-lobed calyx | 5 |
| 5a. Leaves serrate; calyx keeled within; style cleft nearly-down to the base | 8. <i>R. purandharensis</i> |
| b. Leaves crenate; calyx not keeled; style cleft only at apex | 10. <i>R. triquetus</i> |
| 6a. Leaves distantly crenate | 3. <i>R. nepalensis</i> |
| b. Leaves closely serrate | 7 |
| 7a. Flowers <i>ca</i> 6 mm across; petals obtuse and apiculate; disc 5-lobed; ovary 3-4-loculed; style 3-4 cleft | 11. <i>R. wightii</i> |
| b. Flowers up to 3.5 mm across; petals retuse; disc unlobed; ovary 2-loculed; Style 2-cleft | 1. <i>R. collettii</i> |
| 8a. Flowers 5-merous | 4. <i>R. pentapomica</i> |
| b. Flowers 4-merous | 9 |
| 9a. Leaves glabrous, serrulate; petals present | 2. <i>R. dahuricus</i> |
| b. Leaves pubescent, entire or faintly crenate; petals absent | 5. <i>R. persica</i> |
| 10a. Unarmed; leaves alternate, sharply serrate with acute apex; petals absent | 6. <i>R. procumbens</i> |
| b. Armed; leaves fascicled, distinctly crenate, with obtuse apex; petals present | 7. <i>R. prostrata</i> |

Shrubs or trees; branches alternate, fluted, glabrous; internodes 0.5-2 cm long. Leaves ovate-lanceolate, 1.4-2.3 x 0.5-1 cm, apex acuminate, mucronate, base rounded or acute, margin entire below, serrate above, serratures tipped by a deciduous mucro; lateral nerves 5-7 pairs, slightly raised below; secondary veins camptodromous; petioles 2-3 mm long; stipules 0.5-2.2 mm long, subulate, pubescent. Inflorescence an axillary fascicle; fascicles 5-8-flowered; pedicels 1-2 mm long. Calyx lobes deltoid, 1-1.5 mm long, thickened at margin, keeled up to the middle, glabrous. Petals obcordate, 0.5-1 mm long, deeply cucullate, enclosing stamens. Stamens 0.5-0.8 mm long; anthers dorsifixed; filaments acicular. Ovary bicarpellary, glabrous; style 2-cleft at top. Fruit not seen.

Distrib. India : Himachal Pradesh. Endemic.

2. *Rhamnus dahuricus* Pallas in Reiss. 3: 721. 1776 & Fl. Ross. 2, t. 61, 1789; M. Lawson in Fl. Brit. India 1: 639. 1875. **Fig. 37.**

Hindi: *Ihanthar, Chaurdha*; Punj.: *Chato, Chedwala, Chadua, Phipni, Tadru, Setapajja, Kanji, Mamral, Shomfol, Reteon, Gogsa Sindrol, Mutani, Nior, Chatra, Romusk, Dadur.*

Large shrubs or small trees, 4.5-6 m tall; branches much ramified, straight; branchlets forming a dense rounded crown and terminating into a thorn. Leaves rarely subopposite, frequently fascicled on short branchlets, lanceolate or ovate-oblong, 1.4-8.0 x 0.6-2.9 cm, acuminate, base rounded, membranous, serratures tipped by deciduous, glandular mucro, slightly pubescent on nerves beneath when young; lateral nerves 3-4 pairs, arcuate, converging near margins; petioles 4-10 mm long, pubescent. Flowers crowded in the axil of fascicled leaves or at the base of branchlets, 12 mm across, dioecious; pedicels 10 mm long, filiform. Calyx lobes deltoid, 5-7 mm long, acuminate, glabrous, not keeled; tube campanulate or turbinate. Petals entire, linear or spatulate, 1-2 mm long, deeply cucullate enclosing stamens. Stamens 2-3 mm long; anthers dorsifixed. Ovary 2(-3-4)-carpellary, 2(-3-4)-loculed, smooth; ovules one in each locule; style filiform, 2-4-cleft, connate one-fourth to one-third the length, segments recurved. Drupes 4-5 mm in diam.

Fl. & Fr. : Mar. - Nov.



Fig. 37. *Rhamnus dahuricus* Pallas

Distrib. India : N.W. Himalaya, Western Ghats, in wooded and grassland forests, between 200-2400 m. Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh and Tamil Nadu.

Afghanistan, Pakistan, Bhutan, Myanmar, China and Japan.

Note. The leaves fall early and fresh foliage appears in March and April often after profuse flowering.

There appears to be two varieties of this species, one with hirsute leaves and other with glabrous leaves as is evident from materials examined at Kew. In Kew herbarium there are many specimens with hirsute leaves all of them from Pulney and Nilgiri Hills.

Uses. The wood is hard and close-grained and is used for making agricultural implements. The bitter fruit is given in affections of the spleen and also used as an emetic and purgative.

3. *Rhamnus nepalensis* (Wallich) M. Lawson in Fl. Brit. India 1: 640. 1875. *Ceanothus nepalensis* Wallich in Roxb., Fl. Ind. 2: 375. 1824.

Fig. 38.

Asm.: *Birringa*; Nep.: *Archal*.

Large suberect or rambling shrubs; branches slender, glabrescent; nodes slightly enlarged around the leaf scars. Leaves oblong or elliptic-oblong, 5.7-15 x 3.7-6.8 cm, apex shortly acuminate, base usually rounded, chartaceous, crenations tipped with lateral, deciduous, glandular mucro; nerves, 4-7, distichous; petioles 0.9-1.8 cm long, subglabrous, Inflorescence axillary, fascicles in simple or branched racemes; peduncles 2 mm long. Flowers 6 mm across, 5-merous; bracts leafy, 3 mm long. Calyx lobes deltoid, 2-3 mm long, not keeled, glabrous within, pubescent without; tube campanulate. Petals oblong, 1.5-2 mm long, tip shortly acuminate, deeply cucullate, enclosing stamens. Stamens 1.5-2 mm long; anthers dorsifixed. Disc glabrous. Style 3-cleft, cohering up to the middle; stigmatic lobes tapering, curved. Fruits broadly obovate, 7 mm in diam., blackish, seated on the reflexed calyx. Seeds obovoid, 3, 2-3 x 2-2.5 mm, blackish brown with a long open groove on the back.



Fig. 38. *Rhamnus nepalensis* (Wallich) M. Lawson

Fl. & Fr. : July - Feb.

Distrib. India : Generally in the most rocky places in the mountains up to 1350 m in the tropical evergreen forests. Bihar, West Bengal, Assam, Orissa and Andhra Pradesh.

Nepal, Myanmar, Malesia and China.

Note. The pounded fruits macerated in vinegar, are prescribed for the treatment of herpes.

4. *Rhamnus pentapomica* R. Parker in Kew Bull. 1921: 216. 1921. *R. persica* M. Lawson in Fl. Brit. India 1: 638. 1875, *p.p.* (*non* Boiss., 1872).

Hindi: *Chhetulo Chira, Charyula*; Punj.: *Kukai, Kander, Nikki, Wurak*.

Deciduous shrubs or small trees; branches velutinous, ending in thorns. Leaves oblong, elliptic-lanceolate or elliptic-oblong, 1.2-5 x 0.4-2.2 cm, apex and base acute, glabrous above, velvety beneath, margin distantly serrulate or entire; lateral nerves 3-4 pairs, prominent below; petioles 2-10 mm long, pubescent. Flowers crowded in the axils of fascicled leaves; pedicels 3-5 mm long. Calyx lobes deltoid, acute. Petals oblanceolate, deeply cucullate enclosing stamens. Stamens equal to petals; anthers ovate, dorsifixed. Ovary 2-4-carpellary, 2-4-loculed, glabrous; style 2-4-lobed. Drupes obovoid-globose, 5 mm long, 3-4 mm in diam., black. Seeds 2-4, 2-3 x 2-2.5 mm, shining, verrucose, margin cartilaginous, with an open groove on back.

Fl. & Fr. : Oct. - March.

Distrib. India : N.W. Himalaya. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Pakistan and Afghanistan.

Note. Leaves are browsed by camels, sheep and goats. Bark yields a red dye. Fruit is sweet and is eaten; it possesses emetic properties.

5. *Rhamnus persica* Boiss., Fl. Orient. 2: 17. 1872; Brandis, For. Fl. 93: 1874 & Ind. Trees 172. 1971 (Repr. ed.); M. Lawson in Fl. Brit. India 1: 638. 1875; Gamble, Man. Ind. Timb. 185. 1922 (Repr. ed.); Kanjilal, For. Fl. 128. 1969 (Repr. ed.)

Fig. 39.

Garh.: *Cheetulo*; Hindi: *Chirla*; Kum.: *Charyula*; Punj.: *Jalictar*, *Kuchnt*, *Nikki Kander*, *Kukei*, *Nar*.

Deciduous shrubs or small trees, 2-6 m tall; branches stiff, coarse, often thorny; bark smooth, yellowish or dark cinerous, epidermis often whitish. Leaves alternate or fascicled on short shoots, ovate, elliptic-lanceolate, obovate or oblong, 1-2.6 x 0.7-1.3 cm, apex obtuse, base cuneate, coriaceous; lateral nerves 2-5 pairs, camptodromous; petioles 3-10 mm long. Flowers crowded in the axils of fascicled leaves or at base of branchlets, 5 mm across; pedicels 5 mm long. Calyx lobes deltoid, 3-4 mm long, glabrous, not keeled. Stamens 2-2.5 mm long. Ovary glabrous, 2-4 cleft at the top. Drupes obovoid, 5 mm in diam., 5-7 mm long, seated on a flat circular base of calyx. Seeds shining, with a wide open groove on the back, edge of which thickened and curved inwards at the top.

Fl. & Fr. : Mar. - Dec.

Distrib. India: N.W. Himalaya, between 600 - 1800 m. Jammu & Kashmir, Himachal Pradesh, Punjab and Uttar Pradesh.

Pakistan and Iran.

Note. Before the appearance of new leaves, the plants remain leafless for few months in a year, new leaves appear in April and May.

Uses. Fruits are eaten and the leaves are browsed by camel, sheep and goats. Gamble (*op. cit.*) mentions "A beautiful wood..... It would make very pretty turnery articles".

6. *Rhamnus procumbens* Edgew. in Trans. Linn. Soc. 20: 43. 1851; M. Lawson in Fl. Brit. India 1: 640. 1875.

Prostrate shrubs; young branches pubescent; internodes 0.5-2.5 cm long, nodes slightly swollen around the leaf scar. Leaves lanceolate or elliptic,

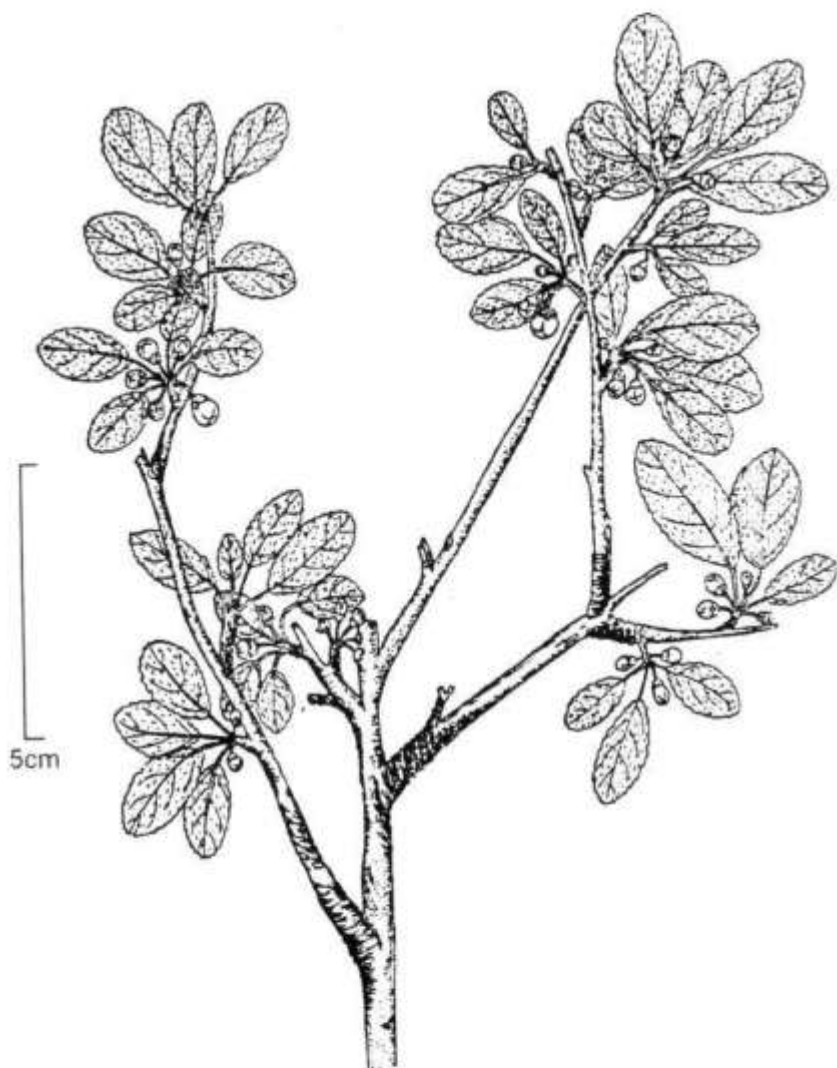


Fig. 39. *Rhamnus persica* Boiss.

1.2-4.3 x 0.5-1.5 cm, apex acute or subacuminate, base acute, coriaceous, serratures mucronulate, glabrous, midrib prominent beneath, depressed above; lateral nerves faint; petioles 2-7 mm long; stipules subulate, persistent. Inflorescence an axillary fascicle. Flowers 4 mm across, pentamerous; pedicels 8-10 mm long, slender; bracts 3-4 mm long, deciduous. Calyx lobes deltoid, 2 mm long, glabrous, acute, not keeled. Petals absent. Stamens 1-2 mm long; anthers dorsifixed, lobes ovate. Ovary trilocular, 3-loculed; style 3-cleft. Fruits obovoid, 3-5 mm in diam., fleshy. Seeds 3, with a groove on the back.

Fl. & Fr. : July - June.

Distrib. India : Western Himalaya, common on rocks from 2100 to 2550 m. Kashmir, Himachal Pradesh, Punjab and Uttar Pradesh.

7. *Rhamnus prostrata* Jacq. ex R. Parker in Kew Bull. 1921: 217. 1921.

Garh.: *Koni*.

Deciduous, prostrate shrubs; branches short, terete, tomentose when young, ending in thorns; internodes 0.5-1.5 cm long; nodes swollen around the leaf scars. Leaves elliptic, 0.7-1.5 x 0.4-0.6 cm, mucronate, base tapering, glabrescent, crenations tipped with deciduous dark mucro; lateral nerves 2-3 pairs, inconspicuous, camptodromous; petioles 1-3 mm long. Flowers in the axil of fascicled leaves, pentamerous. Calyx lobes deltoid, acute. Petals minute, obovate, cucullate, enclosing stamens. Anthers dorsifixed; filaments acicular. Disc glabrous. Ovary trilocular, 3-loculed; style 3-cleft. Drupes obovoid-globose, 5 mm long, 3 mm in diam., black. Seeds 3, 2-3 x 2 mm, verrucose, shining, with a long open groove on the back.

Fl. & Fr. : March - August.

Distrib. India : Western Himalaya, Prostrate on rocks up to 3000 m. Kashmir, Himachal Pradesh and Uttar Pradesh.

Pakistan, Afghanistan and Iran.

8. *Rhamnus purandharensis* Bhandari & Bhansali in J. Econ. Tax. Bot. 5: 911. 1984.

Unarmed shrubs or trees, 6 m tall; young branches white tomentose, glabrous with age; internodes 5-25 cm long; nodes slightly enlarged around the leaf scars. Leaves ovate or elliptic, 0.5-6.2 x 0.3-2.6 cm, apex acute or obtuse, base rounded, mucronate, densely pubescent on nerves beneath, glabrescent, serratures tipped by deciduous mucro; lateral nerves 5-6 pairs, prominent below, camptodromous; petioles 0.3-1.7 cm long, pubescent; stipules 1.1-2.5 mm long, linear, pubescent, deciduous. Racemes axillary; flowers in fascicle of 5-8. Flowers 5-7 mm across, pentamerous; pedicels 2-5 mm long, pubescent. Calyx 3-5 mm long, pubescent without, glabrous within; lobes deltoid, acute, margin thickened. Petals obovate, 2-2.5 mm long, deeply cucullate. Stamens 1.5-2 mm long; anthers dorsified; filaments flat. Disc rounded, massive, glabrous. Ovary tricarpellary, 3-loculed, glabrous; style 3-cleft two-third of length. Fruits 5-6 mm in diam., glabrous, 3-lobed, slightly depressed at top. Seeds 3.

Fl. & Fr. : Oct. - Dec.

Distrib. India : Maharashtra. Endemic.

9. *Rhamnus purpurea* Edgew. in Trans. Linn. Soc. 20: 44. 1851; M. Lawson in Fl. Brit. India 1: 639. 1875. **Fig. 40.**

Garh.: *Babauro*; Hindi: *Luhish, Lhish*; Kum.: *Payan*; Punj.: *Tandra, Sinjal, Maimarari, Kunji, Rangrek, Zanani, Tunani, Chaterni*.

Unarmed, deciduous shrubs or moderate sized trees; the previous year's branchlets purple with white spots, pubescent when young, alternate; internodes 1-3 cm long, nodes slightly enlarged around the leaf scars. Leaves ovate, sometimes obovate, elliptic or ovate-lanceolate, 3.5-17.0 x 1.8-7.8 cm, acute, base rounded, membranous, closely and finely serrate, serratures tipped by deciduous mucro, glabrescent beneath; lateral nerves, 5-10, parallel, nearly straight on either side of the midrib, camptodromous, impressed above and raised below; petioles 0.7-1.6 cm; stipules linear, early deciduous, leaving broad scars at the base of petiole. Cymes axillary; flowers in fascicles of 5-10. Flowers 5-6 mm across, buds ovoid; pedicels 5 mm long. Calyx lobes deltoid, 3-4 mm long, not keeled, having prominent line in the middle, acute; tube campanulate. Stamens 4-5, 1-2 mm long; anthers dorsifixed. Ovary tricarpellary, 3-loculed; style short, 3-cleft nearly to the base; stigma capitate. Drupes subglobose,

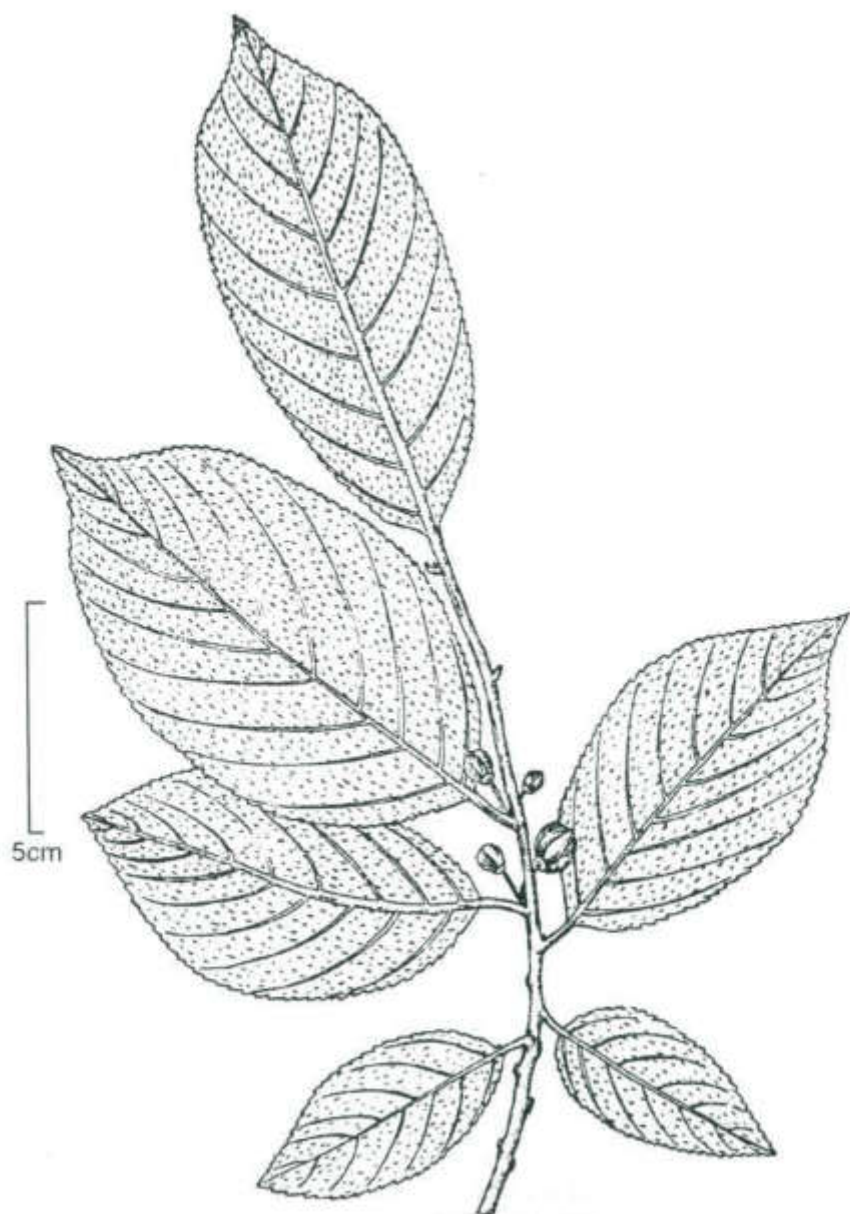


Fig. 40. *Rhamnus purpurea* Edgew.

or pear shaped, 6 mm in diam., bitter. Seeds 3, with a deep furrow on the outer side.

Fl. & Fr. : May - Oct.

Distrib. India : Western Himalaya, usually in open areas of the forests between 1350-3000 m. Kashmir, Himachal Pradesh, Punjab and Uttar Pradesh.

Pakistan and Nepal.

Note. Fruits are used as purgative.

10. *Rhamnus triqueter* (Wallich) Brandis, For. Fl. 92. 1874; M. Lawson in Fl. Brit. India 1: 639. 1875. *Ceanothus triqueter* Wallich in Roxb., Fl. Ind. 2: 376. 1824. **Fig. 41.**

Garh.: *Gaunt*; Jaun.: *Kethera*; Punj.: *Fagora*, *Gurdhan*, *Phulla*, *Gogsa*, *Ghanti*, *Ghont*.

Unarmed, deciduous shrubs, 2-3 m tall, branches alternate, tomentose; bark greyish brown or blackish purple, scabrous with elevated specks. Leaves alternate, ovate, oblong or elliptic or oblong-lanceolate, 4.6-13.4 x 2-7 cm, apex acuminate, base tapering, subcoriaceous, woolly tomentose beneath, glabrous above, crenate, teeth tipped by deciduous mucro; lateral nerves 6-10, prominent; petioles 1.8-3 cm long; stipules 2 mm long, subulate, deciduous. Flowers fascicled, in axillary racemes, 5 mm across, pentamerous; buds ovoid, puberulous; pedicels 5 mm long; bracts 1.5 cm long. Calyx lobes deltoid, 2-2.5 mm long, with prominent line in the middle, acute, puberulous without. Petals broadly obovate, 1-1.5 mm long, shortly clawed, emarginate, deeply cucullate, enclosing stamens. Stamens 0.5-1 mm long. Ovary tricarpeal, 3-loculed, glabrous; style 3-cleft; stigma obtuse. Drupes obovoid, 5-6 x 4-5 mm. Seeds 3, obovoid with a long, broad open groove on the back.

Distrib. India : Western Himalaya, particularly on steep rocky slopes, ascending up to 2000 m. Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh and Maharashtra.

Pakistan and Nepal.

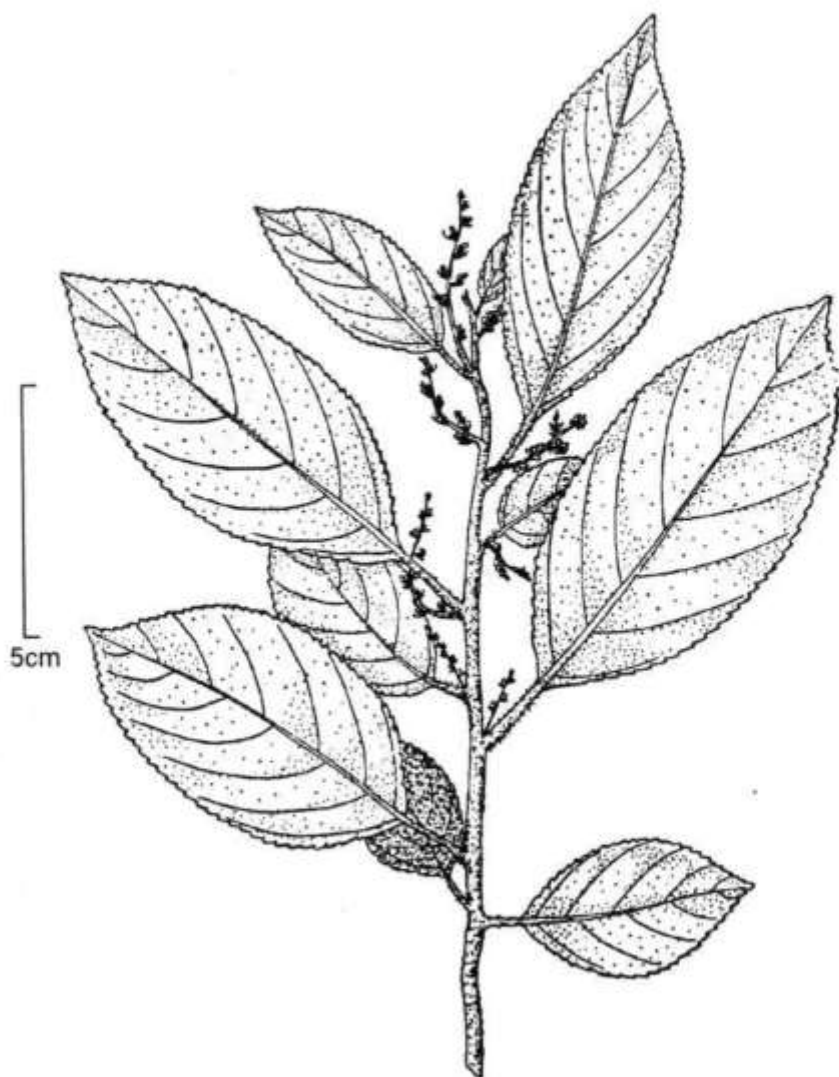


Fig. 41. *Rhamnus triqueter* (Wallich) Brandis

11. *Rhamnus wightii* Wight & Arn., Prodr. 1: 164; 1834; Wight, Ic. t. 159. 1839; M. Lawson in Fl. Brit. India 1: 639. 1875.

Mar.: *Ragat-roda*, *Ragat-rorar*.

Large, glabrous, unarmed, shrubs or small trees, *ca* 3 m tall; younger parts dry black; nodes enlarging around the leaf scars. Leaves alternate, rarely a few subopposite, elliptic-ovate, 2.5-9.3 x 1.3-3.5 cm, base rounded, subcoriaceous, serratures with glandular black tip; lateral nerves *ca* 5-7 pairs, camptodromous; petioles 0.7-1.6 cm long, puberulous; stipules 2.5 mm long, subulate, minutely pubescent, caducous. Flowers in axillary fascicles of 10-20, yellow; pedicels 2.3 mm long, accrescent. Calyx 2.5-3.5 mm long; lobes deltoid, thickened at apex; tube 2 mm wide, campanulate, minutely pubescent without. Petals obovate, 1.5-2.0 mm long, cuneate, cucullate. Stamens 1-1.5 mm long, pale brown. Disc saucer-shaped, glabrous. Ovary glabrous; styles 3-4-cleft one-fourth to one-third the length, diverging. Drupes obovoid, 6-10 x 4-5 mm, smooth, reddish purple when ripe, tipped with the remains of styles; stones 3, 1-seeded. Seeds 4-4.5 mm long, with a deep furrow on the back.

Fl. & Fr. : Jan. - April.

Distrib. India : Western Ghats and Deccan Peninsula, in evergreen forests or bush land up to 2100 m. Madhya Pradesh, Maharashtra and Tamil Nadu.

Nepal and Sri Lanka.

Note. Bark is used in Mumbai under the name of 'Rakta Rhida' and gives a drug similar to Cascara. It contains small quantities of a bitter principle, tannin and resin.

6. *Sageretia* Brongn.

Armed or unarmed shrubs or trees, rarely scandent. Leaves opposite or subopposite, serratures tipped with deciduous, glandular mucro; stipules minute, deciduous. Inflorescence terminal or axillary panicles. Flowers bisexual, pentamerous. Calyx urceolate, persistent; lobes deltoid, acute, keeled inside, thickened towards apex and margin. Petals cucullate, clawed. Stamens enclosed in petals; filaments filiform; anthers 2-loculed, dehiscence longitudinal. Disc

saucer-shaped, 5-lobed, fleshy, nectariferous, filling the calyx tube. Ovary glabrous, superior, tricarpeal, 3-loculed, almost immersed in the disc but free from it; style short, thick, 3-loculed; lobes coherent. Drupes 3-loculed, globular or obovate, suffused at base by the adnate, accrescent calyx tube and disc, with 3-coriaceous, indehiscent kernels. Seeds 3, completely filling the kernels; embryo straight; cotyledons flat, obcordate, foliaceous, enclosed in thin, fleshy albumen; testa crustaceous.

North and South America, Asia; 40 species, 8 in India.

KEY TO THE SPECIES

- | | |
|---|-----------------------------|
| 1a. Leaves persistently woolly on lower surface | 1. <i>S. brandrethiana</i> |
| b. Leaves glabrous on lower surface or pubescent, becoming glabrous with age | 2 |
| 2a. Stamens longer than the petals | 3 |
| b. Stamens shorter than or equal to petals | 5 |
| 3a. Leaves tapering into a long acumen at apex, finely serrulate; lateral nerves 6-8 pairs; flowers pubescent | 3. <i>S. hamosa</i> |
| b. Leaves obtuse or acuminate, distantly serrate; lateral nerves 4-5 pairs; flowers glabrous | 4 |
| 4a. Leaves more than 2.5 cm long, ovate or elliptic; petals notched | 2. <i>S. coimbatorensis</i> |
| b. Leaves up to 2.5 cm long, rotundate or orbicular; petals notched or mucronate | 5. <i>S. kishtwarensis</i> |
| 5a. Flowers glabrous | 6 |
| b. Flowers pubescent | 7 |
| 6a. Leaves less than 2 cm long; petals notched and mucronate | 4. <i>S. kashmirensis</i> |
| b. Leaves more than 2 cm long; petals notched but not mucronate | 7. <i>S. thea</i> |
| 7a. Lateral nerves 3-5 pairs | 8. <i>S. wallichii</i> |
| b. Lateral nerves 5-7 pairs | 6. <i>S. parviflora</i> |

1. *Sageretia brandrethiana* Aitch. in J. Linn. Soc. 8: 62. 1865; M. Lawson in Fl. Brit. India 1: 642. 1875.

Kh.: *Gangeri*; Punj.: *Bajan, Bhamdi, Ganger, Goher, Kanger, Koher, Kunjar*.

Armed shrubs, up to 5 m tall; branches stiff, divergent, generally opposite, often ending in spines. Leaves elliptic or oblong, ovate, 0.5-2.7 x 0.3-1.8 cm,

apex acute, base rounded, sharply serrulate; glabrous above; petioles 3-7 mm long; stipules 2-4 mm long, lanceolate, deciduous. Panicles sessile. Flowers 4-5 mm across, glabrous; bracts ovate, 1-2 mm long, brown. Calyx lobes 1.5-2 mm long, keeled within up to the base. Petals obovate, 0.7-1.5 mm long, notched, incurved, apex obtuse. Stamens equal to the petals; anthers dorsifixed. Disc massive, thickened around the ovary. Ovary narrowed into 3, short, coherent styles. Drupes obovoid, 3-lobed, succulent, black, with raised longitudinal lines.

Fl. & Fr. : June - May.

Distrib. India : Western Himalaya, up to 2550 m. Kashmir and Punjab.

Pakistan, Afghanistan, Iran and Arabia.

Note. The sweet fruits are a great favourite with the Afghans and are sold in the market. Chutney is made from fruits and in some places also used as a condiment.

2. *Sageretia coimbatorensis* Bhandari & Bhansali in J. Econ Tax. Bot. 5: 921. f. 1. 1984.

Large shrubs or small trees; branches scandent, alternate, fluted, glabrous; bark cinereous, often white speckled, armed with thorns; internodes 2-5 mm long. Leaves ovate or elliptic, 4.8-8.7 x 2.5-4 cm, apex acuminate with a callous point, base rounded, subcoriaceous; nerves impressed above, lateral ones camptodromous near margin, tertiary nerves reticulate; petioles 0.8-1 cm long, pubescent; stipules 1.2-1.5 cm long, lanceolate, deciduous. Panicles axillary and terminal. Flowers 5-6 in fascicles, 4.5-5 mm across, sessile; bracts 1-1.5 mm long, pubescent, deciduous. Calyx lobes 1.5-2 mm long, keeled up to the middle. Petals obcordate 0.8-1.2 mm long. Stamens 1-1.5 mm long; anthers dorsifixed; filaments slender, flat at base. Disc round or slightly 5-lobed, margin free, thickened around ovary. Style 3-lobed or grooved; stigma capitate.

Fl. : Nov. - Jan.

Distrib. India : Tamil Nadu. Endemic.

3. **Sageretia hamosa** (Wallich) Brongn., Mem. Fam. Rham. 53. 1826 & in Ann. Sci. Nat. Ser. 1, 10: 360. 1827; M. Lawson in Fl. Brit. India 1: 641. 1875. *Ziziphus hamosa* Wallich in Roxb., Fl. Ind. 2: 369. 1824.

Fig. 42.

Large shrubs; branches long, scandent, glabrous, lateral floriferous branches modified into or ending in thorns. Leaves subopposite, elliptic-oblong or lanceolate, 9.1-13.5 x 4.4-6 cm, glabrous, coriaceous, base rounded; petioles 0.8-1.3 cm long, channelled above; stipules linear, 1-3 mm long, deciduous. Flowers 3-4.5 mm across, sessile, pubescent; bracts minute, ovate, brown. Calyx lobes 1.2-2.5 x 1-1.5 mm, glabrescent. Petals obovate, 1.5 x 2 mm, apex slightly emarginate, margin inrolled. Stamens 2 mm long; anthers dorsifixed. Disc glabrous, entire or slightly 5-lobed. Ovary urceolate; style very short; stigma 3-grooved, convex. Drupes obovoid, 1 x 0.8 cm, pointed. Seeds 3.3-4 mm long.

Fl. & Fr. : Aug. - Jan.

Distrib. India : In hills up to an elevation of 1850 m. Uttar Pradesh, Assam, Tamil Nadu and Kerala.

Nepal, Taiwan and Sri Lanka.

Note. Chromosome number $n = 12$ (Sareen *et al.* in Taxon 18: 433-442. 1974).

This species is based on *Ziziphus hamosa* Wallich, the Holotype of which is preserved in CAL (Wallich 4253). Wallich's original material is heterogenous. Wallich 4253 should be considered as Type of *S. hamosa*, whereas the other material (Wallich 5253B) forms the type of *S. wallichii*.

4. **Sageratia kashmirensis** Bhandari & Bhansali in J. Econ. Tax. Bot. 5: 923. f. 2. 1984.

Armed shrubs with spinescent branchlets; branches glabrous, often modified into thorns; thorns 0.5-4 cm long, strong, subcylindric, pointed forward; internodes 1-3.2 cm long. Leaves ovate-elliptic, 0.6-1.6 x 0.5-1.2 cm, base and apex obtuse; lateral nerves 3-4 pairs, camptodromous; glabrous; petioles 1-2 mm long, hairy;

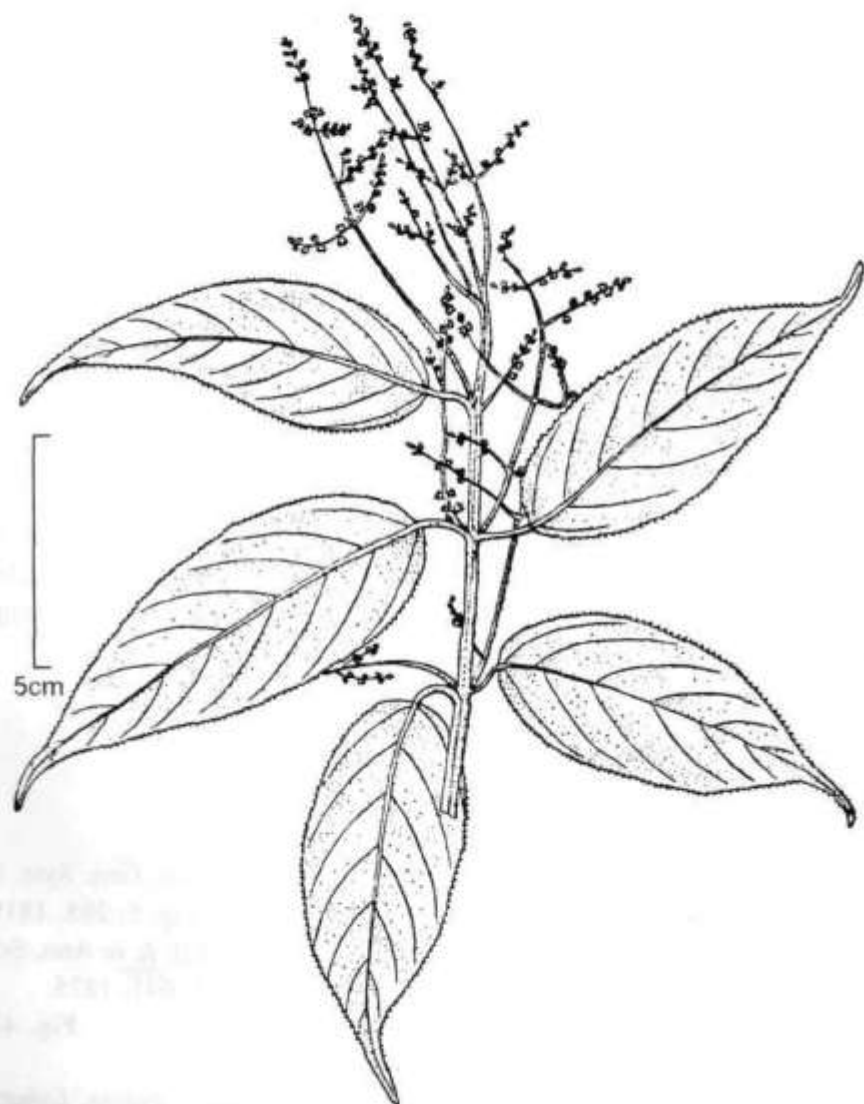


Fig. 42. *Sageretia hamosa* (Wallich) Brongn.

stipules 0.5-0.8 mm long, caducous. Flowers 2-3 in fascicles; bracts 1-2 mm long, caducous. Calyx lobes 1-1.5 mm long. Petals obovate 0.5-0.8 mm long. Stamens 0.5-0.7 mm long; filaments flat; anthers dorsifixed. Disc entire or slightly 5-lobed. Style 3-cleft at apex; stigmas obtuse.

Fl. : July - Sept.

Distrib. India : Kashmir. Endemic.

5. *Sageretia kishwarensis* Bhandari & Bhansali in J. Econ. Tax. Bot. 5; 925. f. 3. 1984.

Armed shrubs; branches scandent, glabrous, opposite, fluted; bark cinereous, white speckled; thorns 2 cm long, pointed forward; internodes 0.8-3 cm long; nodes enlarged around the leaf scars. Leaves orbicular to rotundate, 1-2.5 x 0.6-2 cm, obtuse, mucronate, shining, subcoriaceous, glabrous; lateral nerves craspedodromous, camptodromous near margin, impressed above; petioles 2-2.5 mm long; lanceolate, stipules 2 mm long, minutely pubescent. Panicles with alternate, racemose ramifications. Flowers 2-3 in fascicles, 3-5 mm across, sessile; bracts 1 mm long, caducous. Calyx lobes 1.5-2.5 mm long, keeled below the middle. Petals obovate, 0.8-1.5 mm long. Stamens 1.5-2 mm long; anthers dorsifixed; filaments acicular. Disc thick.

Fl. : May - Dec.

Distrib. India : Kashmir. Endemic.

6. *Sageretia parviflora* (Roemer & Schultes) G. Don, Gen. Syst. 2: 29. 1832. *Rhamnus parviflora* Roemer & Schultes, Syst. Veg. 5: 295. 1819. *Sageretia oppositifolia* Brongn., Mem. Fam. Rham. 53: 1826 & in Ann. Sci. Nat. Ser. 1, 10: 360. 1827; M. Lawson in Fl. Brit. India 1: 641. 1875.

Fig. 43.

Garh: *Gonta, Abin, Kand*; Hindi: *Dyarry*; Kum.: *Aglaiya, Lohari*; Punj.: *Drange, Gidardak, Girthan, Kanak*; Tel.: *Manchi, Surabi*.

Large shrubs or small trees, up to 1.8 m; branches often climbing, angular, armed with thorns. Leaves ovate-elliptic or lanceolate, 2.5-10.2 x 1-4 cm, apex

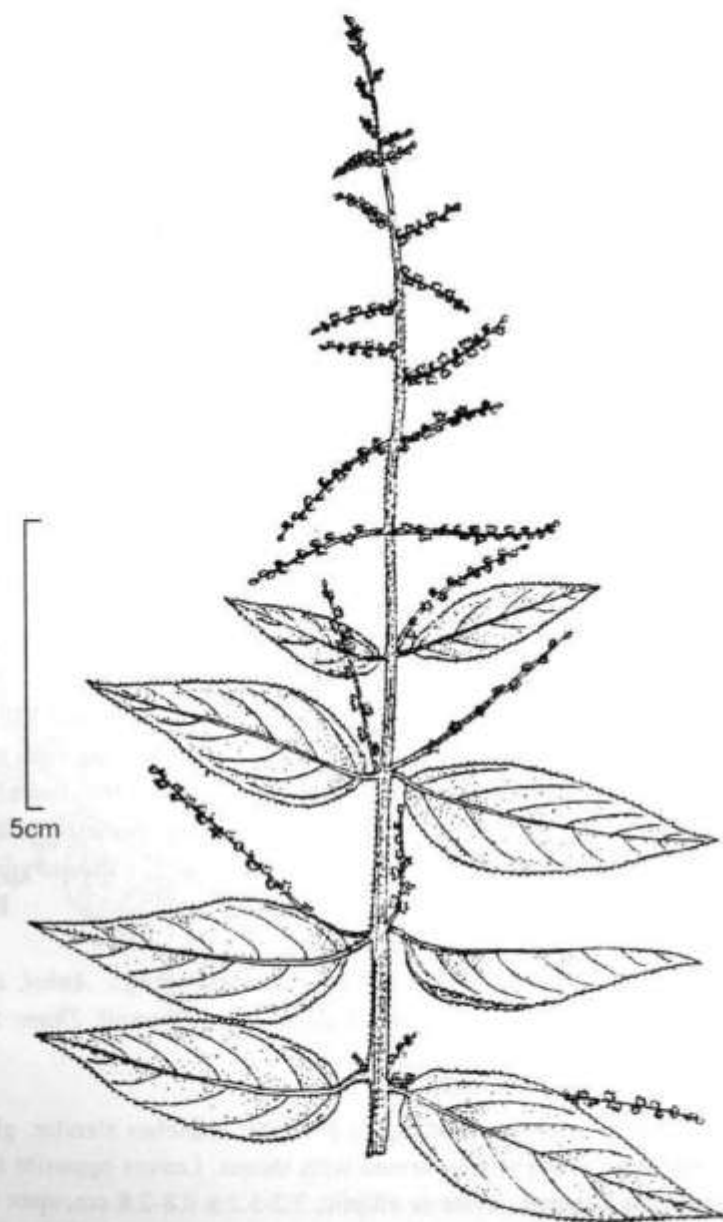


Fig. 43. *Sageretia parviflora* (Roemer & Schultes) G. Don

shortly acuminate, base rounded, serrulate; subcoriaceous, dark green, shining above, hairy on nerves beneath when young; petioles 2-13 mm long, villous; stipules 1.5-3 mm long, linear, villous. Panicles with opposite, racemose ramifications, flower-bearing branches tomentose. Flowers 5 mm across, sessile, usually only 1 flower per fascicle setting fruit; bracts linear, 1-2 mm long, tomentose, deciduous. Calyx obovate, 1-1.5 mm long, emarginate. Stamens 1-1.5 mm long. Disc flat. Ovary urceolate; stigma capitate. Drupes 10 x 5 mm, turbinate, black when ripe, pointed with permanent style. Seeds 3-4 x 2-2.5 mm.

Fl. & Fr. : July - Jan.

Distrib. India : Western Himalaya, Gangetic Plain, North East India, Deccan Peninsula, in wooded grasslands and on rocky places at 2100 m. Kashmir, Himachal Pradesh, Uttar Pradesh, Bihar, West Bengal, Assam, Orissa, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.

Nepal and Indonesia.

Note. The sweet fruits are eaten.

7. *Sageretia thea* (Osbeck) Johnst. in J. Arn. Arbor. 49: 337. 1968. *Rhamnus thea* Osbeck., Dagb. Ofwer Ostind. Resa 232. 1757. *Sageretia theezans* Brongn., Mem. Fam. Rham. 53. 1826; M. Lawson in Fl. Brit. India 1: 641. 1875. *Rhamnus theezans* L., Mant. 207. 1771. *Sageretia theezans* var. *diospyrifolia* M. Lawson in Fl. Brit. India 1: 641. 1875, ('*diospyrifolia*').

Fig. 44.

Garh.: *Kahdgu, Kurkha, Kutku*; Kash. *Brankil*; Punj.: *Ankol, Brinkol, Chaunsh, Orangu, Kanda, Karur, Kauli, Katrain, Kim, Phompli, Thum*; Shimla: *Dargola*.

Sarmentose, spinous shrubs, up to 3 m tall; branches slender, glabrous or finely tomentose when young, armed with thorns. Leaves opposite at basal nodes, upper ones alternate, ovate or elliptic, 2.2-5.2 x 0.8-2.8 cm, apex obtuse, base rounded, serrulate, shining, glabrous on both surfaces; petioles 2-5 mm long, glabrous; stipules 2-2.5 mm long, linear. Panicles with opposite racemose ramifications. Flowers 3-4 mm across; bracts 1-2 mm long, glabrous, deciduous.

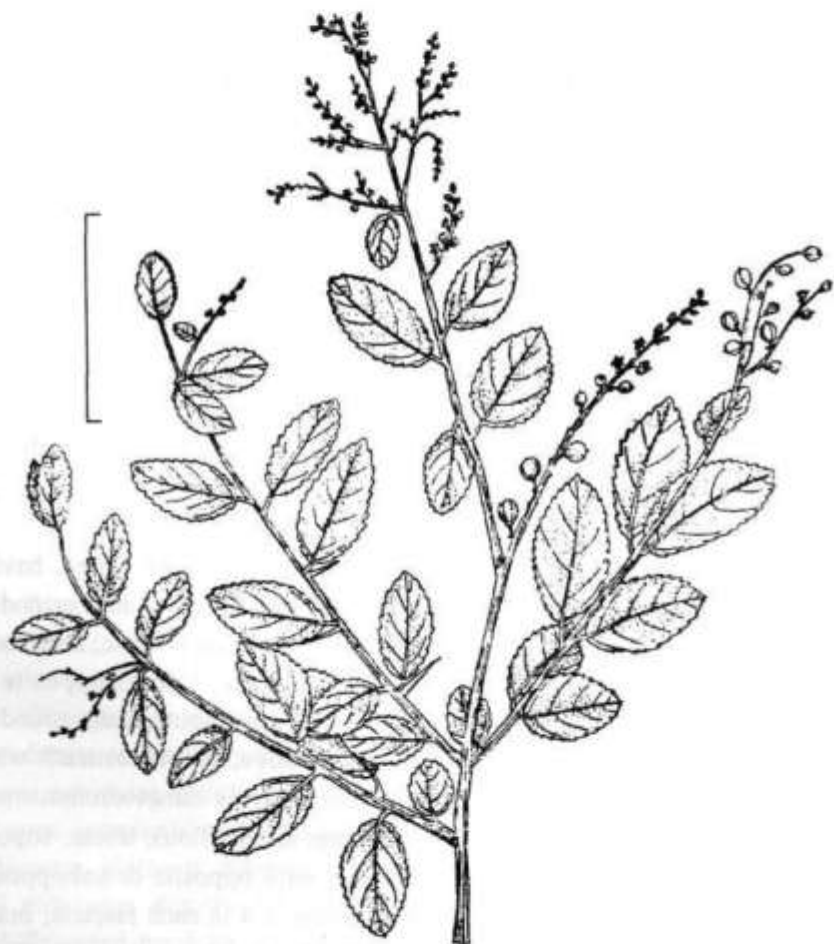


Fig. 44. *Sageretia thea* (Osbeck) Johnst.

Calyx lobes 1.5-2 mm long. Petals yellow, obcordate, 1-1.5 mm long, emarginate. Stamens 1-1.5 mm long; filaments flat; anthers dorsifixed. Disc glabrous, massive, thickened around the ovary. Ovary 3-grooved; style lobes coherent. Fruits obovoid, up to 8 x 5 mm succulent, irregularly rugosè, dark brown when ripe. Seeds 3-3.5 x 2.3 mm.

Fl. & Fr. : May - Nov.

Distrib. India : Western Himalaya, very common in open scrub forests up to an elevation of 2400 m. Kashmir, Himachal Pradesh, Punjab and Uttar Pradesh.

Pakistan, China, Afghanistan and Iran.

Note. The fruits are sweet to taste and are extensively eaten; the leaves are sometimes used as a substitute for tea leaves.

8. Sageretia wallichii Bhandari & Bhansali in J. Econ. Tax. Bot. 5: 927. f. 4. 1984.

Shrubs; branches scandent, alternate, brown pubescent, fluted, having small white lenticels; flower bearing lateral branches modified into or ending in thorns; thorns thin, 1.2-3.2 cm long, sharp pointed, subcylindric; internodes 1.2-5.6 cm long; nodes enlarged near the leaf scars. Leaves opposite or subopposite, ovate-elliptic, 1-4.5 x 0.5-2.5 cm, apex acute, base rounded, with mucro, shining, dark green and glabrous above, villous beneath when young, more so on nerves, finely serrulate; lateral nerves camptodromous near the margin, tertiaries reticulate; petioles 2-6 mm long, villous, terete; stipules lanceolate, 1-2 mm long, pubescent. Panicles with opposite or subopposite cylindrical racemes. Flowers 3-4 mm across, sessile, 3-4 in each fascicle; bracts lanceolate, 0.5-1.2 mm long. Calyx lobes 1.5-2.2 mm long, pubescent. Petals oblong-obovate, 0.8-1.5 mm long, entire. Stamens 0.6-1.2 mm long; filaments flat at base, anthers dorsifixed. Disc rounded, thickened around the ovary. Stigma 3-cleft at top.

Distrib. India. Endemic.

9. *Scutia* (DC.) Comm. ex Brongn., *nom. cons.*

Small trees or shrubs, rarely scandent, glabrous or nearly glabrous, unarmed or armed with straight or recurved thorns; branchlets usually angular. Leaves opposite or subopposite, ovate or obovate, often variable, obscurely dentate, obtuse at both ends, mucronate; petioles short; stipules triangular, usually deciduous. Cymes condensed, axillary, solitary or in umbellate fascicles. Flowers pentamerous, bisexual. Calyx lobes valvate in bud, deltoid. Petals deeply obcordate or bilobed, cucullate or flat. Anthers dorsifixed, ovate, 2-celled. Disc lining the calyx cup, rather thin. Ovary 2-3-celled, sunk in the disc; style very short, slightly lobed. Drupes nearly globose, with 2-3 seeds enclosed in free endocarpous stone; stones embedded in a thin fleshy pulp at maturity, irregularly dehiscent.

Tropical America, S. Africa and Indo-China; 4 species, 1 in India.

Scutia myrtina (Burm.f.) Kurz in J. As. Soc. Bengal 44: 168. 1875; Gamble, Fl. Pres. Madras 1: 223. 1918. *Rhamnus myrtina* Burm.f., Fl. Ind. 60. 1768, ('*myrtinus*'). *Scutia indica* Brongn., Mem. Fam. Rham. 56. t. 4. 1826. *nom. superfl.*; M. Lawson in Fl. Brit. India 1: 640. 1875.

Mar.: *Cheemat*, *Wait-a-bit*; Tam.: *Tuvadi*, *Patty chollimela*, *Chimati*;
Tel.: *Gariki*.

Straggling or scandent shrubs, rarely small trees, 2-5 (-10) m tall; branchlets often decussate, usually armed with subopposite, 2-7 mm long, recurved, thorns. Leaves orbicular, elliptic or obovate to ovate or obcordate, 0.5-5 x 0.6-3.5 cm, apex acuminate or emarginate and mucronulate, base rounded to cuneate, coriaceous, glabrous, margin entire; secondary nerves 4-7, obscure; petioles 2-11 mm long; stipules 2-5 x 2-2.5 mm. Inflorescence condensed cymes or 2-15-flowered fascicles. Flowers 2-2.5 mm across, yellowish green, only 1 flower per cyme developing into fruit; peduncle up to 6 mm long, glabrous; pedicels 1-2 mm long, accrescent; bracts up to 1 mm long, ciliate, glabrous, tomentose or sometimes puberulous at apex. Calyx lobes 1.5-2 mm long, glabrous, erect, keeled below, thickened at apex. Petals yellowish 0.6-1 mm long, apex emarginate or deeply 2-lobed, unguiculate. Stamens 0.7-1 mm long; filaments filiform, inserted on calyx tube, slightly swollen at base. Disc glabrous,

inconspicuous. Ovary bicarpellary, glabrous; style shortly 2-lobed. Drupes globose, 5-9 mm in diam., glabrous; endocarp 5-6 mm long, readily separating into 2, free, indehiscent stones. Seeds 2, plano-convex, light brown, compressed; testa membranous.

KEY TO THE VARIETIES

- | | |
|--|----------------------------|
| 1a. Leaves orbicular, elliptic to ovate, rounded at apex | 9.2. var. <i>myrtina</i> |
| b. Leaves obcordate, emarginate at apex | 9.1 var. <i>emarginata</i> |

9.1. var. *emarginata* Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 71. 1990.

Fl. & Fr. : Jan. - Aug.

Distrib. India : Deccan peninsula. Maharashtra and Andhra Pradesh.

Note. The leaves in this variety are obcordate, emarginate at apex and cuneate at base compared to var. *myrtina*.

9.2. var. *myrtina*

Fig. 45.

Fl. & Fr. : Feb. - Dec.

Distrib. India : Forest margins, bushlands, savannahs, sea coast, evergreen coastal scrubs to evergreen forests at higher altitudes. Bihar, Orissa, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.

Myanmar, Sri Lanka and Mauritius.

Note. This species is grown as hedge plant. Fruit is edible and considered as astringent. Leaves are said to be used in an ointment locally applied to hasten parturition (childbirth).

10. *Smythea* Seem. ex A. Gray

Scandent or subscandent, woody shrubs or climbers; branches flexuous, puberulous atleast when young, having longitudinal ridges and furrows. Leaves

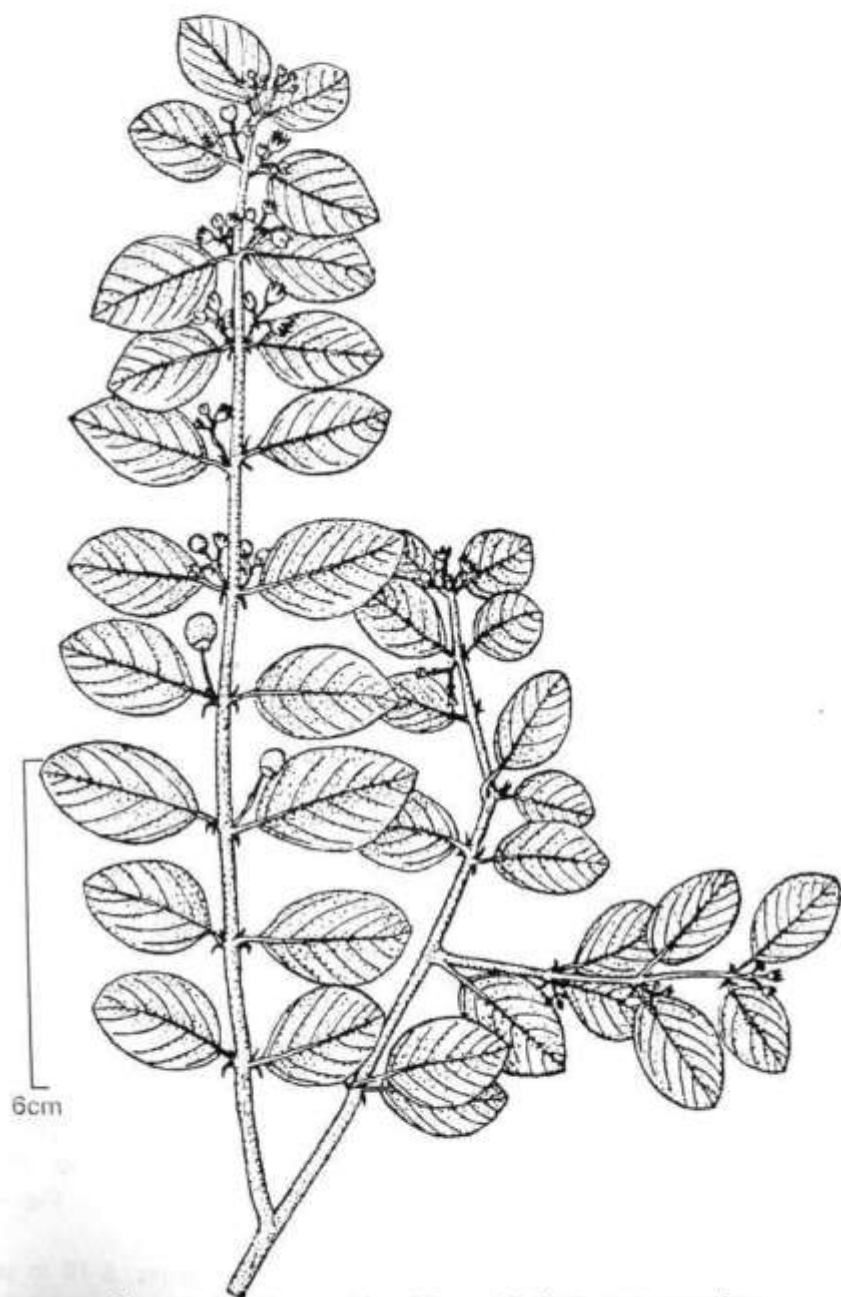


Fig. 45. *Scutia myrtina* (Burm.f.) Kurz var. *myrtina*

alternate, ovate-oblong to elliptic-lanceolate, base obtuse, unequal, margin serrate or dentate, coriaceous to chartaceous. Inflorescence axillary fascicles or rarely paniculate. Flowers pentamerous, complete. Calyx lobes thickened, incurved, acute at apex, keeled, puberulous outside. Petals alternate with sepals, obcordate, cucullate, broadly emarginate or 2-lobed, with or without a small tooth in the notch. Stamens opposite and generally equalling the petals; filaments basally attached to the petals. Disc 5-lobed or entire, flat, filling the calyx tube. Ovary bicarpellary, bilocular; style with 2, slightly divergent, stigmatic arms. Fruits capsular, 1-celled, ovate or oblong-elliptic, acuminate with rounded tip ending in mucro, compressed bilaterally; basal seed chamber not marked outwardly by any constriction, median line generally double atleast at base, associated with parallel reticulations at sides, dehiscing vertically into 2 valves; persistent calyx tube attached only at base of the fruit. Seed 1, compressed, elongated, reniform or obovate, exalbuminous.

Myanmar, Malaysia, Polynesia; 7 species, 4 in India.

KEY TO THE SPECIES

- | | |
|---|--------------------------|
| 1a. Tufts of hairs in axils of lateral nerves on the lower surface of leaf present; fruits elliptic-oblong, broadest at or above the middle | 2 |
| b. Tufts of hairs in axils of lateral nerves on the lower surface of leaf absent; fruits ovate, broadest below the middle | 3 |
| 2a. Leaves acute; branchlets not cirrhiform; fruits densely brown fulvous pubescent; seeds obovate | 1. <i>S. bombaiensis</i> |
| b. Leaves acuminate; branchlets cirrhiform; fruits glabrous; seeds oblong or reniform | 3. <i>S. macrocarpa</i> |
| 3a. Leaves entire to distantly denticulate; stamens longer than the petals; fruits cinereous tomentose, attenuated above | 4. <i>S. lanceata</i> |
| b. Leaves crenate-serrate; stamens equal to petals; fruits brown woolly tomentose, oblique, truncate above | 2. <i>S. calpicarpa</i> |

1. *Smythea bombaiensis* (Dalz.) Banerjee & Mukerjee in Indian For. 96: 214. 1970. *Ventilago bombaiensis* Dalz. in Hook., J. Bot. 3: 36. 1851; M. Lawson in Fl. Brit. India 1: 631. 1875. Fig. 46.

Large, woody, evergreen straggling or climbing shrubs, 8-10 m tall; branches fulvous pubescent. Leaves lanceolate ovate or elliptic-ovate, 3.2-11.2 x 1.5-4 cm, acute, mucronate, subcoriaceous, crenate, shining, glabrous; nerves



Fig. 46. *Smythea bombaiensis* (Dalz.) Banerjee & Mukerjee

4-5 pairs; secondary veins camptodromous; nervules fulvous pubescent below; petioles 2-8 mm long; stipules 2-4 mm long, subulate. Inflorescence axillary, 6-12-flowered fascicles. Flowers 5-6 mm across, greenish yellow, only one or two maturing into fruits; pedicels 2-4 mm long, fulvous pubescent. Calyx lobes deltoid, 2-3 mm long, densely fulvous pubescent without; tube obconical, persistent. Petals truncate or obovate, bilobed, 1.5-2 mm long, toothed at the notch, cuneate below. Stamens 1.5-2 mm long; filaments flattened; anthers subglobose; connective produced into a short process. Disc 5-lobed, glabrous. Ovary hairy, half sunken in the disc. Capsules samaroid; wing 1-nerved, rounded or truncate at apex, apiculate. Seed 1, dull black; testa membranaceous, exalbuminous; cotyledons thick, fleshy.

Fl. & Fr. : Dec. - June.

Distrib. India : Maharashtra, Karnataka and Kerala.

Note. This species has been described under the genus *Ventilago* in all the Indian floras. But due to its dehiscent fruits with divided wing and axillary flowers, it should be included in the genus *Smythea* as has been done by Banerjee and Mukerjee (*l.c.*).

2. *Smythea calpicarpa* Kurz in J. As. Soc. Bengal 41: 301. 1872; M. Lawson in Fl. Brit. India 1: 632. 1875. **Fig. 47.**

Evergreen, scandent shrubs; young branches fulvous pubescent. Leaves lanceolate, ovate-elliptic or elliptic-lanceolate, 6-10 x 2-4 cm, acute at apex, oblique at base; lateral nerves 5-7 pairs; petioles 2-3 mm long, tomentose. Inflorescence 3-10-flowered fascicles, sometimes on leafless branches. Flowers 4-6.5 mm across; pedicels 1.5 mm long, pubescent. Calyx lobes deltoid, 2-3.2 mm long. Petals 1.2 mm long. Stamens 1-2 mm long; connective produced into a short, hard, black process. Disc glabrous. Ovary villous, 2-loculed, only one fertile; style bifid, curved. Capsules samaroid, ovate-oblong, 3-6 x 1.3 cm, coriaceous. Seed 1 or 2, 5 x 5 mm.

Fl. & Fr. : Feb. - Sept.

Distrib. India : South Andaman Islands.

Myanmar.



Fig. 47. *Smythea calpicarpa* Kurz

Note. The number of flowers range from 3 to 10 per fascicle, but solitary as stated by Lawson (1875). The report of this species from Assam by Kanjilal *et al.* (1936) appears to be based on misidentification.

3. *Smythea lanceata* (Tul.) Summerh. in Kew Bull. 1928: 389. 1928; Oza in Indian For. 94: 403. 1968. *Ventilago lanceata* Tul. in Ann. Sci. Nat. Ser. 8, 4: 121. 1857. **Fig. 48.**

Glabrous, scandent shrubs. Leaves ovate or ovate-oblong, 5.5-15 x 3-6 cm., apex acuminate, mucronate, base acute or rounded, glabrous; lateral nerves 4-6 pairs, camptodromous near the margin; tertiary veins perpendicular to midrib; petioles 3-6 mm long, glabrous. Flowers in 10-15-flowered fascicles, 4-5 mm across, puberulous; pedicels 2-6 mm long. Calyx lobes 2.5 mm long, keeled within up to the middle. Petals 1-1.5 mm long, emarginate with a tooth at the notch. Stamens 2.2 mm long; connective with a short apical appendage. Disc glabrous, 5-angled or rounded. Ovary hairy. Capsules pyriform, 4-8 x 2-3 cm, acute to acuminate, crustaceous, tomentose. Seeds vertically elongate, 1 cm long, cuneate at base, glabrous.

Fl. & Fr. : Feb. - July.

Distrib. India : Andaman & Nicobar Islands.

Note. An examination of *Smythea pacifica* Seem. and *S. lanceata* (Tul.) Summerh. reveals that *S. pacifica* is quite distinct from *S. lanceata*. The Plate t. 9 A. Gray, (Bonplandia 10:35. 1862) is considered to be type of the former. This plate does not resemble *S. lanceata* in having flowers borne in axillary fascicles, larger stamens, bilobed petals with a tooth in the middle, calyx being thickened at the apex and its margin being keeled up to the middle. *S. pacifica* has, therefore, been excluded from the synonymy of *S. lanceata*.

Parkinson's collections (nos. 675 and 1031) identified as *Smythea calpicarpa* Kurz from Andaman & Nicobar Islands have been found to be *S. lanceata* (Tul.) Summerh.

4. *Smythea macrocarpa* Hemsley in Hook., lc. Pl. 16. t. 1558. 1886-87; King in J. As. Soc. Bengal 65: 381. 1896; Narayanswami in J. & Proc.



Fig. 48. *Smythea lanceata* (Tul.) Summerh.

As. Soc. Bengal n.s. 27: 468. 1931; Banerjee & Mukerjee in Indian For. 96: 214. 1970.

Large woody climbers; branches scandent, rufous, puberulous. Leaves ovate-lanceolate to oblong-elliptic, 4-10 x 1.5-3.5 cm, ending in a thicker acumens, glabrous, shining, crenate-serrate; lateral nerves 5-7 pairs; petioles 5 mm long; stipules subulate, 3-5 mm long, deciduous. Inflorescence 10-15-flowered fascicles, on bifid, short peduncles. Flowers 5-5.5 mm across, bracteate; pedicels 5 mm long, rusty brown puberulous. Calyx lobes deltoid, 2.5 mm long. Petals truncate, 1.5 mm long, shortly clawed. Stamens 1.5 mm long; connective with hard black point. Disc glabrous. Ovary glabrous. Capsules samaroid, one or more in the axil of leaves, stalked, obovate or elliptic-oblong; wing glabrous, apex rounded or acute, apiculate, base narrowed and grey-brown pubescent. Seed black, smooth or faintly wrinkled.

Fl. & Fr. : Dec. - Jan.

Distrib. India : Assam.

Malesia.

Note. This species differs from *S. lanceata* (Tul.) Summerh. and *S. calpicarpa* Kurz in its foliage and shape of the fruit. Hemsley (1886-87) described the fruits as ovate-oblong but the materials from Assam show a tendency towards obovate-oblong shape. In this character it matches with some collections from Malaya (Perak), housed in CAL.

11. *Ventilago* Gaertner

Scandent or climbing shrubs; branches slender, striate; branchlets often zig-zag, stout. Leaves alternate, simple, coriaceous, secondary nerves ascending, converging along the margin; stipules minute. Inflorescence axillary or terminal, umbellate cymes, fascicled or in panicles. Flowers bisexual, pedicellate. Calyx lobes 5, keeled with a hard incurved point at apex within, puberulous outside; tube obconical. Petals 5, cucullate, membranous, truncate, obcordate, clawed at the base. Stamens 5, opposite to and enclosed by petals, adnate to their bases; filaments filiform; anthers dorsifixed, introrse. Disc thick, filling the calyx tube, 5-lobed or angled, adnate to the lower half of the ovary. Ovary

more or less sunk in the disc; style hairy at base, with two short stigmatic lobes. Samara 1-seeded, indehiscent, the basal seed chamber thinly double walled, prolonged above into a linear or linear-oblong, coriaceous wing; median line on wings single or double. Seeds globose to subglobose; testa membranaous; exalbuminous; cotyledons thick, fleshy; radicle very short.

Indo-Malayan region, Polynesian Islands, Australia and Madagascar; ca 70 species, 4 in India.

KEY TO THE SPECIES

- | | |
|--|----------------------------------|
| 1a. Calyx tube saucer-like, adnate only to the base of the fruit | 2 |
| b. Calyx tube cup-like, adnate to the lower part of the fruit | 3 |
| 2a. Branches slender, pale; panicles minutely grey pubescent; wing grey, puberulous | 4. <i>V. madraspatana</i> |
| b. Branches stout, dark; panicles golden vilous; wing brown, tomentose | 2. <i>V. gamblei</i> |
| 3a. Leaves ovate to ovate-elliptic, usually unequally rounded at base; disc villous; fruit girt up to more than middle by the calyx tube | 1. <i>V. denticulata</i> |
| b. Leaves oblong-lanceolate, attenuate at base; disc glabrous; fruit girt up to one-third portion by the calyx tube | 3. <i>V. goughii</i> |

1. *Ventilago denticulata* Willd. in Ges., Naturf. Fr. Neue. Schr. 3: 417. 1801. *V. calyculata* Tul. in Ann. Sci. Nat. Ser. 8, 4: 124. 1857; M. Lawson in Fl. Brit. India 1: 631. 1875. *V. madraspatana* Gaertner var. *calyculata* King in J. As. Soc. Bengal 65: 378. 1896; Duthie, Fl. Upp. Gang. Pl. 1: 162. 1903.

Hindi: *Rackat-pita, Kalalag, Latapal, Raidhani*; Sant. : *Sarjom*; Tel. *Surati, Chekka*.

Large, woody, climbing shrubs; branchlets green, pubescent; bark dark grey, smooth when young. Leaves 4-16 x 2.3-7.5 cm, obtuse or subacute at apex, oblique at base, crenate-serrate, rarely entire, pubescent, subcoriaceous; nerves 5-8 pairs, arcuate, camptodromous near the margin; petioles 3-14 mm in length, pubescent, channelled. Panicles axillary or terminal, pubescent. Flowers pungent; pedicels 2-5 mm long. Calyx lobes deltoid, 2.8 mm long, hairy within. Petals spatulate, 1.5 mm long, truncate, obcordate or emarginate at apex. Stamens 1.5 mm long; connective prolonged. Disc 5-lobed, rarely 10-lobed.

having depression or furrows. Ovary bicarpellary, hairy; stigmatic arms divergent. Samaras with median line single or often double from middle, 3.5-6 x 0.8-2 cm; fruit wing acute or obtuse or bifid or not at the apex. Seeds ovate or subglobose, 1.6.3 x 3-6 mm, black; seed chamber 6-10 mm in diam., pubescent outside.

KEY TO THE VARIETIES

- | | |
|-------------------------------------|-----------------------------|
| 1a. Apex of the fruit wing bifid | 1.2. var. bifida |
| b. Apex of the fruit wing not bifid | 2 |
| 2a. Apex of the fruit wing acute | 1.1 var. acuta |
| b. Apex of the fruit wing obtuse | 1.3 var. denticulata |

1.1. var. acuta Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 83. 1990.

Distrib. India : Uttar Pradesh and Assam.

1.2. var. bifida Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 84. 1990.

Distrib. India : Uttar Pradesh, Bihar, Orissa, Madhya Pradesh and Karnataka.

1.3 var. denticulata

Fl. & Fr. : Sept. - June.

Distrib. India : Throughout the plains of India, chiefly in dry and dense forests and on rocky soils up to 700 m. Kashmir, Punjab, Uttar Pradesh, Bihar, Gujarat, West Bengal, Assam, Orissa, Madhya Pradesh, Maharashtra, Karnataka, Tamil Nadu and Andaman & Nicobar Islands.

Uses. Wood is used as fuel. The extract of the bark and young shoots is applied to the body as pain killer during malarial fever. The seeds yield an oil used for cooking purpose. Rings made from the tendril is worn on the finger as a cure against toothache. The bark yields a good cordage fibre.

Note. Tulasne (*l.c.*) described 5 species of *Ventilago* from E. India besides a few forms which according to him deserve specific status. He also pointed out the hitherto neglected characters derived from the degree of the adherence of calyx to fruit. The fruit character is most important in specific diagnosis and yet Tulasne (*l.c.*) described these species some of which had fruiting material. Bentham (in *J. & Proc. Linn. Soc.* 5. 72. 1861) merged Tulasne's *V. macrantha*, *V. calyculata*, *V. smithiana*, *V. sulphurea* with the common North Indian species figured by Roxburgh (1796-98) under Gaertner's name in which the adnate calyx is cup-shaped. Bentham (*l.c.*) selected *V. calyculata* for the four species proposed by Tulasne but this name is illegitimate due to an earlier name *V. denticulata* Willd. (Willdenow, *l.c.*) as pointed out by Oza (*l.c.*) and followed by Banerjee and Mukerjee (*l.c.*).

2. *Ventilago gamblei* Suesseng. in Engl. & Prantl, *Nat. Pflazenfam.* 20d: 152. 1953; Banerjee & Mukerjee in *Indian. For.* 96; 209. 1970. *Ventilago lanceolata* Gamble in *Kew Bull.* 1916. 134. 1916. & *Fl. Pres. Madras* 2: 218. 1918 (*non* Merr. 1915).

Climbing shrubs; branches dark, glabrous or puberulous when young. Leaves elliptic to oblong-lanceolate, 5-9.5 x 2.5-4.5 cm, apex acuminate or mucronate, base obtuse, unequal, strongly crenate, younger ones puberulous; lateral nerves 6-8 pairs, camptodromous near the margin; petioles 6-8 mm long, puberulous. Panicles axillary. Flowers 4-5 mm across; bracts caducous; bracteoles subglomerulate-linear. Calyx lobes triangular, 2.5 mm long, keeled within at apex. Petals 1-1.5 mm long. Stamens 1-1.5 mm long; anther connective apiculate, recurved. Disc glabrous or slightly villous. Ovary glabrous. Fruits 5.3 x 1.1 cm, mucronate, wing flat, with double line and accessory reticulations; seed chamber globose, 4 mm in diam., rusty brown tomentose. Seeds globose, 3-4 x 2.5 mm, blackish grey.

Fl. & Fr. : Jan. - March.

Distrib. India : Maharashtra, Andhra Pradesh and Tamil Nadu.

Note. This species is quite distinct due to its glabrous disc and ovary. The most outstanding character is its saucer-shaped calyx tube which cups the fruit only at base.

3. *Ventilago goughii* Gamble in Kew Bull. 1916: 134. 1916 & Fl. Pres. Madras 2: 218. 1918.

Climbing shrubs, minutely grey puberulous. Leaves 8.5-10 x 3.5 cm, apex abruptly acute or obtuse, base oblique, obscurely serrate, glabrous, minutely puberulous on veins; lateral nerves 6-9 pairs, impressed. Flowers 4-5 mm across, arranged in fascicles on panicles. Calyx lobes 2-2.5 mm long, triangular, keeled inside at apex. Petals 1-1.5 mm long, obcordate. Stamens 1-1.5 mm long, opposite the petals; filaments short; anthers oblong, connective apiculate. Ovary villous. Capsules samaroid; wing oblong, 5 x 2.2 cm, grey puberulous; median line double with accessory reticulations, apex mucronate; seed chamber subglobose, 1.1 x 0.9 cm, grey puberulous. Seeds 5.3 x 3 mm black.

Fl. & Fr. : March.

Distrib. India : Karnataka.

4. *Ventilago madraspatana* Gaertner, Fruct. Sem. Pl. 1: 223. t. 49, f. 2. 1788; M. Lawson in Fl. Brit. India 1: 631. 1875.

Hindi: *Keoti, Kalibel*; Kan. *Poplichukay*; Mar.: *Lokandi, Kanwail*, Tam.: *Vempadam*; Tel.: *Surati, Surati Chekka*.

Large woody climbers; young branches grey pubescent or glabrous, pale grey, old stem dark grey, cracked. Leaves oblong-lanceolate or elliptic-ovate, 1.8-8 x 1.2-3.8 cm, apex acute, subacuminate or obtuse, base rounded or cuneate to oblique, entire or crenate, glabrous; lateral nerves 4-9 pairs, camptodromous near the margin. Inflorescence axillary and terminal panicles, occasionally with leafy bracts. Calyx lobes spreading. Petals emarginate with a tooth in the middle. Stamens 1.5 mm long; anthers oval. Disc glabrous. Ovary villous; style arms divergent or curved. Capsules samaroid, yellow to grey, blunt or mucronate at apex; wing of the fruit bifid or not; median line single; seed chamber globose, 2-2.5 mm in diam. Seed globose, 5 x 4 mm, brown, thin walled, exalbuminous; cotyledons thick, fleshy.

KEY TO THE VARIETIES

- 1a. Apex of the fruit wing not bifid
b. Apex of the fruit wing bifid

- 4.2 var. *madraspatana*
4.1 var. *fructifida*

4.1 var. fructifida Santapau in Kew Bull. 1949: 340. 1949 & in Rec. Bot. Surv. India 16(1): 52. 1953.

Fl. & Fr. : March - May.

Distrib. India : Maharashtra.

4.2. var. madraspatana

Fl. & Fr. : Sept. - May.

Distrib. India : Throughout the plains, chiefly in the drier hilly forests, ascending up to 900 m. Uttar Pradesh, Bihar, West Bengal, Assam, Orissa, Maharashtra, Andhra Pradesh and Karnataka.

Myanmar, Sri Lanka and Indonesia.

Uses. Cordage is made of the bark. The root of this species is collected and used as a red dye in Karnataka and Tamil Nadu. The root bark produces a valuable dye which is used for dyeing "tasar silk". The bark is also used in native medicine.

12. *Ziziphus* Tourn. ex Miller

Shrubs or trees, rarely decumbent or creeping; branches often zig-zag. Leaves alternate or opposite, entire or crenate, coriaceous, 3-5-nerved from the base, petiolate; stipules either single or rarely two, spinescent; spines sharp, curved or straight, recurved ones shorter. Inflorescence axillary or terminal cymes or thyrses. Flowers pentamerous, bisexual or polygamous, perigynous, pedicellate. Petals cucullate, incurved or deflexed, rarely absent. Stamens included or excluded, inserted below the disc. Disc flat or pitted, 5 or 10-lobed, or rarely entire, often with 10 depressions covering the receptacle, margins free. Ovary immersed in the disc and adnate to its base, 2-4-loculed; style 2-4, free, diverging or combined; stigma papillose. Drupes globose or oblong; putamen woody or horny, 1-3-celled. Seeds 1-3, plano-convex, testa thin, brittle, smooth shining, exalbuminous or with scanty endosperm; cotyledons thick; radicle short.

Temperate and tropical parts of the world, chiefly in Asia and America, a few extending to the Pacific Islands and Australia; *ca* 135 species, 17 in India.

Literature. KHOSHOO T.N. & N. SINGH (1963) Cytology of North-west Indian trees *J. Ziziphus jujuba* and *Z. rotundifolia*. *Silvae Genetica* 12, 5: 158-165.

KEY TO THE SPECIES

- | | |
|---|--------------------------|
| 1a. Cymes axillary, sessile or shortly pedunculate | 2 |
| b. Cymes terminal or flowers in lateral panicles, distinctly pedunculate | 16 |
| 2a. Flowers in sessile cymes or cymose fascicles | 3 |
| b. Flowers in pedunculate cymes | 10 |
| 3a. Leaves glabrous beneath; disc not pitted | 4 |
| b. Leaves tomentose beneath; disc pitted | 6 |
| 4a. Branchlets fasciculate | 9. <i>Z. jujuba</i> |
| b. Branchlets not fasciculate | 5 |
| 5a. Leaves elliptic, obtuse; basal nerves prominent beneath and continued to the apex | 6. <i>Z. glabrata</i> |
| b. Leaves ovate, not obtuse; basal nerves not prominent beneath and not continued to the apex | 13. <i>Z. oxyphylla</i> |
| 6a. Leaves obliquely ovate, entire or minutely denticulate, base oblique | 7 |
| b. Leaves not obliquely ovate, serrulate, base rounded | 8 |
| 7a. Transverse nerves at right angle to mid-rib | 3. <i>Z. brunoniana</i> |
| b. Transverse nerves not at right angle to mid-rib | 12. <i>Z. oenoplia</i> |
| 8a. Leaves truncate at apex | 15. <i>Z. truncata</i> |
| b. Leaves not truncate at apex | 9 |
| 9a. Leaves fuscous tomentose beneath | 10. <i>Z. mauritiana</i> |
| b. Leaves grey tomentose beneath | 11. <i>Z. nummularia</i> |
| 10a. Style 3-cleft, distinct or nearly so | 11 |
| b. Style 2-cleft, connate up to the middle | 13 |
| 11a. Leaves and fruits tomentose | 17. <i>Z. xylopyra</i> |
| b. Leaves glabrous, except on nerves beneath; fruits glabrous | 12 |
| 12a. Plants armed with thorns | 7. <i>Z. horrida</i> |
| b. Plants unarmed | 4. <i>Z. caracutta</i> |
| 13a. Ovary villous | 14 |
| b. Ovary glabrous | 15 |
| 14a. Leaves acuminate; petals absent; fruits obovoid, pointed at apex | 2. <i>Z. apetala</i> |
| b. Leaves obtusely caudate-acuminate; petals present; fruits globose, not pointed at apex | 1. <i>Z. andamanica</i> |

- 15a. Leaves more than 5 cm long, lateral nerves continuous to the apex;
petioles up to 7 mm long 8. *Z. incurva*
- b. Leaves less than 5 cm long, lateral nerves end near the apex;
petioles more than 7 mm long 16. *Z. williamii*
- 16a. Petals absent; primary nerves branched 14. *Z. rugosa*
- b. Petals present; primary nerves unbranched 5. *Z. funiculosa*

1. *Ziziphus andamanica* Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 89. 1990. *Z. glabra* King in J. As. Soc. Bengal 65: 376. 1897 (*non* Roxb., 1824). Fig. 49.

Scandent shrubs; young branches puberulous, spine solitary, recurved, 2-3 mm long. Leaves ovate-oblong, rarely ovate-lanceolate, 5.5-9.3 x 3.2-4.3 cm, base slightly narrowed, serrulate or subentire, glabrous, shining, except the pubescent midvein, oblique, 3-nerved; transverse nerves parallel, two outer primary nerves with camptodromous secondary nerves diverging at 30°-40° angle; petioles 6-8 mm long, pubescent. Inflorescence 20-25-flowered, pubescent cymes. Flowers 5 mm across; peduncles longer than the petiole; pedicels 2 mm long, accrescent. Calyx lobes ovate, 2 mm long, acute, keeled inside, thickened at apex, pubescent without. Petals 1.5 mm long. Stamens equal to petals; filaments linear. Disc glabrous, hairy at centre with 10 obscure teeth at the edge. Ovary bicarpellary, 2-loculed. Drupes 1.5 x 1.3 cm, glabrescent, yellow, 1-celled. Seeds 1, 8 mm in diam., compressed, brown.

Fl. & Fr. : Oct. - April.

Distrib. India : Damp places on the margins of canals. Assam and Andaman Islands.

Note. King (1897) while describing *Z. glabra* stated this species resembles *Z. glabra* Roxb., but the outer nerves of the leaves are broadly branched outwards and the fruit is minutely tomentose. The specimens of this are scanty. When more material of this and *Z. glabra* Roxb. are obtained, it may be found impossible to keep this up as more than a variety of the older specimen. King's *Z. glabra* as drawn on plate 8 (*l.c.*) is certainly very different from Wallichian specimen no. 4242, the Holotype, examined at K. King's name, being occupied by Roxburgh's plant, is a latter homonym and, therefore, a new name *Z. andamanica* was proposed.



Fig. 49. *Ziziphus andamanica* Bhandari & Bhansali

2. *Ziziphus apetala* Hook.f., Fl. Brit. India 1: 635. 1875.

Fig. 50.

Climbing shrubs, armed; young branches ferruginous-tomentose; prickles recurved, 3-4 mm long, base tomentose. Leaves obliquely ovate or elliptical, 4.2-12.5 x 1.8-7.0 cm, mucronate, oblique at base, glabrous above, ferruginous-pubescent below, membranous, serrate, basally 3-nerved; primary and secondary veins camptodromous; petioles 8 mm long, brownish hairy. Inflorescence 10-15-flowered, axillary, dichotomous cymes; peduncles up to 3 mm long, brown pubescent. Flowers 6-7 mm across, pedicels 4 mm long. Calyx lobes deltoid, 2-3 mm long, acute, glabrous within, thickened along the margin and apex. Stamens equal to the calyx. Disc 5-lobed, hairy towards ovary. Ovary bicarpellary, unilocular, brownish hairy at base; style hairy up to the middle. Fruits compressed, 1-celled, 1.2-1.6 cm in diam., glabrous. Seeds 1, compressed, 11 mm long, 8 mm thick.

Distrib. India : West Bengal and Assam.

Note. Ripe fruit is eaten.

3. *Ziziphus brunoniana* Brandis, Ind. Trees 169. 1971 (Repr. ed.).

Climbing shrubs; branchlets strigose, alternate, internodes 1-2.3 cm long; spines solitary or in pairs, 2-3 mm long, fulvous tomentose at base. Leaves alternate, 2-4.5 x 1-2.7 cm, acute to subacuminate or distantly serrulate, serratures callous tipped, glabrous above, appressed fulvous hairy beneath, basally 3-nerved; secondary veins from the outer 2 primary veins camptodromous, diverging at 30°-40° angle; petioles 3-4 mm long, rusty tomentose. Inflorescence 5-10-flowered, axillary fascicles. Flowers sessile. Calyx lobes deltoid, 1.2-1.5 mm long, thickened at apex, keeled up to the middle, pubescent without. Petals 0.8 mm long. Stamens shorter than petals; anthers dorsifixed. Disc 10-lobed, glabrous, massive. Ovary bicarpellary, bilocular, glabrous; style 2-cleft, united above the middle; stigma obtuse. Drupes obovate, 6-8 mm long, glabrous, 2 (-1)-celled. Seeds 2, black, 4 x 3 mm, compressed.

Fl. & Fr. Oct. - Dec.



Fig. 50. *Ziziphus apetala* Hook.f.

Distrib. India : Assam, Tripura and Andaman Islands.

4. *Ziziphus caracutta* Roxb., Fl. Ind. 2: 361. 1824 & Fl. Ind. 1: 612. 1832. *Z. xylopyrus* var. *glaberrima* Sedgew. in Indian For. 45: 71. 1919. *Z. glaberrima* Santapau in J. Bombay Nat. Hist. Soc. 51(4): 803. 1953 & Fl. Saurashtra 94. 1962. **Fig. 51.**

Hindi: *Bara-bera*

Small trees, up to 7.5 m tall, rarely armed; branches glabrescent. Leaves ovate-elliptic, 3.2-6 x 1.8-2.8 cm, apex acute, obtuse or slightly emarginate, base acute or rounded, unequal, crenate, 3-nerved; the nerves not converging towards apex; petioles 6 mm long, tomentose; stipules 5 mm long, filiform, caducous, scars prominent. Inflorescence axillary fascicles; peduncles up to 12 mm long. Flowers 5 mm across, pale green. Calyx lobes 2-2.5 mm long, acute, thickened at apex, keeled up to the middle, glabrous within, pubescent without. Petals 2 mm long. Stamens equal to and opposite the petals; filaments somewhat thicker, anthers minute, 2-celled, dorsifixed. Disc 5-lobed, glabrous. Ovary tricarpellary, trilocular; styler arms connate up to the middle. Drupes green, when ripe greyish brown or black, globose or slightly compressed at poles, 21 mm in diam.; pericarp woody. Seeds 3, black, orbicular, 8 mm in diam., compressed.

Fl. & Fr. : March - June.

Distrib. India : Scattered from near base to the top of the hills, also in scrub jungle near sea coast. Uttar Pradesh, Bihar, Orissa, Maharashtra and Karnataka.

Note. *Z. caracutta* Roxb. was described in 1824. Later authors reduced it as a synonym of *Z. xylopyrus* var. *glaberrima*. Santapau (1953) raised it to the status of a species *Z. glaberrima*. A critical study of the above two taxa reveals that they are conspecific and therefore, they are treated here under a single taxon *Z. caracutta*, being the earliest valid name.

5. *Ziziphus funiculosa* Buch. - Ham. ex M. Lawson in Fl. Brit. India 1: 636. 1875.

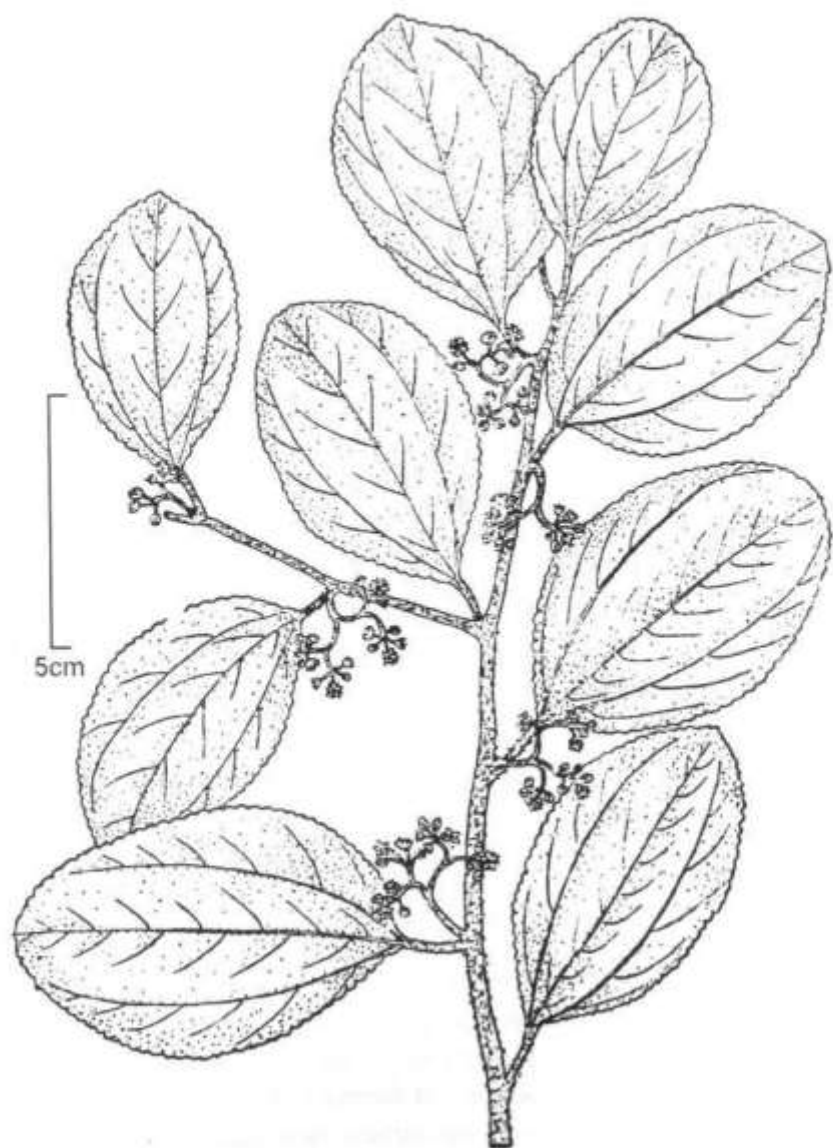


Fig. 51. *Ziziphus caracutta* Roxb.

Abor, Miri : *Tatke-riubi*; Asm. : *Bons-boguri*; Mikir : *Ingsudompo*.

Large climbing shrubs; branches slender, golden silky hairy, glabrous with age; internodes 1-5 cm long; prickles stout, recurved, glabrous or slightly pubescent at base. Leaves alternate, obliquely ovate or elliptic-oblong, 5-10 x 2-4 cm, oblique at base, serrate, glabrous, slightly pubescent on nerves, basally 3-nerved, petioles 0.8-1 cm long, pubescent. Inflorescence panicles. Flowers 5 mm across. Calyx lobes deltoid, 2 mm long, acute, glabrous within, tomentose without, thickened at the margins and at triangular apex. Petals obovate, 1.5 mm long, spreading. Stamens 5, equal to petals; filaments flat. Disc 5-lobed, sometimes faintly 10-lobed, glabrous, thickened around the ovary. Ovary bicarpellary, bilocular, glabrous; style 2-cleft nearly to base, curved near apex. Drupes ovate, 1.3-1.8 cm long, yellow, 1-celled, glabrous, with scanty pulp. Seeds 1, black, 1 x 1 cm, compressed.

Fl. & Fr. : March - Oct.

Distrib. India : Kashmir, West Bengal and Assam.

Bangladesh, Myanmar, Malesia and Borneo.

6. *Ziziphus glabrata* Heyne ex Roth, Nov. Pl. Sp. 159. 1821; M. Lawson in Fl. Brit. India 1: 633. 1875. *Z. trinervia* Roxb., Fl. Ind. 2. 364. 1824. *Z. trinervia* var. *glabratus* Heyne ex Roth, Nov. Pl. Sp. 159. 1821.

Trees, ca 6 m tall, unarmed; branchlets glabrous. Leaves alternate, lanceolate or ovate-oblong, 1.8-10.3 x 1.3-5.2 cm, apex acute, base rounded or subcordate, crenulate, the crenations tipped with callous points, glabrous, shining, bifarious, basally 3-nerved; petioles 3-9 mm long; stipules filiform, deciduous. Inflorescence axillary fascicles; peduncles 2-3 mm long. Flowers 5-6 mm across, slightly puberulous, yellowish green; pedicels 4-5 mm long. Calyx lobes 2-3 mm long, glabrous within, keeled inside upto middle. Petals obtriangular, 1-2 mm long, acute or rounded at apex. Stamens ca 3 mm long; filaments flattened. Disc faintly 10-lobed, glabrous, fleshy. Ovary glabrous; style 2-cleft, connate up to the middle, curved. Fruits globose or obovate, 10-11 mm in diam., considerably flattened, 1-2-loculed with a sweet gelatinous pulp. Seeds brownish, soft; embryo erect; cotyledons nearly orbicular; radicle obovate.

Fl. & Fr. : Sept. - Jan.

Distrib. India : In dry plains and in grasslands at low elevations. Kashmir, Himachal Pradesh, Punjab, West Bengal, Rajasthan, Gujarat, Maharashtra, Tamil Nadu and Andaman.

Bhutan and Bangladesh.

Note. Fruits are noted for their emollient and pectoral properties. They are rather sour, when dried become somewhat sweet. Cultivated varieties have sweet aromatic, mealy whitish pulp and are eaten fresh or sun dried and used in off season. They are also eaten boiled with millet or rice, stewed or baked. A decoction of the leaves is given to purify the blood and as an alternative in venereal diseases.

7. **Ziziphus horrida** Roth, Nov. Pl. Sp. 159. 1821; M. Lawson in Fl. Brit. India 1: 636. 1875.

Shrubs or small trees; branches slender, divaricate, glabrous; thorns paired, one straight, 1.7 cm long, other recurved, 5 mm long, glabrous, hard, shining with broad base. Leaves alternate, broadly elliptic or suborbicular, 0.8-1.8 x 0.7-1.8 cm, apex acute, base rounded, crenate, basally 3-nerved; petioles 2 mm long. Flowers 4 mm across; pedicels shorter than the peduncles. Calyx lobes deltoid, 2 mm long, acute, pubescent without, glabrous within, keeled up to the middle, thickened at the apex and margin. Petals broadly obovate, 1.5 mm long, very long clawed. Stamens equal to petals. Disc 5-angled, not pitted. Ovary tricarpeal, trilobular. Drupes globose, woody, 3-celled. Seeds 3, black, compressed.

Distrib. India : Only on hills. Maharashtra.

8. **Ziziphus incurva** Roxb., Fl. Ind. 2: 364. 1824 & Fl. Ind. 1: 614. 1832; M. Lawson in Fl. Brit. India 1: 635. 1875.

Fig. 52.

Nep.: *Kookusee*.

Large shrubs or small trees, usually unarmed; branches stiff and stout; bark smooth, grey; young shoots, petioles and main nerves strigose. Leaves



Fig. 52. *Ziziphus incurva* Roxb.

ovate or ovate-oblong, 5.6-11.3 x 2.2-5.2 cm, apex acute to acuminate, rounded or acute at base, unequal, glabrous, serrulate with hard brown point, shining above, hairy on nerves beneath, membranous, black on drying, obscurely 5-nerved; petioles pubescent; stipules linear, villous, deciduous. Inflorescence dichotomous, 5-10-flowered cymes; peduncles 15 mm long. Flowers 5 mm across; pedicels 2 mm long; bracts ovate. Calyx lobes deltoid, 2-2.5 mm long, keeled up to the middle, acute, rusty tomentose without, glabrous within. Petals subcucullate, 1-1.5 mm long, convex at distal end. Stamens equal to petals; anthers dorsifixed. Disc 10-lobed, glabrous. Ovary bicarpellary; styler arms straight. Drupes ellipsoid, 2-celled, smooth, shining; putamen thick, hard. Seeds compressed, black.

Fl. & Fr. : April - Dec.

Distrib. India : Frequently on hill tops. Assam, Meghalaya and Tamil Nadu.

Nepal and Bhutan.

9. *Ziziphus jujuba* Miller, Gard. Dict. ed. 8, 1768. *Z. sativa* Gaertner, Fruct. 1: 202. 1788. *Z. vulgaris* Lam., Encycl. 3: 317. 1789; M. Lawson in Fl. Brit. India 1: 632. 1875.

Punj.: *Ban beri*, *Ber*, *Bhitni*, *Birari*, *Kandika*, *Kandiari*, *Simli*, *Sinjli*.

Small trees or shrubs, 7.5-9 m tall, glabrous; branches flexuose, often with dull grey cuticle; prickles unequal, one straight, about 3 cm long, the other recurved, ca 0.7 cm long. Leaves obliquely ovate-lanceolate, 1.3-5 x 0.7-7.3 cm, apex obtusely acute, base slightly acute or rounded, crenulate, glabrous, basally 3-nerved; primary and secondary nerves camptodromous; petioles 2-4 mm long. Inflorescence 2-12-flowered, axillary fascicles. Flowers 5 mm across, glabrous; pedicels 1-2 mm long, bracts subulate. Calyx lobes deltoid, 1.5 mm long, acute keeled within to the base, thickened at margin and triangular apex. Petals 1.2 mm long. Stamens equal to petals; anthers dorsifixed. Disc thin, 5-lobed, sometimes faintly 10-lobed, glabrous; lobes

emarginate. Ovary bicarpellary, bilocular; style 2-cleft, connate up to the middle; arms curved at apex. Drupes dark red or black, ovoid-oblong, 1.7 x 1-1.5 cm, succulent, obtuse at both ends, glabrous; kernel 2-celled, rugose. Seeds 2, compressed, black.

Fl. : March - June; *Fr.* : Throughout the cold season.

Distrib. India: Kashmir and Himachal Pradesh.

Pakistan, Afghanistan, Iran, China, Mongolia, Japan and S. Europe.

Note. Chromosome number : $2n = 42, 72, 96$ (Srinivasan in Cur. Sci. 21: 224. 1952; Moringa *et al.* in Cytologia 1: 16. 1929).

10. *Ziziphus mauritiana* Lam., Encycl. 3: 319. 1789. *Z. jujuba* (L.) Gaertner, Fruct. 1: 203. 1788 (*non* Miller, 1768); M. Lawson in Fl. Brit. India 1: 632. 1875. *Rhamnus jujuba* L., Sp. Pl. 194. 1753.

Abor.: *Gamge-asing*, Beng.: *Bagri*, Garo: *Thengkhi*; Guj.: *Ber*, *Bordi*; Kh. *Dieng-Soh-broi*; Kum. : *Guter*, *Khalis*; Mikir: *Thakri-arong*; Miri & Asm.: *Boguri*.

Large shrubs or trees, 1-15 m tall; bark dark grey or nearly black, with deep vertical cracks, reddish and fibrous inside; younger parts rusty tomentose; spines solitary or in pairs, straight or one of them recurved; nodes slightly enlarged around the leaf scars. Leaves alternate, variable, broadly elliptic or ovate, 2-9.8 x 1-4.3 cm, often obtuse, mucronate at apex, serrulate or entire, pubescent or glabrous above, tomentose to densely brown or white silky tomentose beneath, basally 3-nerved; stipules spinescent. Inflorescence short axillary cymes or 10-13-flowered fascicles; peduncles 1-8 mm long. Flowers 4-6 mm across, green-white; pedicels 2-5 mm in flowers, 3-7 mm in fruits, tomentose. Calyx lobes glabrous within, tomentose without, tube campanulate. Petals spatulate, 1-1.5 mm long. Stamens equal to petals. Disc distinctly 10-grooved, fleshy. Ovary bicarpellary, bilocular, glabrous; style short, 2-cleft, united to the middle; stigmatic lobes curved. Drupes 2(-1) celled; exceeding or less than 1 cm in diam.; kernel irregularly furrowed with a hard, thick, boney shell. Seeds 1 or 2, compressed.

KEY TO THE VARIETIES

- | | |
|---|------------------------------|
| 1a. Flowers borne in cymes; peduncles more than 6 mm long. | 10.3 var. pedunculata |
| b. Flowers born in fascicles; peduncles less than 2 mm long | 2 |
| 2a. Leaves pubescent above | 10.4 var. pubescens |
| b. Leaves glabrous above | 3 |
| 3a. Mature fruits exceeding 1 cm in diameter. | 10.2 var. mauritiana |
| b. Mature fruits less than 1 cm in diameter | 10.1 var. fructicosa |

10.1 var. fructicosa (Haines) Sebest. & Balakr. in Indian For. 89: 525. 1963. *Z. jujuba* Lam. var. *fructicosa* Haines, For. Fl. Chotanagpur 270. 1910. & Bot. Bihar & Orissa 2: 198. 1921; Gamble, Fl. Pres. Madras 1: 220. 1918. *Z. mauritiana* Lam. var. *fructicosa* (Haines) Raizada & Saxena in Indian For. 92: 326. 1966. *nom. illeg.*

Hindi: *Jhar Beri*.

Fl. : Aug. - Feb.

Distrib. India : Uttar Pradesh, Orissa, Madhya Pradesh, Andhra Pradesh and Tamil Nadu.

10.2 var. mauritiana

Distrib. India : Very common in dry places. Throughout.

Pakistan, Sri Lanka, Afghanistan, China, Australia and Tropical Africa.

Note. Chromosome number $2n=48$ (Srinivasan in Cur. Sci. 21: 224. 1952).

10.3 var. pedunculata Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 101. 1990.

Fl. & Fr. : Aug. - March.

Distrib. India : Punjab, Delhi, Uttar Pradesh, Bihar, Tripura, Madhya Pradesh and Rajasthan.

10.4 var. pubescence Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 102. 1990.

Fl. & Fr. : Aug. - May

Distrib. India : Tamil Nadu.

The name *Z. jujuba* Lam., under which this tree is known in our floras cannot be used for this species, as it was previously used for another taxon of Southern Europe and Africa by Miller. It is Miller's plant that goes under the English name of the 'common Jujube'. It is extensively cultivated throughout India for its fruit and there are nearly 30 named cultivars.

11. *Ziziphus nummularia* (Burm.f.) Wight & Arn., Prodr. 162. 1834; M. Lawson in Fl. Brit. India 1: 633. 1875. *Rhamnus nummularia* Burm.f., Fl. Ind. 61. 1768. *Ziziphus rotundifolia* Lam., Encycl. 3: 319. 1789; Cooke, Fl. Pres. Bombay 1: 241. 1902.

Bhoj. : *Jhari, Jharberi, Jand, Kanta*; Guj.: *Chanyabor*; Hindi: *Ber, Berra*; Punj.: *Bal, Mella, Kokenber*; Raj. : *Bhor, Jhar-bhor*.

Straggling shrubs, 2-3.5 (-5) m tall, with widely divaricating flexuous branches; young branches tomentose, profusely armed; spines paired, one straight, slender and very sharp, nearly as long as the petiole, other much shorter, hooked, bent downwards. Leaves ovate, elliptic or orbicular, 1-2.5 x 0.5-1.8 cm, acute or obtuse at apex, oblique or rounded at base, glabrous or tomentose above, tomentose to white woolly tomentose beneath, serrate, each tooth marked by a deciduous, callous point, basally 3-nerved with few prominent lateral nerves; petioles 5-10 mm long, tomentose. Inflorescence short, axillary, compact 10-20-flowered cymes, sessile or very shortly pedunculate. Flowers 4-5 mm across; pedicels 2-5 mm long, tomentose. Calyx lobes deltoid, 1.7-2.2 mm long, acute, keeled nearly to the base, campanulate, thickened at the apex, glabrous within, pubescent without. Petals 1-1.5 mm long, obovate-spathulate, margin convolute, rounded or truncate at the apex. Stamens 0.8-1.2 mm long. Disc slightly 10-lobed. Ovary bicarpellary, bilocular; style 2-cleft, united to above the middle. Drupes 0.8 cm in diam., globose, woody, glabrous, black red and shining when ripe; kernel rugose, with a hard, bony shell. Seeds 2(-1) compressed, black.

KEY TO THE VARIETIES

- 1a. Leaves tomentose on both surfaces 11.2 var. *nummularia*
 b. Leaves glabrous above and tomentose beneath 11.1 var. *glabrescens*

11.1 var. *glabrescens* Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 103. 1990.

Fl. & Fr. : Jan. - Oct.

Distrib. India : Punjab, Andhra Pradesh, Karnataka and Tamil Nadu.

11.2 var. *nummularia*

Fl. & Fr. : March - Jan.

Distrib. India : In dry and arid regions. Punjab, Uttar Pradesh, Madhya Pradesh, Rajasthan, Gujarat, Tamil Nadu and Andaman.

Pakistan, Afghanistan, Iran and Iraq.

Note. Commonly used for fencing; the sweet subacid fruit is used as food, especially in times of famine. Leaves are thrashed out and used as fodder for sheep and goats. The leaves are also used in curing scabies and boils, the fruit is used as an astringent.

12. *Ziziphus oenoplia* (L.) Miller, Gard. Dict. ed. 8: 3. 1768; M. Lawson in Fl. Brit. India 1: 634. 1875. *Rhamnus oenoplia* L., Sp. Pl. 194. 1753.

Fig. 53.

Beng.: *Makoh, Makhora, Shiakol, Shyakul*, Hindi: *Makai*; Mal.: *Mulli*; Mar.: *Burgi*; Or.: *Barokoli*; Tel.: *Paranu, Pariki*; Tam.: *Kottei*; Tipp.: *Ling-Kermrang*.

Straggling or climbing shrubs; branchlets fasciculate or not, strigose, often densely rusty tomentose, fluted; nodes slightly enlarged around the leaf scars. Leaves alternate, obliquely ovate or elliptic, 1-6.5 x 0.2-2.9 cm, acuminate, fulvous tomentose or sparsely ferruginous hairy or glabrescent above, basally

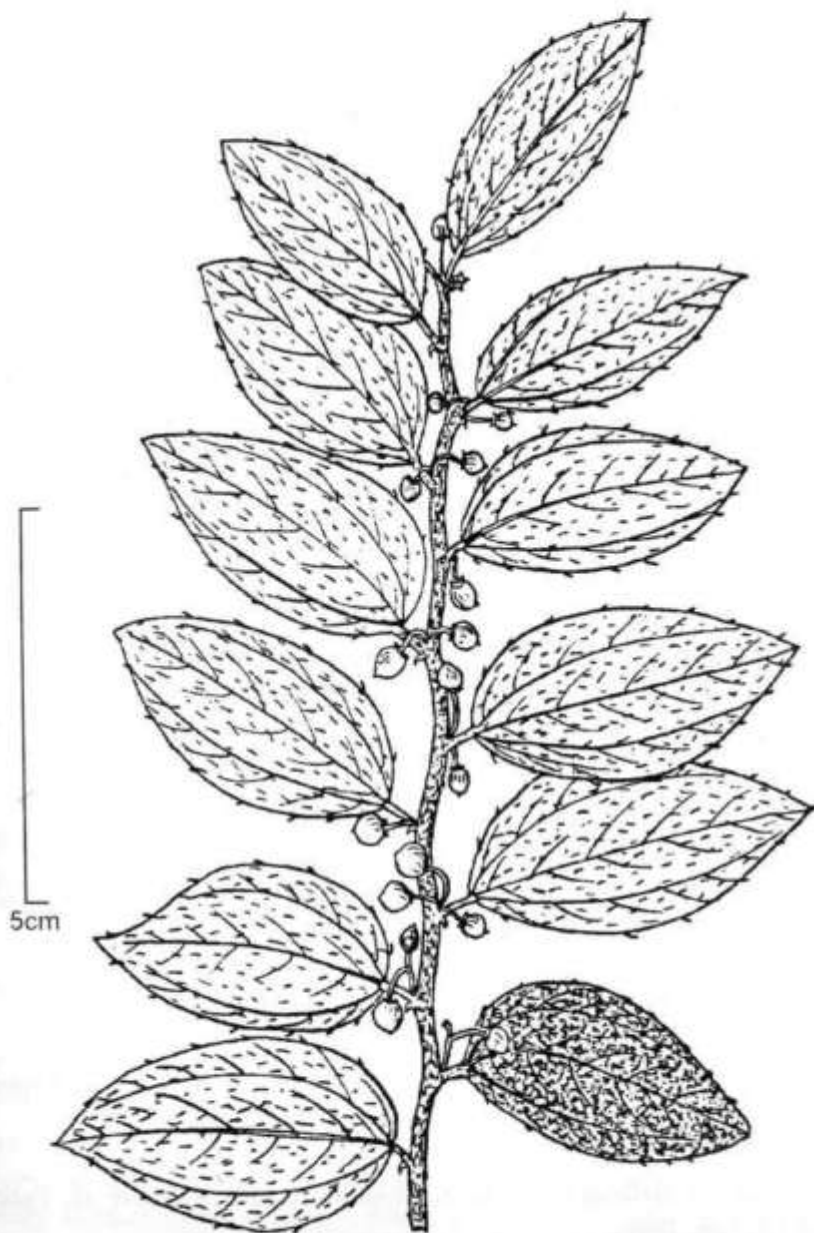


Fig. 53. *Ziziphus oenoplia* (L.) Miller

3-4 nerved. Inflorescence axillary fascicles or pedunculate cymes. Calyx lobes 1.5-2 mm long, margins thickened, glabrous inside, brownish, apparently hairy without. Petals 0.8-1 mm long, emarginate. Stamens 0.7-0.9 mm long. Disc 10-lobed, pitted or grooved, glabrous; lobes opposite each calyx lobe, emarginate. Ovary glabrous; style 2-cleft, united above the middle; stigma obtuse. Drupes 1-3 together on slender pedicels, globose or ovate, black and shining when ripe, with mealy acrid pulp, 1(-2)-celled. Seeds 1-2, 1 cm long.

KEY TO THE VARIETIES

- | | |
|---|-------------------------------|
| 1a. Leaves fulvous tomentose above | 12.2 var. <i>oenoplia</i> |
| b. Leaves sparsely ferruginous hairy or glabrescent above | 2 |
| 2a. Branchlets fasciculate | 12.1 var. <i>fasciculata</i> |
| b. Branchlets not fasciculate | 3 |
| 3a. Flowers borne in axillary fascicles | 12.3 var. <i>pallens</i> |
| b. Flowers borne in pedunculate cymes | 12.4 var. <i>pedicellaris</i> |

12.1 var. *fasciculata* Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 105. 1990.

Fl. : Aug. - Jan.

Distrib. India: Uttar Pradesh, Tamil Nadu and Kerala.

12.2 var. *oenoplia*

Distrib. India : Almost throughout, especially in dry forest localities and open bushy places. Most common in the teak forest in Assam.

Pakistan, Sri Lanka, Malesia and Australia.

Note. The sweet, somewhat acidic fruit is commonly eaten. The branches used for fencing fields and is often grown as hedge plant.

12.3 var. *pallens* Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 106. 1990.

Fl. : June - Oct.

Distrib. India : West Bengal, Assam and Andaman.

Note. Chromosome number: $n = 10, 12, 13$ (Srinivasachar in Proc. Ind. Acad. Sci. 118: 10. 1940).

12.4 var. *pedicellaris* Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 107. 1990.

Fl. : June - Aug.

Distrib. : India : Uttar Pradesh.

Note. Wallich sheet no. 4243 identified as *Z. pedicellaris* or *Z. oenoplia* var. *pedicellaris* has cymes well developed on branched peduncles. This specimen though quite similar to *Z. oenoplia* in other respects is markedly different from it in the character of the peduncle.

13. *Ziziphus oxyphylla* Edgew. in Trans. Linn. Soc. 20: 43. 1846; M. Lawson in Hook.f., Fl. Brit. India 1: 634. 1875.

Punj.: *Amadai, Amnia, Beri, Giggar, Kokan ber, Pitni, Shamor*

Deciduous shrubs or small trees, 7-9 m tall; branches alternate or fascicled, purple, appressed golden pubescent, glabrous with age; spines in pairs, 0.8-1 cm long, one straight and other more or less curved. Leaves broadly to obliquely ovate, 1.5-5.8 x 1.1-3.1 cm, apex acuminate to obtusely acute, broadly rounded or subcordate at base, glabrous to glabrescent, crenate to serrate, basally 3-nerved, the middle nerve with 2-4 prominent lateral nerves, which are camptodromous; petioles 4-8 mm long, glabrous. Inflorescence axillary fascicles or cymes. Flowers 5-6 mm across. Pedicels 1-3 mm long in flower, 10-20 mm long in fruit; bracts brown, subulate, 1-2 mm long, pubescent. Calyx lobes 2-3 mm long, thickened along margin. Petals obovate, 2 mm long, clawed. Stamens equalling the petals; anthers dorsifixed. Disc 5-lobed, thin, thickened around the ovary. Ovary bilocular, glabrous; style 2-cleft, united below the middle. Drupes ovoid, 8 mm in diam., pendulous, red or black when ripe, 2-celled, fleshy; stone thin and crustaceous, flattened. Seeds 2, 4-5 mm long; testa brown, shining.

KEY TO THE VARIETIES

- 1a. Leaves serrulate; inflorescence axillary fascicles 13.1 var. *oxyphylla*
 b. Leaves crenate; inflorescence axillary cymes 13.2 var. *pedicellaris*

13.1 var. *oxyphylla*

Fl. & Fr. : May - Nov.

Distrib. India : Kashmir, Himachal Pradesh, Punjab and Uttar Pradesh.
 Pakistan.

Note. Fruits are generally 2-celled, 2-seeded and not always 1-celled, 1-seeded as described by Lawson (*l.c.*).

Chromosome number: $n=12$ (Mehra & Sarin in *Taxon* 18: 433-442. 1969).

Uses. The plants yield white and moderately hard wood. It is often planted as hedges and also for its acrid fruit which tastes like tamarind.

13.2 var. *pedicellaris* Bhandari & Bhansali in M.P. Nayar *et al.*, *Fasc. Fl. India* 20: 108. 1990.

Fl. : Sept.

Distrib. : India : Uttar Pradesh (Dehra Dun).

14. *Ziziphus rugosa* Lam., *Encycl.* 3: 319. 1789; M. Lawson in *Fl. Brit. India* 1: 636. 1875.

Asm.: *Bon boguri*; *Hindi*: *Bhand, Ber, Churna, Suran*; *Mal.*: *Thodali*; *Mar.*: *Turani*; *Or.*: *Chunu-koli*.

Straggling, evergreen shrubs or small trees, 3-6 m tall, young parts fulvous tomentose; bark dark grey or nearly black, deeply cracked into thick rectangular scales; spines solitary, recurved, tomentose except the tips; internodes 1.5-3.5 cm long. Leaves dark-green, elliptic or ovate, 5-13.5 x 3-7.4 cm, acute,

rounded, slightly emarginate or mucronate at apex, glabrous above, tomentose or glabrous except a few hairs on nerves beneath, closely serrate; seratures with callous points, basally 3-nerved; petioles 0.5-0.7 mm long, tomentose. Flowers 5-6 mm across, yellowish green; pedicels 5-7 mm long, densely tomentose. Calyx lobes 5, 1.5-2 mm long, pubescent without. Stamens 1-2 mm long; anther lobes broadly ovate. Disc 5-lobed, glabrous. Ovary bicarpellary, 2-celled, villous or glabrous; style 2-cleft, united below the middle, curved. Drupes obovoid to globose, 6-12 x 10 mm, fleshy. Seeds 2(-1) compressed, black.

KEY TO THE VARIETIES

- | | |
|---|-------------------------------|
| 1a. Leaves tomentose beneath | 14.3 var. <i>rugosa</i> |
| b. Leaves glabrous except a few hairs on nerves beneath | 2 |
| 2a. Ovary villous | 14.2. var. <i>glabrescens</i> |
| b. Ovary glabrous | 14.1. var. <i>glabra</i> |

14.1. var. *glabra* Bhandari & Bhansali in M. P. Nayar *et al.*, Fasc. Fl. India 20: 109. 1990.

Fl. & Fr. : Jan. - Feb.

Distrib. India : Maharashtra.

14.2. var. *glabrescens* Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 110. 1990.

Fl. : Jan. - April.

Distrib. India : Uttar Pradesh, Assam, Orissa, Rajasthan, Maharashtra, Karnataka, Tamil Nadu and Kerala.

14.3. var. *rugosa*

Distrib. India : In dry deciduous forests, up to 1800 m on hills. Kashmir, Uttar Pradesh, Bihar, West Bengal, Assam, Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.

Pakistan, Bangladesh, Myanmar and Sri Lanka.

Note. The plants yield reddish and moderately hard wood, but susceptible to insects. Used chiefly as fuel. The fruits are eaten and the leaves are lopped for fodder. The bark, powdered and mixed with "ghee", is applied to the swelling in the cheek caused by toothache; also given for ulcers in the mouth.

15. *Ziziphus truncata* Blatt. & Hallb. in J. Bombay Nat. Hist. Soc. 26: 234. 1918.

Small shrubs with divaricate branches; young parts chestnut coloured, downy; stipular spines 2, upto 1 cm long, tomentose at base, one straight and shorter, the other recurved. Leaves alternate, orbiculate, 1.5-3.5 x 1-2.5 cm, subcordate, coriaceous, glabrous above, downy beneath, 3-nerved from base, apical truncate portion irregularly dentate; nerves extending up to apex; midrib with 2-3 equal, secondary veins; petioles 5 mm long. Cymes axillary, sessile, tomentose. Flowers 4-5 mm across; buds hemispherical; pedicels up to 4 mm long. Calyx lobes deltoid, 2-2.5 mm long, acute, pubescent without, glabrous within. Petals spatulate, 1.5-1.8 mm long, cucullate, rounded at apex. Stamens 1.2-1.6 mm long; filaments acicular. Disc 10-lobed with 10 furrows, glabrous. Ovary bicarpellary, superior; styles 2, connate up to the middle, divergent near the apex. Fruits globose, yellow when ripe. Seeds 1-2, compressed, black.

Fl. & Fr. : Oct. - March.

Distrib. India : On rocks. Rajasthan.

Note. *Z. truncata* Blatt. & Hallb. is closely allied to *Z. nummularia* (Burm.f.) Wight & Arn. but differs in shape size and texture of leaves.

16. *Ziziphus williamii* Bhandari & Bhansali in M.P. Nayar *et al.*, Fasc. Fl. India 20: 112. 1990.

Trees, up to 4 m tall; branches straight, yellow, glabrous, fluted; spines in pairs, one straight often wanting, the other recurved. Leaves alternate, ovate or elliptic, 3-5 x 1.5-3.7 cm, apex acute or obtuse, mucronate, rounded or slightly tapered at base, glabrous, crenate, each crenation gland-tipped with deciduous, black mucro, basally 3-nerved; secondary veins diverging from the

midvein at an angle of 40°-60°; camptodromous near the margin; petioles 8.7-15 mm long, glabrous, 4 mm across. Peduncles 2-4 mm long, pubescent; pedicels 3-5 mm long, pubescent. Calyx deltoid; lobes 1.5 mm long, acute, thickened at the apex, keeled up to the middle, glabrous within, pubescent without. Petals obovate, 1 mm long, markedly clawed, deeply cucullate, enclosing stamens. Stamens about as long as petals. Disc 5-10-lobed; lobes opposite the calyx lobes, emarginate, glabrous. Ovary bicarpellary, bilocular, nearly hidden by the disc. Fruits obovate, 8 mm in diam., glabrous, 2-celled. Seeds 2, black, 5 x 5 mm, compressed.

Fl. & Fr. : Nov. - Mar.

Distrib. India : Mostly near the sea coasts. Gujarat and Maharashtra. Endemic.

17. *Ziziphus xylopyra* (Retz.) Willd., Sp. Pl. 1: 1104. 1797; M. Lawson in Fl. Brit. India 1: 634. 1875. (*Xylopyrus*'). *Rhamnus xylopyrus* Retz., Obs. Bot. 2: 11. 1781.

Fig. 54.

Hindi: *Bhander, Gunt, Beri, Kath Ber, Chittonia, Chont, Gotaha, Got, Kakor, Maber*; Mal.: *Kotta*; Or.: *Goto*; Sant.: *Ghoti, Karkat*; Tam.: *Kotteri*; Tel.: *Got*.

Large, straggling shrubs or small trees, 7.5-12 m tall, often gregarious; young shoots rusty tomentose; spines in pairs on younger branches, one straight, the other curved; internodes 1.5-3.5 cm long; nodes swollen at the leaf scars. Leaves broadly elliptic or orbicular, rarely ovate, 2.5-7.5 x 1.5-6.5 cm, obliquely subcordate, obtuse with mucro at apex, yellowish antrorse hairy beneath, serrate, each serration marked by a deciduous glandular mucro, basally 3-4 nerved; primary lateral nerves prominent, campylodromous; secondary nerves camptodromous, diverging at angle of 40°-60°; tertiaries transversely reticulate; petioles 2-7 mm long, fulvous tomentose. Inflorescence dense, axillary, dichotomous cymes; peduncles 2.5-4 mm long. Flowers 4-6 mm across, yellowish green, buds ovoid, densely pubescent; pedicels 3-4 mm long, tomentose. Calyx lobes 2-2.5 mm long, keeled up to the middle, thickened at apex, glabrous within, pubescent without. Petals 1.5-2 mm long. Stamens equal to petals. Disc 10-lobed, pitted or grooved, rarely 5-lobed, glabrous. Ovary tricarpellary, 3-celled, rarely 2 or 4-celled, globose, nearly hidden by the disc; style cleft up to half

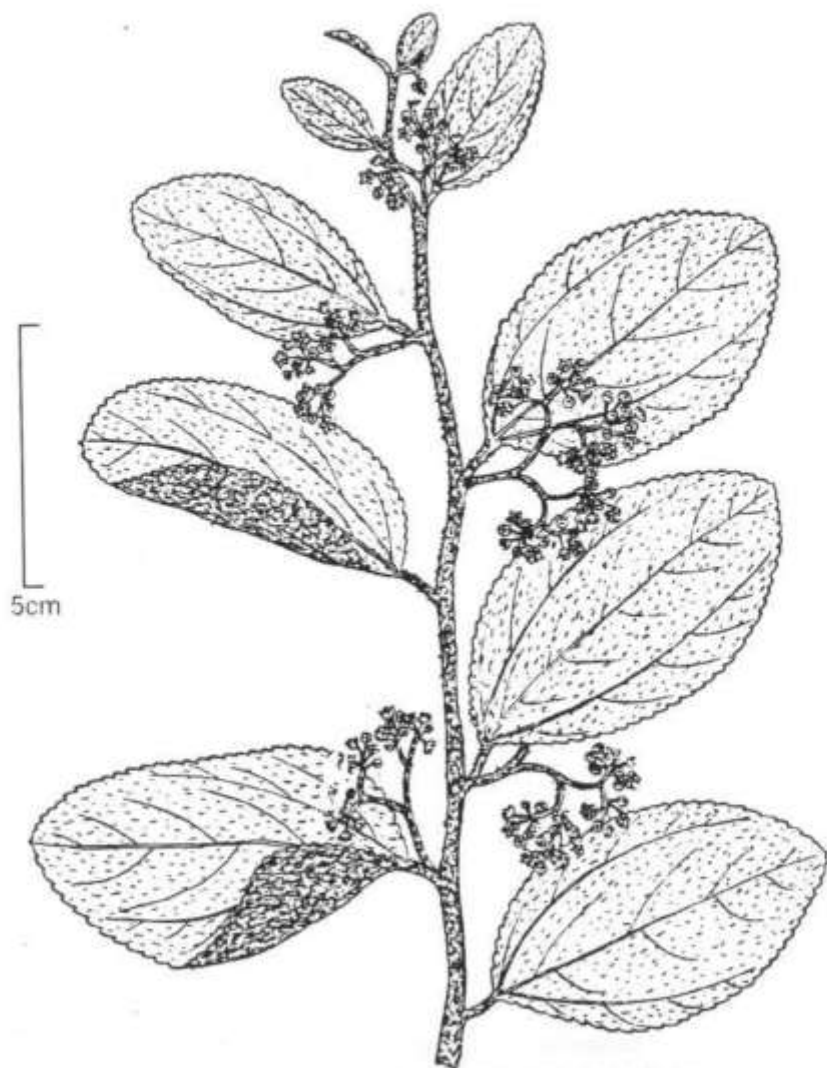


Fig. 54. *Ziziphus xylocarpa* (Retz.) Willd.

to two-third of the length. Drupes globose, 1.8-2.5 cm in diam., woody, slightly rugose; stone thin and hard. Seeds 3, 1-2 x 1-1.5 mm, compressed, black.

Fl. & Fr. : April - Jan.

Distrib. India : In dry deciduous forests, but sometimes also found in Sal forests. Throughout, except E. India.

Nepal and Sri Lanka.

Note. Chromosome number: $n=12$. (Mehra & Sareen in Taxon 18: 433-442. 1969).

Note. The plants yield yellowish brown hard and durable wood. It is also commonly used as fuel. The fruits and the bark are used for tanning and the leaves as fodder. The kernal of the fruit is eaten but not the pulp.

CULTIVATED SPECIES

Colletia cruciata Gillies ex Hook. in Hook., Bot. Misc. 1: 152. t. 43. 1830.

A nearly leafless shrub with decussate branches and flattened spines: native of South America.

Noltea africana (L.) Endl., Cat. Hort. Vindob. 2: 385. 1842.

An upright, glabrous shrub with virgate branches, polygamo-dioecious flowers and 2-lobed fruits covered with persistent calyx tube; native of Africa.

Pomaderris lanigera Sims., Bot. Mag. 1823.

A conspicuous, unarmed shrub; native of Australia and New Zealand.

VITACEAE

(B.V. Shetty and Paramjit Singh)

Climbing or erect shrubs, sometimes herbaceous, rarely small trees. Tendrils usually present, leaf-opposed, simple or branched, sometimes with adhesive discs at the tips. Leaves alternate, simple, sometimes palmately lobed, or palmately or pinnately compound, stipulate. Inflorescence leaf-opposed, axillary or pseudo-terminal, sometimes cirriferous, usually cymose or paniculate. Flowers small, regular, usually 4- or 5-merous, bisexual or unisexual, the parts hypogynous. Calyx cupular or saucer-shaped, entire, dentate or lobed. Petals usually free, sometimes distally coherent and calyprately caducous, valvate, hooded at apex. Stamens antipetalous; filaments slender; anthers introrse; pollen tricolporate. Disc intrastaminal, adnate to ovary, annular or cupular, sometimes of 4 distinct glands. Carpels 2, syncarpous; ovary 2-loculate, superior, usually sunken in the disc; ovules 2 in each locule, anatropous or apotropous; style short or absent; stigma simple, subcapitate or sometimes 2- or 4-fid. Fruit a 1-4-seeded berry. Seeds smooth or rugose, usually with a longitudinal groove on either side of the linear raphe on adaxial surface and with a chalazal knot on abaxial surface; embryo minute, straight; cotyledons small; endosperm copious, oily and proteinaceous.

Widely distributed in the tropics and subtropics throughout the world, with ranges extending into the North and South temperate regions; *ca* 13 genera and *ca* 800 species, 8 genera and 63 species in India.

Literature. LATIFF, A. (1981) Studies in Malesian Vitaceae V. The genus *Cayratia* in the Malay Peninsula. *Sains Malaysiana* 10: 129-139. LATIFF, A. (1982) Studies in Malesian Vitaceae I-IV. *Federation Mus. Journ.* 27: 41-93. LATIFF, A. (1982); Studies in Malesian Vitaceae V. The Malay Peninsula species of *Cissus*. *Malay Nat. J.* 35: 197-207. NAIR, N.C. (1970) Review of embryology of Vitaceae. *Bull. Indian Nat. Sci. Acad.* 41: 174-179. NAIR, N.C. & K.V. MANI (1960) Organography and floral anatomy of some species of Vitaceae. *Phytomorphology* 10: 138-144. SHETTY, B.V. (1958). Cytotaxonomical studies in Vitaceae. *Bibliogr. Genet.* 18: 167-272. SHETTY, B.V. & P. SINGH (1988) The Vitaceae in Rheede's *Hortus Malabaricus*. *Taxon* 37: 169-174. SHETTY, B.V. & P. SINGH (1989) Notes on Vitaceae in India and some neighbouring regions. *Kew Bull.* 44: 469-478. SINGH, P. & B.V. SHETTY (1986) Nomenclature notes on Vitaceae of Indian subcontinent. *Taxon* 35: 596-597.

KEY TO THE GENERA

- | | |
|---|--------------------------|
| 1a. Petals cohering at apex and falling off as a cup at anthesis;
leaves always simple | 8. <i>Vitis</i> |
| b. Petals free, expanding at anthesis; leaves simple or compound | 2 |
| 2a. Flowers 5-merous | 3 |
| b. Flowers 4-merous | 5 |
| 3a. Inflorescences tendril-bearing | 1. <i>Ampelocissus</i> |
| b. Inflorescences not tendril-bearing | 4 |
| 4a. Leaves palmately 3-5-foliolate; tendrils with disc-like adhesive
tips; nectariferous disc obscure, reduced and fused with base
of ovary | 6. <i>Parthenocissus</i> |
| b. Leaves simple or pinnate; tendrils without disc-like adhesive
tips; nectariferous disc conspicuous, cupular, distinct at
least in the upper part | 2. <i>Ampelopsis</i> |
| 5a. Flowers unisexual; stigma 4-lobed | 7. <i>Tetrastigma</i> |
| b. Flowers bisexual; stigma simple or 2-fid | 6 |
| 6a. Flower buds flask-shaped; nectariferous disc of 4, free glands | 5. <i>Cyphostemma</i> |
| b. Flower-buds globose or oblong; nectariferous disc entire | 7 |
| 7a. Inflorescences axillary; berries 2-4-seeded; endosperm T or
N-shaped in cross section | 3. <i>Cayratia</i> |
| b. Inflorescences leaf-opposed; berries 1-2-seeded; endosperm
M- or .. - shaped in cross section | 4. <i>Cissus</i> |

1. *Ampelocissus* Planchon, *nom. cons.*

Climbing shrubs; branches terete, angled or sometimes flattened, hairy or glabrous. Leaves simple to pedately or digitately 3-9-foliolate, petiolate, densely hairy to glabrous; leaflets petiolulate, the terminal the largest; stipules deltate, inconspicuous, caducous. Inflorescences leaf-opposed, pedunculate, cirrhiferous cymes, thyrses or paniculate spikes. Flowers bisexual. Calyx cupular or saucer-shaped, entire or obscurely lobed. Petals 5, free, oblong to ovate-oblong. Stamens 5; filaments short. Disc angular, adnate to ovary, often 5-10-grooved. Ovary usually 10-grooved; style short or absent; stigma minute or discoid. Berries moderately pulpy, 1-4-seeded. Seeds obovate to elliptic-oblong or suborbicular in outline, adaxial surface flattened or angular; raphe linear, somewhat ridged with a parallel wide shallow groove on either side, abaxial surface usually convex; chalazal knot somewhat spatulate in the shallow depression; endosperm T-shaped in cross-section.

Chiefly in tropical Asia and Africa, extending to C. America, Australia and Papua New Guinea; ca 100 species, 10 in India.

KEY TO THE SPECIES

- | | |
|--|--------------------------|
| 1a. Leaves simple, sometimes angled, lobed or deeply partite | 2 |
| b. Leaves pedately 3-9-foliolate | 9 |
| 2a. Vines glabrous, young parts and inflorescences sometimes pubescent | 3 |
| b. Vines woolly or rufous-hairy | 4 |
| 3a. Leaves orbicular-ovate, neither angled nor lobed; inflorescences umbellate cymes; calyx 5-notched; seeds ellipsoid-obovoid, ca 5 x 2.5 mm | 8. <i>A. sikkimensis</i> |
| b. Leaves 3-7-angled or lobed; inflorescences pyramidal-thyrsoid; calyx truncate; seeds elliptic-oblong in outline, 6-7 x 4-5 mm | 6. <i>A. latifolia</i> |
| 4a. Calyx woolly-tomentose | 5 |
| b. Calyx glabrous, puberulous or rarely pubescent, never woolly | 6 |
| 5a. Inflorescences dichotomous, umbellate cymes; tendrils branched; disc restricted to lower half of ovary | 9. <i>A. tomentosa</i> |
| b. Inflorescences paniculate cymes; tendrils simple; disc covering most of ovary, prominent | 10. <i>A. wightiana</i> |
| 6a. Young parts, peduncles and petioles with stiff brown or blackish, 1-2.5 mm long glandular-hairs | 2. <i>A. barbata</i> |
| b. Glandular-hairs absent | 7 |
| 7a. Inflorescences cylindrical, compact, umbellate-racemose; tendrils simple | 5. <i>A. indica</i> |
| b. Inflorescences divaricate or dichotomous, umbellate-cymose; tendrils branched | 8 |
| 8a. Leaves truncate-cordate at base with the basal pair of lateral nerves bordering the sinus; seeds with a deep circular pit on the abaxial surface | 7. <i>A. rugosa</i> |
| b. Leaves deep-cordate at base, not bordered by the basal pair of lateral nerves; seeds with a shallow elliptic or circular pit on the abaxial surface | 1. <i>A. araneosa</i> |
| 9a. Inflorescences racemes of spikes; tendrils simple; flowers sessile; leaves 5-7-foliolate | 4. <i>A. helferi</i> |
| b. Inflorescences dichotomous, umbellate-cymose; tendrils branched; flowers pedicellate; leaves 3-5-foliolate | 10 |
| 10a. Ovary puberulous; style short | 1. <i>A. araneosa</i> |
| b. Ovary glabrous; style absent | 3. <i>A. divaricata</i> |

1. *Ampelocissus araneosa* (Dalz.) Planchon ex Gamble, Fl. Pres. Madras 1: 230. 1918. *Cissus araneosa* Dalz. in Dalz. & A. Gibson, Bombay Fl. 41. 1861. *Vitis araneosa* (Dalz.) M. Lawson in Fl. Brit. India 1: 657. 1875 (*non* Le Conte, 1854). **Fig. 55.**

Hindi: *Kamraj*; Mar.: *Bendri*, *Bendervel*, *Ghorvel*; Tam.: *Kattuthiratchai*.

Slender, far climbing shrubs; branches slender, floccose-woolly. Leaves 3-foliolate, sometimes merely lobed, glabrescent above, brownish-tomentose beneath; petioles 2-5 cm long; terminal leaflets elliptic-ovate, 9-13 x 3-7.5 cm, acute-mucronate at apex, attenuate, rounded or shallowly cordate at base, crenate-serrate at margins; petiolules 1-3 cm long; lateral leaflets semicordate, 7-11 x 5.5-8 cm; oblique, margins and apex as in terminal leaflets; petiolules 0.5-1 cm long. Inflorescences compact, umbellate cymes, tomentose; peduncles 3-8 cm long; tendrils branched; primary branch of inflorescence 1-2 cm long; cymes *ca* 2 cm long, broader than long. Flowers *ca* 2 mm long, red; pedicels *ca* 1 mm long. Calyx saucer-shaped, 5-lobed, membranous, puberulous. Petals oblong, *ca* 2 mm long, incurved at apex, glabrous. Stamens *ca* 1.2 mm long; anthers globose. Disc short, encircling only the base of ovary. Ovary conical, *ca* 1 mm across, 10-ribbed, puberulous; stigma concave. Berries *ca* 8 x 4 mm, 1-4-seeded. Seeds ellipsoid to obovoid, *ca* 7 x 4 mm; adaxial surface with a longitudinal ridge; abaxial surface with an elliptic or circular pit in the centre from which prominent fissures radiate towards margin.

Fl. & Fr. : June - Sept.

Distrib. India : Evergreen forests of western Ghats, up to 1500 m. Maharashtra, Karnataka and Tamil Nadu.

Note. This species is closely allied to *Ampelocissus divaricata* (M. Lawson) Planchon from which it differs in having 3-lobed to 3-foliolate leaves (never 5-foliolate), pubescent ovary and stigma with short style. The colour of the tomentum is also different in the two species; in *A. araneosa* it is usually pale brown, whereas in *A. divaricata* it is white.

Chromosome number $2n = 80$ (Shetty, B.V. & V.S. Raman in Curr. Sci. 29: 279. 1960).

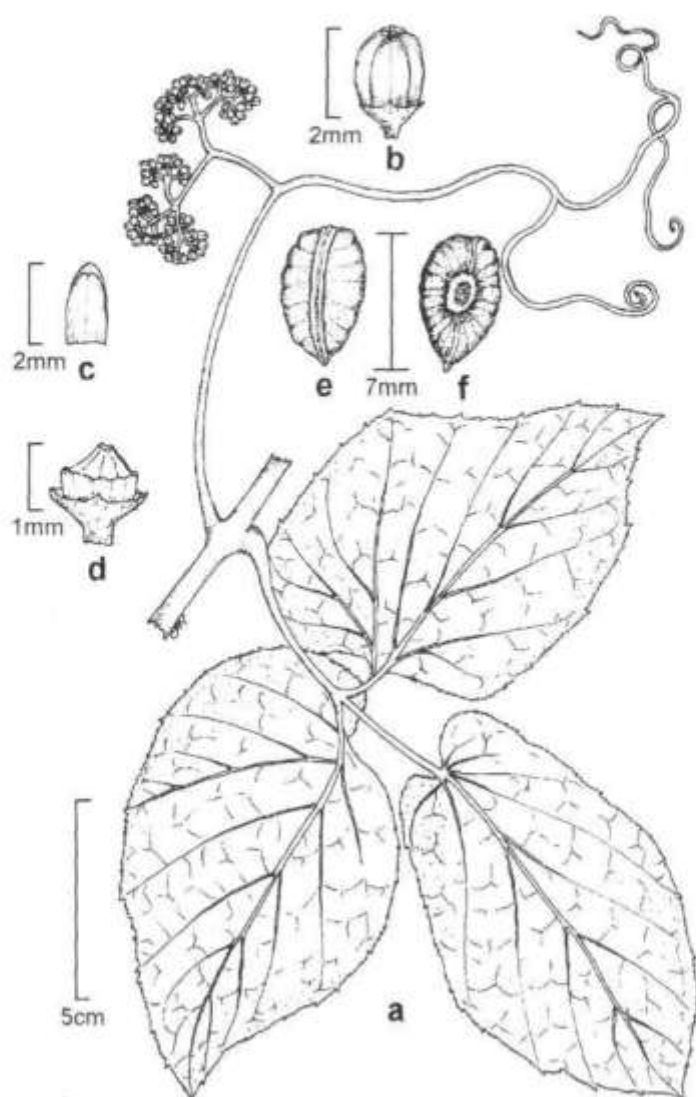


Fig. 55. *Ampelocissus araneosa* (Dalz.) Planchon ex Gamble : a. Habit; b. Flower bud; c. A petal; d. Gynoecium; e. Seed, adaxial surface; f. Seed, abaxial surface.

Uses. The roots have astringent and cooling properties and are sold by the Konkan herbalists under the name *Chamar-musli*. The young twigs are fed to horses as a tonic.

2. *Ampelocissus barbata* (Wallich) Planchon in DC., Monogr. Phan. 5: 372. 1887. *Vitis barbata* Wallich in Roxb., Fl. Ind. 2: 478. 1824; M. Lawson in Fl. Brit. India 1: 651. 1875. **Fig. 56.**

Lep.: *Mikrum-rik*; Nep.: *Jarila laha*.

Large climbers; branches stout, terete, striate, hollow, pubescent to tomentose and with *ca* 1-2.5 mm long, stiff brown or blackish, glandular-capitate hairs. Leaves simple, broad-ovate, 12-30 x 10-20 cm, acute to acuminate at apex, sometimes 3-lobed, deep-cordate at base, irregularly sinuate-dentate at margins, membranous, glabrous above, rufous hairy or tomentose beneath; petioles 6-12 cm long, glandular-hairy. Inflorescences paniculate; peduncles 5-12 cm long; tendrils branched; primary branch of inflorescence *ca* 2 cm long; panicles *ca* 10 cm long. Flowers *ca* 1.75 mm long; pedicels *ca* 0.5 mm long, pubescent. Calyx cupular, 5-notched. Petals oblong, incurved at apex, *ca* 1.7 x 0.8 mm. Stamens *ca* 1 mm long; anthers ovoid. Disc almost covering the ovary, thick, 5-furrowed. Ovary *ca* 1 mm across, glabrous; stigma sessile. Berries globose, 7-10 mm across, fleshy, 1-2-seeded. Seeds elliptic-obovate in outline, *ca* 6.5 x 4.5 mm, laterally compressed; adaxial surface with a longitudinal ridge; abaxial surface with an elliptic chalazal knot from which very fine, sometimes indistinct fissures radiate towards margin.

Fl. & Fr. : March - Sept.

Distrib. India : Tropical and subtropical forests, up to 1500 m. Uttar Pradesh (Kumaon), West Bengal, Sikkim, Arunachal Pradesh, Nagaland, Mizoram, Tripura, Meghalaya and Andaman & Nicobar Islands.

Bhutan, Bangladesh, Myanmar, Thailand, Laos and Vietnam.

Note. The fruits are edible.

3. *Ampelocissus divaricata* (Wallich ex M. Lawson) Planchon in J. Vigne Amer. 8: 375. 1884 & in DC., Monogr. Phan. 5: 378. 1887. *Vitis divaricata* Wallich ex M. Lawson in Fl. Brit. India 1: 657. 1875.

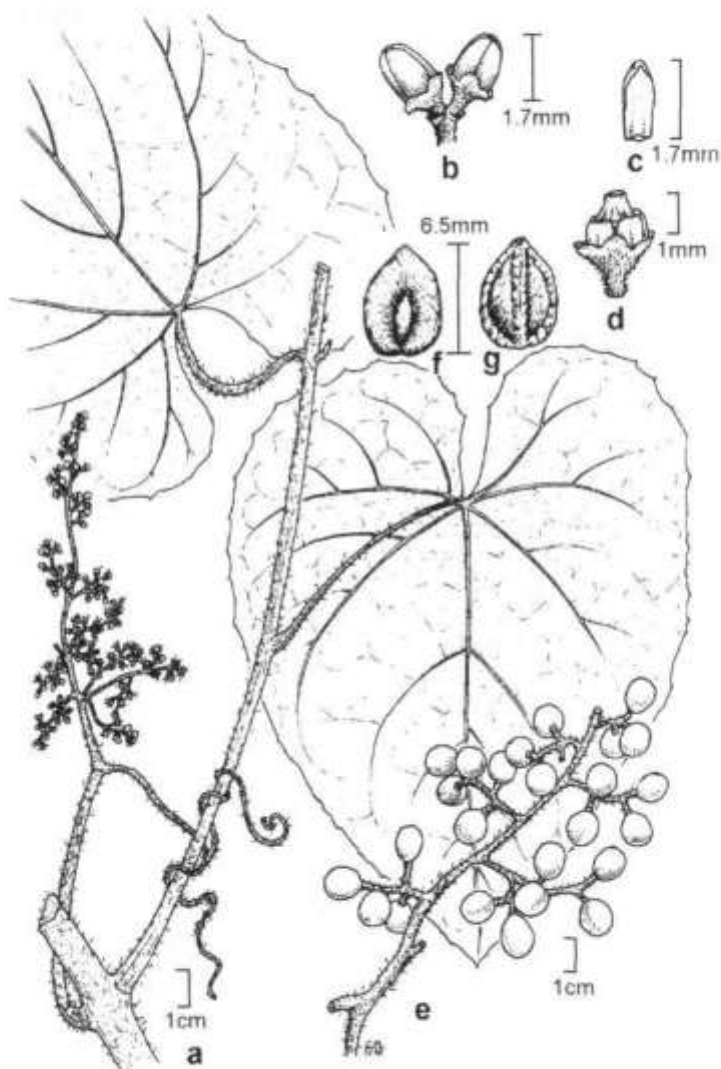


Fig. 56. *Ampelocissus barbata* (Wallich) Planchon : a. Flowering habit; b. Flower buds; c. A petal; d. Gynoecium; e. Fruiting branch; f. Seed, abaxial surface; g. Seed, adaxial surface.

Slender climbing shrubs; branches deep-striate, scarcely woody, tomentose. Leaves 3-5-foliolate, pedate, membranous, greyish red or white woolly tomentose beneath; petioles up to 15 cm long, striate; terminal leaflets elliptic-lanceolate or narrow-ovate, 10-21 x 4-9 cm, acuminate at apex, cuneate to rounded at base, crenate-dentate at margins with teeth subspinulose; petiolules up to 5 cm long; lateral leaflets oblique, 9-17 x 4.5-8 cm, margins and apex as in terminal leaflets; petiolules up to 2.5 cm long. Inflorescences compact, divaricate, umbellate-cymes, pubescent to nearly glabrous; peduncles 5-16 cm long; tendrils branched; primary branch of inflorescence 2-4 cm long; cymes 2-4 cm long. Flowers *ca* 1.5 mm long, red; pedicels *ca* 1 mm long, hairy. Calyx cupular. Petals slightly incurved at apex, *ca* 1.5 mm long. Stamens *ca* 1 mm long; anthers globose. Disc short, thin, covering only the base of ovary. Ovary *ca* 0.8 mm across, glabrous; stigma sessile. Berries globose-ellipsoid, *ca* 1 cm across, 1-4-seeded. Seeds oblong-ellipsoid, *ca* 6 x 3 mm, adaxial surface with a longitudinal ridge broadening towards apex; abaxial surface with a narrow longitudinal groove having a circular or elliptic pit in the centre, finely rugose.

Fl. & Fr. : June - Dec.

Distrib. India : Evergreen forests, between 750-1800 m. Himachal Pradesh, Uttar Pradesh, Bihar, Arunachal Pradesh, Orissa, Madhya Pradesh, Andhra Pradesh and Tamil Nadu.

Nepal, Bhutan and Indo-China.

4. *Ampelocissus helferi* (M. Lawson) Planchon in DC., Monogr. Phan. 5: 411. 1887. *Vitis helferi* M. Lawson in Fl. Brit. India 1: 662. 1875.

Large climbing shrubs; branches terete, pale tomentose when young. Leaves 5-7-foliolate, pedate, coriaceous, glabrous above; nerves pubescent beneath; petioles 6-10 cm long; terminal leaflets lanceolate, *ca* 14 x 6 cm, acuminate at apex, attenuate at base, serrate at margins; petiolules *ca* 2 cm long; lateral leaflets 9-12 x 3.5-5 cm, oblique at base, margins and apex as in terminal leaflets; petiolules *ca* 1 cm long. Inflorescences racemes of spike, *ca* 20 cm; peduncles *ca* 10 cm long, tomentose; tendrils simple, *ca* 10 cm long, tomentose; primary branch of inflorescence *ca* 5 cm long; long. Flowers *ca* 1.5 mm long. Calyx 5-lobed, membranous. Petals *ca* 1.5 x 0.6 mm. Stamens

ca 1 mm long. Disc covering about half of ovary. Ovary ca 1 mm across. Fruits oblong-ovoid.

Distrib. India : Andaman Islands.

Myanmar.

Note. *Ampelocissus helferi* is the only species under the section *Kalocissus* of the genus *Ampelocissus* represented in India. This species was collected again in 1976, after a lapse of more than one hundred years of the type collection, from S. Andaman (*N. G. Nair* 3666 PBL!).

5. *Ampelocissus indica* (L.) Planchon in *J. Vigne Amer.* 8: 375. 1884; Shetty & P. Singh in *Taxon* 37: 169. 1988. *Vitis indica* L., *Sp. Pl.* 202. 1753; M. Lawson in *Fl. Brit. India* 1: 653. 1875. *Ampelocissus arnottiana* Planchon in *DC. Monogr. Phan.* 5: 379. 1887. **Fig. 57.**

Kan.: *Huttige balli*, *Palkanda*; Mal.: *Chembravalli*; Tam.: *Sambravalli*.

Slender climbing shrubs; branches terete striate, ferruginous-woolly. Leaves simple, broadly ovate, sometimes angled, 10-30 x 8-20 cm, acuminate at apex, cordate at base, dentate-serrate at margins with the teeth hardened at tip, coriaceous, glabrescent above, ferruginous tomentose beneath; petioles 2-8 cm long. Inflorescences dense racemes of umbels, 3-5 x 1 cm, peduncles up to 9 cm long; tendrils simple, ca 10 cm long; primary branch of inflorescence ca 1 cm long. Flowers ca 2 mm long, reddish brown; pedicels ca 2 mm long. Calyx saucer-shaped, truncate, glabrous. Petals incurved at apex, ca 2 mm long, glabrous. Stamens ca 1 mm long. Disc elongate, covering most of ovary, 5-furrowed. Ovary ca 1 mm across, glabrous; stigma sessile, concave. Berries globose, ca 1 cm across. Seeds suborbicular in outline, ca 7 x 5.5 mm, mucronate at base; adaxial surface with a longitudinal ridge and a broad groove on either side; abaxial surface with an elliptic chalazal knot from which very fine fissures radiate towards margin.

Fl. & Fr. : June - Feb.

Distrib. India : Evergreen forests of western Ghats from Konkan southwards. Goa, Karnataka, Tamil Nadu and Kerala.

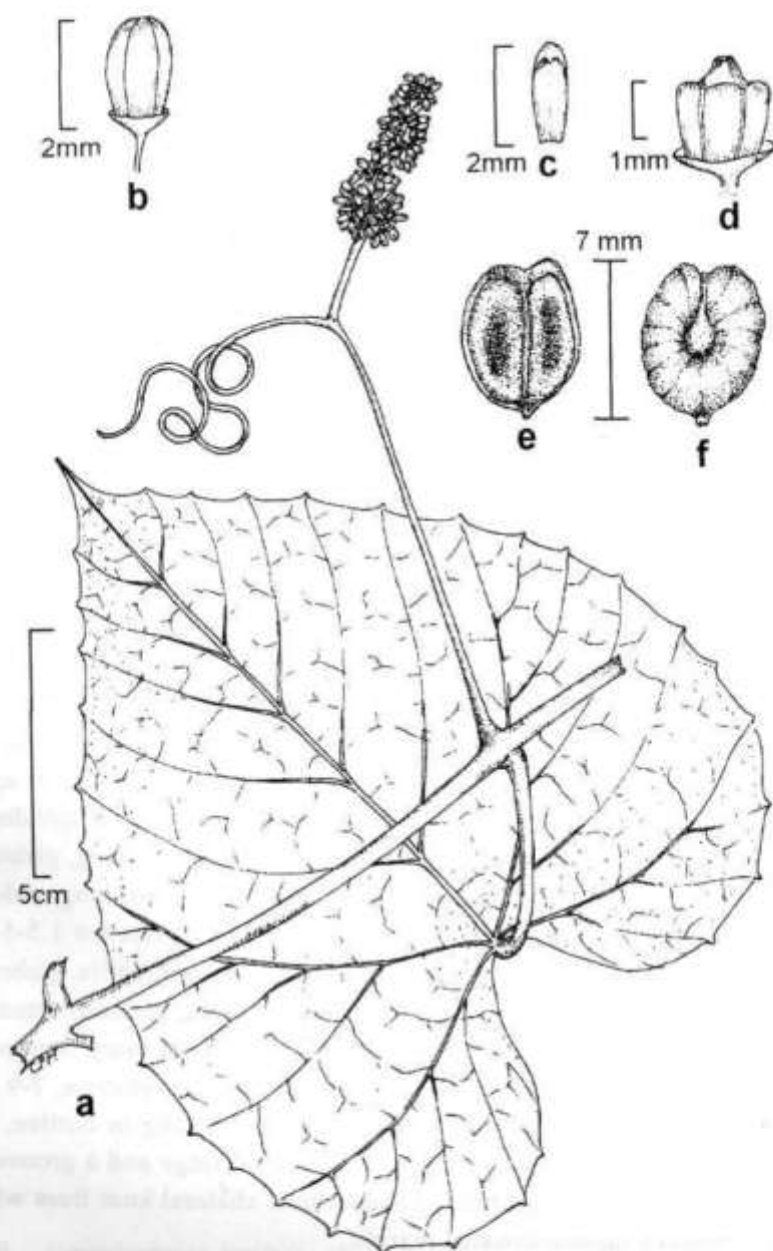


Fig. 57. *Ampelocissus indica* (L.) Planchon: **a.** Habit; **b.** A flower bud; **c.** Petals; **d.** Gynoecium; **e.** Seed, adaxial surface; **f.** Seed, abaxial surface.

Sri Lanka.

Note. Chromosome Number $2n=40$ [Vatsala, P. in *La Cellule* (Louvain) 61: 193-205. 1960-sub "*Ampelocissus arnottiana*"].

Uses. The juice of the roots mixed with coconut kernel is employed as a laxative and blood purifier; it is also considered an alterative and diuretic. The juice of the roots mixed with oil is used in eye diseases and mixed with coconut milk is applied to ulcers. Fruits are said to be sweet and palatable.

6. *Ampelocissus latifolia* (Roxb.) Planchon in *J. Vigne Amer.* 8: 374. 1884 & in *D.C. Monogr. Phan.* 5: 370. 1887. *Vitis latifolia* Roxb., *Hort. Beng.* 18. 1814 & *Fl. Ind.* 2: 474. 1824; M. Lawson in *Fl. Brit. India* 1: 652. 1875.

Fig. 58.

Beng.: *Govila*; Guj. *Junglidrakh*; Hindi: *Panibel*; Mal.: *Karantavalli*, *Valiyapirapitika*; Mar.: *Golinda*, *Nadena*; Or.: *Dibroi*, *Kanjiano*; Tam.: *Kattukkodimundirigai*; Tel.: *Adavi drakshi*, *Bedasativva*, *Nalla drakshi*.

Slender climbing shrubs; branches terete, striate, hollow, nearly glabrous. Leaves simple, often pentagonal, sometimes 3-5-lobed, usually deep-cordate at base, serrate at margins, 10-25 x 10-24 cm, acute to acuminate at apex, glabrous, prominently nerved beneath; petioles 5-15 cm long, upper half deeply grooved. Inflorescences pyramidal-thyrseoid; peduncles 5-10 cm long, glabrous; tendrils branched, 10-15 cm long, puberulous. Flowers 2 mm long, reddish brown; pedicels *ca* 1 mm long; primary branch of inflorescence 1.5-5 cm long; thyrses 3-7 cm long, puberulous. Calyx saucer-shaped, entire, glabrous. Petals oblong, *ca* 1.5 x 0.8 mm, slightly incurved at apex, glabrous. Stamens *ca* 1.2 mm long; anthers globose. Disc enclosing about half of ovary, 5-grooved. Ovary *ca* 1 mm across, glabrous; stigma subsessile. Berries globose, 7-9 mm across, 2-4-seeded, black when ripe. Seeds elliptic-oblong in outline, 6-7 x 4-5 mm; adaxial surface with a broad longitudinal ridge and a groove on either side; abaxial surface with an oblong-elliptic chalazal knot from which prominent fissures radiate towards margin.

Fl. & Fr. : May - Nov.

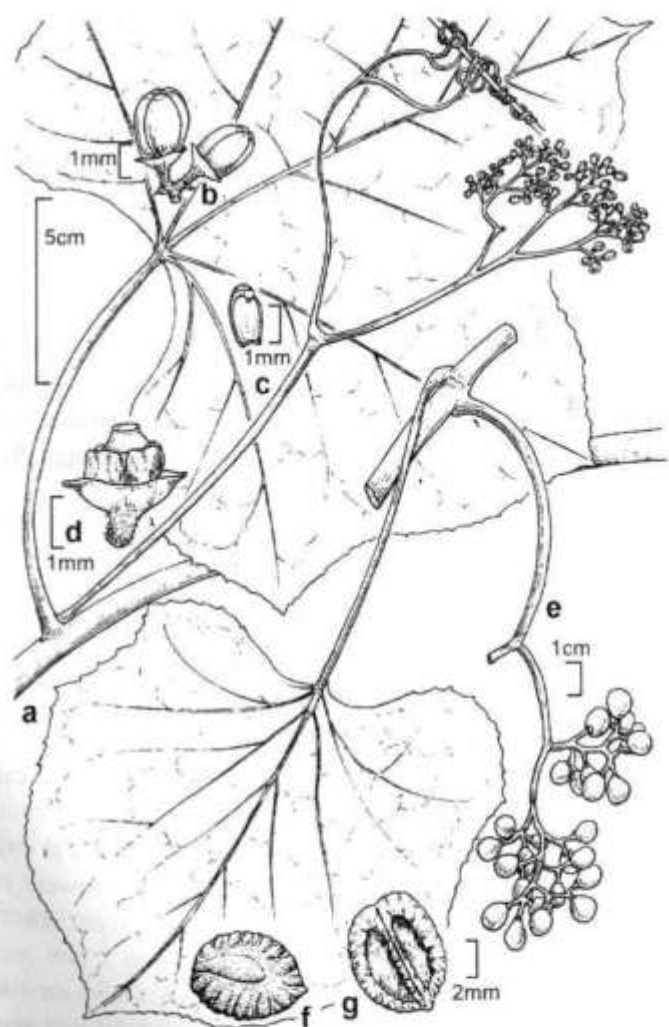


Fig. 58. *Ampelocissus latifolia* (Roxb.) Planchon : a. Flowering habit; b. Flower buds; c. Gynoecium; d. A petal; e. Fruiting habit; f. Seed, abaxial surface; g. Seed, adaxial surface.

Distrib. India : Almost throughout the country in evergreen and deciduous forests, sometimes ascending up to 1600 m.

Pakistan, Nepal and Bangladesh.

Note. Chromosome number $2n=40$ (Syamal, N.B. & G.I. Patel in Proc. Amer. Soc. Hort. Sci. 62: 228-230. 1953; Shetty, B.V. in Curr. Sci. 27: 358-359. 1958 & Bibliogr. Genet. 18: 167-272. 1959); $2n=40, 60$ [Hazra, R. & A. Sharma in Folia Biol. (Cracow) 18: 123-136. 1970].

Uses. The juice from the tender leaves is used in odontalgia, as a detergent for ulcers and internally as an alterative. The roots are astringent. The tender leaves are used as vegetable.

7. *Ampelocissus rugosa* (Wallich) Planchon in J. Vigne Amer. 8: 375. 1884 & in DC., Monogr. Phan. 5: 376. 1887. *Vitis rugosa* Wallich in Roxb., Fl. Ind. 2: 480. 1824. *V. nervosa* M. Lawson in Fl. Brit. India 1: 650. 1875. *Ampelocissus nervosa* (M. Lawson) Planchon in DC., Monogr. Phan. 5: 372. 1887.

Hindi: *Asojapharphuta*.

Climbing or scrambling shrubs; branches fairly stout, striate, reddish tomentose when young. Leaves simple, broad-ovate to suborbicular, 12-45 x 10-40 cm, acute at apex, shallowly 3-7-lobed, truncate-cordate at base with the basal pair of nerves bordering the sinus, sinuate-dentate at margins, pubescent above, greenish white, rusty or brownish tomentose beneath; petioles 6-20 cm long. Inflorescences divaricate, umbellate cymes; peduncles 6-10 cm long; tendrils bifurcate, ca 8 cm long, rusty-tomentose; primary branch of inflorescence ca 2 cm long; cymes 2.5-4 cm long. Flowers ca 1.5 mm long, red; pedicels 1-2 mm long. Calyx cupular, pubescent. Petals oblong, ca 1.5 x 1 mm, incurved at apex, glabrous. Stamens ca 1 mm long; anthers globose. Disc covering about half of ovary, 5-furrowed. Ovary ca 1 mm across, 10-ribbed, glabrous; stigma sessile. Berries globose, 7.5-10 mm across. Seeds ellipsoid-obovoid, 5-7 x 3.5-5 mm; adaxial surface with a broad longitudinal ridge; abaxial surface with a deep circular pit ca 1.5 mm across and shallow rays.

Fl. & Fr. : April - Nov.

Distrib. India : Himalaya, from Garhwal eastwards and Khasia Hills, between 1200-2500 m. Uttar Pradesh, Sikkim, Arunachal Pradesh and Meghalaya.

Nepal and Myanmar.

Note. The type of *Vitis nervosa* M. Lawson (Sikkim, *J.D. Hooker s.n.*, CAL!, K!) is similar to that of *Vitis rugosa* Wallich, except that the tomentum is not so dense. Otherwise in leaf-shape, inflorescence type and seed structure it resembles *V. rugosa* Wallich. They are therefore considered conspecific.

Uses. The fruits are edible.

8. Ampelocissus sikkimensis (M. Lawson) Planchon in *J. Vigne Amer.* 8: 375. 1884 & in DC., *Monogr. Phan.* 5: 371. 1887. *Vitis sikkimensis* M. Lawson in *Fl. Brit. India* 1: 650. 1875. **Fig. 59.**

Slender, climbing or trailing shrubs; branches terete, glabrous. Leaves simple, orbicular-ovate, acute to acuminate at apex, 14-32 x 10-26 cm, rounded-cordate at base, cuspidate-denticulate at margins, membranous, glabrous; petioles 5-9 cm long. Inflorescences umbellate-cymose, glabrous or pubescent; peduncles 3-10 cm long; tendrils forked; primary branch of inflorescence *ca* 2.5 cm long. Calyx 5-notched, glabrous or pubescent. Petals oblong-ovate, *ca* 1.8 x 1 mm, slightly hooded. Disc covering about half of ovary. Ovary *ca* 1 mm across, glabrous. Berries obovoid, *ca* 6 mm across, 2-4-seeded. Seeds ellipsoid-obovoid, *ca* 5 x 2.5 mm; adaxial surface with a broad longitudinal ridge; abaxial surface with a spatulate chalazal knot, otherwise almost smooth, shiny.

Fl. & Fr. : July - Oct.

Distrib. India : Subtropical forests of eastern part between 600-1500 m. Assam, Arunachal Pradesh, West Bengal, Sikkim, Mizoram and Meghalaya.

Nepal.

Uses. Lepchas use it in the treatment of foot and mouth disease of cattle.

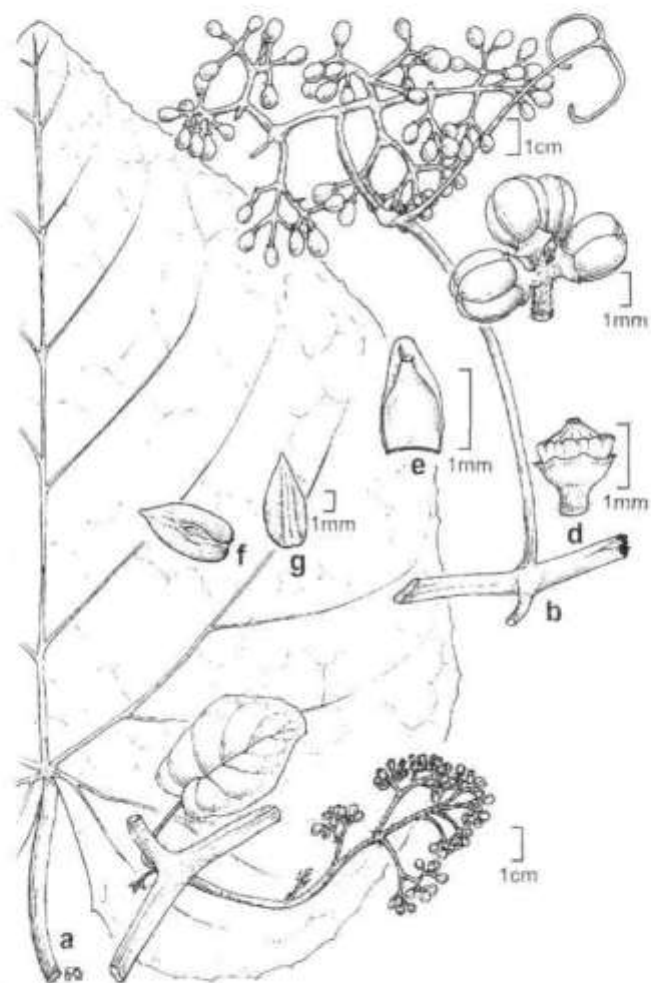


Fig. 59. *Ampelocissus sikkimensis* (M. Lawson) Planchon : a. A flowering branch; b. A fruiting branch; c. Flower buds; d. Gynoecium; e. A petal; f. Seed, abaxial surface; g. Seed, adaxial surface.

9. Ampelocissus tomentosa (Roth) Planchon in J. Vigne Amer. 8: 375. 1884 & in DC., Monogr. Phan. 5: 376. 1887. *Vitis tomentosa* Roth in Roemer & Schultes, Syst. Veg. 5: 318. 1819; M. Lawson in Fl. Brit. India 1: 650. 1875.

Or.: *Ghoralidi, Katobhangonoi*; Tam.: *Sirunarialai*; Tel.: *Atukulabaddu, Nallagummadi theega*.

Stout, climbing shrubs; branches slender, angular, floccose-wooly. Leaves simple, 3-5-angled or lobed, sometimes 3-5-partite, up to 25 x 24 cm, acute to obtuse at apex, cordate at base, crenate-serrate or dentate at margins, pubescent above, greyish red or white tomentose beneath; petioles up to 15 cm long. Inflorescences dichotomous, umbellate cymes, dense woolly tomentose; peduncles *ca* 10 cm long, stout; tendrils branched; primary branch of inflorescence 1-2 cm long; cymes 2-4 cm long. Flowers *ca* 1.5 mm long, red, subsessile or shortly pedicellate. Calyx cupular, 4-5-lobed, woolly. Petals oblong-ovate, 1.2 x 0.7 mm, incurved at apex, *ca* glabrous. Stamens *ca* 1 mm long. Disc annular, restricted to lower half of ovary. Ovary *ca* 1 mm across, 10-furrowed, glabrous; stigma sessile, concave. Berries globose, 8-10 mm across, 1-4-seeded, black. Seeds obovate oblong in outline, 6-7 x 4-5 mm, acute-mucronate at base; adaxial surface with a longitudinal ridge; abaxial surface with an elliptical pit from which fissures radiate towards margin.

Fl. & Fr. : Apr. - Dec.

Distrib. India : Dry deciduous forests of central and eastern India and hill forests of peninsular India, up to 1500 m. Uttar Pradesh, Bihar, West Bengal, Orissa, Madhya Pradesh, Gujarat, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Bangladesh and Myanmar.

Note. It is extremely variable in leaf shape and degree and colour of tomentum. The leaf varies from entire, slightly 3-lobed to 3-5-partite. The colour of the tomentum is usually greyish yellow, cottony white or ferruginous.

Chromosome numbers $2n=40$ (Shetty, B.V. in Curr. Sci. 27: 358-359. 1958 & in Bibliogr. Genet. 18: 167-272. 1959).

Uses. The roots are reported to be used to allay swellings, and the roots and bark are used against piles. The fruits are said to be edible.

10. *Ampelocissus wightiana* Shetty & P. Singh in Kew Bull. 44: 469. 1989. *Vitis erioclada* auct. non. Wight & Arn. 1833: Wight & Arn., Prodr. 130. 1834, p.p.; M. Lawson in Fl. Brit. India. 1: 651. 1875. p.p. *Ampelocissus erioclada* Planchon in J. Vigne Amer. 8: 375. 1884.

Stout climbing shrubs; branches terete, hollow, floccose-woolly. Leaves simple, ovate-orbicular, sometimes shallowly 3-lobed, deeply cordate at base, coarsely glandular-dentate at margins, 10-25 x 8-20 cm, acuminate at apex, membranous, floccose-woolly, especially on nerves beneath; petioles 5-9.5 cm long. Inflorescences thick, branched panicles of cymes, floccose-woolly; peduncles 5-14 (-20) cm long; tendrils simple, 10-45 cm long; primary branch of inflorescence 2-5.5 (-12) cm long; panicles 4-8 (-12) cm long. Flowers ca 1.75 mm long. Calyx saucer-shaped, truncate or obscurely 5-lobed, woolly. Petals oblong-ovate, ca 1.5 x 0.7 mm glabrous. Stamens ca 1 mm long. Disc almost covering the ovary, 5-furrowed. Ovary ca 1 mm across, glabrous; stigma sessile. Berries globose, ca 1.25 cm across. Seeds obovate or suborbicular in outline, ca 8 x 7 mm; adaxial surface with a prominent longitudinal ridge, incurved and crenate at margin; abaxial surface with a clavate chalazal knot and fine rays radiating towards margin.

Fl. & Fr. : June - Sept.

Distrib. India : In evergreen forests of Courtallam, Kannikati and Muthukuz Vayal, up to 1000 m. Tamil Nadu. Rare

Sri Lanka.

2. *Ampelopsis* A. Rich. ex Michaux

Climbing, scrambling or erect shrubs. Tendrils leaf-opposed, simple or branched or absent, not ending in adhesive discs. Leaves simple or imparipinnately compound; leaflets petiolulate. Inflorescences leaf-opposed, corymbosely-

cymose, pedunculate. Flowers bisexual. Calyx cupular. Petals 5, free. Stamens 5: anthers ovate-oblong. Disc cupular, adnate to base of ovary. Style short; stigma subcapitate. Berries pyriform, 2-4-seeded. Seeds obovoid; adaxial surface angular with thread-like raphe; abaxial surface convex with spatulate chalazal knot near centre; endosperm T-shaped in cross-section.

In tropical and warm temperate regions of Asia (mainly centred in China) and North America; *ca* 22 species, 3 in India.

Note. Differs from *Parthenocissus* in the absence of adhesive discs at the tips of tendrils and presence of conspicuous, cupular, nectariferous disc, adnate to the ovary at base.

KEY TO THE SPECIES

- | | |
|---|-------------------------|
| 1a. Leaves imparipinnate with 7-9 leaflets | 2. <i>A. rubifolia</i> |
| b. Leaves simple | 2 |
| 2a. Tendrils present; leaves pubescent above, villous beneath | 1. <i>A. glandulosa</i> |
| b. Tendrils absent; leaves glabrous | 3. <i>A. vitifolia</i> |

1. *Ampelopsis glandulosa* (Wallich) Momiy. in H. Hara, Fl. E. Himal. 2: 78. 1971. *Vitis glandulosa* Wallich in Roxb., Fl. Ind. 2: 479. 1824; M. Lawson in Fl. Brit. India 1: 652. 1875. *Ampelopsis heterophylla* Sieb. & Zucc. var. *hancei* Planchon subvar. *wallichii* Planchon in DC., Monogr. Phan. 5: 457. 1887.

Fig. 60.

Climbing shrubs; stems and branches slender, terete, greyish pubescent; tendrils branched. Leaves broad ovate to 3-lobed, 5-11 (-15) x 4-10 (-12) cm, acuminate at apex, cordate at base, crenate-dentate at margins, pubescent above, pilose beneath especially on nerves; petioles 2-6 cm long, pubescent. Inflorescences dichotomous-corymbose, 2.5-7 cm long, pubescent; peduncles 2-5 cm long. Flowers *ca* 2 mm long, yellowish green; pedicels *ca* 2 mm long. Calyx cupular, subtruncate to shallowly 5-lobed. Petals *ca* 2 x 1 mm. Stamens *ca* 1 mm long. Disc cupular. Ovary *ca* 1 mm across; style short; stigma subcapitate. Berries obovoid, *ca* 7 mm across, with 2 rings at base, one being the persistent calyx and the other the slightly accrescent disc, 2-4-seeded. Seeds obovoid, *ca* 5 x 4 mm; adaxial surface angular with an elongated pit on either side of raphe; abaxial surface convex with a spatulate chalazal knot.

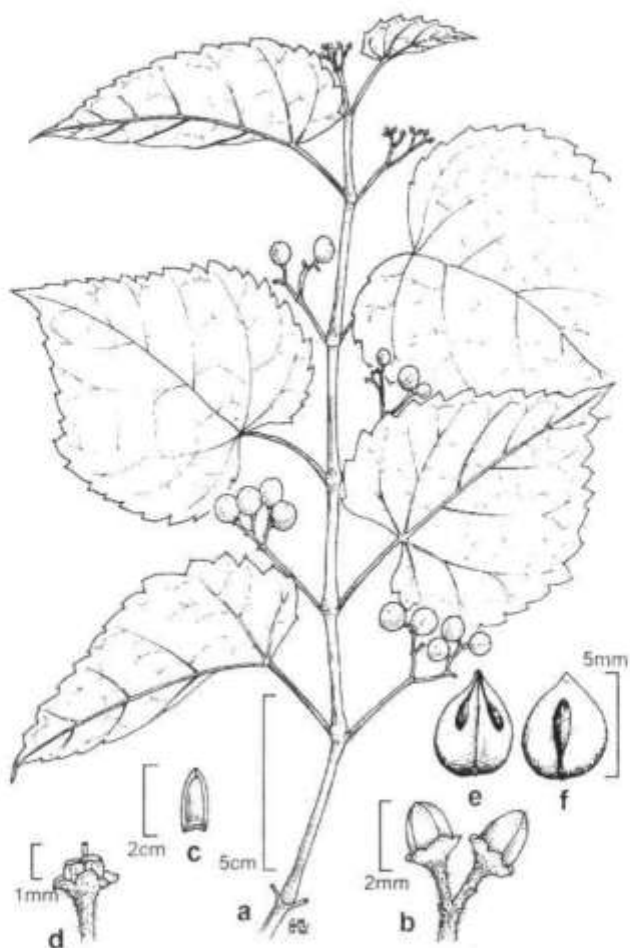


Fig. 60. *Ampelopsis glandulosa* (Wallich) Momiy. : **a.** Habit; **b.** Flower buds; **c.** A petal; **d.** Gynoecium; **e.** Seed, adaxial surface; **f.** Seed, abaxial surface.

Fl. May - June.

Distrib. India : In subtropical forests of North-east India, between 600-1700 m. Sikkim, Manipur and Meghalaya. Rare.

Nepal and Myanmar.

Notes. Its report from Sikkim is based on a single collection of S. Kurz present in (CAL) without exact locality.

2. *Ampelopsis rubifolia* (Wallich) Planchon in DC., Monogr. Phan. 5: 463. 1887. *Vitis rubifolia* Wallich in Roxb., Fl. Ind. 2: 480. 1824; M. Lawson in Fl. Brit. India 1: 663. 1875.

Large climbing shrubs, scandent; stems and branches slightly angular, striate, young ones rufous hairy; tendrils forked. Leaves imparipinnate, 12-18 cm long; petioles *ca* 2.5-6 cm long, rufous hairy; leaflets elliptic-oblong, 5-10 x 2.5-4.5 cm, acuminate at apex, truncate at base (acute in terminal leaflets), crenate-serrate at margins, glabrous above, pubescent on nerves beneath; petiolules *ca* 1-1.5 cm long in terminal leaflets, 0.1-1 cm in lateral leaflets. Inflorescences dichotomous, umbellate-cymose, *ca* 10 cm long, pubescent to rufous hairy; peduncles 5-8 cm long, rufous hairy. Flowers *ca* 2 mm long; pedicels 1-2 mm long, pubescent. Calyx cupular, subtruncate, pubescent. Petals *ca* 2 mm long. Stamens *ca* 1 mm long. Disc cupular. Style short; stigma capitate. Berries *ca* 6 mm across, 2-4-seeded. Seeds obovoid, *ca* 4.5 x 4 mm, rugose, abaxial surface convex with a raised spatulate chalazal knot.

Fl. & Fr. : Aug. - Jan.

Distrib. India : Assam, Meghalaya and Mizoram.

Bangladesh (Sylhet).

Note. Among the Indian species of the Vitaceae, it can be easily recognised by its imparipinnately compound leaves.

3. *Ampelopsis vitifolia* (Boiss.) Planchon in DC., Monogr. Phan. 5: 454. 1887. *Cissus vitifolia* Boiss., Diagn. Pl. Orient. ser. 1: 1(6): 31. 1846. *Vitis persica* Boiss., Fl. Orient. 1: 955. 1867.

Scrambling shrubs; stems and branches slender, subterete, striate, glabrous, glaucous; tendrils absent. Leaves subreniform or 3-lobed, 5-10 x 4-11 cm, acuminate at apex, truncate to shallowly cordate at base, inciso-dentate at margins, glabrous, 5-nerved at base; nerves pale beneath; petioles 1.5-5 cm long. Inflorescences dichotomously branched, cymose, *ca* 5 mm long; peduncles 2-5 cm long. Flowers *ca* 2 mm long, greenish yellow; pedicels 2-3 mm long, glabrous. Calyx cupular, subtruncate, glabrous. Petals *ca* 1.5 x 1 mm, glabrous. Stamens *ca* 1.5 mm long. Disc cupular. Ovary *ca* 1 mm across; style short, subulate; stigma subcapitate. Berries *ca* 8 mm across, black with 2 rings at base, one being the persistent calyx and the other slightly accrescent disc, 2-4-seeded. Seeds obovoid, *ca* 5 x 4 mm, adaxial surface angular with an elongated pit on either side of the raphe; abaxial surface convex with a spatulate chalazal knot.

Fl. & Fr. : May - Sept.

Distrib. India : Jammu & Kashmir and Himachal Pradesh.

Pakistan, Afghanistan and Iran.

Note. Chromosome number $2n=40$ (Christoff, M. in Bull. Soc. Bot. Bulg. 3: 279-302. 1929).

3. *Cayratia* A.L. Juss., *nom. cons.*

Climbing or creeping shrubs, sometimes herbaceous; tendrils leaf-opposed, simple or branched. Leaves 3-7 (-9)-foliolate, pedate, petiolate, hairy to glabrous; leaflets usually petiolulate, terminal usually the largest. Inflorescences axillary, or pseudoterminal, corymbose-cymose, pedunculate. Flowers globose or oblong, bisexual. Calyx cupular, truncate or shallowly 4-lobed. Petals 4, free, hooded at apex. Stamens 4; filaments short; anthers oblong. Disc cupular, sinuate or lobed, adnate to ovary. Style subulate; stigma small. Berries globose or oblong, 2-4-seeded. Seeds obovate or oblong in outline; adaxial surface usually

with 1 or 2 cavities; abaxial surface usually convex with a linear chalazal knot; endosperm crescent, rectangular or T-shaped in cross-section.

Mainly in tropical and subtropical Africa, Asia and Australia with the maximum number of species reported from Malesia; *ca* 55 species, 9 in India.

Note. Planchon (in DC., Monogr. Phan. 5: 471. 1887) treated *Cayratia* under *Cissus* L. as a section. Suessenguth (in Engl. & Prantl, Nat. Pflanzenfam. ed. 2. 20d: 277. 1953) followed Gagnepain [in Notul. Syst. (Paris) 1: 343. 1911] in considering *Cissus* and *Cayratia* as distinct genera.

KEY TO THE SPECIES

- | | |
|--|----------------------------------|
| 1a. Berries globose or subglobose when dry; seeds plano-convex with a single pit on the adaxial side; endosperm crescent shaped or rectangular in cross section | 2 |
| b. Berries pyriform when dry; seeds convex - carinate with two pits - one on each side of the ridge - on the adaxial side or the pits absent or inconspicuous; endosperm T-shaped in cross section | 8 |
| 2a. Leaves 3 - foliolate | 3 |
| b. Leaves more than 3-foliolate | 7 |
| 3a. Seeds 6-7 x 5 mm, adaxial side with a circular pit | 4 |
| b. Seeds 9-10 x 5-7 mm, adaxial side with a rectangular pit | 6 |
| 4a. Plants glabrous | 6. <i>C. roxburghii</i> |
| b. Plants pubescent | 5 |
| 5a. Leaflets elliptic; inflorescences umbellate-cymose | 2. <i>C. geniculata</i> |
| b. Leaflets elliptic-lanceolate; inflorescences dichasial cymes | 5. <i>C. pedata</i> |
| 6a. Plants soft villous; leaflets serrate-dentate, acuminate, cuspidate; seeds with a linear chalazal knot on the abaxial side | 4. <i>C. mollissima</i> |
| b. Plants glabrous; leaflets distantly-serrate, acuminate; seeds with a spatulate chalazal knot on the abaxial side | 9. <i>C. wrayi</i> |
| 7a. Leaflets ovate-subrotund; terminal leaflets 5-6.5 x 3.5 cm; lateral leaflets 2.5-4 x 1.5-3 cm | 1. <i>C. anemonifolia</i> |
| b. Leaflets elliptic-lanceolate; terminal leaflets 10-17 x 4-8 cm; lateral leaflets 7-15 x 3.5-7 cm | 5. <i>C. pedata</i> |
| 8a. Leaves 3-foliolate | 8. <i>C. trifolia</i> |
| b. Leaves 5-foliolate | 9 |
| 9a. Seeds with two pits on the adaxial side; flower buds ovoid, pubescent | 3. <i>C. japonica</i> |
| b. Seeds without pits; flower buds oblong, glabrous | 7. <i>C. tenuifolia</i> |

1. **Cayratia anemonifolia** (Zipp. ex Miq.) Suesseng. ex Suesseng. in Mitt., Bot. Staatssamml. Munchen 1: 352. 1953. *Vitis anemonifolia* Zipp. ex Miq. in Ann. Mus. Bot. Lugd. Bat. 1: 80. 1863.

Slender climbing shrubs; branches obscurely angular, pubescent, greyish green; tendrils branched, puberulous. Leaves 5-7-foliolate, pedate, pubescent; petioles 5-6 cm long, puberulous; stipules persistent, scarious in older branches; terminal leaflets ovate-subrotund, 5-6.5 x 3.5 cm, shortly acuminate at apex, rounded at base, serrate at margins, with 5-7 pairs of lateral nerves; petiolules 1-1.5 cm long; lateral leaflets 2.5-4 x 1.5-3 cm, oblique at base, margins and apex as in terminal leaflets. Inflorescences dichotomous, cymose, 5-6 cm long, pubescent; peduncles ca 3 cm long, pubescent. Flowers 3-3.5 mm long; pedicels 4-5 mm long, fleshy. Calyx 4-lobed with thin margin, puberulous. Petals ovate-lanceolate, ca 2.5 mm long, acute, hooded, puberulous. Stamens 1.5 mm long; anthers oblong. Disc entire, fleshy, enclosing ovary. Ovary ca 1.5 mm across; style 0.5 mm long; stigma minute. Berries ca 1 cm across, 2-4-seeded. Seeds ellipsoid, ca 6 x 5 mm, adaxial surface with a circular pit.

Fl. & Fr. : April - Oct.

Distrib. India : Evergreen forests, between 500-1800 m. Tamil Nadu.

Indonesia (Timor).

2. **Cayratia geniculata** (Blume) Gagnepain in Notul. Syst. (Paris) 1: 345. 1911. *Cissus geniculata* Blume, Bijdr. 184. 1825. *Vitis geniculata* (Blume) Miq., Ann. Mus. Bot. Lugd. Bat. 1: 81. 1863 & in Philipp. J. Sci. Bot. 11: 133. 1916.

Climbing shrubs; branches subterete, striate, pubescent; tendrils forked. Leaves 3-foliolate, glabrous above, pale villous to pubescent beneath; petioles 5-10 cm long, pubescent; terminal leaflets elliptic, 12-20 x 6-10 cm, acute-acuminate at apex, cuneate at base, serrate to subentire at margins, with 9-10 pairs of lateral nerves; petiolules 1.5-6 cm long; lateral leaflets oblique, margins and apex as in terminal leaflets, 12-15 x 5-8 cm; petiolules 1-2.5 cm long. Inflorescences umbellate-cymose, 6-12 cm long; peduncles 4-7 cm

long, pubescent. Flowers globose, 2-2.5 mm long, pubescent; pedicels *ca* 2 mm long. Calyx cupular, truncate. Petals *ca* 2 x 1 mm. Stamens *ca* 1 mm long; anthers oblong. Disc thick, 4-notched, covering ovary. Ovary *ca* 1 mm across; style *ca* 0.5 mm long; stigma minute. Berries 8-12 mm across, 3-4 seeded. Seeds *ca* 6 x 5 mm, adaxial surface with a raised circular pit *ca* 2 mm in diam., abaxial surface convex with a spatulate chalaza.

Fl. & Fr. : March - Nov.

Distrib. India : Tropical and subtropical forests, between 300-1200 m West Bengal (Darjeeling dist.), Sikkim, Arunachal Pradesh, Assam and Manipur

Bhutan, Laos, Indonesia (Borneo, Java) and Philippines.

Note. Chromosome Number $2n=30$ (Petria, E. in Acta Bot. Horti Bucurest.: 23-36. 1967. "1966").

3. *Cayratia japonica* (Thunb.) Gagnepain in Notul. Syst. (Paris) 1: 349. 1911. *Vitis japonica* Thunb., Fl. Jap. 104. 1784. *Cissus japonica* (Thunb.) Willd., Sp. Pl. 659. 1798. *Vitis mollis* Wallich ex M. Lawson in Fl. Brit. India 1: 660. 1875. *Columella japonica* (Thunb.) Merr. in Philipp. J. Sci. Bot. 13: 145. 1918. *Cayratia japonica* (Thunb.) Gagnepain var. *mollis* (Wallich ex M. Lawson) Momiy. in H. Hara, Fl. E. Himal. 1: 199. 1966.

Slender, herbaceous climbers; branches subterete, striate, pubescent; tendrils slender, simple or branched. Leaves 5-foliolate, pedate, glabrous to pubescent; petioles 3-8 cm long, glabrous to pubescent; terminal leaflets ovate to orbicular-ovate or elliptic, 4-8.5 x 3-4 cm, acuminate or acute at apex, cuneate to acute or rounded at base, serrate at margins; petiolules 1-2 cm long; lateral leaflets 2.5-6.5 x 1.5-3 cm, slightly oblique at base, margins and apex as in terminal leaflets; petiolules 0.3-1 cm long. Inflorescences 7-16 cm long, pubescent; peduncles 5-10 cm long, pubescent to glabrous. Flowers ovoid, *ca* 1.7 mm long; pedicels 1-2 mm long, pubescent. Calyx saucer-shaped, pubescent. Petals *ca* 1.5 x 0.9 mm, hooded, pubescent. Stamens *ca* 1.2 mm long; anthers ellipsoid. Disc covering ovary. Ovary *ca* 1.5 mm across; style subulate; stigma capitate. Berries *ca* 7 mm across, 3-4-seeded. Seeds obovoid, acute at base, *ca* 5 x 4 mm; adaxial surface with a longitudinal ridge in the

middle and an elongated pit on either side of it; abaxial surface with a linear chalaza, prominently rugose on sides; endosperm T-shaped in cross section.

Fl. & Fr. : March - June.

Distrib. India : Tropical and subtropical forests, up to 1500 m. West Bengal, Sikkim, Arunachal Pradesh, Assam, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Goa, Karnataka, Tamil Nadu, Kerala and Andaman & Nicobar Islands.

Nepal, Bhutan, Bangladesh, Myanmar, Taiwan, Korea, Japan, Vietnam, Cambodia, Malesia and Australia (Queensland).

Note. In this species the leaves vary from glabrous to dense pubescent. The glabrous form is usually confused with *Cayratia tenuifolia* (Wight & Arn.) Gagnepain. However, the two are distinct in the shape of flower buds and the surface characteristics of petals and seeds.

Chromosome number $2n=60$ (Mitsukuri, Y. & M. Hayashi in Kromosome 17-19: 633-638, 1953); $2n=ca$ 66 (Lavie, P., Contribution at etude caryosystematique des Vitacees. These Doct. Ing. Fac. Sci. Univ. Montpellier, Fasc. 1: 183, 1970).

4. *Cayratia mollissima* (Wallich) Gagnepain in Notul. Syst. (Paris) 1: 345. 1911. *Vitis mollissima* Wallich in Roxb., Fl. Ind. 2: 482. 1824; M. Lawson in Fl. Brit. India 1: 656. 1875. *Columella mollissima* (Wallich) Merr., Enum. Philipp. Fl. Pl. 3: 8. 1923.

Climbing shrubs; branches terete, striate, soft-villous, greyish green when dry; tendrils wiry, branched. Leaves 3-foliolate, villous; petioles 5-7 cm long, villous; terminal leaflets elliptic-ovate, 10-13 x 5-8 cm, acuminate-cuspidate at apex, cuneate to rounded at base, serrate-dentate at margins; petiolules 2-3.5 cm long; lateral leaflets 8-12 x 3.5-6.5 cm, oblique, margins and apex as in terminal leaflets. Inflorescences divaricately branched, cymose, 7-10 cm long; peduncles 3-6 cm long. Flowers *ca* 2.5 mm long, pubescent; pedicels *ca* 3 mm long. Calyx cupular. Petals oblong, *ca* 2 x 1 mm. Disc 4-notched. Ovary *ca* 1.5 mm across; style subulate; stigma minute. Berries globose, *ca* 1.5 cm across, villous, 3-4-seeded. Seeds *ca* 9 x 5 mm, adaxial surface with

ca 7 x 3.5 mm rectangular cavity, incurved at margin, abaxial surface convex with a linear chalaza.

Fl. & Fr. : March - Sept.

Distrib. India : Evergreen forests in Western Ghats, up to 1000 m. Arunachal Pradesh, Karnataka, Tamil Nadu and Kerala.

Myanmar, Thailand, Cambodia, Vietnam and Malesia.

Note. This species is quite distinct from the other Indian species of *Cayratia* and can be easily recognised by its villous, 3-foliolate leaves and the seeds with a large rectangular pit on adaxial surface.

Uses. The berries are used as a poultice on swellings and aching parts. They are also used in curry.

5. *Cayratia pedata* (Lam.) Gagnepain, Notul. Syst. (Paris) 1: 346. 1911. *Cissus pedata* Lam. Encycl. 1: 31. 1783. *Columella pedata* Lour., Fl. Cochinch. 86. 1790. *Vitis pedata* (Lam.) Wallich ex Wight, Cat. 26. 1833; Wight & Arn., Prodr. 128. 1834. *V. canarensis* Dalz. in Hook., Kew J. Bot. 3: 123. 1851; M. Lawson in Fl. Brit. India 1: 655. 1875.

Large, slender climbing shrubs; branches subterete, pubescent; tendrils branched, pubescent. Leaves (3-) 5-11-foliolate, pedate, pubescent to glabrate; petioles 7-13 cm long; terminal leaflets lanceolate to elliptic, 10-17 x 4-8 cm, acuminate at apex, truncate to cuneate at base, serrate at margins; petiolules 2-5.5 cm long; lateral leaflets 7-15 x 3.5-7 cm, oblique at base, margins and apex as in terminal leaflets; petiolules 1-2 cm long. Inflorescences dichasial cymes, 5-15 cm long; peduncles 2-11 cm long, pubescent. Flowers ca 3 mm long; pedicels 2-3 mm long. Calyx cupular, truncate, pubescent. Petals incurved at apex, 2-2.5 x 1-1.5 mm, pubescent to glabrous. Stamens ca 2 mm long; anthers oblong. Disc cupular, 4-lobed, covering ovary. Ovary ca 1.5 mm across; style subulate; stigma subcapitate. Berries subglobose, flattened at apex, ca 1 cm across, 2-4-seeded. Seeds obelipsoid, ca 6 x 5 mm, adaxial surface with a circular pit in the centre; abaxial surface convex with an elliptic chalazal knot; endosperm crescent-shaped in cross section.

KEY TO THE VARIETIES

- 1a. Leaves and petals pubescent 5.2 var. **pedata**
 b. Leaves and petals glabrous 5.1 var. **glabra**

5.1. var. glabra Gamble, Fl. Pres. Madras 1: 236. 1918.

Fl. : June - Oct.

Distrib. India : In evergreen forests at an altitude of about 1800 m. Tamil Nadu. Endemic.

5.2. var. pedata

Asm.: *Tusamphor-doukha*; *Beng.*: *Goalilata*; *Lep.*: *Tungrutrikup*; *Mal.*: *Tripadi*, *Veluttasorivalli*; *Tam.*: *Kattupirandai*, *Naralai*, *Pannikkodi*; *Tel.*: *Adavi draksha*, *Edakulamandulam ari*, *Gonda kura*, *Kadepatige*, *Kannem*, *Pulimada*, *Yedakula vayamu*.

Fl. & Fr. : March - Dec.

Distrib. India : Bihar, West Bengal, Assam, Arunachal Pradesh, Meghalaya, Orissa, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala and Andaman & Nicobar Islands.

Bangladesh, Myanmar, Sri Lanka, Thailand, Cambodia, Vietnam, Indonesia (Java) and Philippines.

Note. Chromosome number $2n = ca\ 72$ (Shetty, B.V. in *Curr. Sci.* 27: 358-359. 1958 & in *Bibliogr. Genet.* 18: 167-272. 1959); $2n = 80$ [Vatsala, P. in *La Cellule (Louvain)* 61: 193-205. 1960]; $2n = 40$ (Patil, V.P. *et al.* in *Curr. Sci.* 49: 37-38. 1980).

Uses. The leaves are astringent and refrigerant. Leaf decoction is used to check uterine reflexes. Roots made into a paste and slightly heated is applied on cracked heels. Leaves are used as vegetable.

6. Cayratia roxburghii Gagnepain in *Notul. Syst. (Paris)* 1: 346. 1911, *p.p.* excl. *Vitis roxburghii* Wight & Arn.; Shetty & P. Singh in *Kew Bull.*

44: 470. 1989. *Cissus roxburghii* Planchon in DC., Monogr. Phan. 5: 572. 1887. *Vitis roxburghii* M. Lawson in Fl. Brit. India 1: 655. 1875, *nom. illegit.*, non *V. roxburghii* Wight & Arn., 1834 (= *Cissus feminea* Roxb.). **Fig. 61.**

Climbing shrubs; branches terete, striate, glabrous, smooth, glaucous; tendrils wiry, simple or forked at tip. Leaves 3-foliolate, glabrous; petioles 3-5.5 cm long; terminal leaflets elliptic-lanceolate, rounded or acute at base, undulate-dentate at margins; 10-16 x 4-6 cm, acuminate at apex, lateral leaflets 10-13 x 3.5-5.5 cm, long, oblique at base, margins and apex as in the terminal leaflets. Inflorescences dichotomous, cymose, *ca* 5 cm long; peduncles *ca* 2.5 cm long. Flowers *ca* 3 mm long; peduncles 1.5-2.5 cm long; glabrous; pedicels *ca* 2 mm long. Calyx cupular, truncate. Petals *ca* 2 x 1 mm. Stamens *ca* 1.5 mm long. Disc fleshy, covering ovary. Ovary *ca* 1.5 mm across; style subulate; stigma minute. Berries *ca* 1 cm across, 2-4-seeded. Seeds *ca* 7 x 5 mm; adaxial surface with a circular pit, abaxial surface convex with a spatulate chalaza.

Fl. & Fr. : May - Nov.

Distrib. India : Tamil Nadu and Kerala.

Sri Lanka (?).

Note. This species was thought to be represented by only the type specimens collected from the Tirunelvely hills in Tamil Nadu (Vajravelu in Pl. Conserv. Bull. 4: 23. 1983; Ramamurthy in Nair & A.N. Henry, Fl. Tamil Nadu ser. 1. 1: 80. 1983). There are, however, some other collections of this species in MH collected from Tamil Nadu and Kerala, most of which had been wrongly identified as *Cissus trilobata* Lam. The specimens resemble *Cayratia roxburghii* in having 3-foliolate, glabrous leaves and a circular pit on the adaxial surface of the seeds.

7. *Cayratia tenuifolia* (Wight & Arn.) Gagnepain in Notul. Syst. (Paris) 1: 348. 1911. *Vitis tenuifolia* Wight & Arn., Prodr. 129. 1834; M. Lawson in Fl. Brit. India 1: 660. 1875. *Cissus tenuifolia*. (Wight & Arn.) Heyne ex Planchon in DC., Monogr. Phan. 5: 563. 1887.

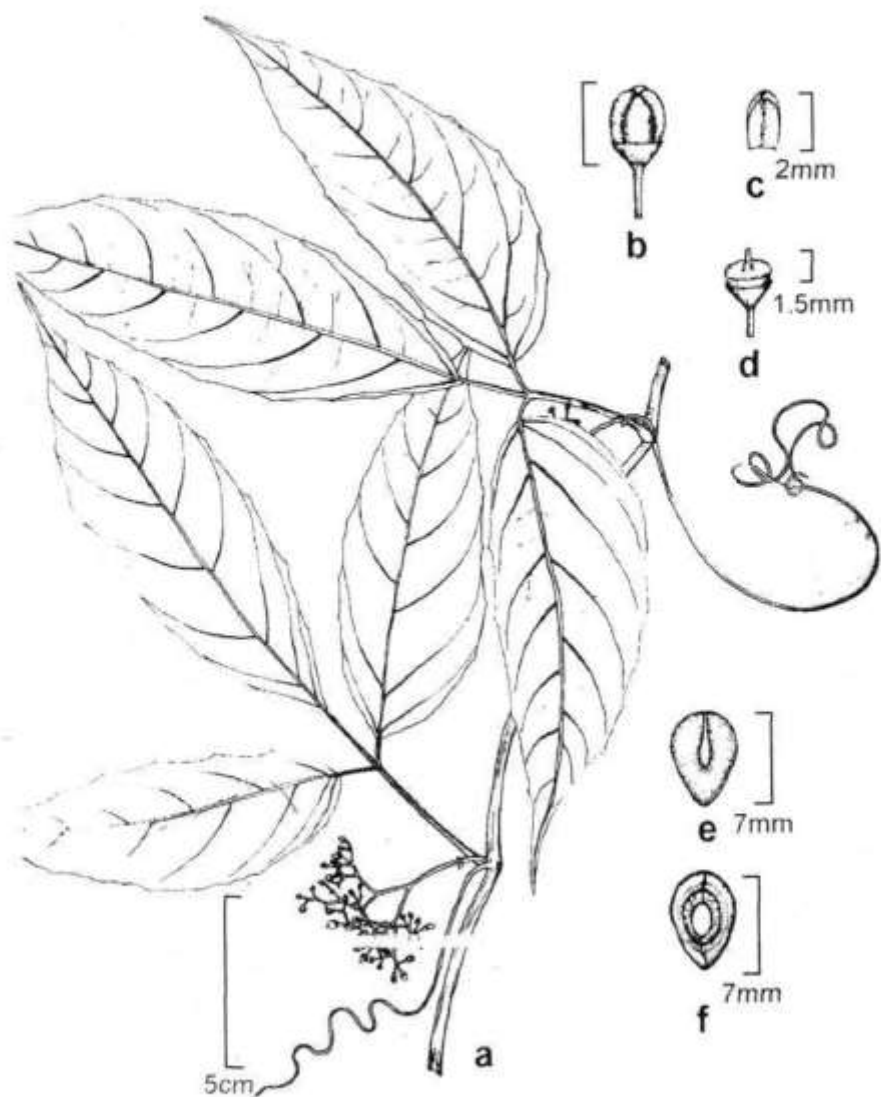


Fig. 61. *Cayratia roxburghii* Gagnepain: **a.** Habit; **b.** A flower bud; **c.** A petal; **d.** Gynoecium; **e.** Seed, abaxial surface; **f.** Seed, adaxial surface.

Very slender, herbaceous climbers; branches weak, subterete, striate, glabrous; tendrils slender, simple, up to 14 cm long. Leaves 5-foliolate, pedate, glabrous; petioles 2-4.5 cm long; terminal leaflets ovate to ovate-lanceolate, 3-6.5 x 1.5-3 cm, acute at apex, attenuate at base, serrate at margins; petiolules up to 5 mm long; lateral leaflets 1.5-4 x 1-2 cm, slightly oblique at base, margins and apex as in the terminal leaflets; petiolules 2-4 mm long. Inflorescences divaricately branched, cymose, 4-5 cm long; peduncles 1-2 cm long. Flowers *ca* 1 mm long, glabrous. Calyx truncate or obscurely lobed. Petals *ca* 1 x 0.7 mm, inflexed at apex. Stamens *ca* 1 mm long; anthers globose. Disc short. Ovary *ca* 1 mm across; style short; stigma capitate. Berries *ca* 1 cm across, 1-2-seeded. Seeds deeply corrugate on sides, 5-6 x 4-4.5 mm; adaxial surface with a longitudinal central ridge, pits absent; abaxial surface with a linear chalaza.

Fl. & Fr. : May - March.

Distrib. India : Karnataka, Tamil Nadu and Kerala.

Sri Lanka and Indo-China.

Note. Chromosome number $2n=30$ (Shetty, B.V. in *Curr. Sci.* 27: 358-359. 1958 & in *Bibliogr. Genet.* 18: 167-272. 1959; Vatsala, P. in *La Cellule* (Louvain) 61: 193-205. 1960).

8. *Cayratia trifolia* (L.) Domin in *Biblioth. Bot.* 89: 370. 1927. *Vitis trifolia* L., *Sp. Pl.* 203. 1753. *Cissus carnos*a Lam., *Encycl.* 1: 31. 1783. *C. cinerea* Lam.; DC., *Prodr.* In 631. 1820. *Vitis carnos*a (Lam.) Wallich ex M. Lawson in *Fl. Brit. India* 1: 654. 1875. *Cissus trifolia* (L.) K. Schum. in Schum. & Hollr., *Fl. Kaiser Wilhelmsl.* 71. 1889. *Cayratia carnos*a (Lam.) Gagnepain in *Notul. Syst.* 1: 347. 1911. *C. carnos*a (Lam.) Gagnepain var. *cinerea* (Lam.) Gagnepain in *Notul. Syst. (Paris)* 1: 348. 1911. *Cayratia trifolia* (L.) Domin var. *cinerea* (Lam.) Babu, *Herb. Fl. Dehra Dun* 108. 1977.

Asm.: Maimati, Marmarati; *Beng.*: Amallata, Bundal; *Guj.*: Khat-khatumbo, Tamanya; *Hindi*: Amalbel, Kassar, Ramchana; *Kan.*: Heggoli; *Mal.*: Sorivalli; *Mar.*: Ambatbel, Kadamadavalli, Odi; *Nep.*: Jarilalahara; *Punj.*: Amalbel, Drukri, Gidardak, Karik, Vallur; *Sans.*: Aranyavasini.

Atyamlaparni, Banastha, Kandura, Tikshna; Tel.: Kadapatige, Kamputige, Kurudinne, Mandulamaritige, Pulimada.

Climbing or spreading, herbaceous shrubs; branches slender, terete, sub-fleshy, pubescent to glabrous; tendrils wiry, branched. Leaves 3-foliolate, pubescent to glabrous; petioles 2-6 cm long; terminal leaflets broadly elliptic to ovate, 3-8 x 2-7 cm, acute to rounded at apex, cuneate to rounded at base, dentate-serrate to subentire at margins; petiolules 0.5-2.5 cm; lateral leaflets 2.5-7 x 2-6 cm, oblique, margins and apex as in terminal leaflets; petiolules 2-10 mm long. Inflorescences axillary or pseudo-terminal, divaricate cymes, 6-12 cm long; peduncles 2.5-8 cm long, pubescent. Flowers *ca* 2 mm long; pedicels 1.5-3 mm long, pubescent. Calyx cupular, subtruncate, pubescent. Petals ovate, *ca* 2 x 1.2 mm, puberulous. Stamens *ca* 1 mm long; anthers oblong. Disc fleshy, 4-lobed; lobes notched. Ovary *ca* 1.5 mm across; style subulate; stigma capitate. Berries obovoid-globose, *ca* 1 cm across, 3-4-seeded. Seeds triangular-obovoid, *ca* 6 x 4.5 mm; adaxial surface with a longitudinal ridge and a pit on either side of it; abaxial surface with a linear chalaza and transverse ridges on sides.

Fl. & Fr. : Throughout the year.

Distrib. India : Almost throughout the country, at lower elevations in the hills.

Pakistan, Nepal, Bangladesh, China, Myanmar, Indo-china, Malesia and Australia.

Uses. The root is astringent. Ground with black pepper, it is applied as poultice on boils. A poultice of leaves is applied to ulcers and yoke-sores of bullocks. Fomentation with a hot decoction of the roots or leaves is said to cause perspiration in case of high fever.

Chromosome number $2n=ca$ 98 (Shetty, B.V. in *Curr. Sci.* 27: 358-359. 1958 & in *Bibliogr. Genet.* 18: 167-272. 1959); $2n=80$ [Vatsala, P. in *La Cellule (Louvain)* 61: 193-205. 1960; Mitra, K. & N. Datta in *Taxon* 16: 457. 1967- all sub *Cayaratia carnososa* Gagnepain]; $2n=80$ [Patil, V.P. *et al* in *Curr. Sci.* 49: 37-38. 1980 - sub *Cissus trifolia* (L.) K. Schum.]; $2n=120$ (Patil, V.P. *et al* in *Curr. Sci.* 49: 37-38. 1980- sub *Cayaratia carnososa* Gagnepain).

9. *Cayratia wrayi* (King) Gagnepain in Notul. Syst. (Paris) 1: 346. 1911. *Vitis wrayi* King in J. As. Soc. Bengal 65: 394. 1896, *p.p.*

Climbing shrubs; branches terete, striate, sub-woody, reddish, glabrous, glaucous; tendrils branched. Leaves 3-foliolate, glabrous; petioles 5-7 cm long; terminal leaflets elliptic-lanceolate, 10-16 x 3-5 cm, acuminate at apex, cuneate at base, distant-serrate at margins, with prominent nerves beneath; petiolules 2-3 cm long; lateral leaflets 9-12 x 2.5-4 cm, oblique at base, margins and apex as in terminal leaflets; petiolules *ca* 1 cm long. Berries subglobose, *ca* 1.5 cm across, 3-4-seeded. Seeds ellipsoid-oblong, *ca* 10 x 7 mm; adaxial surface with *ca* 5 x 2.5 mm rectangular pit; abaxial surface convex with a spatulate chalaza.

Fr. : Dec.

Distrib. India : Assam and Meghalya.

Myanmar, Indonesia (Java) and Malesia.

4. *Cissus* L.

Climbing or erect, shrubs, sometimes herbaceous, rarely small trees; tendrils leaf-opposed or absent. Leaves simple, unlobed or lobed, rarely digitately 3-7-foliolate, petiolate or rarely sessile, membranous to leathery. Inflorescences leaf-opposed, compound, umbellate cymes, pedunculate. Flowers bisexual; flower buds not constricted in middle. Calyx truncate to shallowly 4-lobed, glabrous to hairy. Petals 4, free, hooded at apex. Stamens 4; filaments short. Disc cup-like, truncate or 4-lobed, usually prominent, adnate to ovary. Style subulate; stigma minute or subcapitate. Berries globose to obovoid, 1 (-2)-seeded. Seeds usually obovoid with an encircling raphe, abruptly narrowed at base, smooth or coarsely reticulate; endosperm M- or .. -shaped in cross-section.

Chiefly pantropical in distribution; *ca* 150 species, 18 in India.

Notes. Planchon (in DC., Monogr. Phan. 5: 471-472. 1887) recognised the following sections under the genus *Cissus*: *Cissus* ("Eucissus"), *Cayratia*

(A.L. Juss.) Planchon and *Cyphostemma* Planchon. The last two sections are now a days recognised as distinct genera.

KEY TO THE SPECIES

- | | |
|---|------------------------------|
| 1a. Branches quadrangular or 4-winged, very rarely flat and 2-winged | 2 |
| b. Branches terete or obscurely angled | 3 |
| 2a. Plants succulent; tendrils simple; seeds obovoid, smooth except for the ridged raphe | 11. C. quadrangularis |
| b. Plants not succulent; tendrils forked; seeds obtriangular, transversely rugose | 7. C. glyptocarpa |
| 3a. Leaves simple | 4 |
| b. Leaves compound | 18 |
| 4a. Leaves sessile | 14. C. spectabilis |
| b. Leaves petiolate | 5 |
| 5a. Erect shrubs | 6 |
| b. Climbers | 8 |
| 6a. Seeds with angular facets; plants pubescent | 17. C. vitiginea |
| b. Seeds smooth except for the ridged raphe; plants glabrous or only the apex and the leaves beneath at first sparingly pubescent | 7 |
| 7a. Leaves 20-30 x 20-25 cm; petioles 15-25 cm long; tendrils absent | 18. C. woodrowii |
| b. Leaves 7-18 x 7-18 cm; petioles 4-12 cm long; tendrils present or absent | 3. C. arnottiana |
| 8a. Plants glabrous | 9 |
| b. Plants pubescent or tomentose, at least the young parts | 13 |
| 9a. Leaves blotched with white above and purple beneath; seeds with angular facets | 5. C. discolor |
| b. Leaves not variegated; seeds smooth except for the ridged raphe, sometimes with faint ridges on sides | 10 |
| 10a. Leaves oblong-elliptic, rounded at base | 10. C. nodosa |
| b. Leaves ovate to suborbicular, cordate to cordate-sagittate at base | 11 |
| 11a. Tendrils branched; flower buds contorted at apex | 13. C. repens |
| b. Tendrils simple; flower buds not contorted at apex | 12 |
| 12a. Leaves 4.5-14 x 3-10 cm, not lobed, shallowly cordate and 3-nerved at base, shallowly distantly serrate at margins; stipules adnate, cordate | 8. C. heyneana |
| b. Leaves 18-25 x 15-20 cm, slightly 3-5-lobed, deep cordate-sagittate and 5-nerved at base, repand-serrate at margins; stipules reniform. | 15. C. subramanyamii |
| 13a. Seeds smooth, except for the encircling raphe | 14 |

- b. Seeds with angular facets 15
- 14a. Tendrils branched; trichomes on lower surface of leaves dark coloured, usually dense; stipules pubescent; seeds *ca* 8 x 5 mm 12. *C. repanda*
- b. Tendrils simple; trichomes on lower surface of leaves pale, usually associated with main nerves; stipules glabrous; seeds *ca* 5 x 4 mm 4. *C. assamica*
- 15a. Tomentum grey or fulvous; leaves usually 3-5-angled or -lobed, conspicuously dentate 17. *C. vitiginea*
- b. Tomentum ferruginous; leaves ovate to suborbicular, bristly serrate 16
- 16a. Trichomes on lower surface of leaves 2-armed; ovary glabrous at summit 2. *C. aristata*
- b. Trichomes on lower surface of leaves predominantly of unbranched type; ovary pubescent at summit 17
- 17a. Branches pubescent; leaves dense pubescent beneath. 1. *C. adnata*
- b. Branches glabrous, glaucous; leaves pubescent chiefly on nerves beneath 9. *C. latifolia*
- 18a. Leaves digitately 5-foliolate 6. *C. elongata*
- b. Leaves 3-foliolate (or the upper only 3-lobed) 16. *C. trilobata*

1. *Cissus adnata* Roxb., Fl. Ind, 1: 423. 1820 & ed. 2. 1: 405. 1832.

Vitis adnata (Roxb.) Wallich ex M. Lawson in Fl. Brit. India 1: 649. 1875.
P.P.

Asm.: *Bhatia-lot*, *Down-rang*; Bhoj.: *Bod-lar-nari*; Mar.: *Nadena*;
Nep.: *Pani-lara*.

Climbing shrubs, branches subterete, striate, woody, pubescent; tendrils stout, branched. Leaves ovate, 5-12 x 4-9 cm, acute-acuminate at apex, truncate to cordate at base, bristly-serrate at margins, nearly glabrous above, dense pubescent beneath; petioles 3-8 cm long, hairy; stipules *ca* 3 x 2 mm, glabrous. Inflorescences umbellate cymes, 5-8 cm long, bracteolate; peduncles *ca* 2-4 cm long, hairy. Flowers *ca* 1.7 mm long; pedicels *ca* 2 mm long, hairy. Calyx cupular, truncate, hairy. Petals oblong, *ca* 1.2 x 1 mm, acute, hooded, hairy. Stamens *ca* 1 mm long; anthers ovoid. Disc 4-notched, conspicuous, covering ovary. Ovary *ca* 1 mm across, pubescent at summit; style stout; stigma minute. Berries obovoid to obellipsoid, *ca* 5 mm across, black, 1-seeded. Seeds obovoid, *ca* 6 x 4 mm, oblique at base, tessellated with angular facets on either side of the longitudinally encircling ridged raphe.

Fl. & Fr. : July - Jan.

Distrib. India : West Bengal, Sikkim, Arunachal Pradesh, Assam, Manipur, Mizoram, Tripura, Meghalaya, and Orissa.

Sri Lanka, Nepal, Bangladesh, Myanmar, Indo-China, Malesia, Indonesia, Philippines and Australia.

Note. Chromosome number $2n=20$ (Hazra, R. & A. Sharma in Folia Biol. (Cracow) 18: 123-136. 1970); $2n=22$ (Sarkar, A.K. *et al.* in Taxon 31: 579. 1982).

2. *Cissus aristata* Blume, Bijdr. 183. 1825. *C. simplex* Blanco, Fl. Filip. ed. 1. 72. 1837. *C. pyrrhodasys* Miq., Fl. Ind Bat. Suppl. 1: 517. 1861. *C. adnata* auct. non Roxb.; Gamble, Fl. Pres. Madras 1: 234. 1918. *Vitis adnata* auct. non (Roxb.) Wallich; Wight & Arn., Prodr. 126. 1834; Cooke, Fl. Bombay 1: 251. 1902.

Climbing shrubs; branches subterete, striate, woody, tomentose; tendrils branched. Leaves ovate, 7-13 x 5-11 cm, acute-acuminate at apex, truncate to cordate at base, bristly-serrate at margins, glabrous to tomentose above, arachnoid-hairy beneath; petioles 3-8 cm long, hairy; stipules *ca* 3 x 2 mm, pubescent. Inflorescences umbellate cymes, 2-6 cm long, bracteolate; peduncles 2-4.5 cm long, hairy. Flowers *ca* 1.7 mm long; pedicels *ca* 2 mm long, hairy. Calyx cupular, truncate, hairy. Petals oblong-ovate, *ca* 1.2 x 1 mm, hooded, hairy. Stamens *ca* 1 mm long; anthers ovoid. Disc 4-notched, conspicuous, covering ovary. Ovary *ca* 1 mm across, glabrous; style stout; stigma minute. Berries obellipsoid, *ca* 5 mm across, 1-seeded. Seeds obovoid, *ca* 5.5 x 4 mm, oblique at base, tessellated with angular facets on either side of the longitudinally encircling, ridged raphe.

Fl. & Fr. : July - Jan.

Distrib. India : West Bengal, Sikkim, Assam, Nagaland, Mizoram, Maharashtra, Karnataka, Tamil Nadu and Kerala.

Bangladesh, Myanmar, Sri Lanka, Indo-China, Malesia, Indonesia, New Guinea and Philippines.

Note. This species has in the past been confused with *Cissus adnata* Roxb. to which it is closely allied.

3. *Cissus arnottiana* Shetty & P. Singh in Kew Bull. 44: 473. 1989. *Vitis pallida* sensu M. Lawson in Fl. Brit. India 1: 647. 1875, *p.p.*, (*non* Wight & Arn., 1833). *Cissus pallida* sensu Planchon in DC., Monogr. Phan. 5: 477. 1887, *p.p.* (*non* Salisb., 1796).

Kan.: *Kandage*; Mar.: *Girnal*; Tam. *Nanaminukki*; Tel.: *Adavi gummodi*, *Buradoni*, *Dotta*, *Nallatige*, *Nela gummadi*, *Tella budari*.

Erect shrubs; branches terete, woody, glabrous, glaucous; tendrils when present simple. Leaves suborbicular, 7-20 cm across, sometimes shallowly 3-lobed, shortly acuminate at apex, cordate at base, dentate-serrate at margins with incurved serratures, 7-20 cm across, glabrous; petioles 4-15 cm long. Inflorescences compound, umbellate cymes, 3-7 cm long; peduncles thick, 1.5-5 cm long. Flowers 2.5-3 mm long; pedicels 2-4 mm long, pubescent. Calyx cupular, truncate to obscurely 4-lobed. Petals ovate, *ca* 2.5 x 1.5 mm, glabrous. Stamens *ca* 2 mm long; anthers oblong-ovoid. Disc 4-lobed, fleshy, white, covering ovary. Ovary *ca* 1 mm across, glabrous; style slender. Berries subglobose, 7-8 mm across, mucronate, 1-2-seeded. Seeds 7-8 x 5-6 mm, smooth except for the longitudinally, encircling ridged raphe.

Fl. & Fr. : May - Nov.

Distrib. India : Gujarat, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Sri Lanka.

Note. Chromosome number $2n=24$ (Patil, V.P. *et al.* in Curr. Sci. 49: 37-38. 1980- as *C. pallida* sensu Planchon).

Uses. Bruised roots are applied for rheumatic swellings. Leaves and tender fruits are crushed in water and sprinkled on cots to kill bedbugs. Stem fibre is used for making ropes.

4. *Cissus assamica* (M. Lawson) Craib in Kew Bull. 31. 1911. *Vitis assamica* M. Lawson in Fl. Brit. India 1: 648. 1875.

Asm.: *Amarhlata*.

Climbing shrubs; branches subangular, quite glabrous except the young parts. Tendrils simple. Leaves suborbicular, 6-11 (-15) x 5-9 (-11) cm, acuminate at apex, cordate at base, serrate and recurved at margins; subcoriaceous; nerves prominent beneath; petioles 2-7 (-12) cm long; stipules *ca* 3.5 x 2.5 mm. Inflorescences compound, umbellate cymes, 3-8 cm long; peduncles 1.5-6 cm long. Flowers *ca* 2.5 mm long, glabrous; pedicels filiform, 2-4 mm long. Calyx cupular, subtruncate. Petals oblong, *ca* 2 x 1 mm. Stamens *ca* 1 mm long. Disc 4-lobed, enclosing ovary. Ovary *ca* 1 mm across, glabrous; style slender, *ca* 1 mm long; stigma capitate. Berries obovoid-turbinate, *ca* 5 mm across, dark blue, 1-seeded. Seeds pyriform, *ca* 5 x 4 mm, smooth except for the longitudinally encircling ridged raphe.

Fl. & Fr. : June - Nov.

Distrib. India : West Bengal, Sikkim, Arunachal Pradesh, Assam, Manipur, Tripura, Meghalaya and Orissa.

Nepal, Bhutan, Bangladesh, Myanmar, Indo-China, Malesia and Philippines.

Note. Chromosome number $2n=48$ [Hazra, R. & A. Sharma in Folia Biol. (Cracow) 18: 123-136. 1970].

5. *Cissus discolor* Blume, Cat. 39. 1823 & Bijdr. 1: 181. 1825. *C. javana* DC., Prodr 1: 628. 1824. *Vitis inaequalis* Wallich ex Wight & Arn., Prodr. 125. 1834. *V. discolor* (Blume) Dalz. in Hook., Kew J. Bot. 2: 39. 1850; M. Lawson in Fl. Brit. India 1: 647. 1875.

Mar.: *Telitsayel*.

Climbing, herbaceous vines; branches slender, weak, subterete, glabrous; tendrils branched. Leaves ovate to oblong-lanceolate, oblique, 6-20 x 2.5-11 cm, acuminate at apex, truncate to cordate at base, serrate at margins,

blotched with white patches above, purple and shiny beneath, glabrous; petioles 1.5-7 cm long. Inflorescences divaricately branched, umbellate cymes, *ca* 2.5 cm long; peduncles *ca* 1 cm long. Flowers *ca* 2 mm long; pedicels 1.5-2 mm long. Calyx cupular, subtruncate. Petals oblong, *ca* 1.5 x 1 mm, glabrescent. Stamens *ca* 1 mm long; anthers oblong. Disc 4-lobed, covering ovary. Ovary *ca* 1.5 mm across; style stout, *ca* 0.6 mm long; stigma minute. Berries pyriform, 4-5 mm across, red when mature, 1-seeded. Seeds pyriform, *ca* 4 x 3 mm, acute at base, with longitudinally encircling ridged raphe and a linear pit on either side of raphe near base, tessellated on either side of raphe with angular facets.

Fl. & Fr. : July - Dec.

Distrib. India : Sikkim, Assam, Arunachal Pradesh, Manipur, Mizoram, Meghalaya, Maharashtra, Goa, Karnataka, Tamil Nadu, Kerala and Andaman & Nicobar Islands.

Nepal, Bangladesh, Myanmar, China, Indo-China, Malesia, Indonesia (Java) and Philippines.

Note. The plants are grown in gardens as an ornamental and are also edible.

Chromosome number $2n=24$ (Krishnaswamy, N. *et al.* in *Curr. Sci.* 23: 64-65. 1954; Shetty, B.V. in *Curr. Sci.* 27: 358-259. 1958 & in *Bibliogr. Genet.* 18: 167-272. 1959; Hazra, R. & A. Sharma in *Folia Biol. (Cracow)* 18: 123-136. 1970-as *Cissus javana* DC.).

6. *Cissus elongata* Roxb., *Fl. Ind.* 1: 429. 1820 & ed. 2. 1: 411. 1832. *Vitis elongata* (Roxb.) Wallich ex M. Lawson in *Fl. Brit. India* 1: 658. 1875. *Cayratia elongata* (Roxb.) Suesseng. ex Suesseng. in *Mitt., Bot. Staatssamml. Munchen* 1: 352. 1953.

Large climbing shrubs; branches slightly flattened, glabrous, glaucous; tendrils simple. Leaves 5-foliolate, digitate, glabrous; petioles 5-14 cm long, glabrous; terminal leaflets elliptic to linear-lanceolate, 7-20 x 2-8 cm, acuminate at apex, attenuate at base, dentate-serrate at margins; lateral leaflets 4-17 x 1-6.5 cm, slightly oblique at base, margins and apex as in terminal leaflets.

Inflorescences umbellate cymes, 5-6 cm long, bracteolate; peduncles 1-3 cm long. Flowers 2-2.5 mm long, glabrous; pedicels 2-3 mm long. Calyx cupular, truncate to obscurely 4-lobed. Petals oblong, *ca* 2 x 1 mm. Stamens *ca* 1 mm long; anthers oblong-ovoid. Disc 4-lobed, enclosing ovary. Ovary *ca* 1.2 mm across; style stout; stigma minute. Berries subglobose to ellipsoid, 0.6-1.5 cm across, 1-seeded. Seeds pointed at base, 8-16 x 5-10 mm, smooth except for the ridged raphe encircling longitudinally.

KEY TO THE SUBSPECIES

- | | |
|--|------------------------------------|
| 1a. Berries <i>ca</i> 14 mm across; seeds <i>ca</i> 16 x 10 mm; leaflets elliptic | 6.1. ssp. <i>elongata</i> |
| b. Berries <i>ca</i> 6 mm across; seeds <i>ca</i> 8 x 5 mm; leaflets usually linear-lanceolate | 6.2. ssp. <i>littoralis</i> |

6.1. ssp. *elongata*

Fl. & Fr. : Apr. - Dec.

Distrib. India : Sikkim, Assam, Meghalaya and Andaman & Nicobar Islands.

Bhutan and Bangladesh.

Note. Suessenguth (*l.c.*) transferred *C. elongata* Roxb. to the genus *Cayratia*, apparently on the basis of leaves being compound. This species, however, belongs to the genus *Cissus* and not to *Cayratia* (Singh P. & Shetty in *Taxon* 35: 596. 1986).

6.2. ssp. *littoralis* (W.A. Talbot) Shetty & P. Singh in *Kew Bull.* 44: 475. 1989. *Vitis elongata* (Roxb.) Wallich var. *littoralis* W.A. Talbot, *For. Fl. Bombay* 1: 321. 1909.

Mar.: Khajulgi.

Fl. & Fr. : May - Nov.

Distrib. India : Maharashtra, Goa and Kranataka.

Note. Chromosome number $2n=24$ (Patil, V.P. *et al.* in *Curr. Sci.* 49: 37-38. 1980- sub *Cissus elongata* Roxb.).

7. *Cissus glyptocarpa* Thwaites, *Enum. Pl. Zeyl.* 62. 1858. *Vitis glyptocarpa* (Thwaites) M. Lawson in *Fl. Brit. India* 1: 645. 1875.

Fig. 62.

Herbaceous vines; branches slender, quadrangular, 4-winged, glabrous; tendrils slender, forked. Leaves ovate, 4-11 x 4-7 cm, acuminate at apex, truncate to subcordate at base, distantly spinous-serrate at margins; glabrous with minute raphides, pale green; petioles 3-6 cm long, quadrangular. Inflorescences umbellate cymes, *ca* 4 cm long, glabrous; peduncles 1-3.5 cm long. Flowers *ca* 2.5 mm long, glabrous; pedicels 2-3 mm long. Calyx saucer-shaped, subtruncate. Petals oblong-ovate, *ca* 2 x 1 mm, acute, slightly hooded. Stamens *ca* 1.5 mm long; anthers oblong. Disc 4-lobed, enclosing ovary. Ovary *ca* 1.2 mm across; style stout; stigma minute. Berries oblique-pyriform, *ca* 5 mm across, purple, 1-seeded. Seeds obtriangular; 5-7 x 4-5 mm, adaxial side with a longitudinal ridge and a linear shallow groove on either side; abaxial side with 3 longitudinal ridges, transversely rugose.

Fl. & Fr. : Apr. - Oct.

Distrib. : India : Western Ghats, between 300-1100 m. Karnataka, Tamil Nadu and Kerala.

Sri Lanka.

Note. This species is characterised by winged branches, conspicuously reticulate seeds and minute raphides on the leaves.

8. *Cissus heyneana* Planchon in DC., *Monogr. Phan.* 5: 476. 1887. *Vitis heyneana* Wallich ex Wight & Arn., *Prodr.* 125. 1834; *nom illegit.* (*non* Roemer & Schultes, 1819); M. Lawson in *Fl. Brit. India* 1: 647. 1875. *Cissus thwaitesii* Planchon in DC., *Monogr. Phan.* 5: 502. 1887.

Climbing shrubs; branches terete, fleshy, pale, glabrous, glaucous; tendrils stout, simple. Leaves ovate-cordate, distantly crenate-serrate at margins, 4.5-

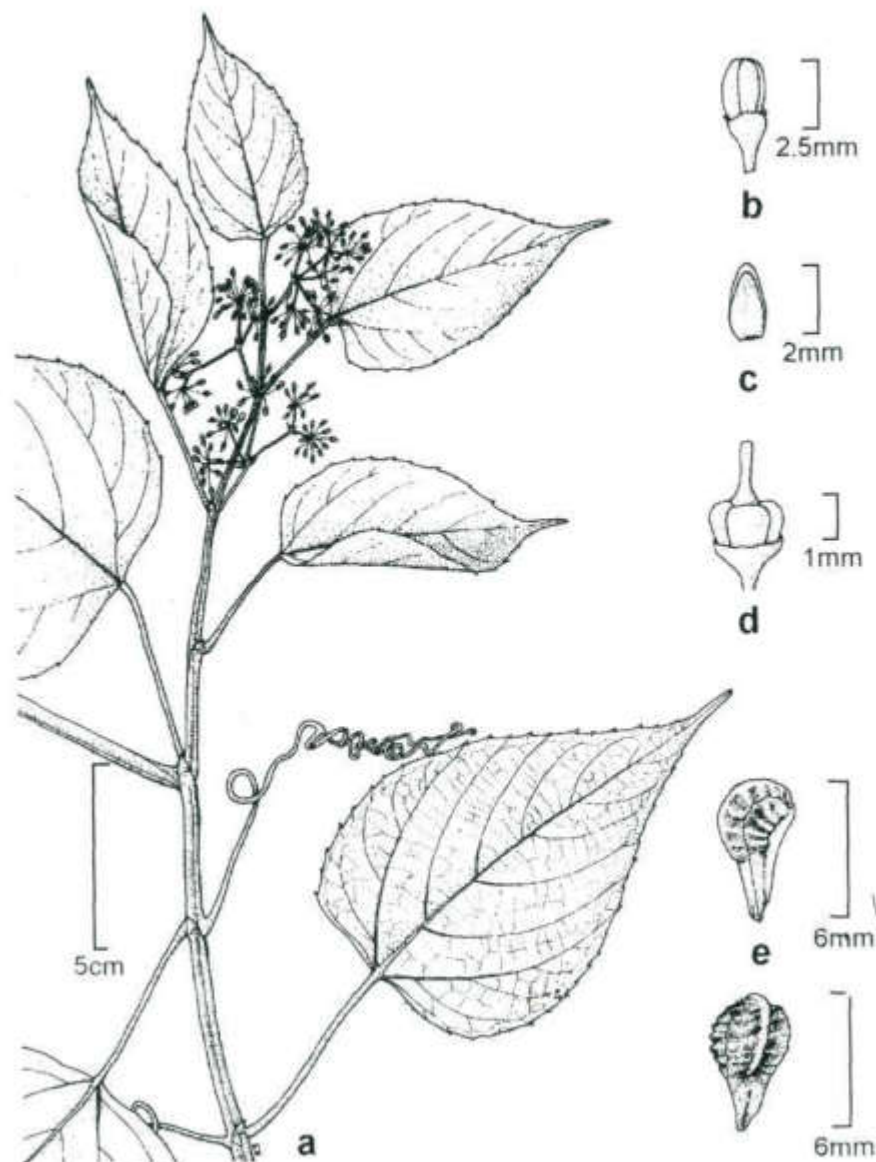


Fig. 62. *Cissus glyptocarpa* Thwaites : a. Habit; b. A flower bud; c. A petal; d. Gynoecium; e. Seed, side view; f. Seed, abaxial surface.

14 x 3-10 cm, acute at apex, leathery, glabrous, pale when dry; petioles 2.5-7 cm long. Inflorescences umbellate cymes, ca 2 cm long, bracteolate; peduncles ca 1 cm long. Flowers ca 2.5 mm long, glabrous; pedicels ca 3 mm long. Calyx cupular, obscurely 4-lobed. Petals oblong-ovate ca 2 mm long, acute, hooded. Stamens ca 1 mm long. Disc 4-lobed, covering ovary. Ovary ca 1 mm across; style stout; stigma minute. Berries pyriform when dry, ca 7 mm across, 1-seeded; fruiting pedicels clavate. Seeds obovoid, ca 7 x 4.5 mm, smooth except for the longitudinally encircling ridged raphe.

Fl. & Fr. : May - Oct.

Distrib. India : Tamil Nadu and Kerala.

Sri Lanka.

9. *Cissus latifolia* Lam., *Encycl.* 1: 30. 1783; Shetty & P. Singh in *Taxon* 37: 172. 1988. *Vitis glauca* sensu Wight & Arn., *Prodr.* 126. 1834. *p.p.*; M. Lawson in *Fl. Brit. India* 1: 648. 1875 *p.p.* *V. gigantea* Beddome in *Trans. Linn. Soc.* 25: 212. 1865. *Cissus gigantea* Beddome in *Madras J. Sci.* 22(2): 75. 1861. *C. wightii* Planchon in DC., *Monogr. Phan.* 5: 478. 1887. *C. glauca* sensu Gamble, *Fl. Pres. Madras* 1: 234. 1918. (*non Roxb.*, 1820).

Climbing shrubs; branches subterete, striate, glabrous, glaucous; tendrils forked. Leaves broadly ovate to suborbicular, 10-18 x 8-13 cm, acuminate at apex, cordate at base, bristly-serrate at margins; glabrous above, pubescent chiefly on nerves beneath, reticulations prominent; petioles 5-11 cm long, terete, glabrous. Inflorescences umbellate cymes, 4-10 cm long, bracteolate; peduncles 2-5 cm long, pubescent. Flowers globose, ca 2 mm across; pedicels 3-4 mm long, pubescent. Calyx cupular, subentire, membranous at margin. Petals oblong, ca 1 x 0.5 mm, puberulous. Stamens ca 1 mm long; anthers oblong-ovoid. Disc 4-notched and 4-lobed, covering about half of ovary. Ovary ca 1 mm across, pubescent at summit; style stout; stigma subcapitate. Berries pyriform, ca 7 mm across, 1-seeded. Seeds ca 7 x 4 mm, tessellated with angular facets on either side of the longitudinally encircling ridged raphe.

Distrib. India : Goa, Karnataka, Tamil Nadu and Kerala.

Sri Lanka.

10. *Cissus nodosa* Blume, *Catalogus* 39. 1823 & *Bijdr.* 182. 1825.
Vitis nodosa (Blume) Miq. *Ann. Mus. Bot. Lugd. Batav.* 1: 87. 1863.

Climbing shrubs; branches angular, striate, glabrous, tendrils simple. Leaves oblong-elliptic, 8-12 x 4-5 cm, acuminate at apex, rounded at base, faint-serrate at margins, coriaceous, glabrous; petioles *ca* 2 cm long, glabrous. Infructescences umbellate cymes, *ca* 5 cm long; fruiting peduncles *ca* 1 cm long. Berries subglobose, 8-10 mm across, 1 (-2)-seeded; fruiting pedicels *ca* 1 cm long. Seeds obovoid, slightly compressed laterally, apiculate at base, *ca* 9 x 7 mm, smooth except for the longitudinally encircling ridged raphe and a linear shallow pit on either side of it near base.

Fr. Jan. - March.

Distrib. India : Andaman Islands.

Malesia.

11. *Cissus quadrangularis* L., *Syst. Nat.* ed. 12. 2: 124. 1767 & *Mant.* Pl. 39. 1767. *Vitis quadrangularis* (L.) Wallich ex Wight, *Cat.* 26. 1833; Wight & Arn., *Prodr.* 125. 1834; M. Lawson in *Fl. Brit. India* 1: 645. 1875. *Cissus edulis* Dalz. in *Kew J. Bot.* 9: 248. 1857.

Beng.: *Harbhanga, Harjora*; Guj. *Chodhari, Vedhari*; Hindi: *Hadjora, Harsankari, Kandawel, Nallar*; Kan.: *Mangara balli*; Mal.: *Changalaparanda*; Mar.: *Chaudhari, Kandavela*; Sans.: *Asthisanhara, Vajravalli*; Tam.: *Pirandai*; Tel. *Nalleru, Nullerutigh.*

Ramblers; branches quadrangular with angles usually winged, succulent; tendrils stout, simple. Leaves ovate to reniform, 2-6 x 2-5 cm, sometimes 3-7-lobed, acute to obtuse at apex, truncate to cordate at base, subentire to denticulate at margins, glabrous; petioles 0.5-1 cm long; stipules broadly ovate, obtuse, *ca* 4 x 2 mm. Inflorescences umbellate cymes, 3-4 cm long; peduncles *ca* 2 cm long. Flowers 2.5-3 mm long; pedicels 2-4 mm long, glabrous. Calyx cupular, obscurely lobed, glabrous. Petals ovate-oblong, *ca* 2 x 1.5 mm, acute, hooded, glabrous. Stamens *ca* 1.5 mm long. Disc 4-lobed, covering

ovary. Ovary *ca* 1.5 mm across; style short, stout; stigma minute. Berries obovoid or globose, apiculate, *ca* 5 mm across, 1-2-seeded. Seeds obovoid, *ca* 5 x 4 mm, smooth except for the longitudinally encircling ridged raphe.

Fl. & Fr. : June - Jan.

Distrib. India : Bihar, West Bengal, Assam, Orissa, Gujarat, Maharashtra, Goa, Daman, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala and Lakshadweep.

Africa, Sri Lanka, Bangladesh, Myanmar, Indo-China, Indonesia (Java) and Philippines.

Note. In this species the stems are usually symmetrically 4-angled and winged but in some forms the wings are lacking (Shah, J.J. in J. Bombay Nat. Hist. Soc. 55: 591. f. 2. 1958; Shetty, B.V. in Bibliogr. Genet. 18: 189. f. 9. 1959). In another form, found only in cultivation in gardens, the stems are flattened with wings on only two opposite angles, the other two angles being suppressed (Shetty, B.V. l.c. 189. f. 10).

Chromosome number $2n=44-53$ [Ghimpu, V. in C.R. Assoc. Anat. (Paris): 11-114. 1929]; $2n=24$ [Raghavan, R.S. in Proc. Indian Acad. Sci. 45B : 294-298. 1957; Shetty, B.V. in Curr. Sci. 27: 358-359. 1958 & in Bibliogr. Genet. 18: 167-272. 1959; Vatsala, P. in La Cellule (Louvain) 61: 193-205. 1960; Hazra, R. & A. Sharma in Folia Biol. (Cracow) 18: 123-136. 1970]; $2n=48$ (Tchoume, M. These Doct. Sci. Nat. Fac. Sci. Abidjan 221. p.p. 1968).

Uses. Tender shoots and leaves are used in the preparation of *pappadams* and cooked as vegetable. Ash of the plant is used as a substitute for baking powder. The plant is rich in vitamin C. A paste made of stems is applied on forehead to get relief from headache and is also given in asthma. Tender branches made into a paste and mixed with milk is a purgative. Tender stems and leaves are used in the treatment of bronchitis. Juice of the plant is said to be beneficial in scurvy, used as an alterative, applied in cases of otorrhoea and epistaxis, and mixed with breast milk is given to infants in fever. Fresh pounded, shoots, are applied on burns and wounds, and on saddle-sores of horses and camels. The powdered root is used in the treatment of fractured bones. The plant yields a strong fibre and is also grown in gardens as an ornamental.

12. *Cissus repanda* Vahl, Symb. Bot. 3: 18. 1794. *Vitis repanda* (Vahl) Wight & Arn., Prodr. 125. 1834; M. Lawson in Fl. Brit. India 1: 648. 1875. *V. rosea* Royle. Illustr. Bot. Himal. 149. 1835. *Cissus rosea* (Royle) Walp., Rep. 1: 437. 1842.

Asm.: *Medmedia-lop*; Hindi: *Panibel*; Mar.: *Gendal*.

Large climbing shrubs; branches subterete, woody; young parts reddish, adpressed woolly; tendrils branched. Leaves suborbicular, sometimes 5-7-angled, 10-20 x 7-15 cm, acuminate at apex, deeply cordate at base, shortly dentate-serrate at margins, membranous, young ones densely reddish adpressed woolly, becoming glabrescent with age; petioles 3-7 cm long; stipules falcate, ca 5 x 2.5 mm, membranous, pubescent. Inflorescences lax, subcorymbosely branched, umbellate cymes, 5-11 cm long, bracteolate; peduncles 3-7 cm long, hairy. Flowers ca 3 mm long; pedicels 3-4 mm long, hairy. Calyx cupular, obscurely 4-lobed, hairy. Petals ovate, ca 2 x 1 mm, hooded, usually hairy. Stamens ca 1.5 mm long; anthers ovoid. Disc 4-lobed. Ovary ca 1 mm across; style stout; stigma capitate. Berries ellipsoid-pyriform, 5-7 mm across, mucronate, 1-seeded. Seeds obovoid, ca 8 x 5 mm, smooth except for the ridged raphe encircling longitudinally.

Fl. & Fr. : Feb. - Aug.

Distrib. India : Uttar Pradesh, Bihar, West Bengal, Arunachal Pradesh, Assam, Tripura, Orissa, Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, Goa, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Sri Lanka, Nepal, Bhutan, Bangladesh, Myanmar and Indo-China.

Note. Stems contain a large quantity of potable water.

13. *Cissus repens* Lam., Encycl. 1: 31. 1783; Planchon in DC., Monogr. Phan. 5: 504. 1887. *p.p.* *C. cordata* Roxb., Fl. Ind. 1: 407. 1820. *C. glauca* Roxb., Fl. Ind. 1: 425. 1820 & ed. 2. 1: 406. 1832. *Vitis repens*. (Lam.) Wight & Arn. in Wight, Cat. 58. 1833; M. Lawson in Fl. Brit. India 1: 646. 1875.

Fig. 63.

Kan.: *Elakom bullaballi*; Kh.: *Meihurijarap*, *Meijakhajrap*; Mal.: *Meriampulli*; Or.: *Diboria*; Tel.: *Kuppikodda*, *Nelaboddu*, *Roggw lambot*.

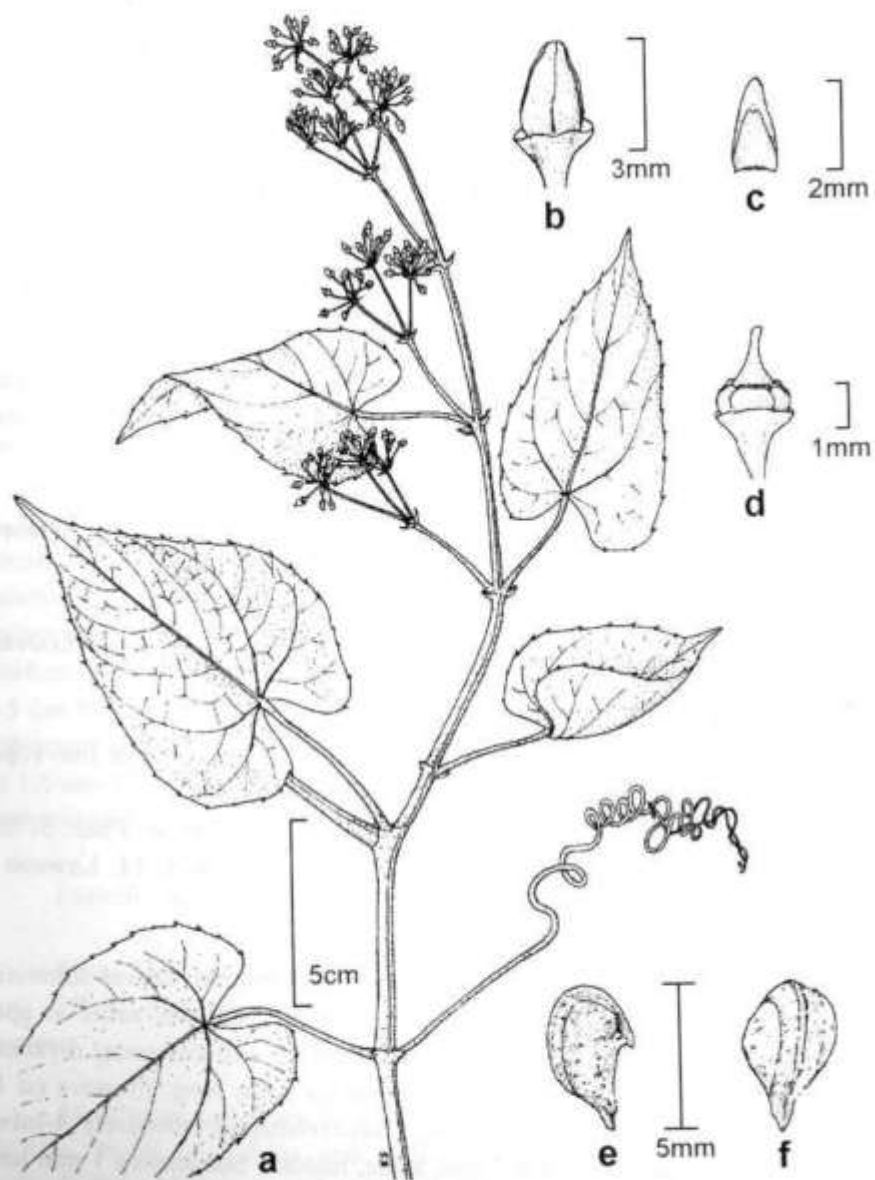


Fig. 63. *Cissus repens* Lam. : a. Habit; b. A flower bud; c. A petal; d. Gynoecium; e. Seed, side view; f. Seed, abaxial surface.

Large climbing shrubs; branches angular, striate, glabrous, glaucous; tendrils branched. Leaves ovate, 7-15 x 5-11 cm, acuminate at apex, cordate at base, dentate-crenate at margins, membranous, glabrous; petioles 2.5-9 cm long. Inflorescences corymbose, umbellate cymes, 5-10 cm long, bracteolate; peduncles 2.5-5 cm long. Flowers 2.5-3 mm long, contorted at apex; pedicels 3-6 mm long, glabrous. Calyx cupular, subtruncate, glabrous. Petals oblong-ovate, *ca* 2 x 1 mm, acute, slightly hooded, glabrous. Stamens *ca* 1 mm long; anthers oblong. Disc 4-lobed, covering ovary. Ovary *ca* 1 mm across; style stout; stigma minute. Berries ellipsoid-pyriform, *ca* 5 mm across, fleshy, 1-seeded. Seeds *ca* 5 x 3 mm with the longitudinally encircling ridged raphe.

Fl. & Fr. : Apr. - Dec.

Distrib. India : West Bengal, Sikkim, Arunachal Pradesh, Assam, Meghalaya, Orissa, Goa, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala and Andaman & Nicobar Islands.

Nepal to Taiwan, Myanmar, Thailand, Indo-China, Malesia and Indonesia (Java).

Note. Chromosome number $2n=96$ [Vatsala, P. in *La Cellule* (Louvain) 61: 193-205. 1960].

Uses. The leaves are used as a vegetable. Stems are made into ropes.

14. *Cissus spectabilis* (Kurz) Planchon in DC., *Monogr. Phan.* 5: 507. 1887. *Vitis spectabilis* Kurz in *J. Bot. n.s.* 3: 196. 1874; M. Lawson in *Fl. Brit. India* 1: 649. 1875.

Erect shrubs; branches upright, striate, soft-pubescent. Leaves sessile, broad-ovate, rhomboid or suborbicular, 13-20 x 13-20 cm, acute at apex, shallowly cordate at base, dentate-serrate at margins. Inflorescences divaricate cymes, *ca* 6 cm long, pubescent; peduncles *ca* 3 cm long. Flowers *ca* 1.5 mm long; pedicels 2-3 mm long. Calyx saucer-shaped, obscurely 4-lobed. Petals oblong-ovate, *ca* 1.5 x 0.7 mm, acute, hooded. Stamens *ca* 1 mm long; anthers globose. Disc 4-notched, covering ovary. Ovary *ca* 1 mm across; style stout, *ca* 1 mm long; stigma minute.

Fl. : June.

Distrib. India : West Bengal and Sikkim. Endemic.

Note. Apart from the type (Sikkim Terai, *S. Kurz s.n.* K! CAL!), there are very few other collections present in various herbaria. All of them are from Sikkim, Siliguri and its neighbouring localities of West Bengal, and are more than hundred years old.

15. *Cissus subramanyamii* Shetty & P. Singh, *sp. nov.*

Cissus arnottiana Shetty & P. Singh affinis, sed habitu magiore scandenti; foliis coriaceis, atroviridibus, margine repandos-serratis differt.

Typus: India, Tamil Nadu, Vilpattivalley R.f., *M. Chandrabose* - 51372 (holotypus CAL; isotypus MH).

Enormous climbers; branches smooth, fleshy, glaucous; tendrils stout, simple. Leaves suborbicular, slightly 3-5-lobed, 18-25 x 15-20 cm, acute to subobtusate at apex, deep cordate-sagittate at base, repand-serrate at margins, coriaceous, dark green; petioles 6-9 cm long, twisted at base; stipules slightly reniform, 4-5 x 2-3 mm. Inflorescences umbellate cymes, 5-7 cm long; peduncles 4-5 cm long, pubescent. Flowers *ca* 3.5 mm long; pedicels *ca* 8 mm long, pubescent. Calyx cupular. Petals *ca* 3 x 2 mm, hooded, pinkish red. Stamens *ca* 1.5 mm long. Disc 4-lobed, fleshy, white. Ovary *ca* 1 mm across, glabrous; style conical; stigma minute. Berries not seen.

Distrib. India : Tamil Nadu. Endemic.

Note. This species is allied to *Cissus arnottiana* Shetty & P. Singh, but differs in being enormous climbers and in the texture and colour of leaves.

16. *Cissus trilobata* Lam., *Encycl.* 1: 31. 1783. *Vitis rheedei* Wight & Arn., *Prodr. Fl. Penins. Ind. Orient.* 127. 1834; M. Lawson in *Fl. Brit India* 1: 653. 1875. *nom. illegit.* *Puria trilobata* (Lam.) Nair in *Biol. Land. Pl.* 127. 1972.

Fig. 64.

Climbing shrubs; branches terete, subfleshy, glabrous; tendrils stout, simple. Leaves 3-foliolate or 3-lobed, glabrous; petioles 3.5-6 cm long; terminal leaflets elliptic-lanceolate, 8-15 x 2.5-4 cm, acute-acuminate at apex, attenuate at base, bristly-serrate at margins; petiolules *ca* 4 mm long; lateral leaflets subsessile, oblique at base, otherwise as in terminal leaflets. Inflorescences divaricate, subumbellate cymes, 2.5-4 cm long; peduncles *ca* 1 cm long. Flowers *ca* 2.5 mm long; pedicels 2-3 mm long. Calyx saucer-shaped, subtruncate, glabrous. Petals oblong ovate, *ca* 2 x 1 mm, acute, hooded, glabrous. Stamens *ca* 1.5 mm long; filaments flattened; anthers oblong. Disc 4-lobed, enclosing ovary. Ovary *ca* 1.5 mm across; style stout; stigma subcapitate. Berries obovoid, 6-7 mm across, black, 1-seeded. Seeds *ca* 6 x 4 mm, mucronate, slightly laterally compressed, smooth except for the ridged raphe encircling longitudinally and the 2 shallow pits at base.

Fl. & Fr. : May - March.

Distrib. India : Tamil Nadu, Kerala and Lakshadweep.

Sri Lanka.

Note. Chromosome number $2n=24$ [Vatsala, P. in *La Cellule* (Louvain) 61: 193-205. 1960].

Nair (in Puri, V. *et al.*, *Biol. Land Pl.* 127. 1974) erected a new genus, *Puria* to accommodate this species mainly on the basis of an embryological peculiarity. But morphological features and cytological data support its placement in the genus *Cissus*.

17. *Cissus vitiginea* L., *Sp. Pl.* 117. 1753; Planchon in DC. *Monogr. Phan.* 5: 472. 1887. *Vitis linnaei* Wight & Arn., *Prodr.* 126. 1834; M. Lawson in *Fl. Brit. India* 1: 649. 1875.

Tel.: *Godhuma theega, Gummadi, Nela gummadi, Tbeega, Vorupaku*

Erect or climbing shrubs, rarely trees; branches subterete, striate, covered with short grey or fulvous pubescence; tendrils when present stout, simple or rarely branched. Leaves rotund-ovate to deeply 3-5 lobed, 3.5-16 x 4-15 cm, acute to obtuse at apex, cordate to truncate at base, dentate at margins,

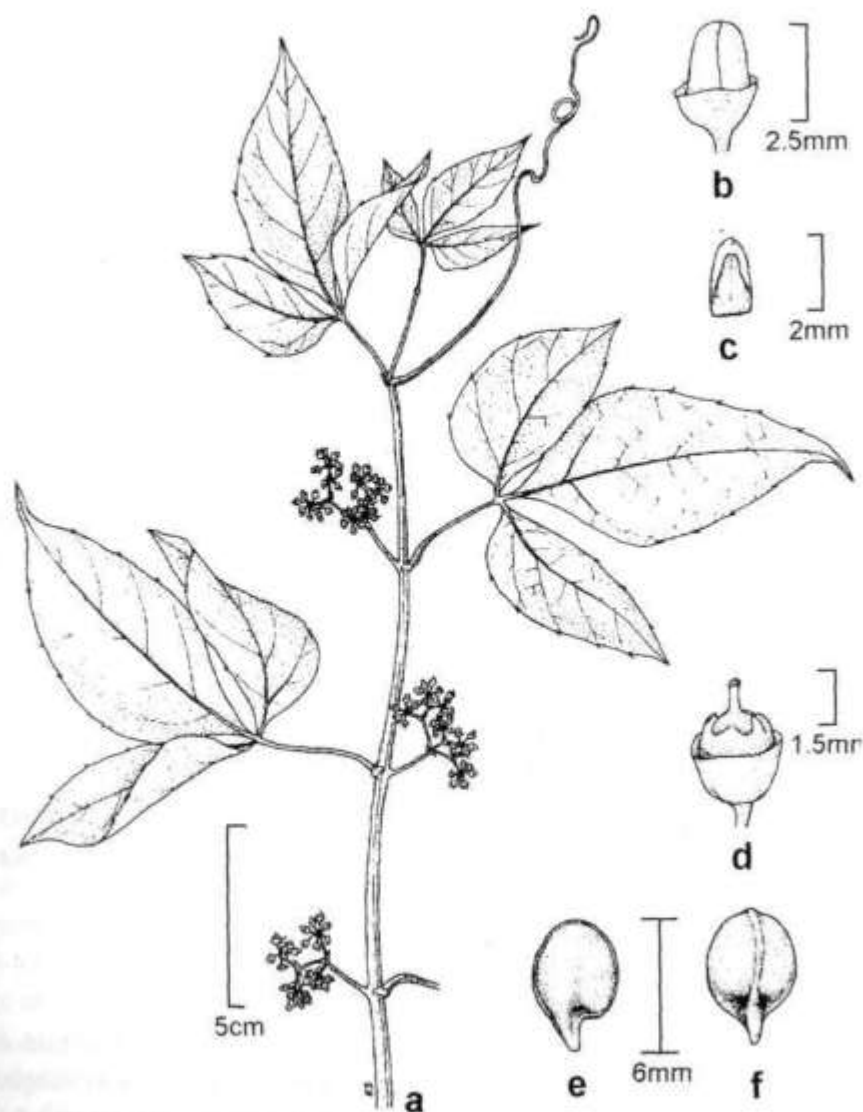


Fig. 64. *Cissus trilobata* Lam. : a. Habit; b. A flower bud; c. A petal; d. Gynoecium; e. Seed, side view; f. Seed, abaxial surface.

puberulous above, grey pubescent beneath; petioles 1-9 cm long, pubescent; stipules ovate, *ca* 2 x 2 mm, obtuse, membranous, pubescent. Inflorescences umbellate cymes, 5-7 cm long; peduncles 2-4 cm long. Flowers *ca* 2 mm long; pedicels 2-4 mm long, pubescent. Calyx cupular, 4-lobed, pubescent. Petals oblong-ovate, *ca* 2 x 1 mm, hooded, pubescent. Stamens *ca* 1 mm long; anthers oblong. Disc 4-lobed, fleshy, covering ovary. Ovary *ca* 1 mm across; style short; stigma minute. Berries pyriform, apiculate, 5-7 mm across, purple with a glaucous bloom on surface, 1-seeded. Seeds 7-8 x 5-7 mm, tessellated on either side of raphe with angular facets.

Fl. & Fr. : May - Dec.

Distrib. India : Orissa, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Sri Lanka.

Note. The species rarely shows arborescent habit with rather stunted and dichotomously branched trees reaching a height of 4-5 m and having a trunk of about 60 cm diameter. (Ellis, J.L. & M.S. Swaminathan in J. Bombay Nat. Hist. Soc. 72: 230. 1975).

Chromosome number $2n=26$ (Shetty, B.V. in *Curr. Sci.* 27: 358-359. 1958 & in *Bibliogr. Genet.* 18: 167-272. 1959).

18. *Cissus woodrowii* (Stapf ex T. Cooke) Santapau in *Kew. Bull.* 1948: 276. 1948 & *Fl. Purandhar* 34. 1957. *Vitis woodrowii* Stapf ex T. Cooke, *Fl. Bombay* 1: 248. 1902.

Mar.: *Girnul.*

Erect shrubs; branches stout, sulcate, glabrous; tendrils absent. Leaves ovate to rotund, usually 3-lobed, cordate with a broad sinus, crenate at margins with crenatures incurved, 20-30 x 20-25 cm, acute to acuminate at apex, young ones pubescent beneath; petioles 15-25 cm long, pubescent when young; stipules triangular-ovate, caducous. Inflorescences compound umbels, 4-7 cm long; peduncles 2-5 cm long. Flowers *ca* 3 mm long; pedicels *ca* 4 mm

long. Calyx cupular, entire or obscurely lobed. Petals *ca* 2.5 mm long, hooded. Disc 4-lobed, covering ovary. Ovary *ca* 1 mm across; style short, stout, conical; stigma minute. Berries obovoid-globose, *ca* 6 mm across, 1-seeded. Seeds *ca* 6 x 5 mm with longitudinally encircling raphe.

Fl. & Fr. : May - Sept.

Distrib. India : Maharashtra.

Notes. This species is very closely allied to *Cissus arnottiana* Shetty & P. Singh. Talbot (in Forest Fl. Bombay 1: 309. 1909) merged it with *C. pallida* sensu Planchon (= *Cissus arnottiana* Shetty & P. Singh). Further field studies are desirable for determining the status of these species.

Chromosome number $2n=24$ (Patil, V.P. *et al.* in Curr. Sci. 49: 37-38. 1980).

CULTIVATED SPECIES

Cissus rotundifolia Vahl, Symb. Bot. 3: 19. 1794.

A native of N. America, often cultivated in gardens.

5. *Cyphostemma* (Planchon) Alston

Erect, prostrate, rambling or climbing herbs or shrubs; tendrils leaf-opposed or absent. Leaves usually 3-9-foliolate, digitate, rarely simple, petiolate or sessile; stipules conspicuous. Inflorescences axillary or pseudo-terminal, corymbose cymes, pedunculate. Flowers bisexual, lageniform. Calyx truncate or 4-lobed. Petals 4, free, oblong, hooded at apex. Stamens 4: filaments filiform. Disc of 4 fleshy, truncate or conical glands, adnate to ovary but free from each other. Ovary glabrous or hairy; style subulate; stigma minutely 2-fid or subentire and minutely subcapitate. Berries usually globose, 1-seeded. Seeds with a dorsal crest and often rugose; endosperm M-shaped in cross section.

Africa, Madagascar, Mauritius, India and Sri Lanka with most of the species endemic to Africa; *ca* 200 species, 2 in India.

Note. This genus was earlier treated as a sections or subgenus under *Cissus* However, the present authors have followed, Alston [in Trimen, Handb. Fl. Ceylon 6 (suppl.): 53. 1931] and Descoings [in Notul. Syst. (Paris) 16: 113. 1960] maintained it as a distinct genus.

KEY TO THE SPECIES

- | | |
|--|---------------------------------|
| 1a. Leaves 5-foliolate; petioles 7-15 cm long; berries glabrous. | 1. <i>C. auriculatum</i> |
| b. Leaves 3-foliolate, subsessile; berries glandular-hispid. | 2. <i>C. setosum</i> |

1. *Cyphostemma auriculatum* (Roxb.) P. Singh & Shetty in Taxon 35: 596. 1986. *Cissus auriculata* Roxb., Fl. Ind. 1: 430. 1820. *Vitis auriculata* (Roxb.) Wallich ex M. Lawson in Fl. Brit. India 1: 658. 1875. *V. erythroclada* Kurz in J. Asi. Soc. Bengal 41: 301. 1872, *Cayratia auriculata* (Roxb.) Gamble, Fl. Pres. Madras 237. 1918.

Fig. 65.

Guj.: *Khat-khatamo*; Kan. *Punditaballi*; Mar.: *Kalivel, Jangli-kajorni*; Tam.: *Ainthilakkeerai*; Tel. *Kurapalleru, Kutamu, Pulusa*.

Large climbing shrubs; bark of older stems spongy and deeply cracked; branches terete, succulent, softly pubescent; tendrils branched. Leaves 5-foliolate, digitate, softly pubescent when young; petioles 7-15 cm long; stipules falcate, *ca* 1 x 0.5 cm; terminal leaflets obovate to rhomboidal or elliptic, 10-13 x 5.5-8.5 cm, acute or shortly acuminate at apex, cuneate at base, serrate at margins; petiolules 1-2 cm long; lateral leaflets 7-12 x 4-7 cm, petiolules *ca* 1 cm long. Inflorescences axillary or pseudo-terminal, much branched, divaricate cymes, 11-26 cm long; peduncles *ca* 8-19 cm long, pubescent. Flowers *ca* 3 mm long, contracted in the middle; pedicels 2-3 mm long, pubescent. Calyx cupular, truncate, pubescent. Petals oblong, hooded, *ca* 2.5 x 1.5 mm. Stamens *ca* 2 mm long; anthers globose. Disc of 4 glands, almost covering the ovary. Ovary pyramidal, *ca* 1.5 mm across, hairy; style *ca* 1 mm long. Berries globose, *ca* 1 cm across, red glabrous 1-seeded. Seeds oblong-obovoid to subglobose *ca* 8 x 5 mm; with a crest on dorsal side; endosperm M-shaped in cross section.

Fl. & Fr. : July - Nov.

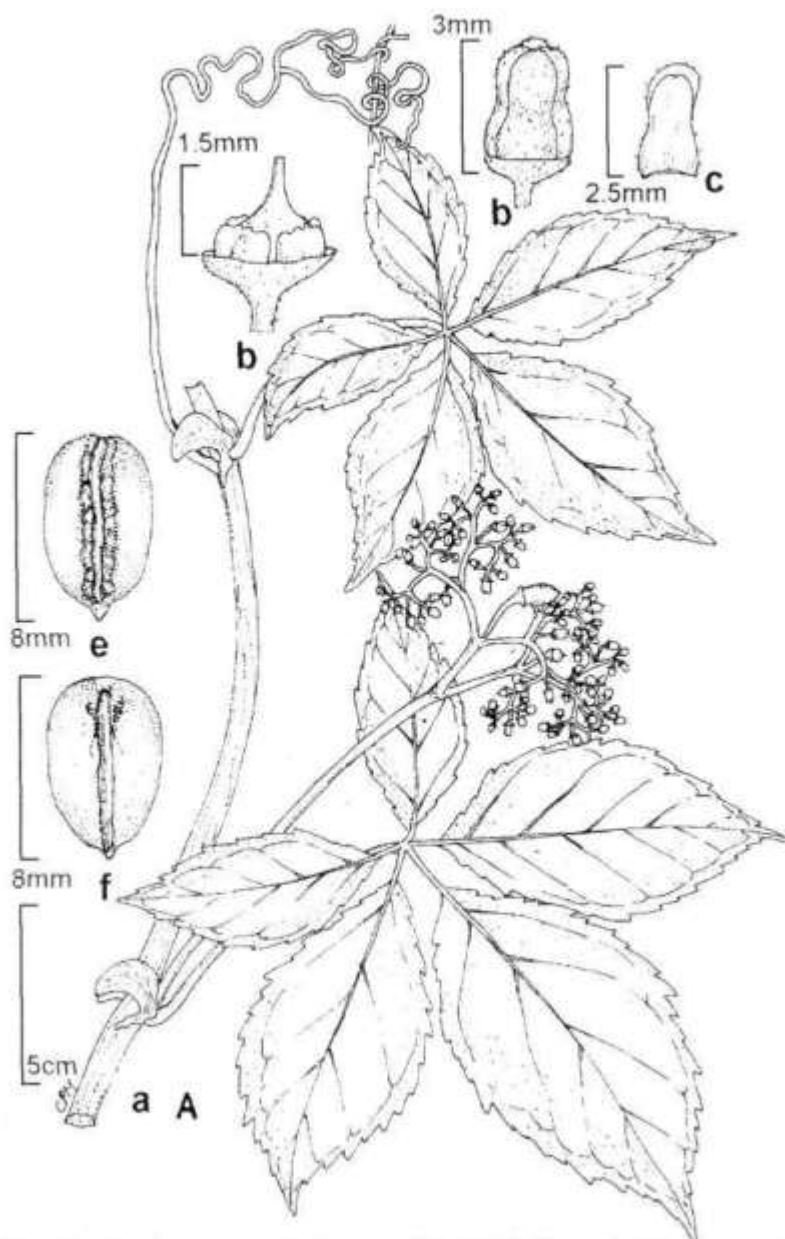


Fig. 65. *Cyphostemma auriculatum* (Roxb.) P. Singh & Shetty : **a.** Habit; **b.** A flower bud; **c.** A petal; **d.** Gynoecium; **e.** Seed, abaxial surface; **f.** Seed, adaxial surface.

Distrib. India : Bihar, West Bengal, Orissa, Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, Goa, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Bangladesh and Myanmar.

2. *Cyphostemma setosum* (Roxb.) Alston in Trimen, Handb. Fl. Ceylon 6(Suppl.): 53. 1931. *Cissus setosa* Roxb., Fl. Ind. 1: 428. 1820. *Vitis setosa* (Roxb.) Wallich ex Wight & Arn. in Wight, Cat. 26. 1833 & Prodr. 127, 1834; M. Lawson in Fl. Brit. India 1: 654. 1875. **Fig. 66.**

Hindi: *Harmal*; Kan.: *Talavaranaballi*; Mar.: *Khajgolichavel*; Tam.: *Kangu kelari*, *Kauri*, *Pulinaralai*, *Pulipirandai*, *Sangugelari*, *Sugambal*; Tel.: *Barrebacbali*, *Pullabachali*.

Herbaceous scramblers or climbers; branches striate, sulcate, succulent, covered with glandular bristly hairs; tendrils branched. Leaves sessile, 3-foliolate, sometimes the lower ones simple, glabrescent above, glandular-hispid beneath; stipules broadly ovate, acute; leaflets elliptic to obovate-oblong, 5-12 x 3-5 cm, acute to obtuse at apex, acute to obtuse or subtruncate at base, irregularly serrate to lacinate at margins, petiolules up to 1 cm long. Inflorescences dichotomous or trichotomous, lax, divaricate, cymes, 5-14 cm long; peduncles 2.5-8.5 cm long, glandular-hispid. Flowers lageniform, *ca* 2.5 mm long; pedicels 2-3 mm long, glandular-hispid. Calyx cupular, subtruncate, glabrous. Petals oblong, hooded, *ca* 2 x 1 mm, glabrous. Stamens *ca* 2 mm long. Disc of 4 truncate glands. Ovary *ca* 1.5 mm across; style subulate. Berries ovoid, 6-7 mm across, red, glandular-hispid, 1-seeded. Seeds subglobose, 7-8 x 5-6 mm, crenate on margin.

Fl. & Fr. : Almost throughout the year.

Distrib. India : Dry localities in peninsular India, on dry stony hills up to 800 m, sometimes on black soil plains. Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.

Sri Lanka.

Note. Chromosome number $2n = 22$ (Shetty, B.V. in *Curr. Sci.* 27: 358-359. 1958 & in *Bibliogr. Genet.* 18: 167-278. 1959 - sub *Cissus setosa* Roxb.).

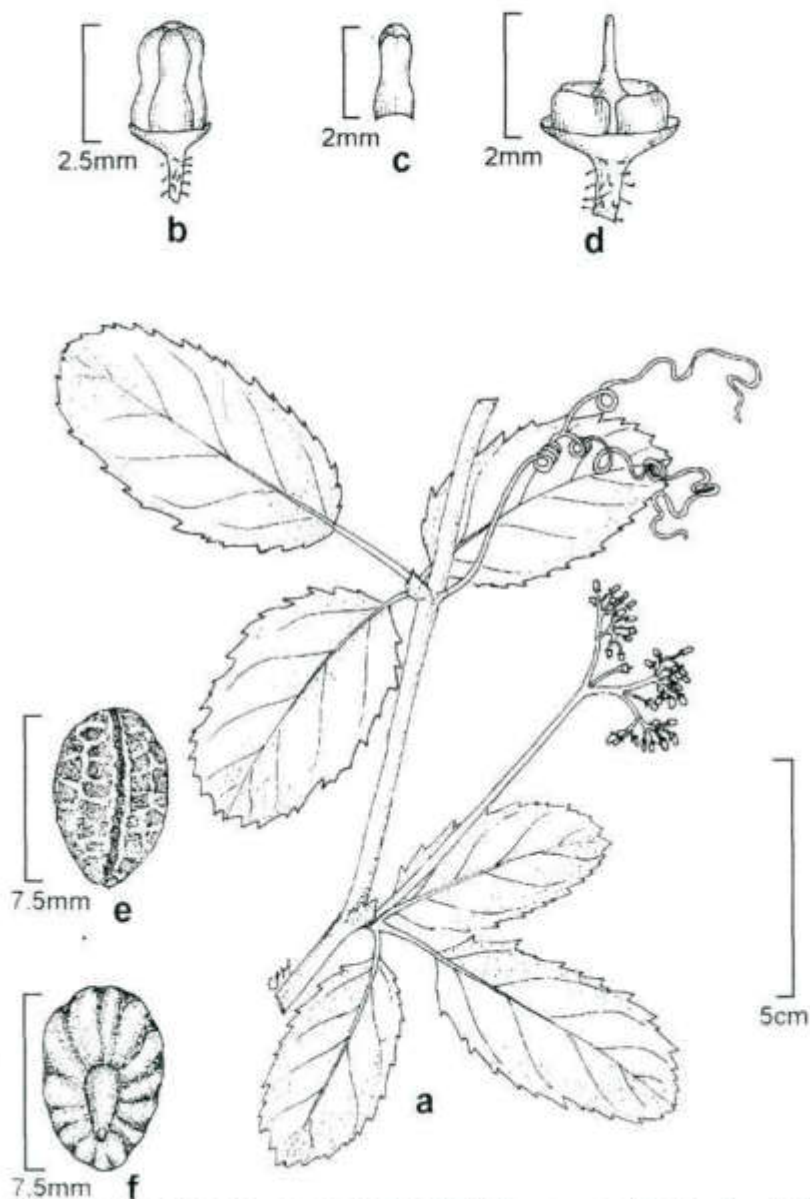


Fig. 66. *Cyphostemma setosum* (Roxb.) Alston : **a.** Habit; **b.** A flower bud; **c.** A petal; **d.** Gynoecium; **e.** Seed, abaxial surface; **f.** Seed, adaxial surface.

Uses. The leaves are applied to ulcers to promote suppuration and to assist in the extraction of Guinea worms.

6. *Parthenocissus* Planchon

Climbing shrubs; tendrils branched, usually with adhesive discs at tips. Leaves 3-5-foliolate, digitate, long petioled; leaflets sessile to petiolulate. Inflorescences leaf-opposed or terminal, pedunculate, corymbose cymes. Flowers bisexual, greenish to reddish brown. Calyx cupular, truncate or obscurely 5-lobed. Petals 5, free, concave. Stamens 5. Disc thin, obscure, fused with ovary. Style short, stout; stigma subcapitate, small. Berries subglobose, dark blue to black, 1-4-seeded. Seeds obovate to obovate-suborbicular; adaxial surface keeled, angular with two narrow parallel infolds; abaxial surface convex with a rounded or elliptic chalazal knot.

In tropical and temperate regions of eastern Asia and North America, but mainly centred in Asia occurring at high altitudes in the Himalayas and hills of Peninsular India; *ca* 15 species, 2 in India.

KEY TO THE SPECIES

- | | |
|--|--------------------------|
| 1a. Leaves 3-foliolate; petals with a linear 2-fid appendage at apex | 1. <i>P. semicordata</i> |
| b. Leaves (3-) 4-5-foliolate; petals without linear 2-fid appendage | 2. <i>P. thomsonii</i> |

1. *Parthenocissus semicordata* (Wallich) Planchon in DC., Monogr. Phan. 5: 451. 1887. *Vitis semicordata* Wallich in Roxb., Fl. Ind. 2: 481. 1824. *Ampelopsis himalayana* Royle, Illustr. Himal. Bot. 149. 1835. *Vitis neilgherriensis* Wight, Ic. Pl. Ind. Orient. 3: t. 965. 1845. *V. anamalayana* Beddome in Trans. Linn. Soc. 25: 213. 1865; M. Lawson in Fl. Brit. India 1: 656. 1875. *V. himalayana* (Royle) Brandis, For. Fl. 100. 1874; M. Lawson in Fl. Brit. India 1: 655. 1875. *Parthenocissus himalayana* (Royle) Planchon in DC., Monogr. Phan. 5: 450. 1887. *P. cuspidifera* Planchon, in DC., Monogr. Phan. 5: 451. 1887. *Vitis himalayana* (Royle) Brandis var. *semicordata* (Wallich) M. Lawson in Fl. Brit. India 1: 656. 1875.

Garh.: *Laderi, Laduli*; Hindi: *Chappar-tang*; Lep.: *Hlotagbret*.

Large climbing shrubs; branches rough, furrowed, young parts hispid-pubescent or glabrous; tendrils branched, usually with adhesive tips. Leaves 3-foliolate, glabrous or hispid-pubescent beneath on nerves; petioles up to 15 cm long; terminal leaflets ovate-obovate, 8-18 x 4-10 cm, acuminate at apex, cuneate or rounded at base, cuspidate-serrate at margins; lateral leaflets 8-16 x 4-8 cm, oblique, margins and apex as in terminal leaflets, petiolules up to 1 cm long. Inflorescences leaf-opposed or terminal, lax, divaricate cymes. Flowers 3-4 mm long, yellowish green or reddish brown; pedicels 1-3 mm long, glabrous. Calyx angular, truncate to irregularly 5-lobed, glabrous. Petals oblong, 2.5-3.5 mm, hooded and with a linear 2-fid appendage at apex, glabrous. Stamens *ca* 2 mm long. Ovary *ca* 1.5 mm across; style stout; stigma subcapitate. Berries *ca* 7 mm across. Seeds *ca* 6 x 5 mm; adaxial surface keeled; abaxial surface with an elliptic chalazal knot.

KEY TO THE VARIETIES

- 1a. Young branches, petioles and nerves on lower surface of leaves hispid-pubescent 1.2 var. *semicordata*
 b. Young branches, petioles and nerves on lower surface of leaves glabrous or almost glabrous 1.1 var. *roylei*

1.1 var. *roylei* (King) Raiz. & Saxena in Indian For. 92: 319. 1966.
Vitis semicordata Wallich var. *roylei* King in J. As. Soc. Bengal 65: 113. 1896. **Fig. 67.**

Garh.: *Philuna*; Hindi: *Chapper-tang, Laderi*; Lep.: *Hlotagbret*; Nep.: *Charchare*.

Distrib. India: Himachal Pradesh, Punjab, Uttar Pradesh, Meghalaya, Tamil Nadu and Kerala.

Pakistan, Nepal, Bhutan, W. China, Myanmar, Thailand and Malesia.

Note. Chromosome number $2n=40$ (Shetty, B.V. in Curr. Sci. 27: 358-359. 1958 & in Bibliogr. Genet. 18: 167-272. 1959).

Uses. The wood is strong, hard, dark brown with silver-grains and is suitable for picture frames and such other purposes. The young vines are

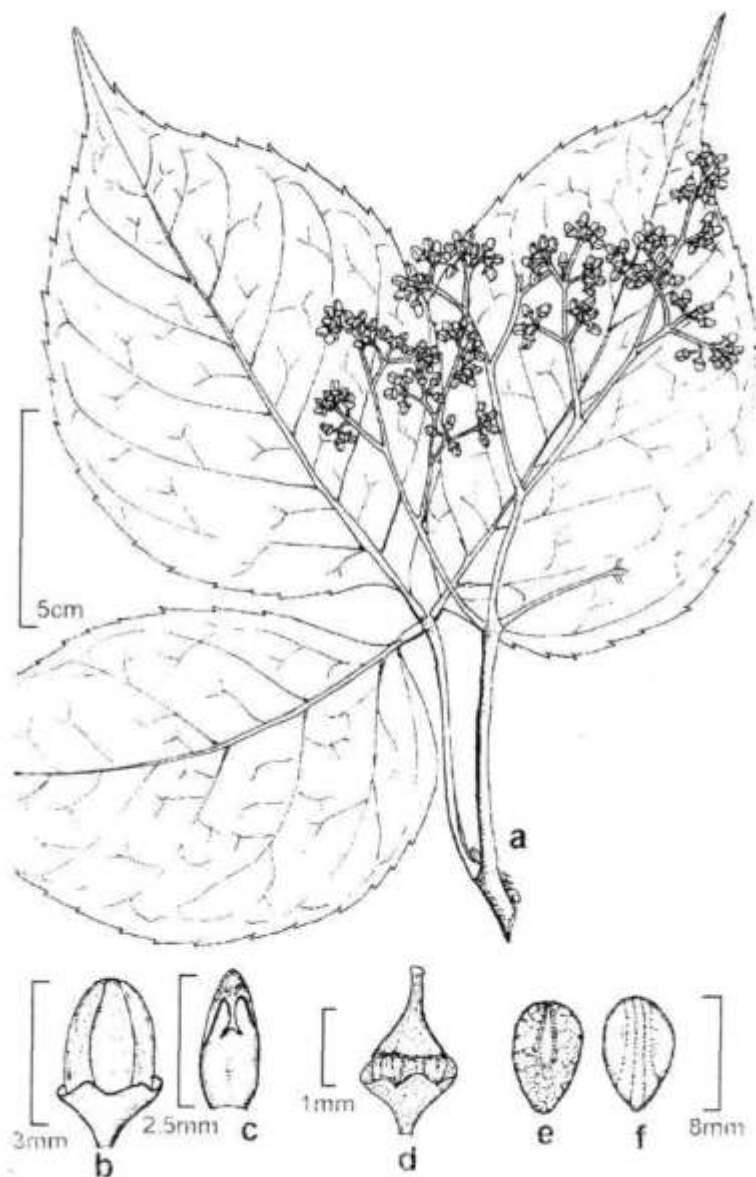


Fig. 67. *Parthenocissus semicordata* (Wallich) Planchon var. *roylei* (King) Raizada & Saxena : **a.** Habit; **b.** A flower bud; **c.** A petal; **d.** Gynoecium; **e.** Seed, abaxial surface; **f.** Seed, adaxial surface.

used for tying bundles of grass. The leaves are used as fodder and the berries are said to be edible.

1.2 var. *semicordata*.

Distrib. India : Himachal Pradesh, Uttar Pradesh, West Bengal, Sikkim Meghalaya and Nagaland.

Pakistan, Nepal and Bhutan.

2. *Parthenocissus thomsonii* (M. Lawson) Planchon in DC., Monogr. Phan. 5: 453. 1887; P. Singh & Shetty in Taxon 35: 596. 1986. *Vitis thomsonii* M. Lawson in Fl. Brit. India 1: 657. 1875. *Cissus thomsonii* (M. Lawson) Planchon in DC., Monogr. Phan. 5: 565. 1887.

Climbing shrubs; branches striate, glabrous; tendrils branched. Leaves (3) 4-5-foliolate, digitate, slightly hispid-pubescent on nerves beneath; petioles up to 9 cm long, hispid-pubescent; leaflets elliptic-lanceolate to ovate, 3-10 x 1.5-4.5 cm, acute-acuminate at apex, acute or rounded at base, upper half serrate at margins; petiolules 2-15 mm long, glabrous. Inflorescences leaf-opposed, dichotomous, corymbose cymes; peduncles *ca* 2.5 cm long. Flowers *ca* 3 mm long, glabrous; pedicels *ca* 5 mm long. Calyx cupular, entire. Petals oblong, *ca* 2 x 1 mm. Stamens *ca* 1 mm long. Disc fused with ovary, inconspicuous. Ovary *ca* 1 mm across; style stout; stigma subcapitate. Berries *ca* 5 mm across. Seeds obovoid, *ca* 5 x 4 mm; adaxial surface keeled; abaxial surface with an elliptic chalazal knot.

Fl. : May.

Distrib. India : Arunachal Pradesh and Meghalaya.

Nepal and W. & C. China.

Notes. Chromosome number $2n=40$ (Lavie, P., Contribution 'I' etude caryosystematique des vitacees. These Doct. Ing. Fac. Sci. Univ. Montpellier, Fasc. 1: 186. 1970).

CULTIVATED SPECIES

Parthenocissus quinquefolia (L.) Planchon in DC., Monogr. Phan. 5: 448. 1887.

A native of N. America, cultivated as an ornamental in gardens.

Parthenocissus tricuspidata (Sieb. & Zucc.) Planchon in DC., Monogr. Phan. 5: 451. 1887.

A native of Japan and C. China, cultivated in gardens as an ornamental.

7. *Tetrastigma* (Miq.) Planchon

Large, woody or rarely herbaceous, dioecious vines; tendrils leaf-opposed, simple or branched. Leaves 3-7-foliolate, digitate or pedate, petiolate, hairy to glabrous; leaflets petiolulate to sessile. Inflorescence axillary; cymes, pedunculate. Flowers unisexual. Calyx cupular or saucer-shaped, truncate or obscurely 4-lobed. Petals 4, free, usually hooded and sometimes with a dorsal spur at apex. Stamens 4; filaments short; anthers oblong-oval. Disc usually distinct, 4-lobed. Style short, thick or simulating ovary; stigma broad, usually 4-lobed. Berries globose or ellipsoid, usually succulent, 1-4-seeded. Seeds obovate to elliptic-oblong; adaxial surface with a linear filiform raphe; abaxial surface with a linear, spatulate or orbicular chalazal knot; endosperm T-shaped in cross section.

Chiefly distributed in South-east Asia and Indo-Malesia, one species in Australia; *ca* 95 species, 16 in India.

Note. *Tetrastigma* shares the character of 4-merous flowers with *Cissus*, *Cayratia* and *Cyphostemma*, but in all these genera the flowers are bisexual and the stigma simple or slightly 2-fid.

KEY TO THE SPECIES

- | | |
|--|---|
| 1a. Leaves digitately 3-6-foliolate | 2 |
| b. Leaves pedately 3-7-foliolate | 8 |
| 2a. Petals of at least male flowers with a dorsal spur | 3 |

- b. Petals without dorsal spur 4
- 3a. Petals *ca* 2.5 mm long; ovary pubescent; berries ellipsoid, 1.5-2.5 cm across; seeds 11-14 x 9-10 mm; leaves 3-5-foliolate 11. *T. obovatum*
- b. Petals *ca* 1 mm long; ovary glabrous; berries globose, 6-9 mm across; seeds *ca* 6 x 5 mm; leaves 3-foliolate 4. *T. bracteolatum*
- 4a. Flowers rusty pubescent; berries oblong-ovoid; seeds oblong-ellipsoid, more than 10 mm long 5. *T. campylocarpum*
- b. Flowers not rusty pubescent; berries globose; seeds globose to oblong-ovoid, less than 10 mm long 5
- 5a. Berries *ca* 2 cm across; seeds *ca* 10 x 5 mm 13. *T. planicaule*
- b. Berries less than 1 cm across; seeds 6-7 x 5 mm 6
- 6a. Leaves 5-foliolate; leaflets subsessile with cuspidate-serrate margins; calyx ciliate at margin 12. *T. obtectum*
- b. Leaves 3-foliolate; leaflets petiolulate with obscurely serrate-dentate to subentire margins; calyx not ciliate at margin 7
- 7a. Leaflets elliptic-obovate; petiolules of terminal leaflets 1.5-2.5 cm long; ovary glabrous; berries 1-seeded. 7. *T. gamblei*
- b. Leaflets elliptic-lanceolate; petiolules of terminal leaflets *ca* 7 mm long; ovary pubescent; berries 2-4-seeded 3. *T. angustifolium*
- 8a. Berries more than 2 cm across; seeds 11-12 x 5-7 mm 9
- b. Berries less than 1 cm across; seeds 5-10 x 3.5-6 mm 10
- 9a. Branchlets muricate; venation between secondary veins of leaflets prominent 16. *T. sulcatum*
- b. Branchlets smooth; venation between secondary veins of leaflets obscure 8. *T. hookeri*
- 10a. Berries turbinate-globose; seeds triangular-obcordate, adaxial surface with a prominent central longitudinal ridge 14. *T. rumicispermum*
- b. Berries globose or ovoid; seeds obovoid, oblong-ovoid to oblong-ellipsoid or pyriform, adaxial surface without a central ridge 11
- 11a. Branchlets muricate; leaflets revolute at margins 10. *T. nilagiricum*
- b. Branchlets smooth; leaflets not revolute at margins 12
- 12a. Style distinct; stigma 4-rayed 6. *T. dubium*
- b. Style indistinct or absent; stigma 4-lobed 13
- 13a. Robust climbers; branches thick; tendrils simple; terminal leaflets 11-20 x 3.5-10 cm; lateral leaflets 7-16 x 3-8 cm; seeds 6-10 x 4-6 mm 14
- b. Weak climbers; branches slender; tendrils bifurcate or branched; terminal leaflets 3-10 (-12) x 1.5-3 (-4) cm; lateral leaflets 1.5-6 (-7) x 0.8-2 (-3) cm; seeds *ca* 5 x 3-4 mm 15
- 14a. Leaves 5-7-foliolate; berries 2-4-seeded; seeds 6-7 x 4-5 mm. 9. *T. leucostaphylum*
- b. Leaves 3 (-5)-foliolate; berries 1 (-2)-seeded; seeds *ca* 10 x 6 mm 2. *T. andamanicum*

15a. Petals with a prominent dorsal spur; seeds with two parallel longitudinal ridges and a shallow groove on abaxial surface, corrugate on sides

1. *T. affine*

b. Petals without dorsal spur; seeds without ridges on abaxial surface, not corrugate on sides

15. *T. serrulatum*

1. ***Tetrastigma affine*** (Gagnepain ex Osm.) Raizada & Saxena in Indian For. 92: 325. 1966. *Vitis affine* Gagnepain ex Osm., For. Fl. Kumaon 119. 1929.

Slender climbers; branches glabrous; tendrils bifurcate, 10-20 cm long. Leaves 5-foliolate, glabrous; petioles 2-6 cm long; stipules triangular, 3-5 mm long, scarious; terminal leaflets lanceolate, 5-10 x 1.5-2.2 cm, acuminate at apex, cuneate at base, crenate at margins, pale above with 7-8 pairs of lateral nerves; petiolules 5-10 mm long; lateral leaflets 2.5-6 x 1-2 cm, lowest pair obliquely ovate, margins and apex as in terminal leaflets; petiolules 2-5 mm long. Inflorescences umbellate cymes, 4-9 cm long; peduncles 2-7 cm long. Flowers *ca* 2 mm long; pedicels 3-4 mm long, pubescent. Calyx obscure, truncate. Petals *ca* 2 x 1 mm, slightly hooded and with a dorsal spur at apex. Stamens *ca* 1.5 mm long. Berries globose, 5-10 mm across, 1-2-seeded. Seeds obovoid, *ca* 5 x 4 mm, deeply corrugate on sides; adaxial surface with a longitudinal raphe, abaxial surface with two parallel longitudinal ridges and a groove, chalaza raised, elongate.

Fl. & Fr. : May - Sept.

Distrib. India : Uttar Pradesh, Sikkim, Arunachal Pradesh, Assam and Meghalaya.

Nepal and Bangladesh.

Note. Momiyama (in H. Hara, & L.H. Williams, Enum. Fl. Pl. Nepal 2: 95. 1979), considers it conspecific with *T. serrulatum* (Roxb.) Planchon.

2. ***Tetrastigma andamanicum*** (King) Suesseng. ex Suesseng. in Mitt., Bot. Staatssamml. Munchen 1: 356. 1953. *Vitis andamanica* King in J. As. Soc. Bengal 65: 393. 1896.

Climbing shrubs, glabrous except the inflorescences; tendrils stout, simple. Leaves 3 (-5)-foliolate; petioles 8-15 cm long; terminal leaflets oblong to elliptic-lanceolate, 13-20 x 6-10 cm, acuminate at apex, acute at base, distantly serrate to subentire at margins, petiolules 2-3.5 cm long; lateral leaflets 11-16 x 4-8 cm, slightly oblique at base, otherwise as in terminal leaflets, petiolules 1.5-3 cm long. Inflorescences corymbose cymes, *ca* 5 cm long, rusty pubescent; peduncles 0.5-2 cm long, rusty pubescent. Flowers 2-2.5 mm long, rusty pubescent; pedicels *ca* 2 mm long, thickened near tip, rusty pubescent. Calyx 4-lobed. Petals *ca* 2 x 1 mm, slightly incurved at apex. Disc ring shaped, fleshy, enclosing ovary. Stamens *ca* 1.5 mm long. Ovary *ca* 1.2 mm across; style indistinct; stigma broadly 4-lobed. Berries globular-ovoid, *ca* 1 cm across, 1-(-2)-seeded. Seeds obovoid, *ca* 10 x 6 mm, mucronate at base, transversely furrowed on sides; adaxial surface with a linear groove; abaxial surface with a longitudinal groove enclosing the oblong chalaza,

Fl. & Fr. : Nov. - March.

Distrib. India : Andaman & Nicobar Islands. Endemic.

3. *Tetrastigma angustifolium* (Roxb.) Planchon in DC., Monogr. Phan. 5: 439. 1887. *Cissus angustifolia* Roxb., Fl. Ind. 1: 427. 1820. *Vitis angustifolia* (Roxb.) Wight, Ic. Pl. Ind. Orient. 1: 9. t. 176. 1839; M. Lawson in Fl. Brit. India 1: 654. 1875. *Tetrastigma thomsonianum* Planchon ex Balakr., Fl. Jowai 1: 137. 1981. *nom illegit.*

Slender climbers; branches terete, striate, glabrous; tendrils slender, simple. Leaves 3-foliolate, glabrous; petioles 1.5-3.5 cm long; terminal leaflets elliptic-lanceolate, 5-12 x 2-4 cm, acuminate at apex, acute at base, serrate at margins; petiolules *ca* 7 mm long; lateral leaflets oblique at base, 4-8 x 1.5-3 cm, otherwise as in terminal leaflets; petiolules *ca* 5 mm long. Inflorescences dense, cymose, 2-3 cm long, pubescent; peduncles 1-2 cm long, pubescent. Flowers *ca* 1.5 mm long, yellowish green; pedicels 1-1.5 mm long, pubescent. Calyx subtruncate. Petals oblong, hooded, *ca* 1.5 x 0.7 mm, pubescent. Ovary *ca* 1 x 0.5 mm, pubescent; stigma sessile. Berries globose, *ca* 6 mm across, 2-4-seeded. Seeds pyriform, *ca* 5.5 x 4 mm; abaxial surface convex with a linear-spathulate chalazal knot.

Fl. & Fr. : Oct. - Jan.

Distrib. India : West Bengal, Assam Arunachal Pradesh and Meghalaya.

Bangladesh, China (Hongkong) and Indonesia (Sumatra).

Note. The tender shoots and leaves are cooked with fish and eaten.

4. *Tetrastigma bracteolatum* (Wallich) Planchon in DC., Monogr. Phan. 5: 428. 1887. *Vitis bracteolata* Wallich in Roxb., Fl. Ind. 2: 483. 1824; M. Lawson in Fl. Brit. India 1: 654. 1875.

Kh.: *Soh-mei-boit*.

Climbers; branches slender, smooth, reddish; tendrils simple, *ca* 15 cm long. Leaves 3-foliolate, membranous, puberulous beneath especially on nerves; petioles 5-10 cm long; terminal leaflets ovate or ovate-lanceolate, 9-14 x 5-8 cm, acute at apex, rounded to acute at base, distantly cuspidate-serrate at margins; petiolules 1-1.5 cm long, usually puberulous; lateral leaflets 6-8 x 3-5 cm, oblique at base, margins and apex as in terminal leaflets; petiolules *ca* 1 cm long. Inflorescences divaricately branched, corymbose cymes, 7-10 cm long, pubescent; peduncles 2-4 cm long, sometimes even longer due to suppression of lateral branches, pubescent. Flowers *ca* 1 mm long; pedicels filiform, *ca* 0.5 mm long, pubescent. Calyx distinctly 4-toothed, pubescent. Petals oblong-ovate, inflexed; with a dorsal spur at apex, *ca* 1 mm long, pubescent. Stamens *ca* 0.7 mm long. Disc thin, membranous, forming a ring encircling lower half in immature fruits. Ovary conical, *ca* 0.5 mm across, glabrous; stigma sessile. Berries globose, 6-9 mm across, 1-2-seeded. Seeds obovoid, *ca* 6 x 5 mm, transversely striate on sides; adaxial surface flattened with a grooved raphe; abaxial surface with an oblong chalaza in a groove formed by two longitudinal ridges.

Fl. & Fr. : Sept. - Feb.

Distrib. India : Bihar, West Bengal, Sikkim, Arunachal Pradesh, Assam, Manipur and Meghalaya.

Nepal, Bhutan and Bangladesh.

Note. This species has the smallest flowers amongst the Indian species of the Vitaceae.

5. *Tetrastigma campylocarpum* (Kurz) Planchon in DC., Monogr. Phan. 5: 437. 1887. *Vitis campylocarpa* Kurz in J. As. Soc. Bengal 41: 302. 1872; M. Lawson in Fl. Brit. India 1: 657. 1875. *Tetrastigma alcicorne* Haines in Kew Bull. 67. 1920. *Vitis alcicorne* (Haines) Haines., Bot. Bihar, Orissa 1: 205. 1921. *Vitis parkeri* Gagnepain ex Osm., For. Fl. Kumaon 120. 1927.

Lus.: *Bepui rhui*.

Climbing shrubs; bark rough, corky; branches terete; tendrils simple. Leaves 3-6-foliolate, leathery, glabrous; petioles 1-3 cm long, swollen at base; leaflets elliptic to obovate, 8-15 x 4.5-8 cm, abrupt-acuminate at apex, cuneate at base, distant-serrate at margins; petiolules 1-3 mm long. Inflorescences lax, subcorymbose cymes, 7-10 cm long, pubescent; peduncles 1-3 cm long. Flowers *ca* 1.5 mm long; pedicels *ca* 2 mm long. Calyx cupular, truncate, rusty pubescent. Petals slightly incurved at apex, *ca* 1 x 0.8 mm, rusty pubescent. Anthers oblong. Ovary conical, *ca* 0.7 mm long; stigma sessile, 4-lobed. Berries oblong-ovoid, 10-15 x 6-8 mm, reddish to black, 1-2-seeded. Seeds oblong-ellipsoid, 10-14 x 3-5 mm, mucronate at base, transversely striate on sides; adaxial surface with a linear groove with raphe; abaxial surface with two longitudinal ridges forming a groove with an oblong chalaza.

Fl. & Fr. : Nov. - May.

Distrib. India : Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Mizoram and Andaman & Nicobar Islands.

Bangladesh, Myanmar and China (Yunnan).

6. *Tetrastigma dubium* (M. Lawson) Planchon in DC., Monogr. Phan. 5: 437. 1887. *Vitis dubia* M. Lawson in Fl. Brit. India 1: 661. 1875. *V. oxyphylla* Wallich ex Prain, Bengal Pl. 337, 338. 1903.

Kh.: *Soh-mei-boyet*.

Slender, climbing shrubs; branches terete, striate, glabrous, tendrils slender, simple. Leaves 3-5-foliolate, membranous, glabrous; petioles 2.5-10 cm long; terminal leaflets elliptic-lanceolate to oblanceolate, 10-18 x 3-7 cm, acuminate at apex, rounded to subacute at base, dentate-serrate at margins; petiolules 1-2 cm long; lateral leaflets 6-14 x 2.5-6 cm, oblique at base, margins and apex as in terminal leaflets; petiolules 0.5-1 cm long. Inflorescences compact, corymbose cymes, 2.5-4 cm long, nearly glabrous to pubescent; peduncles *ca* 1 cm long. Flowers *ca* 2 mm long, pale yellow; pedicels 2-3 mm long. Calyx 4-lobed; lobes triangular, acute. Petals ovate *ca* 1.8 x 1 mm, with a dorsal spur. Stamens *ca* 1 mm long; filaments flat. Disc cupular with undulate margin, thick, covering base of ovary. Ovary *ca* 1 mm long; style columnar; stigma 4-rayed. Berries ovoid, *ca* 1 cm across. Seeds oblong-ellipsoid, *ca* 7 x 3.5 mm; adaxial surface with a linear groove; abaxial surface with an oblong chalaza.

Fl. & Fr. : Feb. - March - May.

Distrib. India : West Bengal, Sikkim, Arunachal Pradesh, Assam, Manipur, Mizoram, Tripura and Meghalaya.

Nepal, Bangladesh, Myanmar and China.

Note. In the Index Kewensis, *Vitis oxyphylla* Wallich ex Prain is cited as a synonym of *V. bracteolata* Wallich. Examination of the types of these species showed that *V. oxyphylla* is conspecific with *V. dubia* M. Lawson [= *Tetrastigma dubium* (M. Lawson) Planchon].

7. *Tetrastigma gamblei* Shetty & P. Singh in Kew Bull. 42: 933. 1987. *T. canarense* Gamble, Fl. Pres. Madras 1: 228. *p.p.*, 1918. *non Vitis canarenensis* Dalz., 1851.

Kan.: *Hothake-balli*.

Climbing shrubs; branches slender, terete; tendrils simple or 2-fid. Leaves 3-foliolate, glabrous; petioles 4-9 cm long; terminal leaflets elliptic to obovate, 7-11 x 4-7.5 cm, acuminate at apex, cuneate at base, serrate dentate to subentire at margins, petiolules 1.5-2.5 cm long; lateral leaflets elliptic, 5-10 x 3.5-

6.5 cm, slightly oblique at base, margins and apex as in terminal leaflets; petiolules 0.5-1 cm long. Inflorescences umbellate cymes, *ca* 3 cm long, pubescent; peduncles 1-2 cm long. Flowers *ca* 2 mm long; pedicels *ca* 2 mm long. Calyx subtruncate or obscurely 4-lobed, pubescent. Petals oblong-ovate, *ca* 1.75 x 0.8 mm, acute, slightly hooded, pubescent. Stamens *ca* 1 mm long; anthers obovoid. Disc membranous, encircling base of ovary. Ovary *ca* 1.25 mm long; stigma sessile, 4-lobed. Berries globose; *ca* 6 mm across, 1-seeded. Seeds subglobose, *ca* 6 x 5 mm, transversely striate on sides, adaxial and abaxial surfaces with longitudinal furrows, chalaza spatulate.

Fl. & Fr. : Nov. - March.

Distrib. India : Maharashtra, Karnataka and Kerala.

8. *Tetrastigma hookeri* (M. Lawson) Planchon in DC., Monogr. Phan. 5: 428. 1887. *Vitis hookeri* M. Lawson in Fl. Brit. India 1: 661. 1875.

Climbing shrubs; branches terete, striate, glaucous. Leaves 3-5-foliolate; petioles 6-12 cm long, swollen and callose at base; terminal leaflets broadly elliptic or ovate, 14-16 x 6-7 cm, acuminate at apex, distantly crenate or subentire at margins, venation between secondary veins obscure; petiolules *ca* 2.5 cm long, callose; lateral leaflets 10-14 x 5-6 cm, otherwise as in terminal leaflets; petiolules *ca* 1 cm long, callose. Inflorescences subcorymbose cymes, 2-4 cm long, pubescent; peduncles 2-4 cm long, pubescent. Flowers 2-3 mm long; pedicels *ca* 2 mm long, pubescent. Calyx subtruncate to obscurely 4-lobed, pubescent. Petals hooded, 2-3 x 1.2-1.5 mm, pubescent. Stamens *ca* 2.5 mm long; anthers ovoid. Ovary *ca* 1.5 mm across; stigma 4-lobed. Berries globose, *ca* 2 cm across, fleshy, 2-seeded. Seeds oblong-obovoid, 11-12 x 5-7 mm, transversely rugose on sides; adaxial surface with raphe on a ridge; abaxial surface with a clavate chalaza.

Fl. & Fr. : Sept. - May.

Distrib. India : Sikkim and Assam.

Nepal, Bhutan, Bangladesh, Malesia and Indonesia (Java).

9. *Tetrastigma leucostaphylum* (Dennst.) Alston ex Mabb. in Taxon 26: 539. 1977. *Cissus leucostaphyla* Dennst., Schlüssel Hort. Malab. 17, 19, 33. 1818. *C. lanceolaria* Roxb., Fl. Ind. 1: 430. 1820. *nom. illegit.* *Vitis lanceolaria* Wallich ex Wight & Arn., Prodr. 128. 1834. *V. serratifolia* Wight & Arn. Prodr. 128. 1834. *V. muricata* Wight & Arn., Prodr. 128. 1834. *p.p. nom. illegit. superfl.* *Cissus muricata* Dalz. in Dalz. & Gibson, Bombay Pl. 40. 1861, *p.p., nom. illegit.* *Tetrastigma lanceolarium* Planchon, DC. Monogr. Phan. 5: 423, 1887. *nom. illegit.* *T. muricatum* Gamble, Fl. Pres. Madras 1: 229. 1918. *p.p. nom. illegit.*

Lep.: *Tundror-rik*; Nep.: *Bherseri*; Tam.: *Perumuruli*.

Climbing shrubs; quite glabrous except the inflorescence; branches flat, woody; tendrils stout, simple. Leaves 5-7-foliolate, glabrous; petioles 5-15 cm long; terminal leaflets oblong-lanceolate, 11-19 x 3.5-8 cm, acuminate at apex, acute to rounded at base, irregularly serrate-dentate at margins; petiolules 1.5-3 cm long; lateral leaflets 7-15 x 3-6 cm, oblique, margins and apex as in terminal leaflets; petiolules 0.5-2 cm long. Inflorescences subcorymbose cymes, 3-7 cm long; peduncles up to 4 cm long. Flowers 1.5-2 mm long, pubescent; pedicels 2-3 mm long, pubescent. Calyx cupular, inconspicuous, sometimes minutely 4-lobed, ciliate-pubescent at margin. Petals hooded and sometimes slightly dorsally spurred at apex, *ca* 1.5 x 0.75 mm. Stamens *ca* 1.5 mm long; anthers oblong. Disc restricted to base of ovary, undulate at margin. Ovary pyramidal, *ca* 1 mm across; stigma sessile, 4-lobed. Berries globose, *ca* 1 cm across, 2-4-seeded. Seeds obovoid, 6-7 x 4-5 mm, plano-convex, transversely striate on sides; adaxial surface with a linear raphe broadened at top; abaxial surface with an oblong chalaza.

Fl. & Fr. : Dec. - Sept.

Distrib. India : Assam, Meghalaya, Orissa, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Nepal, Bhutan and Bangladesh.

Note. Chromosome number $2n=44$ (Krishnaswamy *et al* in Curr. Sci. 23: 64-65. 1954; Shetty, B.V. in Curr. Sci. 27: 358-359. 1958 & in Bibliogr. Genet. 18: 162-272. 1959) all sub *Tetrastigma lanceolarium* Planchon.

Uses. A poultice of leaves is applied on boils, and the juice of the plant is used in cough.

10. *Tetrastigma nilagiricum* (Miq.) Shetty in Kew Bull. 44: 477. 1989. *Cissus nilagirica* Miq. in Linnaea 26: 221. 1854. *Vitis muricata* sensu Wight & Arn., Prodr. 128. 1834, p.p. *Cissus muricata* Dalz. in Dalz. & Gibson, Bombay Pl. 40. 1861, q.d. *Tetrastigma muricatum* sensu Gamble, Fl. Pres. Madras 1: 229. 1918, q.d. *T. leucostaphylum* sensu Ramamurthy in Nair & Henry, Fl. Tamil Nadu ser. 1. 1: 82. 1983 (non Alston ex Mabb., 1977).

Tam.: *Pirandaikkodi*.

Large Climbing shrubs; branches terete, striate, muricate; tendrils stout, simple. Leaves 3-5-foliolate, leathery, light green when dry; petioles 2-5 cm long; terminal leaflets elliptic, 6-13 x 3-6 cm, acute to acuminate at apex, acute to rounded at base, serrate and retrorse at margins; petiolules ca 1 cm long; lateral leaflets 5-9 x 2.5-4 cm, oblique, margins and apex as in terminal leaflets; petiolules ca 0.5 cm long. Inflorescences umbellate cymes, ca 3 cm long, pubescent; peduncles up to 1 cm long. Flowers ca 2 mm long, pale green; pedicels 2-3 mm long, pubescent. Calyx 4-lobed, pubescent. Petals oblong, ca 2 x 1 mm, hooded, pubescent. Disc thick, enclosing lower half of ovary. Ovary pitcher shaped, ca 1 mm across; style distinct; stigma 4-lobed. Berries globose, ca 1 cm across. Seeds oblong-obovoid, ca 8 x 4.5 mm, deep-crenate on sides; adaxial surface with a linear furrow; abaxial surface with an oblong chalaza.

Fl. & Fr. : Jan. - Nov.

Distrib. India : Karnataka, Tamil Nadu and Kerala.

Sri Lanka.

Note. Chromosome number $2n=44$ (Shetty, B.V. & V.S. Raman in Curr. Sci. 29: 279. 1960-sub *Tetrastigma muricatum* Gamble).

11. *Tetrastigma obovatum* Gagnepain in Notul. Syst. (Paris) 1: 266. 318. 1911. *Vitis obovata* M. Lawson in Fl. Brit. India 1: 658. 1875, *nom. illegit.* (non Rafin., 1830; nec Baker 1857).

Kh.: *Soh-lar-pung*.

Large climbing shrubs; branches flattened, brownish-pubescent; tendrils simple. Leaves 3-5-foliolate, fulvous-pubescent especially on nerves beneath; petioles 9-15 cm long, pubescent; terminal leaflets obovate to broad-elliptic, 13-22 x 6-13 cm, acuminate at apex, acute to cuneate at base, distantly bristly-serrate to subentire at margins; petiolules 1.5-3 cm long; lateral leaflets 9-17 x 4-8 cm, slightly oblique at base, otherwise as in terminal leaflets; petiolules 1-1.5 cm long. Inflorescences corymbose cymes, ca 8 cm long, brownish pubescent; peduncles ca 3 cm long. Flowers ca 3 mm long, greenish yellow. Calyx cupular, 4-toothed, pubescent. Petals ca 2.5 x 1.5 mm, hooded, dorsally spurred at apex in male flowers, pubescent. Disc membranous, encircling lower half of ovary. Ovary conical, ca 1 mm across, pubescent; stigma sessile, star shaped. Berries ellipsoid, 1.5-2.5 cm across, black, 1-3-seeded. Seeds ellipsoid, 11-14 x 9-10 mm, plano-convex, mucronate at base, transversely striate on sides; adaxial surface with a linear raphe; abaxial surface with a clavate chalaza.

Fl. & Fr. : Jan. - Nov.

Distrib. India : Sikkim, Arunachal Pradesh, Nagaland and Meghalaya.

Bhutan, Bangladesh and Myanmar.

Note. Presence of 5-foliolate, fulvous-pubescent, digitate leaves, pubescent ovary and the star-shaped stigma distinguishes it from the other species of *Tetrastigma*.

Chromosome number $2n=ca\ 44$ (Lavie, P., These Doct. Ing. Fac. Sci. Univ. Montpellier, Fasc. 1: 1-292. 1970).

12. *Tetrastigma obtectum* (Wallich ex M. Lawson) Planchon ex Franch. in Bull. Soc. Bot. France 33: 458. 1886. *Vitis obtecta* Wallich ex M. Lawson in Fl. Brit. India 1: 657. 1875.

Climbing or creeping, herbaceous vines; branches slender, sometimes with adventitious roots at nodes, soft-villous; tendrils slender, branched. Leaves 5-foliolate; petioles 3-10 cm long, villous; stipules broadly triangular, ca 6

x 4 mm, membranous, glabrous; terminal leaflets subsessile to shortly petiolulate, elliptic to obovate, 5-8 x 2-3.5 cm, acute at apex, attenuate at base, cuspidate-serrate at margins; lateral leaflets 2.5-6 x 1.5-3 cm, oblique at base, otherwise as in terminal leaflets. Inflorescences umbellate cymes, ca 5 cm long, pubescent; peduncles 2-3.5 cm long. Flowers ca 2.5 mm long; pedicels 3-6 mm long. Calyx cupular, ciliate at margin. Petals oblong-ovate, 2-2.5 x 1-1.2 mm, slightly hooded. Stamens ca 2 mm long. Disc ring shaped, encircling base of ovary. Ovary conical, ca 1.5 mm across, glabrous; style obscure; stigma 4-lobed. Seeds transversely rugose, ca 7 x 5 mm.

Fl. & Fr. : May - Nov.

Distrib. India : Uttar Pradesh, Sikkim, Arunachal Pradesh and Manipur.

Nepal, Bhutan and China (Yunnan).

13. *Tetrastigma planicaule* (Hook.f.) Gagnepain in Notul. Syst. (Paris) 1: 319. 1911. *Vitis planicaulis* Hook.f. in Bot. Mag. t. 5685. 1868; M. Lawson in Fl. Brit. India 1: 658. 1875. *V. neurosa* Kurz in J. As. Soc. Bengal 44: 204. 1876.

Asm.: *Chepata lata*; *Garó*: *Samarang*.

Large climbing shrubs; branches flattened, striate, glabrous, tendrils simple. Leaves 5-foliolate, subcoriaceous, glabrous; petioles 8-15 cm long; terminal leaflets elliptic to oblong-lanceolate, 15-18 x 5-8 cm, acuminate at apex, acute at base, distantly cuspidate-serrate at margins; petiolules ca 3 cm long; lateral leaflets 9-15 x 3-9 cm, oblique at base, otherwise as in terminal leaflets; petiolules 1-2 cm long. Inflorescences corymbose cymes, ca 10 cm long; peduncles ca 5 cm long. Flowers ca 2.5 mm long, pubescent; pedicels ca 4 mm long. Calyx truncate. Petals 2 mm long. Ovary ca 1 mm across, glabrous. Berries ca 2 cm across, 1-2-seeded. Seeds oblong-obovoid, ca 10 x 5 mm, transversely ribbed.

Fl. & Fr. : Apr. - Oct.

Distrib. India : Sikkim, Arunachal Pradesh, Assam and Meghalaya.

Note. This species is allied to *T. obovatum* Gagnepain but differs mainly in having glabrous leaves and ovary and in the petals of the male flowers being not spurred.

14. *Tetrastigma rumicispermum* (M. Lawson) Planchon in DC., Monogr. Phan. 5: 429. 1887. *Vitis rumicisperma* M. Lawson in Fl. Brit. India 1: 661. 1875. *Tetrastigma pyriforme* Gagnepain in Bull. Soc. Bot. France 91: 35. 1944. *T. corymbosum* Long in Edinb. J. Bot. 47 (3): 358. 1990.

Climbing shrubs; branches terete, usually with corky warts and tubercles; tendrils forked. Leaves 5-foliolate, coriaceous, glabrous; petioles 4-10 cm long; terminal leaflets obovate or oblanceolate, 5-13 x 2-5 cm, acuminate at apex, acute or cuneate at base, sharp-serrate at margins, with *ca* 12 pairs of lateral nerves; petiolules 1-1.5 cm long; lateral leaflets 4-9 x 2-4 cm, slightly oblique at base, otherwise as in terminal leaflets; petiolules 0.2-1 cm long. Inflorescences spreading, subcorymbose cymes, 5-11 cm long; peduncles up to 5 cm long. Flowers *ca* 1.2 mm long; pedicels *ca* 1 mm long, pubescent. Calyx cupular, membranous, 4-lobed. Petals oblong, *ca* 1 x 0.7 mm, slightly hooked, pubescent. Stamens *ca* 1.5 mm long; anthers oblong. Disc membranous, enclosing base of ovary. Ovary conical, *ca* 1 mm across; style conspicuous; stigma 4-lobed. Berries turbinate - globose, *ca* 1 cm across, reddish black, 1-4-seeded. Seeds triangular-obcordate, 5-7 x 4-5.5 mm; adaxial surface with a sharply ridged raphe and two fine grooves radiating at an angle on either side of the ridge; abaxial surface with an oblong chalaza in a shallow groove, rugose.

Fl. & Fr. : May - Sept.

Distrib. India : West Bengal, Sikkim, Arunachal Pradesh, Assam, Manipur and Meghalaya.

Nepal, Bhutan, Myanmar, Vietnam, Laos and Malesia.

Note. This species can be easily distinguished by the turbinate-globose berries and broadly triangular-obcordate seeds.

Chromosome number $2n=52$ [Eichhorn, A in C.R. Acad. Sci. (Paris) 206. 1266-1268. 1938].

15. *Tetrastigma serrulatum* (Roxb.) Planchon in DC., Monogr. Phan. 5: 432. 1887. *Cissus serrulata* Roxb., Fl. Ind 1: 432. 1820. *C. nepaulensis* DC. Prodr. 1: 632. 1824. *Vitis capreolata* D. Don, Prodr. Fl. Nep. 188. 1825; M. Lawson in Fl. Brit. India 1: 659. 1875. *Tetrastigma indicum* Malik in Bull. Bot. Surv. Ind. 13: 352. 1971.

Kh. : *Mei-sch-mynjiriang*; Nep.: *Charchari*.

Slender, far climbing or creeping shrubs; branches terete to angular, glabrous; tendrils slender, branched near apex. Leaves 5-foliolate; petioles 2-5 cm long, striate; terminal leaflets obovate or elliptic, 3-7 x 1.5-3 cm, acute or obtuse and mucronate at apex, attenuate at base, crenate-serrate at margins, petiolules ca 5 mm long; lateral leaflets 1.5-4 x 0.8-2 cm, oblique at base, margins and apex as in terminal leaflets; petiolules ca 3 mm long. Inflorescences 3-4-chotomous, umbellate cymes, 2-6 cm long, glabrous; peduncles 1-3 cm long. Flowers ca 2 mm long; pedicels ca 2 mm long. Calyx cupular, truncate, glabrous. Petals elliptic, 2-2.5 x 1 mm. hooded, glabrous. Stamens ca 1.5 mm long; anthers oblong. Disc basal. Ovary pitcher shaped, ca 1.5 mm long, glabrous; style obscure; stigma 4-fid. Berries globose, ca 6 mm across, shortly apiculate, 1-3-seeded. Seeds pyriform, ca 5 x 3 mm; adaxial surface with a prominent raphe; abaxial surface convex with a spatulate chalaza.

Distrib. India : Himachal Pradesh, Uttar Pradesh, Sikkim, Arunachal Pradesh, Assam and Meghalaya.

Nepal, Bhutan, Bangladesh, China (Yunnan) and Thailand.

Note. A very elegant and common climber throughout the Himalaya in between 1500-2000 m, sometimes upper branches hang in dense leafy festoons.

16. *Tetrastigma sulcatum* (M. Lawson) Gamble, Fl. Pres. Madras 1: 229. 1918. *Vitis sulcata* M. Lawson in Fl. Brit. India 1: 661. 1875.

Large climbing shrubs; branches angled, sulcate, muricate or tuberculate, glabrous; tendrils simple. Leaves 3-5-foliolate, coriaceous, glabrous, brown when dry; petioles 5-9 cm long; terminal leaflets elliptic-lanceolate, 12-19

x 5-7 cm, acuminate at apex, acute at base, serrate at margins; venation between secondary veins prominent; petiolules 1.5-3 cm long; lateral leaflets 8-13 x 3-6 cm, oblique at base, otherwise as in terminal leaflets; petiolules ca 1.5 cm long. Inflorescences corymbose cymes, ca 5 cm long, pubescent. Flowers ca 2.5 mm long; pedicels ca 3 mm long, pubescent. Calyx cupular, 4-lobed, pubescent. Petals oblong, ca 2.2 x 1.5 mm, slightly hooded, pubescent. Stamens ca 1.7 mm long; anthers oblong. Disc ring-shaped, thick. Ovary ca 1.5 mm across; style short; stigma 4-lobed. Berries globose, 2-2.5 cm across. Seeds oblong-obovoid, ca 12 x 7 mm, faintly crenate on sides; adaxial surface with a longitudinal raphe and a furrow on either side of it radiating at an angle, abaxial surface with a spatulate chalaza.

Fl. & Fr. : Dec. - Oct.

Distrib. India : Goa, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Note. Lawson (*l.c.*) while describing *Vitis sulcata* wrongly cited Wight *l.c.* t. 28, which belongs to *Tetrastigma nilagiricum* (Miq.) Shetty. Planchon (in DC., *Monogr. Phan.* 5: 424. 1887). merged this species with *T. lanceolarium* Planchon [*T. leucostaphylum* (Dennst.) Alston ex Mabb.], but Gamble (*l.c.*) reinstated it and made the new combination *T. sulcatum* (M. Lawson) Gamble. Talbot (*Forest Fl. Bombay* 1: 324. 1909) wrongly named this species as *V. reticulata*. *V. reticulata* Thwaites in fact belongs to the genus *Cayratia*.

Chromosome number $2n=52$ (Patil, V.P. *et. al.* in *Curr. Sci.* 49: 37-38. 1980).

8. *Vitis* L.

Climbing, polygamo-dioecious shrubs; bark usually shreddy; tendrils leaf-opposed, usually bifurcate. Leaves simple, often lobed, petiolate. Inflorescences leaf-opposed, paniculate; peduncles sometimes cirrhiferous. Flowers both bisexual and unisexual. Calyx saucer-shaped, subtruncate or 5-dentate. Petals 5, connate at apex, separating at base and falling off as a calyptra. Stamens 5, straight in male and bisexual flowers; staminodes reflexed in female flowers. Disc usually ring-shaped. Ovary pitcher-shaped; style conical, short; stigma small; gynoecium rudimentary in male flowers. Berries globular, succulent, purple to black, whitish to bronze or greenish, 2-4-seeded. Seeds

pyriform, shiny; adaxial surface 2-furrowed; abaxial surface 1-furrowed with a prominent rounded or elliptic chalazal knot; endosperm T-shaped in cross section.

In temperate and tropical regions of the Northern Hemisphere, mainly centred in China and eastern N. America; *ca* 60 species, 3 in India.

KEY TO THE SPECIES

- | | |
|--|--|
| 1a. Leaves nearly glabrous; inflorescences 3-7 cm long | 1. <i>V. flexuosa</i> var. <i>parvifolia</i> |
| b. Leaves tomentose; inflorescences 7-15 cm long | 2 |
| 2a. Lower surface of leaves with lax, greyish to greyish brown tomentum; seeds with chafaza depressed or indistinctly raised at the bottom of depression on the abaxial side | 2. <i>V. heyneana</i> |
| b. Lower surface of leaves with dense, reddish floccose tomentum; seeds with raised chalaza on the abaxial side | 3. <i>V. jacquemontii</i> |

1. *Vitis flexuosa* Thunb. in Trans. Linn. Soc. London 2: 332. 1794, var. *parvifolia* (Roxb.) Gagnepain in Sargent, Pl. Wilson. 1: 103. 1911. *V. parvifolia* Roxb., Fl. Ind. 2: 475. 1824; M. Lawson in Fl. Brit. India 1: 652. 1875.

Garh.: *Barain*

Slender climbing shrubs; branches slender, terete, striate, glabrous; tendrils up to 10 cm long, branched. Leaves ovate to 3-lobed, 5-8 x 3-6 cm, acuminate at apex, truncate to cordate at base, dentate-serrate at margins, membranous, hairy in the axils of nerves beneath, otherwise glabrous; petioles 1.5-4 cm long. Inflorescences bifurcated panicles with flowers arranged in umbellate fascicles, 3-7 cm long. Flowers *ca* 2 mm long; pedicels slender, 2-4 mm long. Stamens *ca* 2 mm long. Disc membranous, restricted to base of ovary. Ovary *ca* 1 mm across. Berries globose, 5-7 mm across, 2-4-seeded. Seeds obovoid, *ca* 4.5 x 3 mm.

Fl. & Fr. : March - Aug.

Distrib. India : Kashmir, Himachal Pradesh, Uttar Pradesh, West Bengal, Assam and Manipur.

Pakistan, Nepal and China.

Note. The fruits are edible.

2. *Vitis heyneana* Roemer & Schultes, Syst. Veg. 5: 318. 1819. *V. lanata* Roxb., Fl. Ind. 2: 474. 1824; M. Lawson in Fl. Brit. India 1: 651. 1875, p.p.

Climbing or scandent shrubs; bark rough, reddish brown; branches terete, striate, tomentose; tendrils branched. Leaves ovate, sometimes angled, 5-12 x 4-10 cm, acute or acuminate at apex, cordate or rarely truncate at base, serrate at margins, glabrate above, greyish to greyish brown tomentose beneath; petioles 2-7 cm long. Inflorescences thyriform, paniculate cymes, 7-15 cm long; peduncles 2-4 cm long, tomentose, sometimes with a bifurcated tendril. Flowers *ca* 2 mm long; pedicels 2-3 mm long. Stamens *ca* 1.5 mm long; anthers oblong. Disc ring shaped. Ovary *ca* 1 mm across. Berries globose, *ca* 6 mm across, 2-4-seeded. Seeds obovoid, *ca* 4 x 3 mm, dark brown, shiny.

Fl. & Fr. : Apr. - Oct.

Distrib. India : Himachal Pradesh, West Bengal, Sikkim, Assam, Meghalaya and Andhra Pradesh.

Nepal, Bhutan, W. China and Myanmar.

Note. The fruits are edible. The roots are also said to be eaten.

3. *Vitis Jacquemontii* R. Parker, For. Fl. Punjab ed. 2. 559. 1924 & in Indian For. 59: 63. t. 8. 1933. *Ampelocissus Jacquemontii* (R. Parker) Raizada, Suppl. Fl. Gangetic Plain 44. 1976. **Fig. 68.**

Climbing shrubs densely reddish tomentose; branches terete, striate; tendrils 2-fid, one branch sometimes forked again. Leaves very variable, broadly ovate to suborbicular, undivided, angled or indistinctly lobed, 6-20 x 6-18 cm, acuminate at apex, cordate to truncate at base, dentate to serrate at margins, glabrate above, clothed with reddish floccose tomentum beneath; petioles 3-9 cm long. Inflorescence thyriform, paniculate cymes, 5-20 cm long; peduncles 2-6 cm long, sometimes tendril bearing. Flowers *ca* 2 mm

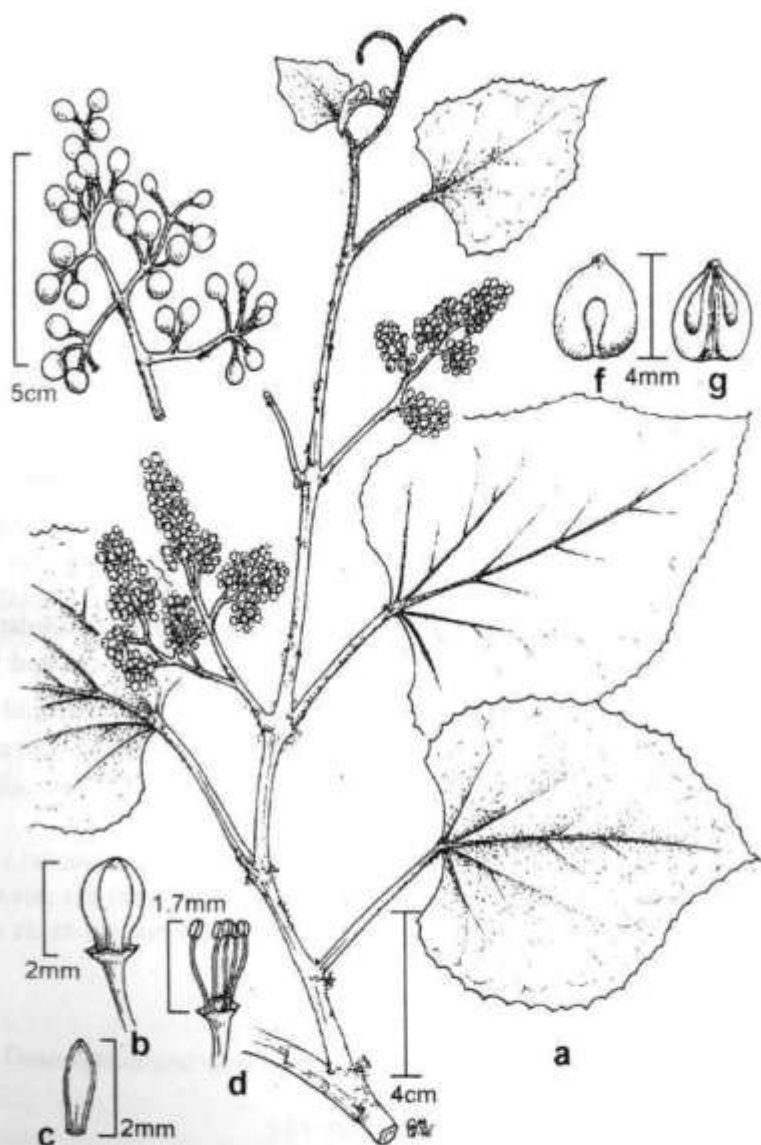


Fig. 68. *Vitis jacquemontii* R. Parker : a. Habit; b. A flower bud; c. A petal; d. Stamens; e. Inflorescence; f. Seed, abaxial surface; g. Seed, adaxial surface.

long; pedicels 2-3 mm long. Stamens *ca* 1.7 mm long; anthers oblong. Disc ring shaped. Ovary *ca* 1 mm across. Berries *ca* 7 mm across, 1-3-seeded. Seeds obovoid, *ca* 4 x 3 mm.

Fl. & Fr. : May - Aug.

Distrib. India : Himachal Pradesh and Uttar Pradesh.

Pakistan and Nepal.

CULTIVATED SPECIES

Vitis labrusca L., Sp. Pl. 203. 1753.

Eng. : *Fox-Grape*.

A native of Europe, often cultivated in certain parts of India.

Vitis vinifera L., Sp. Pl. 202. 1753.

A native of W. Asia, extensively cultivated in N.W. and peninsular India for highly prized edible fruits from which raisins, grape juices and wines are also made.

LEEACEAE

(B.D. Naithani)

Small trees or erect or creeping shrubs or herbs with woody base; stems and branches with swollen nodes, occasionally beset with rows of spines. Leaves alternate, distichous, 1-3-foliolate or 1-4-pinnate, often with caducous pearl glands beneath; petioles variously dilated into long and narrow or short and broad, sheathing, persistent or caducous stipules. Flowers greenish, white or red to orange-yellow, bisexual, usually many in leaf-opposed, condensed or laxly branched, bracteate, cymose inflorescence. Sepals 4-5, connate into a cupular calyx with triangular lobes, glandular at apex. Petals 4-5, partially connate below at a line and adnate to staminal tube forming a rim on which stamens are inserted, choripetalous towards base, valvate above in bud and reflexed at maturity. Staminal tube free above and below line of attachment, 4-5, lobed at apex, lower portion forming a collar, usually free, sometimes extending as far as ovary. Stamens, 4-5; filaments extending over to staminal tube through sinus; anthers tetrasporangiate, syngenesious, rarely free; pollen tricolporate, suboblate to subprolate. Carpels 4(-5), connate into a superior ovary incompletely divided into 4-6 (-8) apparent locules; ovules solitary in each locule, basal; style short; stigma slightly thickened. Berry depressed, subglobose. Seeds wedge shaped; endosperm ruminant.

Mostly in tropical and subtropical regions of S.E. Asia, Malesia, Micronesia, Melanesia, Australia and tropical Africa, monogeneric; ca 34 species, 11 species in India.

Literature. CLARKE, C.B. (1881) A revision of the Indian species of *Leea*. *J. Bot.* 19: 100-106; 135-142 & 163-167. RIDSDALE, C.E. (1974) A revision of the family Leeaceae. *Blumea* 22: 57-100. RIDSDALE, C.E. (1976). *Leeaceae. Fl. Malesiana*. 1.7: 759-782.

***Leea* L., nom. cons.**

Description and distribution same as the family.

KEY TO THE SPECIES

- 1a. Inflorescence and leaflets with conspicuous, large, discoid, brown, pearl glands
- b. Pearl glands inconspicuous

L. L. sequata

- | | |
|--|-----------------------------------|
| 2a. Flowers greenish white | 3 |
| b. Flowers crimson-red to orange yellow | 8 |
| 3a. Stems and ultimate branches with spines | 3. <i>L. angulata</i> |
| b. Stems and ultimate branches without spines | 4 |
| 4a. Leaflets 5-7-nerved at base | 5 |
| b. Leaflets 3-nerved at base | 7 |
| 5a. Staminodial lobes deeply bifid; bracts ovate to linear-lanceolate | 4. <i>L. asiatica</i> |
| b. Staminodial lobes shallowly cleft; bracts deltoid to triangular | 6 |
| 6a. Calyx mealy pubescent | 8. <i>L. macrophylla</i> |
| b. Calyx glabrous | 6. <i>L. grandifolia</i> |
| 7a. Bracts of inflorescence broadly ovate, somewhat foliaceous, up to 12 mm long; leaves trifoliolate or 1-2-pinnate; stipules narrow persistent | 5. <i>L. compactiflora</i> |
| b. Bracts of inflorescence narrowly triangular, up to 4 mm long, early caducous; leaves 2-3 pinnate; stipules obovate, caducous | 9. <i>L. indica</i> |
| 8a. Leaves 1-pinnate; rachis narrowly winged | 2. <i>L. alata</i> |
| b. Leaves 2-3-pinnate; rachis not winged | 9 |
| 9a. Staminodial tube 2-3 mm long | 7. <i>L. guineensis</i> |
| b. Staminodial tube less than 2 mm long | 10 |
| 10a. Leaves membranous with setaceous hairs above; flowers creamish yellow at maturity | 11. <i>L. setuligera</i> |
| b. Leaves chartaceous, without setaceous hairs above; flowers and inflorescence red | 10. <i>L. rubra</i> |

1. *Leea aequata* L., Syst. Nat. ed. 12, 2: 627. 1767. Cooke, Fl. Pres. Bombay 1: 261. 1902. *L. hirta* Roxb. ex Hornem., Hort. Hafn. 1: 231. 1813; M. Lawson in Fl. Brit. India 1: 668. 1875. *L. kurzii* C.B. Clarke in J. Bot. 19: 165. 1881.

Fig. 69.

Beng.: *Kak-Jhanga*.

Shrubs, sometimes small trees, usually 2-3 or rarely up to 10 m tall; young branches villous. Leaves (1-) 2 (3-) pinnate; rachis pubescent, angled; petiole 6-15 cm long; stipules wedge shaped, 3-8 cm long, caducous. Leaflets oblong-lanceolate or lanceolate, 7-22 x 2.5-6 cm, acuminate to caudate at apex, more or less rounded at base, sharply serrate at margins, membranous, hispid, with scattered grey hairs above, hirsute along the nerves and rough due to scattered rounded brown peltate glands beneath; lateral nerves 8-12



Fig. 69. *Leea aquata* L.

pairs, slender, arched; petiolules of lateral leaflets 3-12 mm, terminal 2.5-3.5 cm long, pubescent. Inflorescence subterminal, 6-10 cm long, more or less glandular hairy. Flowers 5-merous, greenish white; bracts conspicuous, ovate to oblong, 6 mm long. Calyx glabrous to densely pubescent, covered with pearl glands on the outside, 3-4 x 3-4 mm, lobed half-way down. Corolla lobes 2-3 x 1.5 mm. Staminodial tube 1.5-2.5 mm long; lobes deeply cleft. Ovary 4-7 loculed style 1-2 mm long. Fruits depressed globose, 6-7 mm across, orange red, black when ripe. Seeds 3-6.

Fl. & Fr. : June - Jan.

Distrib. India : Uttar Pradesh, Bihar, West Bengal, Sikkim, Arunachal Pradesh, Assam, Orissa, Madhya Pradesh, Maharashtra, Karnataka, Tamil Nadu and Andamans.

Nepal, Bhutan Bangladesh, Myanmar, Laos, Vietnam, Cambodia, Thailand, Malesia, Singapore, Indonesia and Philippines.

2. *Leea alata* Edgew. in Trans. Linn. Soc. 20: 36. 1846; M. Lawson in Fl. Brit. India 1: 665. 1875.

Fig. 70.

Asm.: *Bon-ou*; *Hindi*: *Chhataver*.

Undershrubs or shrubs, up to 3 m tall; branches often ribbed. Leaves 1-pinnate, rarely trifoliolate; petioles 4-8 cm long, grooved or winged, reddish; rachis 5-15 cm long, narrowly winged; petiolar stipules oblong, 3-4 x 1 cm, obtuse to rounded at apex, caducous. Leaflets 5-9, elliptic-oblong to elliptic lanceolate, 15-25 x 4-7 cm, acute at apex, rounded, unequal at base, dentate-serrate at margins, sessile or nearly so, glabrous on both sides or sometimes minutely pubescent on nerves beneath, chartaceous to subcoriaceous; pearl glands stellate, sparsely distributed; nerves 8-12 pairs, curved near the margins. Inflorescence reddish, glabrous or minutely pubescent, compact; bracts and bracteoles absent or inconspicuous; peduncles 4-20 cm long, ultimate branches short, somewhat condensed. Flowers red. Calyx 2-2.5 x 1.5-2 mm, glabrous. Corolla tube with staminodial lobes 3 mm; staminodial lobes emarginate; corolla lobes 2.5 x 1 mm. Ovary 6-locular; style 1 mm long. Fruits 5-10 mm across, red, bluish purple when ripe. Seeds usually 4-6, ca 3 x 2 mm.

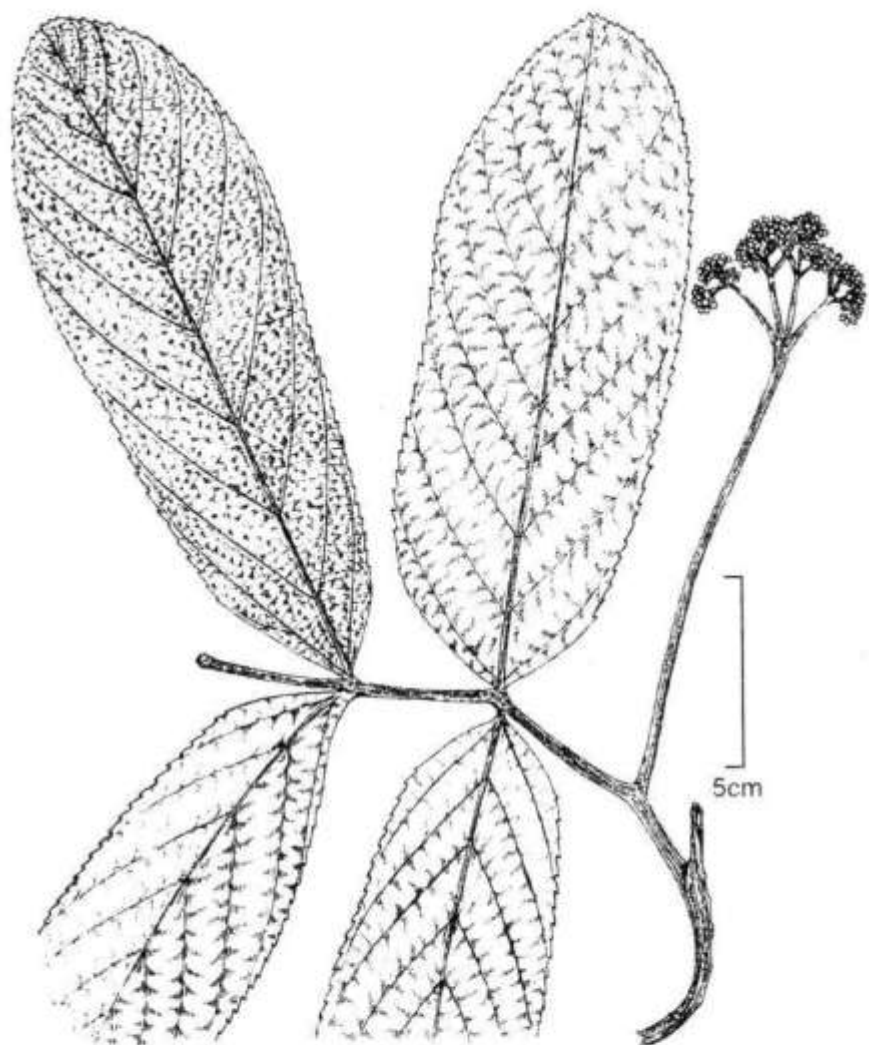


Fig. 70. *Leea alata* Edgew.

Fl. & Fr. : June - Dec.

Distrib. India : Gangetic plains, eastern and central India, ascending up to 1500 m in the Himalaya. Himachal Pradesh, Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Arunachal Pradesh, Meghalaya, Orissa and Madhya Pradesh.

Nepal and Bhutan.

3. *Leea angulata* Korth. ex Miq. in Ann. Mus. Bot. Lugd. Bat. 1: 97. 1863; C.B. Clarke in J. Bot. 19: 166. 1881; Ridsdale in Fl. Males. 1, 7(4); 772, 1976. **Fig. 71.**

Prickly shrubs or small trees, usually up to 3 (-15) m tall, sometimes with several stems and suckering. Leaves 2-3-pinnate; petioles 3-6 cms; stipules represented by a narrow wing, as long as the petiole, persistent; rachis 10-20 cm. Leaflets elliptic-lanceolate to ovate-lanceolate, 10-15 x 3-5 cm, apex acuminate, uppermost cuneate and lateral ones rounded at base, crenate to serrate at margins, glabrous on both sides, pearl glands sometimes present; petiolules 3-6 mm long; nerves in 10-12 pairs, curving near the margins. Inflorescence 7-15 cm long, pubescent; bracts ovate, 2-3 x 1-2 mm. Flowers whitish green. Calyx 2 x 2 mm, lobed halfway down, pubescent. Corolla lobes 2-3 x 1-2 mm. Staminodial tube 1.5-2.5 mm, upper free portion emarginate. Ovary 6-loculed style; 2 mm long. Fruits 6-18 mm across, red. Seeds 4-6.

Fl. & Fr. : July.

Distrib. India : Coastal belts. Nicobar Islands.

Peninsular Thailand, Malaysia, Singapore, Indonesia and Philippines.

4. *Leea asiatica* (L.) Ridsdale in Manilal, Bot. Hist. Hort. Malab. 189. 1980. *Phytolacca asiatica* L., Sp. Pl. 474. 1753. *Leea crispa* L., Syst. Nat. ed. 12. 2: 627: 1767; M. Lawson in Fl. Brit. India 1: 665. 1875. *L. aspera* Edgew. in Trans. Linn. Soc. 20: 36. 1846, *nom. illeg.* (*non* Wallich ex G. Don, 1831); M. Lawson in Fl. Brit. India 1: 665. 1875. *L. herbacea* Buch-Ham. in Trans. Linn. Soc. 14: 228. 1823; Hara, Fl. E. Himal. 200. 1966.



Fig. 71. *Leca angulata* Korth. ex Miq.

L. pumila Kurz in J. As. Soc. Bengal 41(2): 302. 1872; M. Lawson in Fl. Brit. India 1: 666. 1875. *L. edgeworthii* Santapau in Rec. Bot. Surv. India 16: 54. 1953.

Fig. 72.

Beng.: *Ban-chalita*; Hindi: *Kumala, Murkhur*; Kh.: *Sohphyrnou*.

Undershrubs, shrubs or trees, up to 8 m tall; stems, branches, petioles, petiolules, rachis and peduncles often fluted and crispately winged. Leaves 1 or 2-pinnate, densely softly villous beneath when young; petioles 1-4 cm long; petiolar stipule represented by a narrow wing; rachis 4-12 cm long. Leaflets 5-7, broadly ovate to elliptic or ovate-oblong to elliptic-oblong, 10-20 x 4-9 cm, acute, acuminate to caudate at apex, rounded to cordate at base, sharply serrate at margins, chartaceous to subcoriaceous, glabrous or sparsely hairy above and densely hairy below, with sparse globular pearl glands; petiolules 5-15 mm long; nerves in 8-16 pairs. Inflorescence 2-12 cm long, glabrous or pubescent; bracts ovate to linear-lanceolate, up to 6 mm long, subpersistent; bracteoles lanceolate, 3 mm long; peduncle up to 6 mm long. Flowers greenish white. Calyx 2 x 3 mm, glabrous to pubescent. Corolla tube along with staminodial lobes 3-4 mm long; corolla lobes 2.5-3 x 1-1.5 mm. Staminodial lobes deeply bifid. Stamens free. Ovary 4-8 loculed; style 1-2 mm long. Fruits purple black, 12 mm across. Seeds usually 6, ca 5 x 3 mm.

Fl. & Fr. : June - Dec.

Distrib. India : Evergreen, deciduous and lower mountain forests, ascending up to 2250 m in the Himalaya, also in grasslands in the plains where the upper portion often dries up annually. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Bihar, West Bengal, Sikkim, Arunachal Pradesh, Assam, Nagaland, Manipur, Mizoram, Meghalaya, Orissa, Madhya Pradesh, Rajasthan, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala and Andaman Islands.

Nepal, Bhutan, Bangladesh, Myanmar, Laos, Vietnam, Thailand and China.

5. *Leea compactiflora* Kurz in J. As. Soc. Bengal 42(2): 65. 1873. *L. trifoliata* M. Lawson in Fl. Brit. India 1: 666. 1875. *L. bracteata* C.B.



Fig. 72. *Leea asiatica* (L.) Ridsdale

Clarke in J. Bot. 19: 164. 1881; Duthie, Fl. Up. Gangetic Plain 1: 176. 1903; Kanjilal *et al.*, Fl. Assam 1: 308. 1936. **Fig. 73.**

Kh.: *Lang-Kurnu*.

Straggling shrubs, sometimes with creeping rootstocks, 2-5 m tall, or trees up to 10 m tall. Leaves trifoliolate or 1-2 pinnate; basal pair of leaflets sometimes reduced in size; petioles 5-8 cm long; stipules represented by a narrow wing extending to the entire length of petiole, persistent; rachis 12-20 cm long. Leaflets usually 7-15, elliptic to elliptic-lanceolate, 15-30 x 5-10 cm, acuminate at apex, obtuse at base, serrulate at margin, glabrous above pubescent on the nerves beneath, subcoriaceous; petiolules 3-10 mm, usually hairy; nerves in 8-15 pairs. Inflorescence 8-15 cm long, short and compact, pubescent; bracts broadly ovate-lanceolate, 6-12 mm long, persistent; peduncle 3-5 cm long. Flowers greenish white. Calyx *ca* 3 mm long, glabrous to pubescent. Corolla tube along with staminodial lobes 3-3.5 mm long. Staminodial tube 2-2.5 mm long, upper free part 1.5-2 mm long; lobes shallowly retuse or cleft. Ovary 4-6-loculed; style 2-3 mm. Fruits 7-10 mm across, orange-yellow, black when ripe. Seeds usually 6.

Fl. & Fr. : May - Dec.

Distrib. India : At lower heights in evergreen forests, ascending up to 2000 m. Uttar Pradesh (Terai), West Bengal, Sikkim, Arunachal Pradesh, Nagaland, Assam, Manipur, Mizoram and Meghalaya.

Bhutan, Bangladesh, Myanmar, Laos, N. Vietnam and China.

6. *Leea grandifolia* Kurz in J. Bot. 13: 325. 1875; C.B. Clarke in J. Bot. 19: 138. 1881; Prain in J. As. Soc. Bengal 60(2): 167. 1891.

Small to medium sized trees, up to 7 m tall. Leaves 1-pinnate, rarely trifoliolate; petioles *ca* 12 cm long; stipules subobovate, *ca* 3.5 x 1.2 cm; rachis 14-15 cm long. Leaflets 5-7, broadly ovate-elliptic, 20-30 x 12-16 cm, acuminate at apex, rounded to obtuse at base, serrulate at margin, glabrous, subcoriaceous; petiolules up to 2.5 cm long; nerves in 8-12 pairs. Inflorescence 6-8 cm long, glabrous; bracts deltoid to triangular, early caducous; peduncle 2-3 cm long. Flowers greenish white. Calyx 2 x 4 mm, glabrous. Corolla

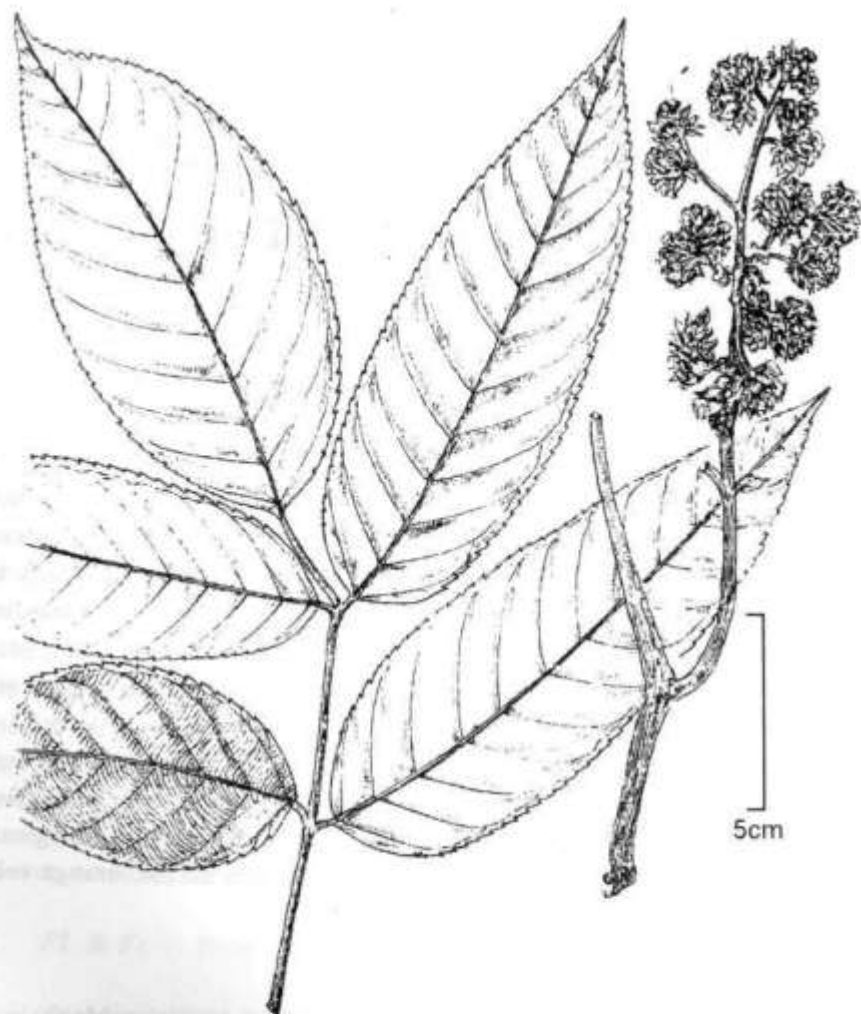


Fig. 73. *Leea compactiflora* Kurz

tube along with staminodial lobes 4.5 mm long; lobes shallowly cleft. Style 2.5 mm long. Fruits large pea sized, black, 3-6-celled.

Fl. & Fr. : Feb. - Nov.

Distrib. India : In the coastal areas. Andaman & Nicobar Islands.

7. *Leea guineensis* G. Don, Gen. Hist. 1: 712, 1831. *L. wightii* C.B. Clarke in J. Bot. 19: 105. 1881; Gamble, Fl. Pres. Madras 1: 239. 1918. *L. acuminata* Wallich ex C.B. Clarke J. Bot. 19: 141. 1881; Kanjilal *et al.*, Fl. Assam 1: 304. 1936; Parkinson, For. Fl. Andaman Isls. 133. 1923. *L. staphylea auct. non* Roxb.: Wight, Illustr. Ind. Bot. 1. t. 58. 1845. *L. aurantiaca* Zoll. & Mor., Nat. Geneesk. Arch. N.I. 2: 577. 1851; Banerjee & Babu in Indian For. 97: 19. 1971.

Asm.: Bajiou, Kath-dhingia; *Kh.*: Diang-langkyanthei.

Undershrubs - shrubs or small trees, up to 5 m tall; branches glabrous or sparsely pubescent. Leaves 2 or 3, rarely 4-pinnate. Leaflets usually many; rachis 20-60 cm long, glabrous; stipules obovate-oblong. Leaflets ovate, ovate-oblong, or oblong-lanceolate, 10-20 x 3-7 cm, terminal leaflets usually the largest, acuminate at apex, rounded to cuneate at base, serrate at margins, coriaceous at maturity, glabrous or under surface sparsely pubescent, small globose pearl glands sometimes present; petiolules 5-10 mm long, glabrous-pubescent; nerves 8-10 pairs, much arched. Inflorescence 6-10 cm long, pubescent or minutely red-rusty villous; bracts ovate to triangular, 3 mm long. Flowers red to orange red. Calyx 3 to 4 mm long, glabrous or pubescent, persistent in fruit. Staminodial tube 2-3 mm long, upper free part emarginate. Ovary 4-8 loculed; style 1-2 mm long. Fruits 6-8 mm across, orange red.

Fl. & Fr. : May - Feb.

Distrib. India : Uttar Pradesh, Sikkim, Assam, Manipur, Meghalaya, Maharashtra, Tamil Nadu and Andaman Islands.

Myanmar, Thailand, Laos, Cambodia, Malaya, Indonesia, New Guinea, Philippines, Taiwan, Micronesia, Tropical C., W. and E. Africa, Madagascar, Bourbon and Mauritius.

Uses : The stems are used as substitute for bamboos in building temporary huts in forests where no bamboos grow.

8. *Leea indica* (Burm.f.) Merr. in Philip. J. Sc. 14: 245. 1919; Santapau in Rec. Bot. Surv. India 16: 56, 1953; Banerjee in Rec. Bot. Surv. India 19: 33. 1965. *Staphylea indica* Burm.f., Fl. Ind. 75.t. 24. f.2. 1768. *Leea sambucina* Willd., Sp. Pl. 1: 1177. 1798; M. Lawson in Fl. Brit. India 1: 666. 1875, p.p. *L. umbraculifera* C.B. Clarke in J. Bot. 19: 141. 1881; Kanjilal *et al.*, Fl. Assam, 1: 306. 1936. **Fig. 74.**

Beng.: *Kukum-Jhiwa*; Mal.: *Nyeru*, *Maniparandis*, Mar.: *Karkani*; Tam.: *Nyekki*, *Ottanali*.

Large shrubs, occasionally small trees, usually 2-5 m tall, rarely up to 15 m; stems several to single, often with stilt roots usually fluted at base; branches generally glabrous, straight rigid. Leaves 2-3-pinnate; petiole purple, 10-20 cm long; stipules obovate-oblong, 6 x 3 mm long; rachis 15-40 cm long, stout, glabrous; leaflets oblong, ovate-lanceolate or elliptic-lanceolate, 7-20 x 2-9 cm, acute, acuminate to caudate at apex, rounded to cuneate at base, coarsely serrate to dentate at margins, glabrous, coriaceous; pearl glands small, caducous; petiolules 5-25 mm; nerves in 7-12 pairs, arcuate, bifurcating near the margin, raised beneath. Inflorescence 10-20 cm long, usually lax, sometimes dense, glabrous to pubescent; peduncles; 5-10 cm long bracts narrowly triangular to linear, up to 4 mm long, early caducous. Flowers 5-merous, greenish white; pedicels; 2-3 mm long. Calyx 2-4 mm long, lobed up to middle, glabrous to pubescent. Corolla tube and staminodial lobes 2.5-3.5 mm long; corolla lobes 3-4 mm long. Staminodial lobes cleft or notched. Ovary 6-loculed; style 1-2 mm long. Fruits depressed, globose, 6-7 mm across, purple-black. Seeds 4-6, grooved.

Fl. & Fr. : June - March.

Distrib. India : Punjab, Uttar Pradesh, Bihar, West Bengal, Sikkim, Arunachal Pradesh, Assam, Nagaland, Mizoram, Tripura, Meghalaya, Orissa, Madhya Pradesh, Maharashtra, Goa, Andhra Pradesh, Tamil Nadu, Kerala and Andaman & Nicobar Islands.

Sri Lanka, Nepal, Bangladesh, Myanmar, Singapore, Indonesia, New



Fig. 74. *Leea indica* (Burm.f.) Merr.

Guinea, Philippines, Laos, Vietnam, Cambodia, Thailand, China, Malesia, N. Australia, Solomon Island, Santa Cruz Island and Fiji.

9. *Leea macrophylla* Roxb. ex Hornem., Hort. Hafn. 1: 213. 1813; M. Lawson in Fl. Brit. India 1: 664. 1875. *L. aspera* Wallich ex G. Don, Gen. Hist. 1: 713. 1831. *L. integrifolia* Roxb., Fl. Ind. 2: 472. 1824; M. Lawson in Fl. Brit. India 1: 667. 1875. *L. robusta* Roxb., Fl. Ind. 2: 468. 1824; M. Lawson in Brit. India 1: 667. 1875, p.p. *L. cinerea* M. Lawson in Fl. Brit. India 1: 665. 1875. *L. coriacea* M. Lawson in Fl. Brit. India 1: 665, 1875. *L. diffusa* M. Lawson in Fl. Brit. India 1: 667. 1875. *L. parallela* Wallich ex M. Lawson in Fl. Brit. India 1: 666. 1875. *L. talbotii* King ex Talbot, For. Fl. Bombay Pres. & Sind. 1: 329. 1909. *L. venkobarrowii* Gamble in Kew Bull. 1917: 26. 1917 & Fl. Pres. Madras 1: 240. 1918. **Fig. 75.**

Beng.: *Dhol-Samudra*; Bhoj.: *Harmada*; Hindi.: *Hathipau*; *Dhol-Samudra*; Kh.: *Pharumborne*; Tel.: *Booradipokai*.

Perennial herbs, shrubs or small trees, up to 2 m tall; young branches, petioles, rachis, petiolules and inflorescence hairy to mealy pubescent; petiole, up to 20 cm long; rachis generally 10-15 cm long; stipule obovate, 2-6 x 1-4 cm. Leaves variable in shape and size, foliolate and then leaflets broadly ovate, almost as long as broad or elliptic, 15-60 cm long, apex acute, base cordate, lower sometimes larger than the upper, or 1-3-pinnate and then leaflets 7-21 or numerous, elongate-oblong, ovate-lanceolate or elliptic-lanceolate, 9-30 x 4-9 cm, acuminate to caudate at apex, rounded or acute at base, serrate at margins, glabrous to sparsely hairy above, sparsely to densely hairy, sometimes mealy pubescent beneath, chartaceous to subcoriaceous; petiolules up to 25 mm long; nerves in 4-14 pairs, pubescent to hairy. Inflorescence 12-45 cm long, much branched; bracts deltoid to narrowly triangular, up to 6 mm long; peduncle up to 25 cm long. Flowers greenish white. Calyx 1.5-3 x 2.5-4 mm, mealy pubescent. Corolla tube with staminodial lobes 3-4 mm long; corolla lobes thick, 2-4 x 1.2 mm, greyish pubescent to papillose. Staminodial lobes slightly retuse or shallowly cleft. Ovary 6-loculed; style 1-1.5 mm. Fruits 10-15 mm across. Seeds usually 6, ca 4 x 3 mm.

Fl. & Fr. : July - March.

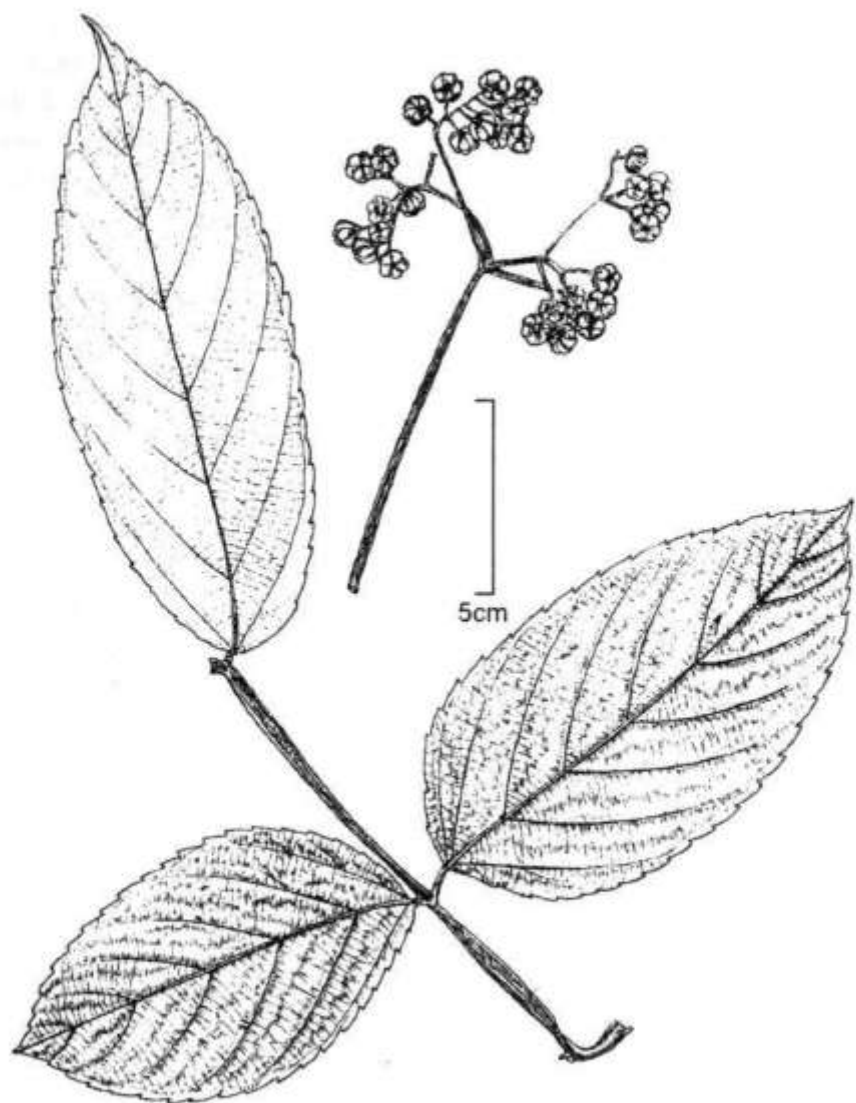


Fig. 75. *Leea macrophylla* Roxb. ex Hornem.

Distrib. India : In subHimalayan tract and Western Ghats, ascending up to 2250 m in the Himalaya. Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Meghalaya, Orissa, Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala and Andamans.

Nepal, Bhutan, Bangladesh, Myanmar, Laos, Cambodia and Thailand.

Uses. Fruit is edible and is also of medicinal importance. The root is said to yield a dye. The root is also reported to be a remedy for ringworm and Guinea worm and is also applied as poultice on obstinate sores and sprains.

10. *Leea rubra* Blume ex Spreng., Syst. Veg. 1: 670. 1824; Prain, Bengal Pl. 239. 1903. *L. brunoniana* C.B. Clarke in J. Bot. 19: 166. 1881. *L. linearifolia* C.B. Clarke in J. Bot. 19: 165. 1881.

Nearly glabrous shrubs, up to 2 m tall. Leaves usually 3-pinnate, sometimes 2-or 4-pinnate; petiole 2-8 cm long; stipules represented by a narrow wing. Leaflets numerous, ovate to ovate-oblong or elliptic to elliptic-lanceolate, 5-10 x 2.5-5 cm, acute to acuminate at apex, cuneate to rounded at base, crenulate-serrulate at margins, without pearl glands, chartaceous, glabrous, dark green; nerves in 6-10 pairs, continued to the margins; petiolules up to 0.5 cm long, winged and crisped. Inflorescence 5-12 cm long, glabrous-rusty pubescent; peduncles; 4-10 cm long; bracts deltoid, inconspicuous. Flowers crimson red. Calyx 2-3 mm long, lobed to the middle, glabrous; corolla tube and staminodial lobes 2-3 mm long. Staminodial tube 1-2 mm long, upper free part notched. Ovary 4-6-loculed; style 1-2 mm long. Fruits deep red, 8-10 mm. Seeds 6.

Distrib. India : West Bengal, Assam and Meghalaya.

Bangladesh, Myanmar, Thailand, Laos, Vietnam, Cambodia, Malesia, Philippines New Guinea and N. Australia.

11. *Leea setuligera* C.B. Clarke in J. Bot. 19: 105. 1881; Cooke, Fl. Pres. Bombay 1: 261. 1902; Santapau in Rec. Bot. Surv. India. 16: 56. 1953.

Shrubs, up to 2 m tall. Leaves 2-pinnate, uppermost 2-3-pinnate; petioles 8-20 cm long; stipules a narrow wing, 2.5 x 3-1 cm; rachis 8-20 cm long. Leaflets numerous, ovate to ovate-oblong or elliptic to elliptic-lanceolate, 6-12 x 1-2.5 cm, acuminate at apex, acute to rounded, rarely subcordate or unequal at base, serrate at margins, setaceous hairy above, membranous to chartaceous, sometimes wine coloured below; pearl glands angular, sparse; nerves 6-12, setaceous hairy beneath. Inflorescence dense or lax, 5-15 cm long, glabrous to pubescent; bracts and bracteoles narrowly triangular, inconspicuous, caducous; peduncles up to 8 cm long. Flowers wine red to carmine in bud, greenish yellow when open. Calyx 1.5 x 2.5 mm. Pubescent. Corolla tube with staminodial lobe 2-2.75 mm long; corolla lobes 2-2.5 x 1.25-1.4 mm; staminodial lobes cleft or notched; anthers 1-1.25 mm. Ovary 4-6-loculed; style 1 mm long. Fruits 7-10 mm across. Seeds 4-6, ca 5 x 4 mm.

Fl. & Fr. : Sept. - Nov.

Distrib. India : Assam, Maharashtra (Khandala) and Karnataka (Concan).

Thailand and China.

Note. The species is similar to *L. guineensis* in appearance. The leaflets resemble *L. rubra* in size and shape but differ in the margin being closely serrate and in 3-6-rows of unusually stiff bristles on the upper surface of the leaflets between each pair of the nerves.

SAPINDACEAE

(P.C. Pant)

Trees or shrubs, sometimes woody or herbaceous climbers with axillary tendrils; plants tanniferous, producing proanthocyanins, and not ellagic acid. Leaves alternate, rarely opposite, pinnate, palmate or trifoliolate, rarely simple; stipules absent excepting in some of the climbers; leaflets opposite or alternate, entire or dentate, occasionally lobed; petiolules swollen into a pulvinus. Inflorescence axillary or terminal cymes, racemes or panicles, seldom solitary and axillary. Flowers regular or irregular, bisexual or functionally unisexual, usually small. Sepals 4-5, free or united below, imbricate or rarely valvate. Petals free, mostly 4 or 5, seldom more than 5 or only 3, equal or unequal, imbricate, at times with an appendage at the base, sometimes absent. Disc annular, sometimes unilateral, rarely the disc is minute and intrastaminal. Stamens in a single whorl, 4-10, usually 8, inserted within the disc at the base of the ovary, or outside, or on the disc or unilateral; filaments free, often pubescent-hairy, long in the male, short in bisexual flowers; anthers 2-locular, opening by longitudinal slits; pollen grains tricolporate or syncolporate, rarely bicolporate or 3-4-porate. Ovary superior, entire or 2-3-lobed, usually of 3 carpels, rarely of 2 or 6 or less than 6 carpels, united into a compound, generally plurilocular ovary; style terminal, lobed or divided, rarely 2-4, free; ovules 1-2 or rarely many in each locule, axile, rarely parietal. Fruits capsules, drupes or nuts, fleshy or dry, dehiscent or indehiscent, smooth, rough, hairy or spiny, sometimes winged. Seeds without endosperm, often arillate; embryo twisted, plicate, oily and starchy.

Throughout the world, especially in tropical and subtropical regions; ca 150 genera and 2000 species; 18 genera and 37 species in India.

Literature. VAN DEN BERG, R.G. (1978). Pollen Morphology of the genera *Pometia*, *Cubilia*, *Otonophelium* and *Litchi* (Sapindaceae - Nephelieae). *Blumea* 24: 369-494. LEENHOUTS P.W. (1978). Systematic Notes on the Sapindaceae - Nephelieae. *Blumea* 24: 395-403. MUKERJEE, S.K. (1980). Sapindaceae of Peninsular India. *J. Econ. Tax. Bot.* 1: 77-81. MULLER, J. & P.W. LEENHOUTS (1976). A general survey of the pollen types in Sapindaceae in relation to taxonomy. In: I.K. Ferguson, J. Ferguson & J. Muller, *The evolutionary significance of the exine*. *Linn. Soc. Symp. Ser.* 1: 407-445. RADLKOFER (1931-34). In: Engl., *Das Pflanzenreich*. Heft 98.

KEY TO THE GENERA

- | | |
|---|-------------------------|
| 1a. Herbaceous climbers | 3. Cardiospermum |
| b. Shrubs and trees | 2 |
| 2a. Leaves simple | 3 |
| b. Leaves compound (sometimes unifoliolate in some races of <i>Allophyllus chartaceus</i>) | 5 |
| 3a. Fruits compressed and winged | 7. Dodonaea |
| b. Fruits neither compressed nor winged | 4 |
| 4a. Fruits tubercled | 13. Nephelium |
| b. Fruits not tubercled | 12. Mischocarpus |
| 5a. Flowers irregular | 6 |
| b. Flowers regular | 7 |
| 6a. Sepals-4, hooded | 1. Allophyllus |
| b. Sepals-5, not hooded | 6. Dittelasma |
| 7a. Rachis broadly winged | 8. Filicium |
| b. Rachis not winged | 8 |
| 8a. Ovules-2 | 9 |
| b. Ovules solitary | 10 |
| 9a. Fruits inflated capsules | 10. Harpullia |
| b. Fruits membranous, winged capsules | 7. Dodonaea |
| 10a. Sepals in two whorls | 11 |
| b. Sepals not in two whorls | 13 |
| 11a. Fruits saponaceous | 16. Sapindus |
| b. Fruits not saponaceous | 12 |
| 12a. Petals without scales | 18. Xerospermum |
| b. Petals with scales or hairy rim or pair of auricles at base | 11. Lepisanthes |
| 13a. Young branches, upper surface of leaflets and flowers with resinous scales | 9. Ganophyllum |
| b. Resinous scales absent | 14 |
| 14a. Petals absent | 15 |
| b. Petals present | 19 |
| 15a. Lowest pair of leaflets stipuliform | 16 |
| b. Leaflets not stipuliform | 17 |
| 16a. Fruits densely covered by soft, weak prickles | 14. Otonephelium |
| b. Fruits glabrous | 15. Pomertia |
| 17a. Deciduous or subdeciduous trees | 17. Schleicheria |
| b. Evergreen plants | 18 |
| 18a. Fruits tubercled | 13. Nephelium |
| b. Fruits not tubercled | 12. Mischocarpus |

- | | |
|----------------------------------|-------------------------|
| 19a. Fruits indehiscent | 20 |
| b. Fruits dehiscent | 21 |
| 20a. Disc densely hairy | 5. Dimocarpus |
| b. Disc glabrous | 15. Pometia |
| 21a. Aril with two spurs at base | 12. Mischocarpus |
| b. Aril not spurred | 22 |
| 22a. Flowers tetramerous | 4. Cupania |
| b. Flowers pentamerous | 2. Arytera |

1. *Allophylus* L.

Shrubs, subscandent or small trees. Leaves alternate, exstipulate, 1-3-foliolate; leaflets entire, subentire or serrate. Flowers small polygamo-dioecious, pedicellate, fascicled in simple or branched axillary thyrses, white or yellowish. Sepals 4, in opposite pairs, imbricate, outer smaller. Petals 4, generally declinate, naked, inside or with a shaggy scale. Disc unilateral, usually with 4-glands, opposite the petals. Stamens 8, inserted and in bisexual flowers surrounding the ovary. Ovary usually 2-lobed, 2-loculed; in male flowers merely a pistillode; styles 2, ovule 1 in each cell. Fruits indehiscent, 1-2-lobed; lobes subglobose. Seeds with short aril.

Tropical and subtropical America, Africa, Mascarin Island, Madagascar, Asia to Australia, Indian Archipelago and Pacific; ca 255 species, 9 in India.

Note. The species of this genus are highly polymorphic and exhibit wide range of ecological variation.

Literature. LEENHOUTS, P.W. (1967). A conspectus of the Genus *Allophylus* (Sapindaceae). *Blumea* 15(2): 301-358. MUKERJEE, S.K. (1972). Indian *Allophylus* (Sapindaceae). *Indian For.* 98: 489-496.

KEY TO THE SPECIES

- | | |
|--------------------------------|--------------------------------|
| 1a. Leaves unifoliolate | 1. <i>A. chartaceus</i> |
| b. Leaves trifoliolate | 2 |
| 2a. Berry black | 3 |
| b. Berry red | 5 |
| 3a. Climbers | 3. <i>A. concanicus</i> |
| b. Shrubs or small sized trees | 4 |

- | | |
|--|--------------------------|
| 4a. Leaflets glabrescent or puberulous along midrib and petiolules; fruits globose | 2. <i>A. cobbe</i> |
| b. Leaflets glabrous; fruits obovoid-subglobose | 4. <i>A. dimorphus</i> |
| 5a. Leaves glabrous | 6 |
| b. Leaves tomentose | 7 |
| 6a. Leaflets lanceolate | 7. <i>A. subfalcatus</i> |
| b. Leaflets ovate, elliptic or obovate | 8. <i>A. triphyllus</i> |
| 7a. Racemes stout; leaflets oblong-lanceolate or oblong-ovate | 9. <i>A. villosus</i> |
| b. Racemes slender; leaflets obovate-ovate | 8 |
| 8a. Bark of the branches yellowish brown | 5. <i>A. rheedii</i> |
| b. Bark of the branches whitish | 6. <i>A. serratus</i> |

1. *Allophylus chartaceus* (Kurz) Radlk. in Engl. & Prantl, Nat. Pflanzenfam. 3(4): 313. 1895. *Schmidelia chartacea* Kurz in J. As. Soc. Bengal 43 (2): 183. 1874. *Allophylus zeylanicus* var. *grandifolia* Hiern. in Fl. Brit. India 1: 673. 1875.

Small shrubs; branches glabrous, terete; bark greyish. Leaves 1-foliolate, chartaceous to subcoriaceous; petioles broadly channeled. Leaflets broadly lanceolate, 5-36 x 1.5-15 cm, margin remotely toothed to repand, glabrous on both sides. Flowers ca 2 mm across. Sepals glabrous. Petals hairy, glands villous with reddish hairs. Stamens pilose. Fruits up to 1 cm in diam., subglobose or obovoid, glabrous.

Fl. & Fr. : April - Dec.

Distrib. India : Mostly in North Eastern region. Sikkim, West Bengal, Assam and Nagaland.

Note. Two very small lateral leaflets are also sometimes met in this species. Radlkofer (1932, l.c.) considers this species as a form of *A. subfalcatus* Radlk.

2. *Allophylus cobbe* (L.) Raeusch., Nomencl. Bot. ed. 108. 1797. *Rhus cobbe* L., Sp. Pl. 267. 1753. *Allophylus cobbe* (L.) Raeusch. forma *racemosus* Hiern in Fl. Brit. India 1: 674. 1875.

Fig. 76.

Mar.: *Tipan*.

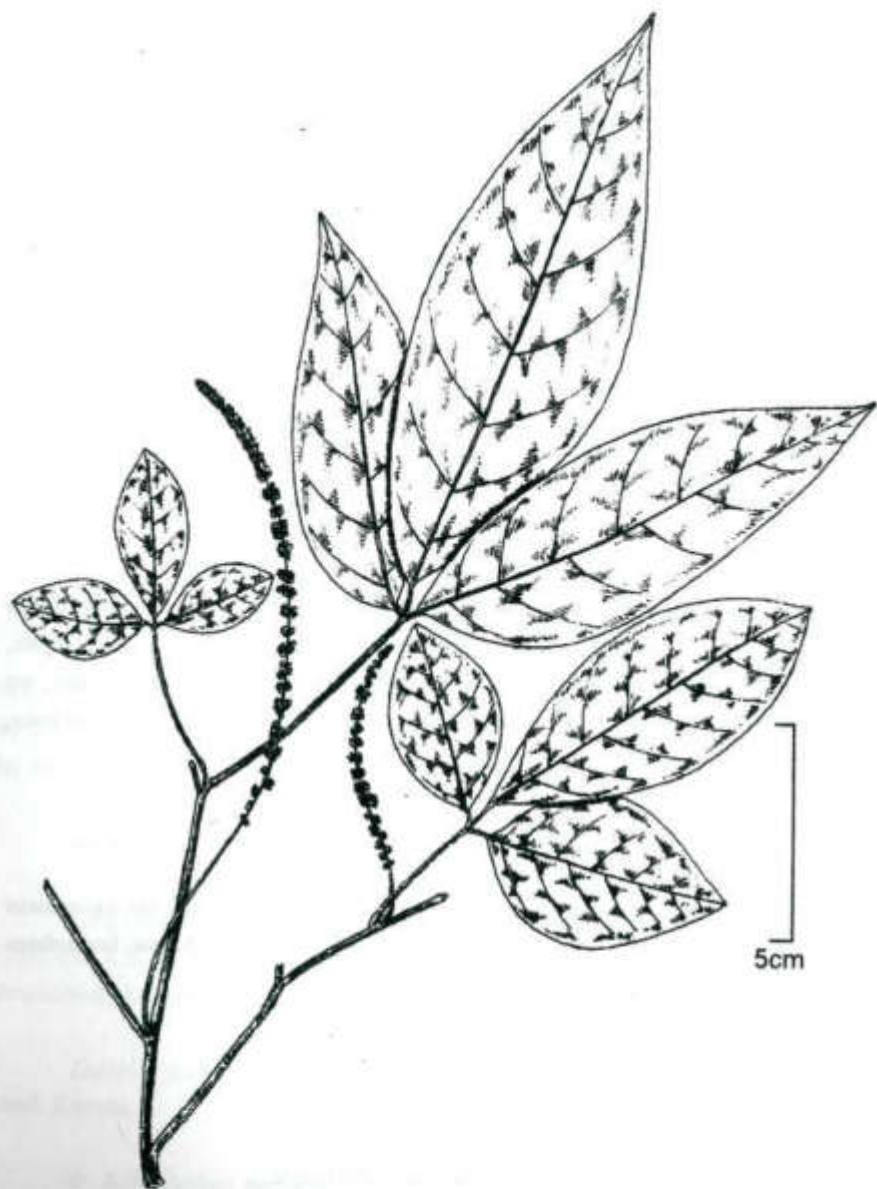


Fig. 76. *Allophylus cobbe* (L.) Raeusch.

Small sized trees, up to 15 m tall. Leaves 3-foliolate; leaflets ovate or elliptic-ovate, 1.5-12 x 0.8-6.5 cm, apex acute, base cuneate, subentire or serrulate, sparsely tomentose above, silvery tomentose on undersurface. Flowers *ca* 0.3 cm across, shortly pedicelled, in branched racemes. Fruits globose, glabrous.

Fl. & Fr. : March - Dec.

Distrib. India : Plains of Eastern India, Western Ghats and Deccan plateau, along rivers and streams and in moist deciduous forests, up to 600 m. West Bengal, Maharashtra, Goa, Daman & Diu, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala and Andaman & Nicobar Islands.

Myanmar, Bangladesh, Sri Lanka and Philippines.

3. *Allophylus concanicus* Radlk. in Sitzb. Math.-Phys. Acad. Muench. 20: 230. 1890; Gamble, Fl. Pres. Madras 1: 246. 1918.

Woody climbers; branchlets conspicuously lenticelled. Leaflets broadly ovate to lanceolate or oblanceolate, 17.6 cm long, obtusely acuminate at apex, base cuneate, subcoriaceous, glabrous, coarsely serrate. Flowers white, on long, much branched thyrses. Fruits subglobose, *ca* 0.7 cm across, glabrous.

KEY TO THE VARIETIES

- | | |
|--|------------------------------------|
| 1a. Leaflets broadly ovate | 3.1 var. <i>concanicus</i> |
| b. Leaflets lanceolate or oblanceolate | 3.2 var. <i>lanceolatus</i> |

3.1. var. *concanicus*

Fl. & Fr. : March - Aug.

Distrib. India : Karnataka and Kerala. Endemic.

3.2. var. *lanceolatus* Gamble, Fl. Pres. Madras 1:246. 1918; Ramchandran & Nair, Fl. Cannanore 110. 1988.

Fl. & Fr. : March - Aug.

Distrib. India : Western Ghats, upto 1350 m. Tamil Nadu. Endemic.

4. *Allophylus dimorphus* Radlk., Sap. Holl.-Ind. 17: 56. 1879; Leenh. in Blumea 15: 325. 1967; Lakshmin. in Hajra *et al.*, Fl. Andaman-Nicobar Isls. 1: 311. 1999.

Shrubs, up to 2 m tall; branchlets blackish brown, terete, lenticellate. Leaves 3-foliolate; leaflets elliptic-rhomboid, *ca* 10 x 5 cm, acuminate, cuneate and oblique at base, serrate along margins in upper half only, coriaceous, glabrous. Panicles *ca* 3.5 cm long. Flowers *ca* 1 mm long.

Fl. & Fr. : February - May.

Distrib. India : South Nicobar Islands.

Philippines.

5. *Allophylus rheedii* (Wight) Radlk. in Engl. & Prantl., Nat. Pflanzenfam. 3(5): 313. 1895. *Schmidelia rheedii* Wight, Sp. Nilgerrh. 1: 30, t. 33. 1846 & Ico. 3: t. 964. 1845. *Allophylus cobbe* (L.) Raeusch. forma *rheedii* Hiern in Fl. Brit. India 1: 674. 1875.

Mal.: *Mukannen peru*.

Large shrubs to small trees, densely ferruginous tomentose; bark lenticelled. Leaflets 8.5-16 x 3.5-6.5 cm, acuminate, margin obscurely serrate. Racemes branched, longer than the leaves. Flowers small. Fruits globose.

Distrib. India : Western Ghats, up to 1670 m. Maharashtra, Tamil Nadu and Kerala.

6. *Allophylus serratus* (Roxb.) Kurz in J. As. Soc. Bengal 44(2): 185. 1876. *Ornitrophe serrata* Roxb., Pl. Corom. 1: 44. t. 61. 1796. *Allophylus cobbe* (L.) Raeusch. forma *serratus* (Roxb.) Hiern in Fl. Brit. India 1: 675. 1875.

Fig. 77.



Fig. 77. *Allophylus serratus* (Roxb.) Kurz

Mal.: *Siruvalli*; *Perakudikkai*; Or.: *Kandakola*; *Kontakura*.

Climbing shrubs. Leaves 3-foliolate; leaflets elliptic or obovate 7-10 x 5-6 cm, apex shortly acuminate, cuneate at base, greyish tomentose underneath, margin serrate-denticulate. Flowers *ca* 0.2 cm across, yellowish or white, clustered in simple axillary racemes. Fruits globose to subglobose, *ca* 0.6 cm in diam., orange red on ripening.

Fl. & Fr. : June - Sept.

Distrib. India : West Bengal, Arunachal Pradesh, Tripura, Orissa, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Note. Leenhouts (Blumea 25: 351. 1967) considers this species to be closely related and sympatric with *A. cobbe* and *A. rheedii*.

7. ***Allophylus subfalcatus*** Radlk. in Rec. Bot. Surv. India 3(3): 342. 1907. *Schmidelia distachya* DC., Prodr. 1: 610. 1824. *Allophylus cobbe* forma *distachyus* Hiern in Fl. Brit. India 1: 674. 1875 and forma *glaber* Hiern. in Fl. Brit. India 1: 674. 1875. *A. distachyus* Radlk. in Engl. & Prantl, Nat. Pflanzenfam. 3(5): 313. 1895. *A. glaber* var. *acutissimus* Radlk. in Engl., Das Pflanzenr. 98B. 567. 1932.

Arborescent shrubs; bark lenticelled, greyish white. Leaves long petioled; leaflets ovate-lanceolate or elliptic-lanceolate, 7-24 x 0.5-8 cm, acuminate, unequal at base, lateral ones usually smaller, glabrous to glossy, chartaceous, distantly serrate-dentate, repand crenate. Racemes dense flowered, unbranched. Sepals glabrescent. Petals cuneate; disc puberulous. Fruits clavate-ellipsoid, glabrous, orange red.

KEY TO THE VARIETIES

- | | |
|--|-----------------------------|
| 1a. Leaflets lanceolate | 7.3 var. subfalcatus |
| b. Leaflets ovate-lanceolate or elliptic-lanceolate | 2 |
| 2a. Lateral leaflets unequal at base; racemes usually paired | 7.2 var. distachyus |
| b. Lateral leaflets usually subfalcate; racemes not paired | 7.1 var. acutissimus |

7.1 var. **acutissimus** (Radlk.) Mukerjee in Indian For. 98(8): 493. 1972. *Allophylus glaber* (Roxb.) Boerl. var. *acutissimus* Radlk. in Engl., Das Pflanzenr. 98B. 567. 1932.

Fl. & Fr. : July - Nov.

Distrib. India : Andaman & Nicobar Islands.

Myanmar.

7.2. var. **distachyus** (DC) Mukerjee in Indian For. 98(8): 493. 1972. *Schmidelia distachya* DC., Prodr. 1: 610. 1824. *Allophylus cobbe* (L.) Raeusch. forma *distachys* Hiern in Fl. Brit. India 1: 674. 1875. *A. distachyus* Radlk. in Engl. & Prantl, Nat. Pflanzenfam. 3(5): 313. 1895.

Fl. & Fr. : May - Dec.

Distrib. India : Frequently as an undergrowth in evergreen forests, up to 800 m. Assam, Meghalaya, Karnataka, Tamil Nadu and Kerala.

Bangladesh and Indo-Malaya.

Note. This variety has been considered as a distinct species by some authors (Leenhouts in Blumea 25(2): 328. 1967; Balakr., Fl. Jowai 1: 141. 1981; Haridasan, K. & R.R. Rao, For. Fl. Meghalaya 1: 141. 1985; Ram Chandran & Nair, Fl. Cannanore 110. 1988).

7.3. var. **subfalcatus**

Fl. & Fr. : Oct. - Jan.

Distrib. India : Assam and Meghalaya.

Myanmar and Bangladesh.

8. **Allophylus triphyllus** (Burm.f.) Merr. in Philip. J. Sc. 19: 363. 1921. *Usubis triphyllus* Burm.f., Fl. Ind. 89, t. 32. f. 1. 1768. *Allophylus cobbe* (L.) Raeusch. forma *glaber* Hiern in Fl. Brit. India 1: 674. 1875.

Shrubs, up to 2 m tall, glabrous. Leaves 3-foliolate; leaflets ovate, elliptic or obovate, acute or acuminate, margin obscurely crenulate upwards; lateral leaflets smaller. Flowers in fascicles or racemes, white, shortly pedicelled. Fruits globose.

Fl. & Fr. : Sept. - Nov.

Distrib. India : West Bengal, Tamil Nadu and Andaman & Nicobar Islands.

Myanmar and Malaysia.

9. *Allophylus villosus* (Roxb.) Blume, Rumph. 3: 132. 1847. *Ornitrophe villosus* Roxb., Fl. Ind. 2: 265. 1832. *Allophylus cobbe* (L.) Raeusch. forma *villosus* (Roxb.) Hiern in Fl. Brit. India 1: 674. 1875 and forma *aporetica* Hiern in Fl. Brit. India 1: 674. 1875. *A. aporeticus* Voigt ex Kurz in J. As. Soc. Bengal 44(2): 185. 1875.

Shrubs; bark lenticelled, greenish brown; branchlets with densely ferruginous tomentum or glabrous. Leaves 3-foliolate; leaflets obliquely oblong, lanceolate, broadly elliptic-lanceolate or oblanceolate, 7.5-20 x 3.5-10 cm, apex acuminate, base cuneate, glabrescent on upper surface, villous beneath. Inflorescence simple hispid racemes. Flowers up to 0.3 cm across, greenish-yellow. Fruits subglobose, orange red.

KEY TO THE FORMS

- 1a. Branchlets densely hairy
- b. Branchlets glabrous

- 9.2. forma **villosus**
- 9.1 forma **aporeticus**

9.1. forma *aporeticus* (Voigt ex Kurz) Mukerjee in Indian For. 98. 492. 1972.

Fl. & Fr. : Aug. - Nov.

Distrib. India : Common as an undergrowth in forests. Meghalaya and Assam.

Bangladesh, Myanmar and Indo-Malaya.

9.2. forma *villosus*

Fl. & Fr. : June - Sept.

Distrib. India : Assam.

Bangladesh, Myanmar and Indo-Malaya.

2. *Arytera* Blume

Trees or shrubs. Leaves paripinnate, spirally arranged. Leaflets 4-6 (-8), ovate to oblong-lanceolate, apex, obtuse or subobtusely acuminate, base acute, margin entire, sparingly coriaceous. Flowers uni or bi-sexual, yellow, in branched racemes. Sepals 5-6. Petals 5-6, with long ciliate auricles at base which are sometimes connate into a scale. Disc annular, crenate, glabrous. Stamens 8; filaments pilose; in male flowers exerted, short in female ones; anthers pubescent, glabrescent. Ovary 2-loculed. Fruits capsular, 2-lobed, coriaceous. Seeds with saccate aril.

China, Indo-Malaya, China, Australia and Pacific; 25 species, 1 in India.

Arytera littoralis Blume, Rumphia 3: 170. 1849; Parkinson, For. Fl. Andaman Isls. 137. 1923. *Euphoria xerocarpa* Blume, Bijdr. 234. 1825. *p.p.* *Arytera xerocarpa* (Blume) Adelb. in Blumea 6: 324. 1948. *Cupania adenophylla* Planchon ex Hook.f., Fl. Brit. India 1: 677. 1875.

Trees or shrubs, up to 10 m tall; branchlets lenticellate with prominent leaf-scars, together with rachis pale brown; hairy to glabrous. Leaves (2-) 4-6 foliolate; leaflets subopposite, ovate, elliptic, elliptic oblong or oblong-lanceolate, 4-1.5 x 1.75-6.5 cm, acuminate at apex, cuneate to slightly attenuate at base, coriaceous, glabrous; lateral nerves 8-10 pairs. Inflorescences axillary or pseudoterminal, pubescent. Flowers yellow, up to 2.5 cm in diam. Calyx deeply lobed, segments subvalvate. Petals hairy above. Capsules with compressed lobes. Seeds ellipsoid-orbiculate, black.

Fl. & Fr. : Feb. - Nov.

Distrib. India : In the littoral forests. Andaman & Nicobar Islands.

Myanmar and Malesia.

3. *Cardiospermum* L.

Climbing herbs; stem and branches wiry, grooved, tendrillar. Leaves alternate, exstipulate, biternate; leaflets coarsely dentate. Flowers polygamodioecious, ca 0.5-0.8 mm across, atoping coiled tendrils, in axillary racemes or corymbs. Sepals 4 in two pairs; outer small; inner large. Petals 4 in two pairs; upper pair with a suprabasal scale; lower with an inflexed appendage. Disc with 2 glands. Stamens 8; filaments free or connate below, of unequal lengths. Ovary sessile or subsessile, 3-loculed. Fruit an inflated, membranous, trigonous, 3-celled, loculicidally 3-valved capsule. Seeds globose usually with hilum at base.

Tropical America and Africa; ca 12 species, 2 in India.

Literature. MATTHEW, K.M. (1983). *Flora of Tamil Nadu Carnatic* 1: 291-292.

KEY TO THE SPECIES

- | | |
|--|--------------------------|
| 1a. Capsules pyriform, winged at the angles; seeds with large heart-shaped hilum | 2. <i>C. halicacabum</i> |
| b. Capsules subglobose, ovate when young, not winged; seeds with small orbicular hilum | 1. <i>C. canescens</i> |

1. *Cardiospermum canescens* Wallich, *Pl. As. Rar.* 1: 14.t. 14. 1829; Hiern in *Fl. Brit. India* 1: 670. 1875.

Softly hairy, scandent annuals; stems sulcate. Leaves biternate; petioles up to 5 cm long; petiolules 0.1-1 mm long, hairy; leaflets 3-5, margins irregularly toothed, both sides hairy, more so on lower surface. Flowers white; in long, peduncled, umbellate cymes arising from the base of a pair of coiled tendrils. Outer sepals rounded, hairy on outer faces. Petals rounded at apex. Style short. Capsules subglobose, 3-angled, sparsely hairy. Seeds globose, smooth, black, with white aril.

Fl. & Fr. : Throughout the greater part of the year.

Distrib. India: Western Ghats and Deccan Plateau. Andhra Pradesh, Gujarat, Maharashtra, Tamil Nadu, Karnataka and Kerala.

Sri Lanka, Myanmar and Abyssinia.

Note. Matthew (Flora of Tamil Nadu Carnatic 1: 291-292. 1983) is of the opinion that the material present in many Indian herbaria and described in Indian Floras under this species is referable to *C. halicacabum* L. var. *luridum* (Blume) Adelb. However, the material examined by the author agrees well with the protologue of *Cardiospermum canescens* Wallich.

2. *Cardiospermum halicacabum* L., Sp. Pl. 366. 1753; Hiern in Fl. Brit. India 1: 670. 1875. *C. microcarpum* Kunth, Nov. Gen. et Sp. Pl. 5: 104. 1821.

Beng.: *Sibjhul, Nayaphutki*; Guj.: *Kagadolio, Korolio*; Kan.: *Kakarlata*; Mani.: *Putka, Sibjul*; Mar.: *Tejovati, Kapal-phodi*.

Annual or perennial, tendrillar, climbing herbs; stem and branches slender, furrowed, pubescent or glabrous. Leaves deltoid or ovate, 3-8 cm, biternate; leaflets deeply incised, acute at apex, narrowed at base. Flowers very small, white in umbellate cymes; cyme resting on 2 opposite circinate tendrils. Outer sepals rounded-obovate, inner rounded, larger than the outer, very thin. Petals rounded. Capsules on short stalks, subglobose or broadly pyriform, 1.2-3 cm across, trigonous, truncate at top, angles winged. Seeds globose, black.

Fl. & Fr. : Throughout the greater part of the year.

Distrib. India : Throughout the country in tropical and subtropical regions, mostly amidst hedges.

Note. Roots, leaves and seeds are reported to be used in indigenous system of medicine in Maharashtra.

4. *Cupania* Plum.

Small to medium trees or large shrubs. Leaves alternate, pinnate, exstipulate; leaflets opposite or subopposite, entire, subcoriaceous. Inflorescence

axillary and subterminal panicles or raceme, bracteolate. Flowers polygamodioecious. Sepals 5-4, concave, imbricated in 2 rows. Petals 5-4, alternating with calyx segments, often with 1-2 basal scales. Disc regular or unequally thick, annular, glabrous, exerted. Stamens 7-10 or fewer, free, inserted in the disc. Ovary ovoid-obovoid or obcordate, 2-4-celled; ovules solitary. Fruits obcordate-pyriform, glabrous, 1-2 seeded. Seeds arillate at base.

Pantropical, Australia; *ca* 55 species, 1 in India.

Cupania jackiana Hiern in Fl. Brit. India 1: 678. 1875. *Arytera montana* Blume, Rumphia 3: 171. 1847. *Lepidopetalum montanum* (Blume) Radlk., Sap. Holl.-Ind. 14. 1879; Lakshmin. in Hajra *et al.*, Fl. Andaman-Nicobar Isls. 1: 319. 1999. *Lepidopetalum jackianum* Radlk., Sap. Holl.-Ind. 45. 1879.

Small trees; young parts pubescent. Upper leaves 15-30 cm long; leaflets 6-8, opposite-subopposite, elliptic, 5-15 x 3.5-6 cm, obtusely acuminate, cuneate-obtuse at base. Panicles towards the apex of the branches, short petioled; lateral veins 8-10 pairs. Sepals lanceolate, united at the base. Corolla ovate-cordate. Stamens 8; filaments slender, glabrous; anthers oblong. Ovary 2-loculed. Capsules oblong-obovoid, 2-celled, 1-seeded, sometimes 2-seeded, mucronate-cuspidate, shortly stipitate at base. Seeds ellipsoid, black.

Fl. & Fr. : April - March.

Distrib. India : Andaman & Car Nicobar Islands.

Note. The fruits are said to be favourite to pigeons in Andaman & Nicobar Islands.

5. *Dimocarpus* Lour.

Trees or shrubs. Leaves paripinnate; petiole slightly swollen at base, exstipulate; leaflets opposite or alternate; membranous or thin coriaceous, glabrous or somewhat hairy, entire, repand or serrate to dentate, blunt at apex to acuminate, often mucronate, base more or less oblique. Inflorescence terminal, thyrsoid. Flowers unisexual, yellowish to white. Sepals 5-6-lobed. Petals 5, rarely 6. Disc 5-lobed, densely hairy. Stamens 6-10, slightly exerted

or not; filaments very slender, thread like. Ovary sessile, broadly cordate, tuberculate. Fruits globular to broadly ellipsoid.

South and S.E. Asia, Sri Lanka, Eastern Malesia; 5 species, 1 in India.

Dimocarpus longan Lour., Fl. Cochinch. 293. 1790. *Nephelium longan* Cambess., Mem. Mus Hist. Nat. Pairs 18: 30. 1829; Hiern in Fl. Brit. India 1: 688. 1875.

Kan.: *Kanakindeli*; Kh.: *Samphal-bol*; Mal.: *Psakotta*; Mar.: *Umb, Yumb*; Tam.: *Puvatti, Katta Puvan, Shempuvan, Sakattai*.

Trees, up to 25 m tall, sometimes buttressed; bark smooth, younger parts with stellate pubescence; twigs terete, faintly grooved. Leaves upto 45 cm long; leaflets 4-10, opposite or alternate, oblong or ovate-lanceolate, 3.5-14 x 1.5-3.5 cm; thin, membranous to coriaceous; apex acute to acuminate, more or less oblique at base, rachis rusty puberulous, becoming glabrous on ageing, thinly tufted, tomentose on mid rib and nerves, with or without naked gland or tuft of hairs on nerve axils beneath. Panicles terminal or axillary, pubescent. Flowers in clusters; pedicels short, pubescent. Calyx lobes confluent at base, partially hairy on inner side. Petals linear-spathulate, densely hairy or if not hairy, sessile glands present inside towards apex. Ovary 2-3-lobed. Fruits smooth to warty, sometimes granular, glabrescent.

Fl. & Fr. : Feb. - Aug.

Distrib. India : Indo-Gangetic plain. N.E. India, Deccan peninsula, commonly in evergreen forests, up to 1800 m. Punjab, Uttar Pradesh, Assam, Arunachal Pradesh, Meghalaya, Maharashtra, Karnataka, Tamil Nadu and Kerala.

Bangladesh, Myanmar, Sri Lanka, China, Taiwan, Thailand, Vietnam, Philippines and Papua New Guinea.

Note. Forms with narrow linear leaves are also often met with. The young leaves are conspicuously red. The bases of upper leaflets are distinctly oblique. Often cultivated. The aril is edible.

6. *Dittelasma* Hook.f.

Trees; bark grey leathery, young parts softly tomentose. Leaves alternate, pinnate, exstipulate; leaflets subopposite or alternate. Inflorescence axillary or terminal panicle. Flowers polygamo-monoecious; bracteate. Sepals 5, tomentose on outer face. Petals 4, each with a scale, tomentose outwards. Disc semicircular, glabrous. Stamens 8, inserted at the base of ovary and disc, equal; filaments hairy. Ovary 3-lobed, 3-loculed, ovoid-globose, glabrous; ovules 1 in each locule. Fruits fleshy, indehiscent, of 3 cocci. Seeds globose, exarillate; testa thick.

Indo-Malaya; a monotypic genus in North-Eastern region of India.

Dittelasma rarak (DC.) Hook.f., in Benth. & Hook.f., Gen. Pl. 1: 396. 1862; Hiern in Fl. Brit. India 1: 672. 1875. *Sapindus rarak* DC., Prodr. 1: 608. 1824.

Trees, up to 20 m tall, terete, with glabrous, smooth bark. Leaves paripinnate, up to 50 cm long; leaflets 14-26, falcately lanceolate or oblong, 3.5-18 x 0.8-6 cm, oblique at base, subcoriaceous, pubescent when young, becoming glabrescent or glabrous afterwards, short petioled. Panicles erect, ovoid-pyramidal, fulvus, velvety. Flowers white or pale. Calyx appressed, pubescent; sepals of unequal length, oblong. Petals oblong. Anthers slightly exerted. Fruits subglobose, ca 6 mm across; pericarp saponaceous.

Fl. & Fr. : June - Nov.

Distrib. India : In primary and secondary forests, between 200-1000 m. West Bengal, Assam and Meghalaya. Rare.

Bhutan, Myanmar, Vietnam, China, Sumatra, Malaya, Java and Sri Lanka (introduced).

7. *Dodonaea* L.

Shrubs, rarely attaining tree habit; branches slender, often viscous, angular; bark ash black-reddish brown. Leaves alternate, subsessile, simple or abruptly pinnate, exstipulate. Inflorescence lateral and terminal, racemes or panicles. Flowers polygamous. Sepals 2-5, imbricate or valvate. Petals absent. Disc very

small in female flowers; obsolete in male ones. Stamens 5-10, usually 8, inserted on outer face of disc; filaments short; anthers linear-oblong. Ovary 3-6-loculed, sessile; ovules 2 in each cell. Capsules membranous or coriaceous, septicidally 2-6-valved, valves winged, cells 1-2-seeded. Seeds lenticular or subglobose, compressed.

Tropical and subtropical regions, chiefly Australian; *ca* 55 species, 2 in India.

Literature. LEENHOUTS, P.W. (1983). Notes on the Extra Australian species of *Dodonaea* (Sapindaceae). *Blumea* 28(2): 271-289.

KEY TO THE SPECIES

- | | |
|---|----------------------------------|
| 1a. Flowers mostly unisexual, often dioecious; scar of sepals on fruit usually annular, occasionally slightly lobed; fruits glandular, reddish tinged, especially the wings | 1. <i>D. angustifolia</i> |
| b. Flowers bisexual; scar of sepals under fruit mostly strongly lobed; fruits straw-coloured or brownish | 2. <i>D. viscosa</i> |

1. *Dodonaea angustifolia* L.f., Suppl. Pl. 218. 1782. *D. viscosa* Jacq. var. *angustifolia* Benth., Fl. Austrl. 1: 476. 1863.

Tam.: *Viraali, Vilaari.*

Shrubs or small sized trees, up to 6 m tall; bark blackish; young branchlets glandular. Leaves elliptic-lanceolate, 1-9 x 0.2-1.8 cm, apex acute to acuminate, when fresh somewhat coriaceous, surfaces glandular. Inflorescence axillary and terminal racemes or panicles. Flowers green, up to 4 cm long. Sepals 4-5, connate at base, persistent. Stamens up to 10; anthers oblong, slightly hairy at the tip. Disc annular. Pistil 2-4-merous; style cleft at apex, rarely not so. Capsules 2-3-winged, glandular, glabrous. Seeds subglobose, up to 4 mm across, black.

Fl. & Fr. : Throughout the year.

Distrib. India : In open grounds, especially the forest clearings and establishes quickly in such locations; Central India and Western Ghats. Madhya Pradesh and Tamil Nadu.

Pakistan, Afghanistan, Iraq, Iran, Arabia, China, Japan, Sri Lanka, Vietnam, Malesia, Australia, New Zealand, Tropical Africa, Madagascar, Mascarene Island, South Africa, N. & S. America and West Indies.

2. *Dodonaea viscosa* Jacq., Enum. Syst. Pl. 19. 1760; Hiern in Fl. Brit. India 1: 697. 1875. **Fig. 78.**

Hindi: *Sannata*; Kan.: *Bhandaru*; Mal.: *Vrali*; Tam.: *Virali*; Tel.: *Bhandaru*.

Shrubs to small sized trees, up to 4 m tall; branches terete, often angled; young parts scurfy puberulous. Leaves oblanceolate-obovate or broadly elliptic, 1-8 x 0.2-1.5 cm, subacute or shortly apiculate or sometimes notched, abruptly tapering towards the basal end, viscid, with shining yellowish resinous exudation. Inflorescence paniced cymes, up to 7 cm long, lateral nerves up to 35, looping. Flowers greenish yellow. Sepals oblong. Anthers oblong-linear. Capsules membranous, compressed, up to 1.5 cm long, notched at apex and base, 2-3-winged, 1-2-seeded. Seeds black.

Fl. & Fr. : Jan. - Sept.

Distrib. Throughout India.

Myanmar, Vietnam, Malesia, Australia, Pacific, Pakistan, Tropical Africa, Madagascar, N. and S. America and West Indies.

Note. A very complex and variable species. On the basis of differences in leaf shape and shape and size of the fruits, Radlkofer (1933, *l.c.*) has mentioned three varieties, eight forms and seven subforms under the species. The local name *Viraali*, according to Mathews (*Flora of the Tamil Nadu Carnatic* 1: 294. 1983) is applicable to *D. angustifolia* L.f. This species is commonly used as a hedge. Wood is very hard and heavy, therefore, useful in making tool-handles and walking sticks.

8. *Filicium* Thwaites ex Benth. & Hook.f.

Trees; branches angular, covered with waxy scales. Leaves alternate, imparipinnate, subcoriaceous; leaflets subopposite, entire, rachis broadly winged. Flowers small, polygamous. Sepals 5, imbricate, caducous. Petals 5. Disc



Fig. 78. *Dodonaea viscosa* Jacq. : a. A twig bearing fruits, b. A twig bearing flowers, c. A flower.

5-lobed. Stamens 5; filaments subulate, free; anthers ovate. Ovary globose, sessile, 2-loculed; in male flowers with pistillode only; style bent; stigma simple or bilobed; ovules solitary in each cell. Fruits fleshy, drupes 1-celled.

Tropical Africa and Asia; 3 species, 1 in India.

Filicium decipiens (Wight & Arn.) Thwaites, Enum. Pl. Zeyl. 408. 1864; Bennett in Fl. Brit. India 1: 539. 1875. *Rhus decipiens* Wight & Arn., Prodr. 172. 1834.

Mal.: *Val muriccha*, *Niroli*; Tam.: *Ningal*.

Trees, up to 20 m tall; bark reddish brown covered with scales. Leaves up to 35 cm long, dark green with broadly winged spatulate rachis, subcoriaceous. Leaflets 6-8 pairs, obovate 5-10.5 x 1.5-2.5 cm, apex emarginate, base narrow, unequal, subcoriaceous, resinous dotted. Flowers in axillary panicles, greenish white. Calyx 5-lobed. Petals 5, equalling the calyx, white, imbricate, without scales. Disc tomentose. Stamens inserted within the disc, equal. Ovary sessile, compressed-globose. Fruits almost globose, apiculate, purple, 1-2-seeded. Seeds oblong.

Fl. & Fr. : Oct. - Feb.

Distrib. India : Western Ghats, up to 1800 m, usually in drier situations, rare in evergreen forests. Karnataka, Tamil Nadu and Kerala.

Note. An ornamental avenue tree with fern like leaves, under cultivation in parks and gardens of Peninsular India.

9. *Ganophyllum* Blume

Trees. Leaves pinnate, spirally arranged; leaflets oval to oblong-lanceolate, entire. Flowers in axillary panicles, polygamo-dioecious. Sepals 5, segments subvalvate. Petals absent. Disc 5-lobed. Stamens 5. Ovary 2-loculed, ovules 2; style short, thick; stigma 2-lobed. Fruits ovoid, 1-celled, 1-seeded.

Africa, S.E. Asia to Australia; 2 species, 1 in India.

Ganophyllum falcatum Blume, Mus. Bot. Ludg. Bat. 1: 230. 1850; Parkinson, For. Fl. Andaman Isls. 116. 1923.

Trees, up to 20 m tall; bark rough, reddish brown, lenticellate; young branchlets and leaves with small, white resinous scales. Leaves up to 70 cm long; leaflets 7-21, 7-7.5 x 2.5-3 mm, acuminate, broadly cuneate to rounded at base, herbaceous or coriaceous, often falcate, entire; lateral nerves 6-11 pairs, looping away from the margins. Inflorescence axillary or close to apex, up to 20 cm long. Flowers yellow. Calyx glabrous outwards and somewhat scaly, hairy on inner surface, persistent in fruit. Disc orange. Ovary pubescent. Fruits glossy, ovoid, 10 x 8 mm, green, orange-yellow on ripening. Seed 1.

Fl. & Fr. : Dec. - March.

Distrib. India : In coastal forests. Andaman & Nicobar Islands.

Tropical West Africa, Philippines, Malaya, Sumatra, Java, New Guinea and N.E. Australia.

Note. Wood is hard and useful for making buildings.

10. **Harpullia** Roxb.

Shrubs to medium sized trees. Leaves alternate, exstipulate, pinnate; leaflets alternate or rarely opposite, narrowly obovate, entire, variably hairy to glabrous. Flowers unisexual, dioecious, in axillary, terminal, sometimes pseudoterminal racemes; bracts and bracteoles mostly caducous. Sepals 5, imbricate, equal or sometimes outer two smaller, hairy, sometimes with glandular hairs along the margin. Petals 5, either distinctly clawed with a pair of auricles above the claw or sessile, glabrous or ciliate. Disc annular, rarely 5-lobed. Stamens 5-8, exerted in male flowers. Ovary 2 or 3 (-4) loculed. Fruits inflated, rounded, coriaceous. Capsule 2 or 3-lobed, almost glabrous or variably hairy.

Tropical and subtropical Asia to Australia, and Pacific Islands; 26 species, 2 in India.

KEY TO THE SPECIES

- 1a. Glabrous; petals thin fleshy, neither clawed nor auricled; seeds almost enveloped by the aril 2. *H. cupanoides*
- b. Hairy; petals distinctly clawed and auricled; seeds with small annular aril 1. *H. arborea*

1. *Harpullia arborea* (Blanco) Radlk. in Sitzb. Math.-Phys. Acad. Muench. 16: 409. 1890. *Ptelea arborea* Blanco, Fl. Filip. 63. 1837. *Harpullia cupanoides auct non* Roxb. : Hiern in Fl. Brit. India 1: 692. 1875. *p.p.* (*non* Roxb., 1824). **Fig. 79.**

Trees, *ca* 50 m tall, sometimes shrubs up to 30 m; young parts finely fulvous-pubescent. Leaves alternate, imparipinnate; leaflets oblong-lanceolate, 5.5-20 x 3-6 cm, apex acute to rounded, sometimes acuminate, base obtuse or cuneate, entire, glabrous, very sparsely hairy on mid rib and nerves beneath, shining light green. Flowers in lax, drooping, axillary panicles. Sepals ovate to obovate, sometimes with scattered glandular hairs, not persistent in fruit. Petals with a claw and exceeding the sepals, margin often ciliate. Disc sparsely to densely hairy. Stamens 5-7. Pistil 2-4-merous; ovules 1 or 2 in each cell. Fruits ellipsoid to globular, coriaceous to woody, inflated. Seeds 1-2 in each cell.

Fl. & Fr. : Dec. - Sept.

Distrib. India : Eastern India, Deccan Plateau and in Western Ghats in evergreen forests up to 1350 m. Assam, Maharashtra, Karnataka, Tamil Nadu and Kerala.

Sri Lanka, Thailand, Vietnam, Malay Peninsula, Sumatra, Java, Lesser Sunda Island, Philippines, Celebes, Moluccas, New Guinea, Australia, Solomon Island, Fiji Island, Somoa Island and Tonga Island.

Note. Bark is used as fish poison. Fruits are used in laundry and for washing hairs. Oil from seeds is antirheumatic.

2. *Harpullia cupanoides* Roxb. Fl. Ind. 2: 442. 1824; Hiern in Fl. Brit. India 1: 692. 1875 *p.p.*

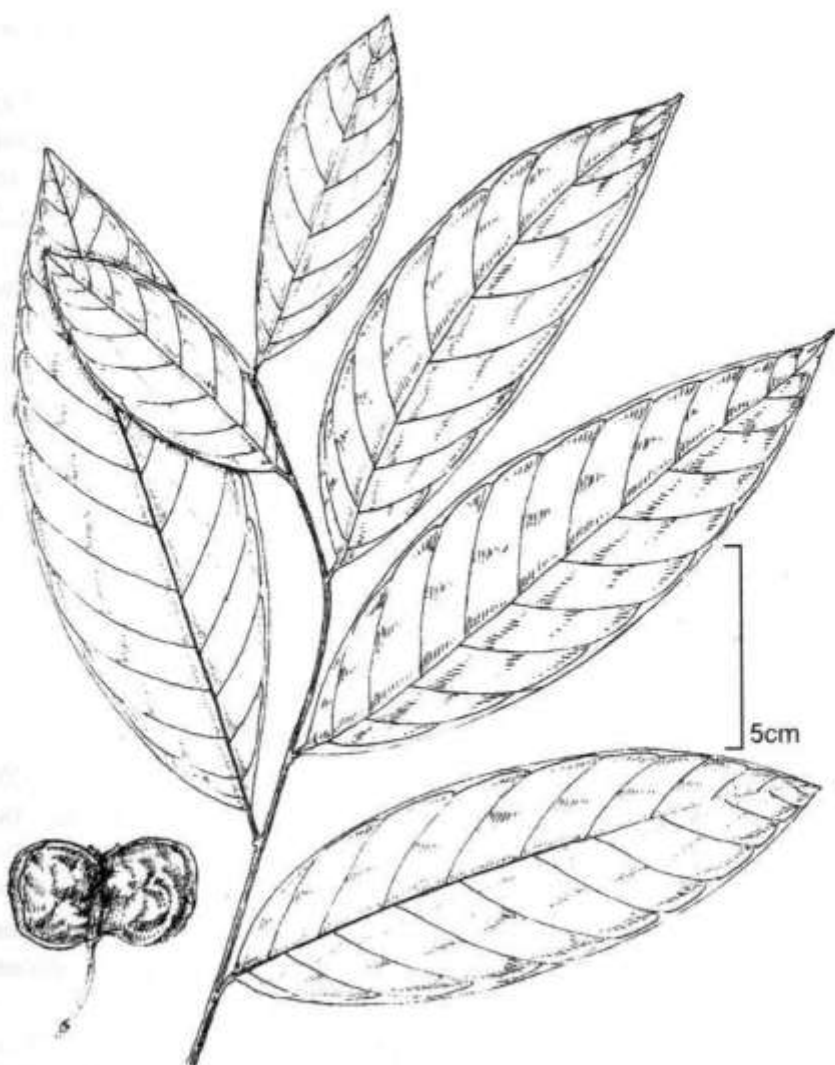


Fig. 79. *Harpullia arborea* (Blanco) Radlk.

Trees, rarely shrubs, up to 20 m tall. Leaves alternate, exstipulate; leaflets opposite and alternate, elliptic, 2.5-16 x 3-5.5 cm, acute to rounded at apex, sometimes abruptly acuminate, base equal on both sides to oblique, entire, glabrous, sparsely hairy on nerves on undersurface. Inflorescence axillary, sometimes pseudo-terminal racemes or panicles. Flowers dioecious or polygamous. Sepals elliptic to orbicular or broadly ovate, persistent in fruit. Petals oblong-ovate to oblanceolate. Disc annular. Stamens 4-6. Pistil 2-3-merous; ovules 1 in each cell, rarely 2. Fruits ellipsoid, obovoid or globular, inflated, coriaceous.

Fl. & Fr. : Feb. - Aug.

Distrib. India : Assam and Andaman & Nicobar Islands.

Bangladesh, China, Myanmar, Thailand, Java, Vietnam, Malesia and Australia.

11. *Lepisanthes* Blume

Trees or shrubs. Leaves pari- or imparipinnate, rarely simple, with or without stipules; leaflets opposite or alternate, hairy or glabrous underneath, margin entire, base equal sided to oblique. Inflorescence axillary or terminal, simple or branched. Flowers unisexual, mostly monoecious. Sepals 4-6, free, outer 2 mostly smaller, imbricate, glabrous to puberulous, mostly ciliolate, often partly glandular, entire to denticulate. Petals 4-7, mostly distinctly clawed, partly ciliate, partly glandular, hairy at base; scales mostly well developed. Disc crescent shaped, slightly lobed, hairy or glabrous. Stamens *ca* 8, in male flowers distinctly exerted or filaments very short to absent; anthers hairy or glabrous. Ovary lobed or not, hairy or glabrous, 2 or 3, rarely 1 or 4-loculed; stigma on a short style or sessile; ovules 1 in each cell. Fruits lobed or not, smooth or slightly warty. Seeds exarillate, shining brown to black.

Old world tropics, West Africa, Madagascar, S. & S. E. Asia, Malesia to New Guinea; 40 species, *ca* 5 in India.

Literature. LEENHOUTS, P.W. (1969). *Florae Malesianae Praecursores* L. A. Revision of *Lepisanthes* (Sapindaceae). *Blumea* 17(1): 33-91.

KEY TO THE SPECIES

- | | |
|---|---------------------------|
| 1a. Petals as long as sepals | 4. <i>L. senegalensis</i> |
| b. Petals longer than sepals | 2 |
| 2a. Fruits parted, glabrous | 3. <i>L. rubiginosa</i> |
| b. Fruits either lobed or, if parted, tomentose | 3 |
| 3a. Pericarp thick; fruits more or less wrinkled when dry | 2. <i>L. erecta</i> |
| b. Pericarp thin; fruits smooth to warty | 4 |
| 4a. Basal pair of leaflets stipuliform; petiole absent | 1. <i>L. andamanica</i> |
| b. Stipular leaflets wanting; petiole present | 5. <i>L. tetraphylla</i> |

1. *Lepisanthes andamanica* King in J. As. Soc. Bengal 65 (2): 428. 1896; Parkinson, For. Fl. Andaman Isls. 137. 1923.

Evergreen shrubs or trees, 5-6 m tall; branches purplish brown to light silvery. Lowest pair of leaves at base caducous; rachis 3-6 cm long, terete, grooved; leaflets opposite, 2-21 x 1.5-7 cm, apex blunt, obliquely cuneate to rounded at base, thin, papery, mid rib and veins prominent; petiolules 2-6 mm long. Inflorescence axillary, solitary or branched, densely fulvous to greyish puberulous, many-flowered-panicles, 8-20 cm long; pedicel 1-2 mm long; bracts narrowly triangular, 1 mm long. Sepals 4, outer 2 smaller, ovate, 2.5 x 1.5 mm, densely ciliate; inner elliptic-obovate, 3 x 2 mm. Petals 4, spatulate, 5-6 mm long, with scale, woolly inside. Disc interrupted, glabrous. Stamens 8; filaments 4 mm long, woolly; anthers ovoid, 1.25 mm. Fruits 3-lobed, almost globular, 2 mm long, smooth to densely appressed hairy. Seeds glabrous.

Fl. & Fr. : April - Sept.

Distrib. India : South Andamans and North Nicobar Islands. Endemic.

2. *Lepisanthes erecta* (Thwaites) Leenh. in Blumea 17(1): 69. 1969. *Nephelium erectum* Thwaites, En. Pl. Zeyl. 57. 1858. *Sapindus erectus* Hiern in Fl. Brit. India 1: 683. 1875.

Shrubs, 2-3 m tall; branches glabrous, greyish to purplish brown. Leaves pinnate; leaflets 6-10, subopposite, oblong-lanceolate, 12-25 x 5-7.5 cm, obtuse to bluntly acuminate at apex, cuneate at base chartaceous, glabrous, with prominent venation on both sides; petiolules 3-6 mm long, grooved. Inflorescence almost terminal, branched, many-flowered panicles, 2-20 cm long; pedicels

1 mm long; bracts small. Flowers (only male flowers are known) 5-merous, *ca* 4 x 3 mm. Sepals ovate, ciliolate outwards, glabrous inside; outer 2, 2.5-3 x 2 mm; inner 3.5-4 x 3 mm. Petals 5 mm long, with oblong scales. Disc glabrous. Stamens 8; filaments pubescent above; anthers glabrous. Fruits deeply 3-4-parted, sparsely tomentose, ellipsoid, 3 x 2 mm, yellowish, somewhat fleshy, coarsely wrinkled on drying.

Fl. & Fr. : April - June.

Distrib. India : Tamil Nadu and Kerala.

Sri Lanka and Myanmar.

Note. The seeds lack aril. However, in most earlier works the presence of aril has been mentioned in this species.

4. *Lepisanthes rubiginosa* (Roxb.) Leenh. in *Blumea* 17(1): 82. 1969. *Sapindus rubiginosa* Roxb., *Pl. Corom.* 1: 44, t. 62. 1796. *Erioglossum edule* Blume, *Bijdr.* 229. 1825; Hiern in *Fl. Brit. India* 1: 672. 1875. *E. rubiginosa* Blume in *Rumphia* 3: 118. 1849; Parkinson, *For. Fl. Andaman Isls.* 137. 1923.

Fig. 80.

Tel.: *Ishi rashi*.

Large to moderate sized trees, *ca* 16 m tall; bark dark grey, warty; shoots, petioles, rachis and inflorescence ferruginous pubescent. Leaves alternate, paripinnate, exstipulate; leaflets 8-12, subopposite, ovate, ovate-lanceolate or oblong-lanceolate, 4.5-17 x 2-7 cm, acute or acuminate, base obtuse, often oblique, softly villous on both sides; petiolules upto 5 mm long. Panicles terminal, rusty tomentose, 25-50 cm long. Flowers male and bisexual in the same inflorescence, white, 0.4-0.6 cm long. Sepals 5; inner 2 smaller, pubescent outside, upto 3.75 mm long, imbricate. Petals 4, slightly larger than the sepals, glabrous, oblong-rounded, each with a woolly scale. Disc interrupted, glabrous. Stamens 8; filaments hairy; anthers oblong. Ovary 3-merous, densely hairy. Fruits 5-8 mm long, glabrous, black when ripe.

Fl. & Fr. : Jan. - Aug.



Fig. 80. *Lepisanthes rubiginosa* (Roxb.) Leenh.

Distrib. India : Gangetic Plains, Eastern Himalaya, North East India, and Eastern Ghats, in evergreen, littoral forests, up to 670 m. Uttar Pradesh, West Bengal, Sikkim, Assam, Meghalaya, Andhra Pradesh, Tamil Nadu and Andaman & Nicobar Islands.

Myanmar, Malaya and N.W. Coast of Australia.

5. *Lepisanthes senegalensis* (A.L. Juss. ex Poiret) Leenh. in *Blumea* 17(1): 85. 1969. *Sapindus senegalensis* A.L. Juss. ex Poiret, Enc. 6: 666. 1805. *S. attenuatus* Wallich ex Hiern in Fl. Brit. India 1: 684. 1875. *S. danura* Voigt, Suburb. Calcutta. 94. 1845; Hiern in Fl. Brit. India 1: 684. 1875. *S. bifolius* Hiern in Fl. Brit. India 1: 684. 1875. *S. rubra* Kurz, Fl. Burma 1: 298. 1877. *Otophora paucijuga* Hiern in Fl. Brit. India 1: 680. 1875. *Aphania danura* Radlk. in Sitzb. Math.-Phys. Acad. Muench. 8: 238. 1878; Kanjilal *et al.*, Fl. Assam 1: 322. 1936. *Aphania rubra* Radlk. in Sitzb. Math.-Phys. Acad. Muench. 8: 238. 1878; Kanjilal *et al.*, Fl. Assam 1: 321. 1936. *Aphania nicobarica* Radlk. in Feddes Repert. 18: 332. 1922.

Asm.: Tang-ting; Bon-gadhi, Hekikeko; *Beng.*: Ambuj, Danura, Nuncha; *Kh.*: Dieng-soh-jmmang; *Mani.*: Nuncha.

Evergreen shrubs or small trees, up to 10 m tall, rarely upto 20 m tall; bark greyish brown or dark brown; branches dark brown, verrucose, minutely fissured. Leaves unifoliolate, often crowded at the ends of branches or paripinnate; rachis glabrous; leaflets opposite, elliptic-oblong, ovate or lanceolate, 4-38 x 1-12 cm; acute or shortly acuminate, rounded or subcordate at base, entire, subcoriaceous, glabrous, petiolules 8-12 mm long. Inflorescence axillary and terminal panicles, up to 20 cm long. Sepals 5, connate at base, outer 2 smaller, sparingly ciliate. Petals 5, equalling sepals, with scales at base, very rarely wanting. Disc complete, slightly lobed at base, glabrous. Stamens 5-8; filaments absent or very short, hairy. Ovary 2-3-lobed, glabrous. Fruits ellipsoidal, 8-12 mm long, orange red, purple to blackish on ripening.

Fl. & Fr. : Nov. - June.

Distrib. India : North Western and Eastern region and Western Ghats, usually in evergreen and coastal forests. Uttar Pradesh, Sikkim, West Bengal,

Assam, Arunachal Pradesh, Nagaland, Mizoram, Tripura, Meghalaya, Tamil Nadu and Andaman & Nicobar Islands.

Africa, Nepal, Bhutan, Bangladesh, Myanmar, Sri Lanka, Thailand, Laos, Vietnam, Malay Peninsula, Sumatra, Java, Borneo, Philippines, Celebes, Mollucas and New Guinea.

Note. A highly polymorphic species. A pair of leaflets sometimes occur at the base of the petiole. These are regarded as equivalent to stipules. Further, simple leaves are not infrequently met with in this species.

Uses. Wood is hard and is considered suitable for making tool handles and walking sticks. Fruit is edible.

6. *Lepisanthes tetraphylla* (Vahl) Radlk. in Sitz. Math.-Phys. Acad. Muench. 8: 276. 1878. *Sapindus tetraphylla* Vahl, Symb. 3: 54. 1794. *Hemigyrosa canescens* Blume in Rumphia 3: 166. 1849; Hiern in Fl. Brit. India 1: 671. 1875. *H. deficiens* Beddome, Fl. Sylv. t. 231. 1872; Hiern in Fl. Brit. India 1: 671. 1875. *Lepisanthes montana* Blume, Bijdr. 238. 1825; Hiern in Fl. Brit. India 1: 679. 1875. *L. burmanica* Kurz in J. As. Soc. Bengal 44(3). 183-184. 1875. *L. browniana* Hiern in Fl. Brit. India 1: 680. 1875. *L. cuneata* Hiern in Fl. Brit. India 1: 680. 1875. *Ostodes appendiculata* Hook.f., Fl. Brit. India 5: 401. 1887. *Lepisanthes assamica* Radlk. in Rec. Bot. Surv. India 3: 343. 1909. *L. listeri* King ex Radlk. in Rec. Bot. Surv. India 3: 344. 1909.

Fig. 81.

Mar.: *Karpa, Lokhandi*; Tam.: *Nekota*; Tel.: *Korivi*.

Medium sized, evergreen trees or shrubs, upto 8 m tall, with glabrescent to variably hairy twigs. Leaves pinnate, exstipulate; petiolar base appendaged with scales or without scales; leaflets 4-9-foliolate, subopposite or opposite to alternate, elliptic-oblong, ovate or lanceolate, 4-55 x 2-20 cm, usually rounded at apex, glabrous or variably hairy. Inflorescence axillary, rarely terminal, greyish to fulvous-tomentose, branched panicles, 3-30 cm long. Flowers white or pale yellow, scented. Sepals 5, hairy outside, glabrous within; outer 2 smaller, ovate or elliptic to orbicular, 4 mm long, oblong to transversely elliptic, ovate to obovate, inner 6 mm long. Petals 4, longer than the sepals, with basal scales having either a hairy rim or 2 small auricles, entire to 2-4 lobed. Disc hairy or glabrous,



Fig. 81. *Lepsanthes tetraphylla* (Vahl) Radlk.

complete or interrupted. Stamens up to 18, usually 8, didynamous. Fruits flattened, ellipsoid, obovoid or suborbicular, slightly lobed. Seeds glabrous or densely hairy.

Fl. & Fr. : Feb. - Dec.

Distrib. India : North Eastern region, Western Ghats, Deccan Peninsula, in evergreen dry forests, abundant near coasts, up to 1000 m. Assam, Arunachal Pradesh, Mizoram, Orissa, Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu and Kerala.

Myanmar, Thailand, Vietnam, Sri Lanka and Malay Peninsula.

Note. Flowers are sweet scented and female ones have often 5 petals. A complex and highly variable species with as many as 47 races recognized in the world (Leenhouts, *l.c.*), of which *ca* 6 are recognisable in India.

12. *Mischocarpus* Blume

Trees or large shrubs. Leaves pinnate or very rarely simple; leaflets alternate to opposite, petioluled, margin entire, sometimes revolute, glabrous and shining above, brownish green and hairy on mid rib and nerves beneath, equal sided or rarely slightly oblique at base. Inflorescence axillary or pseudoterminal racemes. Flowers 5-merous; male and bisexual on the same tree. Calyx spreading or cup shaped; lobes subequal, sometimes slightly imbricate at base. Petals 3, 5 or absent, slightly longer than sepals. Disc annular, sometimes irregularly lobed, puberulous or glabrous. Stamens 7-9; filaments puberulous or glabrous; anthers basifixed. Fruits capsular. Seeds globose to ellipsoid.

South East Asia to Australia; 11 species, *ca* 2 in India.

Note. Species of this genus are known for variation in size and reduction in number or total absence of the petals.

Literature. VAN DER HAM, R.W.J.M. (1977). Revision of *Mischocarpus* (Sapindaceae). *Blumea* 23: 251-288. VAN DER HAM, R.W.J.M. (1977). Pollen Morphology of the genus *Mischocarpus* (Sapindaceae). *Blumea* 23: 301-355.

KEY TO THE SPECIES

- 1a. Leaflets 1-6, venation usually coarse on both surfaces; stamens with puberulous filaments; petals 0 or 5 **1. *M. pentapetalus***
- b. Leaflets 1-4, venation fine or almost obsolete; stamens with glabrous filaments; petals 0 or 3 **2. *M. sundaicus***

1. *Mischocarpus pentapetalus* (Roxb.) Radlk., Sapind. Holl-Ind. 43. 1879. *Schleichera pentapetala* Roxb., Fl. Ind. ed. 2: 275. 1832. *Cupania pentapetala* Wight & Arn., Prodr. 113. 1834; Hiern in Fl. Brit. India 1: 678. 1875. *C. sumatrana* Miq., Fl. India Bat. 1(2): 566. 1859; Hiern in Fl. Brit. India 1: 678. 1875. *C. helferi* Hiern in Fl. Brit. India 1: 679. 1875.

Shrubs or trees, up to 25 m tall; young parts puberulous. Leaves up to 30 cm long; leaflets elliptic or oblong-lanceolate, 5-20 x 1-15 cm, entire, apex acuminate, rounded or cuneate at base, thin to coriaceous; domatia along the whole midrib; petiolule 3-6 mm long. Inflorescence axillary and pseudoterminal panicles ca 15 cm long, brownish ferruginous. Flowers yellowish green. Calyx pubescent, lobes triangular-ovate, sometimes slightly imbricate. Petals, if present, mostly auricled and unequal, ovate to elliptic. Disc annular, sometimes irregularly lobed, puberulous or glabrous. Stamens 8. Fruits capsular, pyriform 1-1.5 cm long. Seeds ellipsoid-globose.

Fl. & Fr. : March - Sept.

Distrib. India : Mizoram, Tripura, Meghalaya and Andaman & Nicobar Islands.

Bangladesh, Myanmar, Thailand, Vietnam, Cambodia, Philippines, Malay Peninsula, Indonesia and China.

2. *Mischocarpus sundaicus* Blume, Bijdr. 238. 1825. *Cupania lessertiana* Cambess., Mem. Mus. Hist. Nat. Paris 18. 28, 46, t. 3. 1829; Hiern in Fl. Brit. India 1: 678. 1875.

Evergreen trees or shrubs, up to 16 m tall; branches dark reddish brown, striate; only young parts and inflorescence puberulous, twigs reddish brown. Leaves 15-30 cm long; leaflets opposite to subopposite, ovate-oblong to ovate-

lanceolate 4-20 x 1.5-10 cm; entire, acute at apex, base cuneate, thin to subcoriaceous, upper surface mostly glossy, domatia along the midrib; petiolules 3-8 mm long. Flowers in axillary and pseudoterminal panicles, 6-14 cm long. Calyx connate; lobes triangular. Petals, if present, inconspicuously auricled. Disc annular, glabrous or sparsely puberulous. Stamens 6-9. Fruits globular-pyriform, ca 1.7 x 0.5 cm, sharply 3-angled, hairy when young. Seeds globose-ellipsoid.

Fl. & Fr. : May - Dec.

Distrib. India : Meghalaya and Andaman & Nicobar Islands.

Myanmar, Thailand, Cambodia, Laos, Vietnam, Malay Peninsula, Philippines, Sumatra, Java, Borneo, Australia and China.

Note. This species is not very distinct from *M. pentapetalus*.

13. *Nephelium* L.

Medium-tall trees, rarely shrubs. Leaves spirally arranged, paripinnate, rarely unifoliolate, exstipulate; leaflets alternate, rarely opposite, coriaceous to thin papery, hairy on mid rib above, sparsely puberulous beneath on nerves and mid rib. Flowers mostly dioecious, sometimes monoecious. Sepals free to connate, hairy on both outer and inner faces. Petals absent. Disc complete, often slightly lobed. Stamens exerted in male flowers; filaments densely hairy, long. Ovary 2-3, very rarely 4-loculed. Fruits 1-2-lobed, covered with prickles.

South East Asia, Malesia, Yunnan, Hainan and Moluccas; ca 22 species, 2 in India.

Literature: LAKSHMINARSHIMAN, P., S.P. MATHEW & L.N. RAY (1991). A *Nephelium* New to India From the Nicobar Islands. *Bull. Bot. Surv. India* 33 (1-4): 317-318. LEENHOUTS, P.W. (1986). A taxonomic Revision of *Nephelium* (Sapindaceae). *Blumea* 31: 373-436.

KEY TO THE SPECIES

- 1a. Inflorescence axillary and pseudoterminal; fruits mostly densely spiny, sometimes knobby with short tongue-shaped appendages

1. *N. ramboutan-ake*

- b. Inflorescence usually terminal; fruit appendages somewhat hair like or sometimes more or less tongue-shaped

2. *N. uncinatum*

1. *Nephelium ramboutan-ake* (Labill.) Leenh. in *Blumea* 31(2): 415-419. 1986. *Litchi ramboutan-ake* Labill. in DC., *Bull. Soc. Philomath Paris* 2: 161. 1801. *Nephelium mutabile* Blume, *Rumphia* 3: 104. 1847; Hiern in *Fl. Brit. India* 1: 686. 1875.

Trees or shrubs, up to 10 m tall, rarely more; twigs puberulous or tomentose while young, glabrescent or glabrous on ageing. Leaves rarely 1-foliolate; leaflets 1-7 pairs, oblong or oblong-elliptic, 3-22 x 1.7-12 cm, obtusely acuminate, base acute or rounded, attenuate, entire or slightly repand, surfaces minutely hairy to sometimes glabrous; domatia mostly common, sometimes scarce or absent. Inflorescence axillary to partly pseudoterminal, simple or branched racemes, pubescent. Calyx 4-5-fid or half way connate, pale green or white. Disc glabrous. Stamens 5-8. Ovary densely hairy, 2-rarely 3-merous. Fruits ellipsoid-subglobular, densely coarsely spiny.

Fl. & Fr. : Dec. - June.

Distrib. India: Assam, Arunachal Pradesh, Tripura, Meghalaya and Andaman & Nicobar Islands.

Myanmar, Malaya, Sumatra, Borneo, Moluccas, Philippines and probably Java also.

Note. Flowers are mildly fragrant and the white aril is sweet.

2. *Nephelium uncinatum* Radlk. ex Leenh. in *Blumea* 31(2): 421. 3c & 4b. 1986; Lakshmin. *et al.*, in *Bull. Bot. Surv. India* 33(1-4): 317. 1991.

Trees, up to 60 m tall; bark white; branchlets longitudinally grooved, rusty tomentose, when young, glabrescent on ageing. Leaves petioled, alternate, paripinnate, 4-8-jugate; leaflets subopposite or alternate, elliptic or elliptic-oblong, 3.5-12 x 1-4.5 cm, acute or acuminate, cuneate or sometimes oblique at base, puberulous or glabrous on upper surface towards base of midrib, sparsely hairy on midrib and nerves on the lower surface; lateral nerves 9-20 pairs, impressed or flattened, faintly visible above; petiolules 1-4 mm long. Sepals

more or less connate, 1-1.1 mm in male flowers and 1.4-1.5 mm in female ones. Disc well developed in male flowers with protruding lobes between the stamens, less conspicuous in female flowers, glabrous or hairy. Stamens 5 or 6. Pistil usually 2-merous, rarely 1-merous. Fruits 2.75-3.5 x 2-2.25 cm, warted, red. Seed-1.

Fr.: June.

Distrib. India : Tropical island forests. Andaman & Nicobar Islands.

Malaya, Sumatra and Borneo.

14. *Otonephelium* Radlk.

Middle sized trees. Leaves paripinnate; leaflets glaucous; petiolules short. Inflorescence axillary and terminal panicles. Flowers small, polygamous. Sepals spreading, deeply lobed, hirsute. Petals absent. Stamens 5-9, inserted in the disc; filaments usually pubescent or glabrous and fleshy. Ovary 2-3-lobed; style 2-3 lobed, erect. Fruits echinate.

A monotypic, confined to Indian Peninsula in Western Ghats, 1 species.

Otonephelium stipulaceum (Beddome) Radlk., Sapind. Holl.- Ind. 71. 1879. *Nephelium stipulaceum* Beddome in Trans. Linn. Soc. 25: 212. 1865; Hiern in Fl. Brit. India 1: 690. 1875.

Mal.: *Paviri mulei*

Medium sized trees, wood hard. Leaves 12.5-39 cm long; leaflets opposite or alternate, 4-6 pairs, elliptic, 6-15 x 4-7.5 cm, obtuse, cuneate at base, pale underneath with thin, lateral glandular veins; petiolules short, ca 6 mm long; lowest pair of leaflets stipuliform. Inflorescence axillary and terminal panicles. Calyx 5-6-partite, subvalvate. Stamens 5-9, short; anthers small. Ovary 2-3-lobed; styles 2-3-lobed. Fruits ellipsoid, covered with soft hairy prickles. Seeds half covered by succulent aril.

Fl. & Fr. : March - Aug.

Distrib. India : Common in evergreen forests, up to 1000 m. Karnataka, Tamil Nadu and Kerala. Endemic.

15. *Pometia* J.R. & G. Forst.

Tall, evergreen trees; young parts and branches rusty pubescent, feebly grooved or smooth. Leaves alternate, pinnate; leaflets subsessile, subentire, hairy or glabrous on the midrib above. Inflorescence terminal and axillary, rusty puberulous panicles. Flowers minute, polygamous. Sepals 5. Petals 5 or rarely wanting. Disc annular, sometimes obscurely 5-lobed; glabrous. Stamens 5; filaments slender, shorter in female flowers. Ovary 2-lobed, locules 2, with 1 ovule in each cell. Fruits ellipsoid. Seeds with mucilaginous aril.

Sri Lanka, Malesia, Vietnam, Thailand, S. Yunnan, Famosa; 10 species, 1 in India.

Literature. JACOBS, M. (1962). *Pometia* (Sapindaceae), a study in variability. *Reinwardtia* 6(2): 109-114.

Pometia pinnata J.R. & G. Forst., *Cher. Gen.* 110, t. 55. 1776. *Irna glabra* Blume, *Bijdr.* 230. 1825. *I. tomentosa* Blume, *Bijdr.* 230. 1825. *Pometia tomentosa* Kurz, *Andam. Rep. ed.* 2, 34. 1870; Hiern in *Fl. Brit. India* 1: 691. 1875.

Trees, up to 50 m tall; inner bark with red gum; branchlets grooved, puberulous to densely rusty brown. Leaves up to 90 cm long; rachis glabrescent; leaflets ovate-oblong to oblong-lanceolate, 4-13, 5-15 x 3-6 cm, acuminate to subacuminate at apex, narrowed towards the rounded base, glabrescent to glabrous underneath, the lowest pair suborbicular to elliptic, mostly clasping like a stipule; nerves 11-25 pairs, prominently raised underneath ending in a marginal hydathode or tooth. Inflorescence pubescent or glabrescent, up to 60 cm long. Flowers yellowish green. Calyx dish like or shallow cup shaped, lobed, acute to rounded. Petals usually truncate. Ovary densely pubescent, obcordate. Fruits indehiscent, smooth, in various shades of deep red or brown, yellow and purple. Seeds oblong.

KEY TO THE FORMS

- | | |
|--|------------------------------|
| 1a. Inflorescence erect | 15.2. forma pinnata |
| b. Inflorescence more or less drooping | 2 |
| 2a. Midrib glabrous above | 15.1. forma glabra |
| b. Midrib hairy above | 15.3. forma tomentosa |

15.1. forma glabra (Blume) Jacobs in Reinwardtia 6(2): 125. 1962. *Irna glabra* Blume, Bijdr. 230. 1825.

Fl. & Fr. : Jan. - April.

Distrib. India : South Andaman Islands.

Java, Sumatra, Borneo, Malaya, Philippines and Celebes.

15.2. forma pinnata

Fl. & Fr. : Dec. - May.

Distrib. India : Andamans.

Sri Lanka, Malesia, Samoa, Indo-China, N. Siam, S. Yunnan and Famosa.

15.3. forma tomentosa (Blume) Jacobs in Reinwardtia 6(2): 130. 1962. *Irna tomentosa* Blume, Bijdr. 230. 1825.

Fl. & Fr. : Dec. - April.

Distrib. India : Andaman & Nicobar Islands.

Sri Lanka, Vietnam, Java and Sumatra.

16. Sapindus L.

Trees or shrubs. Leaves alternate, paripinnate, exstipulate; leaflets entire, coriaceous, subopposite. Flowers polygamous, in terminal and axillary panicles. Sepals up to 5, in two series, ovate-rounded in outline. Petals 4-5; scales present

or absent. Disc annular, fleshy. Stamens 8-10, inserted; filaments pilose. Ovary entire or 2-4-lobed; ovule solitary. Fruits fleshy or coriaceous, indehiscent, oblong or globose. Seeds usually globose with two integuments, outer hard, inner membranous.

Throughout the tropical regions of the world; 40 species, 3 in India.

Literature. PRAKASH, V. & B.N. MEHROTRA (1990). Indian species of *Sapindus* L. (Sapindaceae). *J. Econ. Tax. Bot.* 14(1). 75-79.

KEY TO THE SPECIES

- | | |
|--|---------------------------------|
| 1a. Leaflets 5-8 pairs | 2. <i>S. mukorossi</i> |
| b. Leaflets 2-3 pairs | 2 |
| 2a. Leaflets lanceolate, apex acuminate; drupes ferruginous, velvety, almost combined | 3. <i>S. trifoliatus</i> |
| b. Leaflets oblong, apex emarginate; drupes smooth, glabrous, young slightly pubescent, partially combined | 1. <i>S. emarginatus</i> |

1. *Sapindus emarginatus* Vahl, *Symb. Bot.* 3: 54. 1794. *S. trifoliatus* auct non L. 1753; Hiern in *Fl. Brit. India* 1: 682. 1875 *p.p.* *S. laurifolius* Vahl var. *emarginatus* (Vahl) Cooke, *Fl. Bombay* 1: 267. 1902. *S. trifoliatus* var. *emarginatus* (Vahl) Radlk. in *Engl., Das Pflanzenr.* 98. 1956.

Hindi: *Ritha*; Kan.: *Aratala*; Mal.: *Berugukay*; Or.: *Makra maya*; Tam.: *Manipungu*, *Nilta Vanchi*, *Pounanga*, *Ponnangottai*; Tel.: *Konkudu*.

Trees, 8-14 m tall; bark rough, grey. Leaves alternate, 10-30 cm long; leaflets opposite or alternate, ovate-oblong or obovate-oblong, entire, 1.5-15 x 0.5-5.5 cm, rounded or emarginate at apex, glabrescent above, softly tomentose beneath and on mid rib above. Flowers 4-5 mm long, white. Sepals 5, ovate, hairy on outer surface. Petals clawed, with tufted, white, shining hairs, glabrous on inner surface. Stamens 8; filaments pilose; anthers oblong. Ovary 3-lobed, densely hairy when young. Drupes ovoid, smooth.

Fl. & Fr. : Major part of the year.

Distrib. India : Gangetic Plain, Western Ghats, Deccan Plateau, in deciduous and dry evergreen forests, occasionally along roadsides and sometimes

in gardens. Uttar Pradesh, Bihar, West Bengal, Orissa, Madhya Pradesh, Rajasthan, Gujarat, Goa, Daman & Diu, Andhra Pradesh, Tamil Nadu and Kerala.

Pakistan, Myanmar and Sri Lanka.

Note. Fruits are used as a substitute for soap, for washing clothes.

2. *Sapindus mukorossi* Gaertner, *Fruct.* 1: 342, t. 70. f. 3. 1788; Hiern in *Fl. Brit. India* 1: 683. 1875. **Fig. 82.**

Hindi: *Ritha*.

Deciduous trees, 5-12 m tall; bark dark or pale grey, rough; branchlets somewhat tomentose. Leaves pinnate, 15-45 cm long; leaflets alternate to subopposite, lanceolate-oblong, 4.5-16.5 x 1.1-4.5 cm, usually acuminate, sometimes acute to obtuse, glabrous, somewhat falcate or oblique, entire, conspicuously nerved. Flowers white or purple, numerous, in large, terminal and lateral, pubescent, pyramidal panicles. Flowers white or purple, ciliated. Calyx hairy outwards. Petals with woolly scale. Disc lobed, glabrous. Stamens 8-10, inserted within the disc. Ovary entire or 2-4-lobed, glabrous. Fruits fleshy or coriaceous, indehiscent. Seeds globose, black.

Fl. & Fr. : April - Feb.

Distrib. India : North-West and Eastern Himalaya, Gangetic Plains, Assam Plains, up to 1660 m, frequently planted along the road sides. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, West Bengal, Sikkim, Arunachal Pradesh and Assam.

Pakistan, Nepal, Bangladesh, China and Japan.

3. *Sapindus trifoliatus* L., *Sp. Pl.* 367. 1753; Hiern in *Fl. Brit. India* 1: 682. 1875 *p.p.* *S. laurifolius* Vahl, *Symb. Bot.* 3: 54. 1794; Gamble, *Fl. Pres. Madras* 1: 178. 1956. (Repr. ed.).

Hindi: *Ritha*; Kan.: *Kogatemara*, *Antuvala*, *Artala*; Mal.: *Pasakotta*.

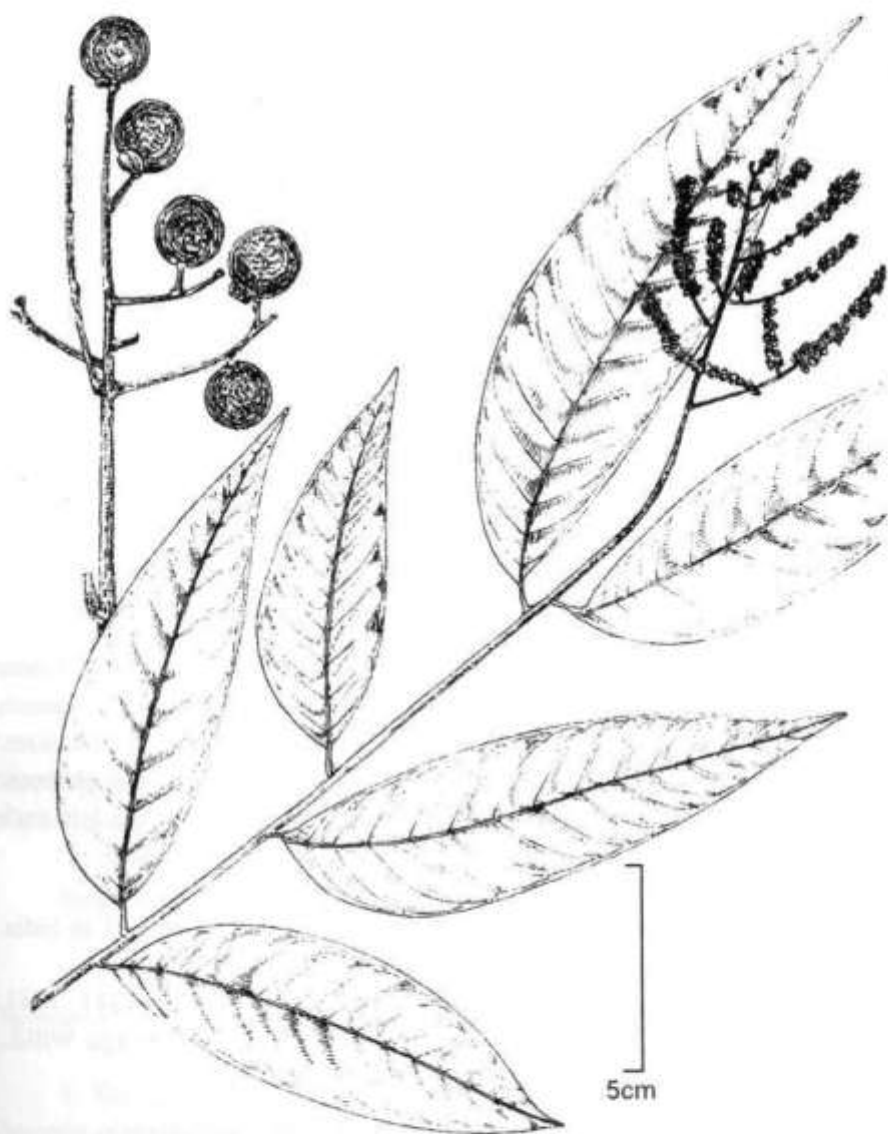


Fig. 82. *Sapindus mukorossi* Gaertner

Trees, up to 10 m tall. Leaves alternate, pinnate; leaflets subopposite, usually 2 pairs, rarely 3 pairs, lanceolate or elliptic-lanceolate, 7.5-17.5 x 2.5-10 cm, entire. Flowers white, in terminal, rusty pubescent panicles. Calyx pubescent outwards, glabrous within. Petals clawed, narrowly lanceolate, with 2 scales at base. Disc concave, margin fleshy, hirsute. Stamens 8; anthers oblong. Fruits coriaceous, fulvous hairy when young, wrinkled when ripe. Seeds black.

Fl. & Fr. : Sept. - March.

Distrib. India : Plains of Northern, Western, Central and Eastern India, Western Ghats, common in evergreen and moist forests, sometimes planted. Uttar Pradesh, West Bengal, Orissa, Madhya Pradesh, Rajasthan, Karnataka, Tamil Nadu and Kerala.

Pakistan and Sri Lanka.

Note. Fruits used as a substitute for soap, especially for washing clothes.

17. *Schleichera* Willd.

Trees, 6-20 m tall; bark smooth, grey. Leaves alternate, paripinnate, exstipulate; leaflets opposite, subopposite or alternate, entire. Flowers polygamodioecious, greenish yellow, fascicled in hairy tomentose racemes or panicles. Sepals 4-6, valvate or obscurely imbricate. Petals absent. Disc undulate, glabrous. Stamens 5-8, inserted; filaments pubescent. Ovary 3-4-loculed; ovule 1 in each locule; stigma 3-4 cleft. Fruits ovoid. Seeds enclosed in fleshy aril.

Tropical Asia, Indian Archipelago and Philippines; 2 species, 1 in India.

Schleichera oleosa (Lour.) Oken., Allg. Naturgesch 3(2): 1341. 1841. *Pistacia oleosa* Lour., Fl. Cochinch. 615. 1790. *Schleichera trijuga* Willd., Sp. Pl. 4: 1096. 1806; Hiern in Fl. Brit. India 1: 681. 1875.

Hindi: *Kusum*; Kan.: *Chakota*; Mal.: *Puvam*; Mar.: *Kosimb*; Tam.: *Puvan*.

Deciduous or subdeciduous trees. Leaves paripinnate, 20-40 cm long; leaflets opposite, 2-4 pairs; elliptic or elliptic-oblong, 1.5-15 x 0.5-

7 cm, usually rounded at apex, base rounded or tapering, entire, glabrous on both sides, sessile or subsessile. Inflorescence axillary racemes, 5-10 cm long. Flowers pale green. Calyx small, cupular, lobed, hairy-tomentose outside. Fruits dry, crustaceous, indehiscent, tipped with style, smooth or often with blunt prickles. Seeds 1-2, compressed, brown.

Fl. & Fr. : Feb. - Nov.

Distrib. India : Throughout in subtropical, dry deciduous forests, up to 1000 m.

Myanmar, Thailand, Vietnam and Sri Lanka.

Note. Young leaflets are pink to dark red in color. The trees are, therefore, easily spotted from a distance in forests. The tree yields high quality lac. Young flower buds are used as 'Chatni' and fruits as vegetable; seeds also yield cooking oil.

18. *Xerospermum* Blume

Trees, up to 25 m tall; bark dark or black-brown, rough. Leaves alternate, paripinnate, exstipulate; leaflets opposite. Inflorescence axillary and terminal racemes. Flowers polygamo-dioecious, greenish or yellow. Sepals 4-5, subequal. Petals 4-5, spatulate. Disc annular, fleshy. Stamens up to 8, inserted in the disc; filaments filiform, pubescent. Ovary 2-loculed; ovules solitary; style short; stigma thick, hairy. Fruits 1-2-lobed, indehiscent. Seeds exarillate.

South East Asia, W. Malesia; 2 species, 1 in India.

Literature. LEENHOUTS, P.W. (1983). A Taxonomic Revision of *Xerospermum* (Sapindaceae). *Blumea* 28 (1): 389-401.

1. *Xerospermum glabratum* (Kurz) Radlk., Sap. Holl.-Ind. 23(93). 1877. *Cupania glabrata* Kurz in J. As. Soc. Bengal 44(2): 186. 1875. *Xerospermum noronhianum* sensu. Hiern in Fl. Brit. India 1: 686. 1875. (*non* Blume, 1847).

Kh.: *Shanpi*, *Khuranchi*.

Trees, 10-15 m tall; branchlets puberulous. Leaves 15-35 cm long; leaflets elliptic to oblong-lanceolate, 3.5-20 x 1-6 cm, acuminate to obtuse, base acute, cuneate, coriaceous, glabrous. Racemes short, subfascicled, simple or branched. Flowers 0.2-0.4 cm across, polygamous. Calyx 4-8-lobed, cup shaped, valvate or imbricate in bud. Petals small, sometimes lacking, without scales. Stamens 5-10, inserted in fleshy, glabrescent-pubescent disc. Ovary 2-3-lobed, 2-3-loculed; ovule 1 in each locule. Fruits ellipsoid, oblong, muricate, with pyramidal tubercles. Seeds pilose.

Fl. & Fr. : April - March.

Distrib. India : In tropical evergreen forests, up to 500 m. Assam and Meghalaya.

Myanmar, Bangladesh, Thailand, Vietnam, Malay Peninsula, Sumatra, Java and Borneo.

Note. This species occurs in forests in association with *Garcinia paniculata*, *Sterculia villosa* and *Dysoxylum binectarifarum* and forms upper storey.

CULTIVATED SPECIES

Blighia sapida Kon. in Kon. & Sims, Ann. Bot. 2: 571. 1806; Cooke, Fl. Bombay 1: 281. 1958 (Repr. ed.)

Trees, 10-12 m tall. Flowers greenish-white.

A native of W. Africa, popularly known as "Akee tree". Ripe fruits are edible. Seeds are poisonous.

Often cultivated in gardens in Tamil Nadu.

Cupaniopsis anacardioides (A. Rich.) Radlk in Sitzb. Math.-Phys. Acad. Muench. 9: 585. 1879. *Cupania anacardioides* A. Rich., Sert. Astrol. 33. t. 13.

Evergreen trees, *ca* 10 m tall with white flowers. The plant, popularly known as "Tackeroo" or "Carrot wood", is endemic to Australia.

Cultivated as an ornamental in Indian gardens.

Koelreuteria paniculata Laxm. in Nov. Comm. Acad. Petrop. 16. 561. t. 18. 1772.

A tropical species native to China, Formosa and Fiji.

Cultivated as an ornamental in gardens, particularly in northern India.

Litchi chinensis Sonner, Voy. Ind. 2: 230. t. 129. 1782. *Nephelium litchi* Cambess. in Mem. Mus. Hist. Nat. 18: 30. 1829; Hiern in Fl. Brit. India 1: 687. 1875.

An evergreen tree, native of China.

Cultivated in large scale in orchards, mostly in northern India, for its fleshy edible fruits.

HIPPOCASTANACEAE

(P.C. PANT)

Large to medium sized, trees or shrubs, generally tanniferous. Leaves opposite, palmately 3-11 or more foliolate, exstipulate; leaflets obovate or oblong, serrate to serrulate. Inflorescence in terminal panicles or racemes, showy. Flowers large, on jointed pedicels, hypogynous, somewhat irregular, perfect or some functionally staminate. Sepals 5, nearly free, imbricate or united to form a tube. Petals 4-5, free, unequal, clawed, imbricate. Nectary disc small, extrastaminal and often unilateral. Stamens 5-8, distinct, in two whorls; inner whorl complete of 5 stamens; outer whorl incomplete; anthers tetrasporangiate and dithecal, opening lengthwise. Gynoecium of (2-) 3-(-4) carpels, united to form a compound, plurilocular ovary with terminal style and papillate simple or obscurely lobed stigma; ovules 2 in each locule. Fruit a loculicidal capsule, often unilocular and 1-seeded by abortion, dehiscent by 3 valves. Seeds few, large, with hard testa; endosperm wanting.

Temperate N. America, S. America, Balkan Peninsula, Europe, S. and E. Asia; 2 genera and *ca* 25 species, 1 genus and 2 species in India.

Literature: SANTAPAU, H. (1961) The Genus *Aesculus* L. in India - A correction. *Bull. Bot. Surv. India* 3 (2): 207. NASIR, E. (1975). Hippocatanaceae. Nasir, E. & S.I., Ali, *Fl. W. Pakistan* 82: 1-3.

Aesculus L.

Trees; branches spreading; bark greyish, warty outside, peeling off in narrow strips; young shoots pubescent to tomentose. Leaves opposite, digitate, deciduous, exstipulate; leaflets obovate or oblong, serrate. Flowers in terminal thyrses; polygamous. Sepals 5, campanulate or tubular. Petals 4-5, unequal, clawed, without scales, longer than the calyx. Disc annular, lobed or entire. Stamens 5-9, free, inserted in the disc. Ovary 3-locular; style slender. Fruits capsular, leathery, 1-3-loculed. Seeds subglobose.

America, Europe, S. E. Asia; *ca* 15 species, 2 in India.

KEY TO THE SPECIES

- 1a. leaflets thin, membranous, margins sharply serrate;
panicles oblong 2. *A. indica*
- b. Leaflets coriaceous, margins feebly toothed or crenate;
panicles lanceolate 1. *A. assamica*

1. *Aesculus assamica* Griffith, Notul. 4: 540. 1854. *Aesculus punduana* Wallich ex Hiern in Fl. Brit. India 1: 675. 1875.

Asm.: *Raman-bih, Sarlok-Asing*; Kh.: *Sangkenrop, Ngraurau*.

Medium sized trees, with spreading, glabrous, terete branches; bark greyish, warty. Leaves glabrous, petioles upto 30 cm long; leaflets oblanceolate, obovate-elliptic, 14-30 x 4.5-7 cm, acuminate, finely serrulate, subcoriaceous; petiolules 5-15 mm long. Flowers many, in thyrsoid panicles. Calyx 5-lobed, campanulate, 5-7 mm long, downy. Petals 4, rarely 5, unequal, clawed, white, often with a yellow spot at base. Stamens slender. Fruit a loculicidal capsule, ovoid, 5-6 cm long, leathery, rugose, rusty brown.

Fl. & Fr. : March - Aug.

Distrib. India: Common along streams and ravines, in deciduous forests, ascending, up to 1400 m. Sikkim, West Bengal, Assam, Arunachal Pradesh, Nagaland, Mizoram and Meghalaya.

Afghanistan and Myanmar.

Note. Usually associated with *Trewia nudiflora*, *Terminalia*, *Vatica lancefolia*, etc. Often planted in parks, particularly in hills, for ornamental purposes. The wood is used for making vases, plates, cups and toys.

2. *Aesculus indica* (Wallich ex Cambess.) Hook. f. in Curtis, Bot. Mag. t. 5117. 1859; Hiern in Fl. Brit. India 1: 675. 1875. *Pavia indica* Wallich ex Cambess. in Jacq., Voy. Ind. 4: 31. 1844. **Fig. 83.**

Garh. : *Panger*.



Fig. 83. *Aesculus indica* (Wallich ex Cambess) Hook.f.

Large, deciduous trees, 18-25 m tall, with glabrous, terete branches; bark ash black; young shoots pubescent to tomentose. Leaves glabrous; petioles 7-15 cm long; leaflets oblanceolate, 7-32 x 1.5-12.5 cm, acuminate, sharply serrate, under surface glaucous; petiolules up to 2 cm long. Flowers many, in small pubescent cymes, arranged in terminal, erect, pyramidal panicles. Calyx tubular, shortly 5-lobed; lobes unequal, densely clothed with grey tomentum. Petals 4, clawed, tomentose outwards, white with yellow or orange red throat. Stamens exserted. Fruit a capsule, ovoid or subpyriform, reddish brown. Seeds 1-3, dark brown, shining.

Fl. & Fr. : April - Nov.

Distrib. India: Temperate Himalaya, sometimes gregarious between, 1500-3000 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim and Meghalya.

Pakistan, Nepal, Bhutan, Myanmar, N. Thailand, Laos, S.W. Yunnan, Afghanistan and Iran.

Note. In Western Himalaya, the species is found at places in association with *Juglans regia*. The upright panicles are singularly attractive when in full bloom. It is often planted both as an avenue tree as well as in public parks for beautifying the land scape.

A C E R A C E A E

(M.P. Nayar and Anukul Datta)

Trees or shrubs, unarmed, non laticiferous. Leaves opposite, exstipulate, simple or compound. Inflorescence corymbose-fasciculate, racemose or fasciculate, terminal or lateral. Flowers andro-monoecious, andro-dioecious or dioecious, actinomorphic, usually 4-5-merous. Sepals free. Petals sometimes none. Disc annular, lobed. Stamens 4-12, often 8, hypogynous or perigynous; filaments free, filiform; anthers 2-loculed, versatile, oblong or linear, longitudinally dehiscent; pollen grains tricolpate or tricolporate. Ovary superior, bilobed, 2-loculed, compressed; ovules 2 in each locule; style 1 or 2, 2-armed, free or connate; stigmas 2, filiform. Fruit a samara; mericarps 2, winged on the outer side, 1-2-seeded. Seeds campylotropous, exalbuminous; testa thin. Embryo with flat or plicate cotyledons.

Temperate northern hemisphere and tropical and sub-tropical Asia; 2 genera and *ca* 120 speices, 1 genus and 17 species in India.

Literature. FANG, WEN P'EI (1978) *Aceraceae. Fl. Reipubl. Pop. Sinicae* 46: IV-X, 66-273. 68. pl. MURRAY, E. (1975) *Aceraceae in Fl. W. Pak.* 92: 1-7. NAYAR, M.P. & A. DUTTA, (1982) *Aceraceae. Fasc. Fl. India* 9: 1-22.

ACER L.

Trees, rarely shrubs, with perulate buds; usually deciduous, rarely evergreen. Leaves petiolate, palmately 3-7-lobed or entire or pinnately 3-7(9)-foliate. Inflorescence on 2-4, leafy, terminal branches or on leafless lateral or terminal branches. Petals equal to or shorter than sepals, often yellowish-green. Disc rarely reduced or absent, often intrastaminal, rarely extrastaminal or having stamens in the middle. Anthers introrse; in male flowers exerted; in bisexual flowers inserted. Ovules collateral or superposed. Seed in each locule very often solitary through abortion.

Temperate N. America, N.W. Africa, Asia and Malesian islands; *ca* 118 species, 17 in India.

Literature. BANERJEE M.L. & S. DAS (1971) Acers in Nepal. *Indian For.* 97(5): 243-250. MURRAY, E. (1974) Himalayan maples. *Kalmia* 6: 2-8.

KEY TO THE SPECIES

- | | |
|--|-------------------------------------|
| 1a. Plants having both lobed and unlobed leaves. | 10. <i>A. osmastonii</i> |
| b. Plants having either lobed or unlobed leaves, both conditions not present together | 2 |
| 2a. Leaves not lobed | 3 |
| b. Leaves lobed | 9 |
| 3a. Inflorescence racemose, pendent | 4 |
| b. Inflorescence paniculate or corymbose | 6 |
| 4a. Leaf margins subentire or finely serrulate; samaras indistinctly stalked or almost sessile; stalk 0.2 cm long | 14. <i>A. sikkimense</i> |
| b. Leaf margins serrate or deeply serrate; samaras distinctly stalked; stalk 0.7-5 cm long | 5 |
| 5a. Samaras 1.8-2.5 cm long; fruit stalk 0.7-1 cm long; petiole 2.5 cm long; leaves glabrous or glabrate beneath; flowers 5-merous | 6. <i>A. hookeri</i> |
| b. Samaras 2.5 cm long; fruit stalk 3-5 cm long; petiole 5-7 cm long; leaves canescent or villous beneath; flowers 4-merous | 15. <i>A. stachyophyllum</i> |
| 6a. Leaf apex caudate-acuminate; inflorescence lateral | 7 |
| b. Leaf apex acuminate; inflorescence terminal | 8 |
| 7a. Petals 2.5-8 cm long | 8. <i>A. laurinum</i> |
| b. Petals less than 2 mm long | 13. <i>A. pinnatinervium</i> |
| 8a. Upper surface of leaves green, lower surface glaucous; petiole 2-7 cm long, usually <i>ca</i> 1/3rd of the lamina length | 9. <i>A. oblongum</i> |
| b. Upper surface of leaves olive green, lower surface brownish; petiole 0.7-1.8 cm long; usually <i>ca</i> 1/8th of the lamina length. | 7. <i>A. laevigatum</i> |
| 9a. Leaves 3-lobed, lobations sometimes obsolete | 10 |
| b. Leaves 3-lobed, sometimes 7 lobed, the lower lobations not prominent | 12 |
| 10a. Apex of leaf lobes cuspidate-serrulate, long caudate, margin deeply dentate | 1. <i>A. acuminatum</i> |
| b. Apex of leaf lobes acuminate, margin entire or obsoletely serrate | 11 |
| 11a. Samaras 2-3 cm long, glabrous; leaves 5-9 x 9-11 cm, undersurface glabrescent or glabrous | 12. <i>A. pentapomicum</i> |
| b. Samaras 5-8 cm long, villous; leaves 13-15 x 14-24 cm; undersurface of leaves along the nerves villous, glabrescent. | 17. <i>A. thomsonii</i> |

- | | | |
|---|-----------------------------|----|
| 12a. Margins of leaves entire | 4. <i>A. cappadocicum</i> | 13 |
| b. Margins of leaves serrate to remotely serrate | | 14 |
| 13a. Samaras erect, the angles of divergence 90° or less than that | | 16 |
| b. Samaras slanting, the angles of divergence more than 90° | | |
| 14a. Under surface of leaves glabrous or glabrescent except at the axils of nerves which are bearded | 2. <i>A. caesium</i> | 15 |
| b. Undersurface of leaves pubescent | | |
| 15a. Leaf margin inciso-serrate; apex caudate; inflorescence racemose, erect; samaras 3 x 1-1.5 cm | 5. <i>A. caudatum</i> | |
| b. Leaf margin remotely serrate; apex acuminate; inflorescence lateral, fasciculate-racemose, pendulous; samaras 4-5 x 1.5-2 cm | 16. <i>A. sterculiaceum</i> | |
| 16a. Leaf lobes deltoid, apex caudate-acuminate, leaf margins deeply serrate; samara-nutlets elliptic-oblong | 11. <i>A. pectinatum</i> | |
| b. Leaf lobes ovate-caudate or lanceolate-caudate, leaf margins subentire to serrulate; samara-nutlets orbicular | 3. <i>A. campbellii</i> | |

1. *Acer acuminatum* Wallich ex D. Don, Prodr. Fl. Nepal. 249. 1825; R.N. Parker, For. Fl. Punjab 104. 1918. *A. caudatum* sensu Hiern in Fl. Brit. India 1: 695. 1875. *p.p.* (*non* Wallich, 1831).

Dioecious. Small to medium sized, deciduous trees with glaucous branches. Leaves subcordate to truncate, often as long as broad lobed, 7.0-12.5 x 5-10 cm, middle lobe larger than the lateral ones, chartaceous, base rounded. 5-nerved. Inflorescence corymbose racemes, appearing with or after leaves; staminate inflorescence on leafless, lateral shoots; pistillate inflorescence terminal on leafy shoots. Stamens 4-6, exserted. Disc extra-staminal. Ovary glabrous; styles elongate; stigma short. Samaras glabrous; wings subparallel or acutely divergent.

Fl. & Fr. : Feb. - Aug.

Distrib. India: Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Nepal.

2. *Acer caesium* Wallich ex Brandis, For. Fl. N.W. India 111. t. 21. 1874, *non A. caesium* (Reinw. ex Blume) Kosterm. 1965; Hiern in Fl. Brit. India 1: 695. 1875. Fig. 84.

Garh.: *Kilu*; Kash.: *Kinar*; Punj.: *Trekhan, Mandar*.



Fig. 84. *Acer caesium* Wallich ex Brandis

Andro-monoecious. Large deciduous trees, 20-25 m tall. Leaves, palmately 5-lobed, 8-18 x 10-20 cm, lobes caudate-acuminate; upper surface green, undersurface characteristic caesio-pruinose; base deeply cordate, 5-nerved; petioles 6-15 cm long, reddish. Inflorescence corymbose-panicle, erect, terminal, puberulous, appearing after the leaves; dormant flower buds large and prominent. Flowers pale-greenish yellow to yellow. Sepals longer than petals. Stamens 8, inserted into the disc, exserted. Ovary pubescent; styles 2, connate half-way up. Samara wings slightly divergent.

Fl. & Fr. : March - Oct.

Distrib. India : Western Himalaya, between 2130-3050 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Pakistan and Nepal.

Note. Chromosome number : $n=13$ (Mehra & Sareen in Taxon 18: 440. 1969).

This species is the largest Maple in W. Himalaya. The overall colour of the foliage appears bluish grey which signifies the specific name.

3. *Acer campbellii* Hook.f. & Thomson ex Hiern in Fl. Brit. India 1: 696. 1875.

Bhut.: *Kilok*, Lep.: *Daom yatli*; Nep.: *Kapashi*.

Andro-monoecious. Very tall trees, 12-30 m; branches greyish green or yellow. Leaves palmately 5-7 lobed, broader than long, 10-12 x 12-15 cm, base truncate-cordate, chartaceous, both surfaces light green, shining, glabrous or sparsely pilose, at the axils and along the nerves beneath, 5-7 nerved. Inflorescence corymbose, terminal, appearing with leaves, 5-15 cm long. Flowers 5-merous, greenish white. Stamens 8, somewhat included, reddish; filaments short. Disc extra staminal. Ovary glabrescent. Samaras 1.7-3 cm long, glabrous; wings horizontal or divergent.

KEY TO THE VARIETIES

- 1a. Lamina truncate at base, margins serrulate; nerves glabrous; inflorescence dense; nuts globular; wings contracted at base on the inner side and abruptly broadened upwards, back slightly curved at the apex, more or less truncate **3.1. var. campbellii**
- b. Lamina cordate at base, margins serrate, often twice serrate, pubescent at nerves on the lower surface; inflorescence elongate; nuts ovoid; wings slightly contracted at the base, gradually expanded upwards, back more or less straight **3.2. var. serratifolium**

3.1. var. campbellii

Fl. & Fr. : April - Aug.

Distrib. India : Sikkim, West Bengal and Arunachal Pradesh.

Nepal.

Note. Chromosome number : $n=13$ (Mehra & Khosla in *Taxon* 18: 218, 1969).

Uses. Wood is moderately hard, shining, and is extensively used for making planks.

3.2. var. serratifolium Banerji in *J. Bombay Nat. Hist. Soc.* 58(1): 306, 1961.

Fl. & Fr. : May - August.

Distrib. India : Eastern Himalaya. Sikkim and West Bengal.

Nepal and China.

4. *Acer cappadocicum* Gleditsch in *Schrift. Ges. Naturf. Freunde Berl.* 6: 116. t. 2. 1785. *A. pictum* sensu Hiern in *Fl. Brit. India* 1: 696. 1875 (*non* Thunb., 1784). **Fig. 85.**

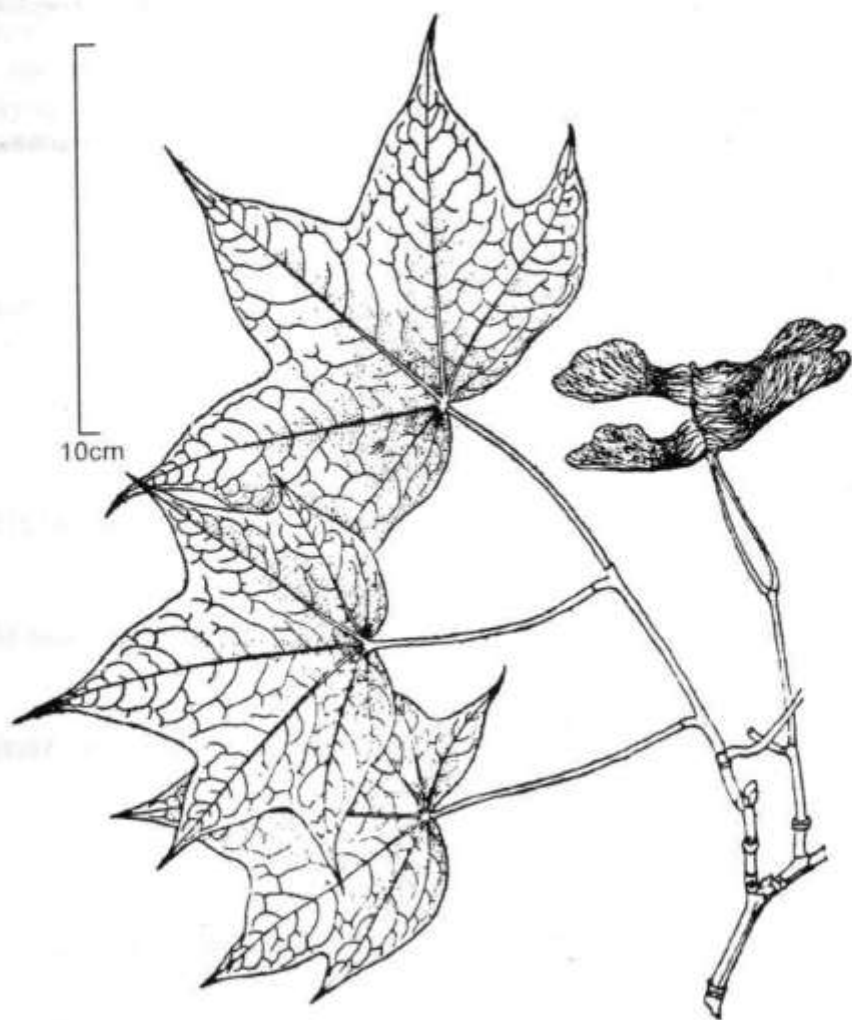


Fig. 85. *Acer capadocicum* Gleditsch

Garh.: *Tilpattar, Kilpattar.*

Deciduous, large trees, 15-20 m tall. Leaves 5-7-lobed, lobes equal, ovate, sinuses rounded, 4-14 cm x 6-20 cm, apex acuminate base truncate or sub-cordate, chartaceous, light green, lustrous, glabrous, under-surface hairy at the axil of nerves at base, 5-7 nerved; petioles glabrous, 2-10 cm long. Inflorescence corymbose panicles, terminal, appearing with leaves. Flowers 5-merous, long stalked, yellowish green. Sepals and petals 3-4 mm long. Stamens 8, inserted on disc, included. Ovary glabrous; styles 2, free. Samaras 3.5-5 cm long, widely divaricate to sub horizontal, compressed; wings diverging in almost a straight line.

Fl. & Fr. : April - Sept.

Distrib. India : Throughout the Himalayan belt from Kashmir to the farthest end of E. Himalaya. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim, West Bengal, Arunachal Pradesh, Meghalaya, Manipur and Mizoram.

Bhutan, Nepal, China, Japan, Pakistan, N. Iran, N.E. Turkey and Caucasus.

Note. Chromosome number: $2n=26$ (Wright in Bull. Morris Arb. 8: 33-34. 1957).

Uses. It is the commonest Himalayan Maple. Wood is used for making farm implements, poles and bedsteads.

5. *Acer caudatum* Wallich, Pl. Asiat. Rar. 2: 4. 1830 & 2: 28. t. 132. 1831; Hiern in Fl. Brit. India 1: 695. 1875.

Bhut.: *Yalishin*; Garh.: *Kanzla*; Nep.: *Kabashi, Khansino.*

Andro-monoecious. Trees or shrubs, upto 15 m tall; branches flacky grey brown or rust coloured; buds pubescent. Leaves 5-lobed, 7.5-15.0 x 8-18 cm, apex long, linear, cuspidate-serrulate, base cordate, chartaceous, margins inciso-serrate, 5-lobed, basal lobes small or often obscure; adult barbate in the axils of nerves below; petioles 5-10 cm long, pubescent. Inflorescence terminal, villose. Flowers 5-merous, yellowish. Stamens 8, exerted. Disc large,

extrastaminal. Ovary pubescent; style elongate; stigma short. Samara wings divergent or subparallel; locules carinate, convex.

Fl. & Fr. : March - Oct.

Distrib. India : Himalayas. Himachal Pradesh, Uttar Pradesh, Sikkim and West Bengal.

Bhutan, Nepal, Myanmar, S. Tibet, China, Korea and Japan.

Note. Chromosome number : $n=13$ (Mehra & Sareen in Taxon 18: 440. 1969).

6. *Acer hookeri* Miq. in Arch. Neerl. Sci. Nat. 2: 471. 1852; Hiern in Fl. Brit. India 1: 694. 1875.

Lep.: *Pale.*; *Nep.*: *Lahara Kapasi, Lal Kapasi*

Andro-monoecious or dioecious. Trees, 12-16 m tall; branches green, whitish striped, later grey brown. Leaves undivided, cordate to subcordate or ovate, 7-14 cm x 3.5-8.5 cm, chartaceous or coriaceous, base 5-nerved, margins imperfectly or distinctly biserrate. Inflorescence appearing with leaves, bracteate, puberulous, brown to greenish yellow. Flowers glabrous, yellowish green. Sepals and petals equal, 2.5-3 mm long. Stamens 8, exserted; filaments 1.5-2 mm long. Ovary glabrous. Samaras subhorizontal, erect; nuts rounded, glabrous; wings widely divergent, extrorsely falcate or straight.

KEY TO THE VARIETIES

- 1a. Leaves 7-12 x 3.5-6.5 cm, adult leaves papery or chartaceous, margin biserrate; serratures cuspidate; samara wings extrorsely falcate or widely divergent **6.1 var. *hookeri***
- b. Leaves 10-14 x 5.5-8.5 cm, adult leaves coriaceous, margins imperfectly biserrate; serrature less cuspidate; samara wings straight **6.2 var. *majus***

6.1 var. *hookeri*

Fl. & Fr. : April - Nov.

Distrib. India : Eastern Himalaya, very common between 2250-3180 m. Sikkim, West Bengal and Arunachal Pradesh.

Note. The seeds of the plant carried by wind are often deposited in crevices or hollows of other large trees and hence the plant sometimes grows as an epiphyte.

Chromosome number : $n=13$ (Mehra & Khosla in Taxon 18: 218. 1969).

6.2 var. majus Pax in Bot. Jahrb. 7: 216. 1886.

Fl. : Oct.

Distrib. India : Eastern Himalaya. Sikkim and West Bengal. Endemic.

7. Acer laevigatum Wallich, Pl. As. Rar. 2: 3-4.t. 104. 182. 1830; Hiern in Fl. Brit. India 1: 693. 1875.

Kh.: *Dieng-than, Dieng-Soh-tyrkhum*; Lep.: *Tungnyok*; Lush.: *Thing-Khim*; Nep.: *Thali kabashi*.

Andro-monoecious. Trees, 10-15 m tall; branches olive green or purplish; bark grey, furrowed. Leaves elliptic-oblong or oblong-lanceolate, 7-15 x 4-5 cm, coriaceous, prominently reticulate, margins entire to minutely or remotely serrate. Inflorescence appearing with the leaves, glabrous. Flowers 5-merous, minute. Sepals purplish green, 2 mm long. Petals obovate, obtuse, white, equal to sepals. Stamens 5-8, exserted; anthers dorsifixed. Disc extrastaminal. Ovary villose; style elongate. Samaras 2-3 cm long, purplish; wings acutely divergent, straight or somewhat introrsely falcate.

Fl. & Fr. : March -Aug.

Distrib. India : Uttar Pradesh, West Bengal, Arunachal Pradesh, Meghalaya, Nagaland and Manipur.

Nepal, N. Myanmar and West & C. China.

Note. Chromosome number : $n=13$ (Mehra & Khosla in Taxon 18: 218. 1969; Mehra & Sareen in Taxon 18: 441. 1969).

Uses. Wood is used as building material.

8. *Acer laurinum* Hassk. apud Hoeven de Vriese in Tijdschr. Natuurl. Geschied. Phys. 10: 138. 1843. *A. niveum* Blume in Jahrb. K. Nederl. Maatsch. Aanmoed. twinbouw. 1844: 84. 1845 & in Rumphia. 3: 193. t. 167. 3.f. 1. 1849; Hiern in Fl. Brit. India 1: 693. 1875.

Kuki: *Nabar*.

Andro-monoecious. Trees, 30-45 m tall; bark brownish grey, reticulately fissured. Leaves coriaceous, ovate-elliptic or oblong, 10-16 x 4.0-5.5 cm, entire, base rounded, 3-nerved, upper surface shining dark green, lower surface snow white or grey, glabrous. Inflorescence appearing with leaves. Flowers 5-merous, yellowish or yellowish green. Sepals lanceolate or oblong, white, hairy at the top, 2.5-3 mm long. Petals equal to sepals. Stamens 5-8; filaments white, included, inserted on the disc. Ovary pubescent; styles 2, attached only at base. Samaras 4-7.5 cm long, glabrous; mericarps unequal; wings erect or divergent, introrsely falcate.

Fl. & Fr. : Aug. - April.

Distrib. India : Eastern Himalaya, in deep, humid forests. Assam and Arunachal Pradesh

Malesia, Indonesia and Phillipines.

Note. Chromosome number : $n=13$ (Mehra & Khosla in Taxon 18: 218. 1969).

Uses. Wood is considered to be good for making poles.

9. *Acer oblongum* Wallich ex DC., Prodr. 1: 593. 1824; Hiern in Fl. Brit. India 1: 693. 1875.

Garh.: *Kirmoli*; Kh.: *Dieng-Soh-Khru*; Nep.: *Buzimpala*.

Andro-monoecious. Trees, evergreen, 15-18 m tall; buttressed at base; bark smooth to wrinkled, white and green. Leaves ovate-lanceolate or oblong, 5-17 x 3-7 cm, rounded at base, membranous or coriaceous, minutely reticulate. 3-nerved, glabrescent. Inflorescence appearing with leaves, pubescent, lateral shoots 5-15 cm long. Flowers 5-merous, greenish white to yellowish green, 7-8 mm across. Sepals linear or lanceolate, outside brabate, 2-4 mm long. Petals elliptic-lanceolate, equal to or shorter than sepals. Stamens 8, inserted on or inside the disc. Ovary densely pubescent. Samaras 1-3 cm long; wings divergent.

KEY TO THE VARIETIES

- | | |
|---|------------------------------|
| 1a. Leaves membranous, dull red or reddish, concolored,
leaf base acute to subacute. | 9.1 var. membranaceum |
| b. Leaves coriaceous, mature leaves dark green above, pale
to silvery glaucous beneath, leaf base obtuse or rounded. | 2 |
| 2a. Leaves 10-17 x 5-7 cm; samaras 2-3 cm long | 9.3. var. oblongum |
| b. Leaves 5-12 x 3-5 cm; samaras 1 cm long. | 9.2. var. microcarpum |

9.1. var. membranaceum Banerji in *Phytologia* 9(5): 265-266. 1963.

Fl. & Fr. : March - Sept.

Distrib. India : Uttar Pradesh.

9.2 var. microcarpum Hiern in *Fl. Brit. India* 1: 693. 1875.

Distrib. India : Arunachal Pradesh. Endemic.

9.3. var. oblongum

Fig. 86.

Fl. & Fr. : Feb. - Sept.

Distrib. India : Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim, Arunachal Pradesh, Meghalaya, Manipur and Nagaland.

China and Indo-China.

Note. Chromosome number $n=13$ (Mehra & Khosla in *Taxon* 18: 218. 1969; Mehra & Sareen in *Taxon* 18: 441. 1969).



Fig. 86. *Acer oblongum* Wallich ex DC. var. *oblongum*

Uses. Wood is reddish. It is used for agricultural equipments.

10. *Acer osmastonii* Gamble in Kew. Bull. 1908: 446. 1908, *emend* Delendick in Brittonia 30(4): 473-476. 1978.

Polygamous. Trees up to 30 m tall; branches olive to purplish brown. Leaves glabrous above, thickly reticulate beneath, when lobed with 2-3 lobations in upper half; lobes erect, ovate-lanceolate, 12-15 x 6-8 cm, apex long, caudate-acuminate, base rounded or slightly cordate, margins acutely serrate. Inflorescence pedunculate cymes, in terminal panicles, 7-10 cm long. Flowers greenish to creamy yellow, 5-merous. Stamens 8, inserted inside the disc; filaments subulate; anthers oblong, minutely papillose. Ovary silky-villose. Samaras erect to divergent.

Fl. & Fr. : July - Nov.

Distrib. India : Uttar Pradesh, Sikkim and West Bengal.

Note. Delendick (*l.c.*) has reported that the species is a hybrid between two other species of sect. *Palmata*, *A. campbellii* Hook.f. & Thomson (ser. *Sinensia*) and *A. laevigatum* Wallich (ser. *Penninervia*). This was Osmaston's view and Gamble cited it in protologue but did not support it. Delendick reaffirmed Osmaston's observation and concluded that the taxon is a hybrid. (see also Mehra, Khosla & Sareen in *Silvae Genet.* 21: 96-102. 1972).

Chromosome number : $n=13$ (Mehra & Khosla in *Taxon* 18: 218. 1969).

11. *Acer pectinatum* Wallich ex Pax in Engler, Bot. Jahrb. 7: 249. 1886. *A. caudatum* Wallich forma *pectinatum* Hiern in Fl. Brit. India. 1: 695. 1875.

Andro-monoecious. Trees, 10-15 m tall; branches purplish brown. Leaves chartaceous, base deeply cordate, 6-14 x 6.5-15 cm, axils of nerves tufted hairy beneath, 3-5 lobed; lobes deltoid or ovate caudate, basal lobes small, often inconspicuous; petioles 6-10 cm long. Inflorescence racemose, terminal, appearing with leaves. Flowers 5-merous. Sepals purplish red. Petals whitish. Stamens 8, included. Ovary glabrous, stigma pubescent. Samaras glabrous; locules flat; wings horizontal, somewhat introrsely falcate, scarcely or not attenuate at the base.

Fl. & Fr. : May - Oct.

Distrib. : India : Himalaya, Uttar Pradesh, West Bengal and Sikkim.

Nepal and S.W. China.

Note. Chromosome number : $n=13$ (Mehra & Khosla in Taxon 18: 218. 1969).

12. *Acer pentapomicum* J.L. Stewart ex Brandis, For. Fl. N.W. C. India. 111. 1874; Hiern in Fl. brit. India 1; 694. 1875.

Deciduous, polygamous. Small or medium sized trees or shrubs; trunk dark brownish grey, smooth; twigs grey or reddish, glabrous. Leaves 3-lobed, 4-10 x 6-15 cm, grey-green above, pale green beneath, base truncate, subcordate or rounded, 3(5)-nerved, axils of nerves bearded, beneath, margins crenate-serrate to subentire; petioles 3.5-10 cm long. Inflorescence corymbose panicles, 3.5-5 cm long, glabrous. Flowers 5-merous, appearing with the leaves, greenish white. Disc annular, 5-lobed. Stamens 8, 5 in bisexual flowers. Ovary glabrous. Samaras erect; wings divergent to connivent.

Fl. & Fr. : March - June.

Distrib. India : North-west Himalaya. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Pakistan, Afghanistan and Turkestan.

Uses. Wood used for making agricultural implements.

13. *Acer pinnatinervium* Merrill in Brittonia 4: 109. 1941; Sahni & Naithani in Indian. For. 114(1): 48-50. 1988.

Trees, up to 25 m tall; bark dark grey, reticulately fissured; branches glabrous, terete. Leaves elliptic or oblong-elliptic, 10-15 x 3-6 cm, abruptly caudate-acuminate, base rounded, glabrous papery or slightly leathery, when dried olive coloured above, snow white beneath; main nerves on both sides 8-12 curved, forming a network, brownish beneath, raised, conspicuous; petiole

1.6 cm long, glabrous. Samara coppery-pink, about 2.5 cm long; wings acutely divergent, falcate, roundish, 7-9 mm broad, glabrous.

Distrib. : India : Arunachal Pradesh.

North Myanmar.

14. *Acer sikkimense* Miq. in Arch. Neerl. Sci. Nat. 2: 471. 1852; Hiern in Fl. Brit. India 1: 694. 1875.

Lep. *Palegnyok*.

Andro-monoecious or dioecious. Tall trees; branches green to reddish brown or grey. Leaves ovate, 9-17 x 7-9 cm, apex caudate to cuspidate, base subcordate to cordate, subcoriaceous, glabrous, dark green above, paler beneath, 5-nerved, entire, serrulate on the margins. Inflorescence appearing with leaves, bracteate, densely spicate. Flowers 5-merous, yellowish green. Sepals lanceolate, 2 mm long. Petals short, 1.5-2 mm long. Stamens 8; filaments 2.5-3 mm long. Ovary glabrous. Samaras 1.5-1.8 cm long; nuts globular; wings divergent, nearly straight, base narrowed.

KEY TO THE VARIETIES

- | | |
|--------------------------------------|------------------------------------|
| 1a. Leaf margins subentire to entire | 14.2 var. <i>sikkimense</i> |
| b. Leaf margins serrulate | 14.1 var. <i>serrulatum</i> |

14.1 var. *serrulatum* Pax in Bot. Jahrb. 7: 215. 1886.

Distrib. India : Arunachal Pradesh. Endemic.

14.2 var. *sikkimense*

Fl. & Fr. : Nov. - Aug.

Distrib. India : Eastern Himalaya. Sikkim, West Bengal and Arunachal Pradesh.

Bhutan, Nepal and W. China.

Note. Chromosome number : $n=13$ (Mehra & Khosla in Taxon 18: 218. 1969).

15. *Acer stachyophyllum* Hiern in Fl. Brit. India 1: 694. 1875.

Dioecious. Small trees. Leaves ovate, 9-10 x 3.5-6.0 cm, apex caudate-acuminate, base rounded or broadly cordate, submembranaceous, 7-nerved. Inflorescence elongate, usually branched, equalling the leaves; pistillate inflorescence terminal; staminate inflorescence lateral. Flowers yellowish. Sepals 3.5-4 x 2-2.5 mm. Petals membranaceous, 3.2 x 1.8-2 mm. Stamens 4, 4-4.5 mm long; anthers 1-1.5 mm long, dorsifixed, bilobed. Samaras carinate-convex; nuts erect, ovoid, base cuneate; wings introrsely falcate, angles actually divergent.

Fl. & Fr. : May - Nov.

Distrib. India : Eastern Himalaya. Sikkim and West Bengal.

Bhutan, Nepal, S. Tibet and China.

Note. Chromosome number : $n=13$ (Mehra & Khosla in Taxon 18: 218. 1969).

16. *Acer sterculiaceum* Wallich, Pl. As. Rar. 2: 3. t. 105. 1830. *A. villosum* sensu Wallich Pl. As. Rar. 2: 4. 1831. (*non* Presl.); Hiern in Fl. Brit. India 1: 695. 1875.

Dioecious. Tall trees, 10-15 m tall. Branches brownish; young branchlets villose. Leaves 3-5 lobed, 12-20 x 13-22 cm, subcoriaceous, apex acuminate base deeply cordate, 5-7 nerved; basal lobes smaller, often obscure, both surfaces dull green, upper glabrate, older leaves rusty brown; petiole densely villose, 8-15 cm long, canaliculate. Inflorescences pubescent, appearing with or before leaves, lax. Flowers 5-merous, greenish yellow, bracts woolly; pedicels villose. Stamens 5-8 (7-10), perigynous, exserted. Ovary greenish brown. Disc prominent, green. Samaras puberulent, brownish; wings erect and parallel.

Fl. & Fr. : March - Oct.

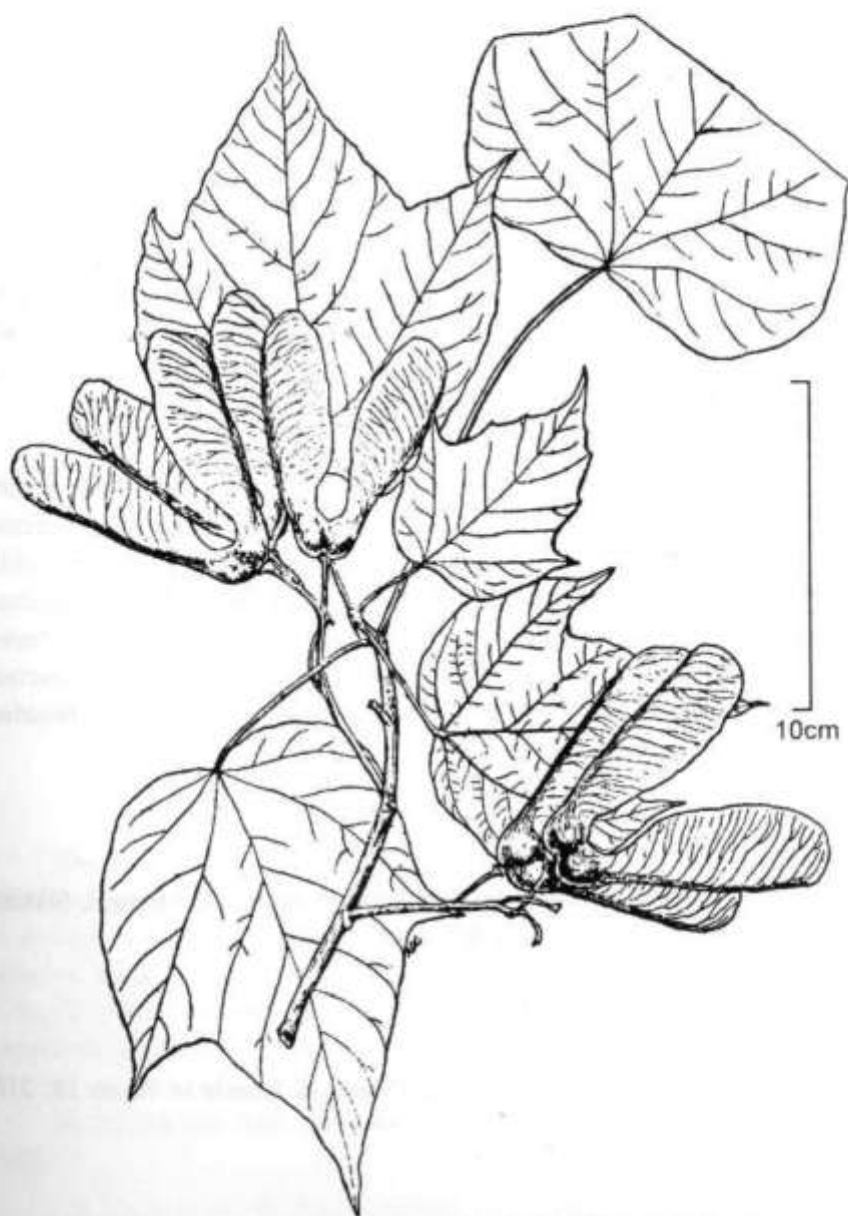


Fig. 87. *Acer thomsonii* Miq.

Distrib. India : Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, West Bengal, Assam, Arunachal Pradesh and Manipur.

Bhutan, Nepal and China.

Note. Chromosome number : $n=13$ for E. Himalayan plants (Mehra & Khosla in Taxon 18: 218. 1969); $n=13 + 0 - eB$ for West Himalayan plants (Mehra & Sareen in Taxon 18: 441. 1969).

17. *Acer thomsonii* Miq. in Arch. Neerl. Sci. Nat. 2: 470. 1852. *A. villosum* Wallich var. *thomsonii* (Miq.) Hiern in Fl. brit. India 1: 695. 1875.

Fig. 87.

Beng. : *Kabashi*; Nep.: *Kabashi*.

Dioecious. Large trees. Leaves chartaceous or coriaceous, glabrescent. obtuse, apex shortly acuminate, margins entire, repand or remotely serrate, base cordate, 5-nerved, bright green above, pale green beneath, 3-lobed; middle lobe broadly triangular; laterals very short petioled, glabrescent, canaliculate. 5-15 cm long. Inflorescence lateral, spicate raceme, appearing with leaves, 7.5-21 cm long. Flowers 5-merous, yellowish green. Stamens 6, exserted; filaments glabrous; anthers versatile. Samaras brown; wings straight, broadest above middle, base very narrow.

Fl. & Fr. : Nov. - July.

Distrib. India : Himachal Pradesh, Uttar Pradesh, West Bengal, Sikkim, Arunachal Pradesh, Manipur and Mizoram.

Bhutan, Nepal and N. Myanmar.

Note. Chromosome number : $n=13$ (Mehra & Khosla in Taxon 18: 218. 1969).

MELIANTHACEAE

(P.C. PANT)

Shrubs or small trees, tanniferous, producing ellagic acid. Leaves petioled, alternate, stipulate, pinnate; leaflets coarsely serrate, often with winged rachis. Flowers irregular, dense, in racemes, bracteate, perfect or less often unisexual, hypogynous. Sepals 5 or 4 by fusion of 2, unequal, imbricate, free or connate below, one of them spurred or saccate-gibbous. Petals 4-5, free, brown-red, narrow, long clawed, fifth petal very small or wanting. Nectary disc well developed, unilateral, extrastaminal. Stamens 4 or 5, alternate with petals; filaments distinct or basally connate; anthers 2-locular, opening lengthwise; pollen grains tricolporate. Ovary of 4, less commonly 5 carpels, united to form a compound, plurilocular ovary; style truncate or apically dentate; ovules 2-5 or solitary in each locule, on axile placenta. Fruit capsular, loculicidal, often longitudinally sulcate and sometimes apically lobed. Seeds 1 or 2 in each locule, with hard oily and sometimes with starchy endosperm and straight embryo.

Tropical and subtropical Africa; 2 genera and 15 species, 1 genus and 1 species in India.

Note. In warm regions some species are grown for ornamental purpose.

Melianthus L.

Shrubs, strongly scented, glabrous, with widely creeping roots. Leaves odd-pinnate, up to 60 cm or more long, stipulate; leaflets unequal sided. Flowers in axillary or terminal racemes. Calyx 5-partite, united at base, unequal, often gibbous. Petals narrow, long clawed. Stamens 4, didynanous, inserted with in the disc. Disc unilateral, with nectary glands. Ovary 4-lobed. Capsules inflated, loculicidally dehiscent by valves.

S. Africa and Asia (introduced as an ornamental); *ca* 6 species, 1 in India.

Melianthus major L., Sp. Pl. 639. 1753; Hiern, in Fl. Brit. India 1: 698. 1875.

Undershrubs, glabrous. Leaves up to 30 cm or more long; upper cauline ones smaller, dull green above, pale beneath; stipules connate, *ca* 5 cm or more long; leaflets 9-11, 7.5-10 x 5 cm, deeply serrate; petiole with cuneate wings between leaflets. Racemes densely flowered, *ca* 30 cm or more long. Flowers brown-red; 2.5 cm long; bracts ovate, acuminate. Calyx 5-lobed, imbricate. Petals 4-5. Stamens inserted within the disc. Disc with nectar bearing glands. Capsules 2.5-3.2 cm long, papery. Seeds black and glossy, two in each cell.

Fl. & Fr. : March - June.

Distrib. India: Western Himalaya, up to 1700 m. Uttar Pradesh and Tamil Nadu.

Bhutan (introduced) and S. Africa.

Note. Introduced in Kumaon and Nilghiris. Bruised leaves emit rotten smell.

STAPHYLEACEAE

(P. C. Pant)

Small sized trees or shrubs. Leaves opposite or rarely alternate, pinnate or trifoliolate, occasionally unifoliolate; stipules caducous or wanting. Flowers in terminal or axillary panicles or sometimes racemes, regular, 5-merous, bisexual, sometimes some or all unisexual and then plants dioecious. Calyx 5, free, imbricate, rarely connate partly or for most of their length, petaloid. Petals 5, free, imbricate, inserted on or below hypogynous disc. Stamens 5, free, borne on or outside annular nectary-disc, alternating with petals; anthers 2-locular, opening lengthwise; pollen grains tricolporate. Disc sometimes poorly developed or wanting. Ovary 2-3, rarely of 4 carpels, united to form a plurilocular ovary; styles free or coherent above or fused into a single style; ovules 6-12, rarely 1-2, in two rows in each locule. Fruit a membranous inflated capsule, opening at the tip; carpels separate distally and opening **along** the ventral suture or indehiscent and drupaceous or baccate or the fruit of distinct follicles. Seeds few, truncate at the base; endosperm copious fleshy, oily.

Central and S. America, Europe, Asia; *ca* 5 genera and 60 species; 2 genera and 5 species in India.

KEY TO THE GENERA

- | | |
|-------------------------------------|---------------------|
| 1a. Fruits inflated, capsular | 1. <i>Staphylea</i> |
| b. Fruits fleshy berry, indehiscent | 2. <i>Turpinia</i> |

1. *Staphylea* L.

Shrubs or small trees. Leaves opposite, trifoliolate or pinnate; leaflets serrulate, glabrescent on upper surface, finely pubescent beneath, apex acuminate; base obtuse or cuneate; lateral leaflets subsessile; terminal petioled. Flowers in dense cymes, bisexual, pendulous. Sepals 5, coloured, caducous. Petals 5, imbricate, white. Stamens 5; filaments slender. Ovary 2-3 -lobed; styles 2-3, slender; stigmas subcapitate; ovules 6 or more in each locule, in 2-rows, anatropous. Capsules up to 7 cm long, dehiscing at apex. Seeds subglobose.

North America, Europe and Asia; ca 4 species, 1 in India.

Staphylea emodi Wallich ex Brandis, *For. Fl. N.W.C. India*. 114. 1874; Hiern in *Fl. Brit. India* 1: 698. 1875.

Hindi: *Nagdaun*; Kash.: *Chitra, Milyachi, Sarpa-Lor, Gur-Kateh*.

Shrubs or small trees, glabrous, often with strong adventitious shoots at base; bark spotted. Leaves opposite 10-35 cm long, long petioled, trifoliate; leaflets ovate or elliptic, 2-11 x 2.5-7 cm, acuminate at apex, basal end obliquely acute, sharply serrate, thin, membranous, glabrous above, pale beneath. Flowers in terminal, usually drooping panicles. Calyx 5-parted, segments ovate-oblong. Petals 5, oblong, equalling the calyx, white. Disc 5-lobed. Stamens 5, equalling the petals; anthers shortly apiculate. Capsules, inflated, broadly ovoid, 5-8 cm long, narrowed to the base, shortly 3-pointed at the top.

Fl. & Fr. : April - Dec.

Distrib. North - western temperate Himalaya, between 2000-3340 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Nepal, Pakistan, Afghanistan and Iran.

Note. The long shoots, with ornamentation on the bark, are much sought for walking sticks. It is also believed to have the property of driving off snakes.

2. *Turpinia* Venetant, *nom. cons.*

Glabrous trees or shrubs; branches smooth, terete. Leaves opposite, imparipinnate, stipulate; leaflets opposite, serrate or serrulate, herbaceous to subcoriaceous. Flowers regular, bisexual, bracteate, up to 0.5 cm across, in axillary and terminal, mostly glabrous panicles. Sepals 5, free, persistent, fleshy, ciliate at margins; outer ones somewhat wider, imbricate. Petals 5, free, membranous, imbricate, equal sized, longer than the sepals, usually ciliate at margin, caducous. Disc lobed or crenulate. Stamens 5, episealous, equal sized, glabrous, inserted outside but near the disc; anthers rounded, ovate or apiculate. Ovary sessile, broadly ovoid, 3-lobed, 3-loculed; ovules 2, collateral.

or several in 2 vertical rows. Fruit a subglobose berry. Seeds angular, shining, dark brown.

Central and tropical S. America and Sri Lanka to S.E. Asia; ca 40 species, 4 in India.

Literature: MERRIL, E.D. & L.M. PERRY (1941) Observations on the old world species of *Turpinia* Venetant. *J. Arn. Arb.* 22: 543 - 555.

KEY TO THE SPECIES

- | | |
|---|-------------------------------------|
| 1a. Pericarp about 1 mm in thickness, scarcely fleshy; ovules 2 in each locule; fruit 8-10 mm in diam. | 2 |
| b. Pericarp 5 mm thick, somewhat fleshy; ovules 6 in each locule; fruit 2.5 cm in diam. | 3 |
| 2a. Leaflets coriaceous, caudate-acuminate; nerves arched; ovules 2-3 | 1. <i>T. cochinchinensis</i> |
| b. Leaflets thin and herbaceous, acuminate; nerves straight, connected to intramarginal vein; ovules constantly 2 | 3. <i>T. montana</i> |
| 3a. Flowers 3-5 mm long; filaments glabrous; anthers oblong-ovate | 4. <i>T. pomifera</i> |
| b. Flowers 2-3 mm long; filaments hairy; anthers more or less round | 2. <i>T. malabarica</i> |

1. *T. cochinchinensis* (Lour.) Merr. in *J. Arn. Arb.* 19: 43. 1938. *Triceros cochinchinensis* Lour., *Fl. Cochinch.* 184. 1790. *Turpinia nepalensis* Wight & Arn., *Prodr.* 156. 1834. *T. pomifera* auct Hiern in *Fl. Brit. India* 1: 698. 1875, *p.p.* [*non* (Rox.) DC., 1825].

Asm.: *Pani-Letchu*; Kh.: *Dieng jarrrhri*.

Shrubs to small trees, up to 7 m tall; bark grey, corky. Leaflets elliptic-oblong, 5-12 x 2-4 mm, base acute to cuneate, coriaceous, glabrous, serrulate; lateral nerves 4-7, secondary nerves indistinct. Flowers in axillary or terminal panicles, greenish white, 2 to 5 mm in diam. Petals shortly cillate. Filaments glabrous. Disc 5-lobed. Nuts globose, up to 8 mm in diam. 1-3-lobed.

Fl. & Fr. : Jan - Nov.

Distrib. India: Western Himalaya, Eastern subtropical Himalaya, Western Ghats, in wet evergreen and Shola forests, between 1000-2000 m. Uttar Pradesh, Sikkim, Assam, Meghalaya, Tamil Nadu and Kerala.

Nepal, Myanmar, Vietnam and China.

2. *Turpinia malabarica* Gamble in Kew Bull. 1916: 135. 1916 & Fl. Pres. Madras 1: 173. 1956 (Repr. ed). **Fig. 88.**

Mal.: *Pamba Vetti*; Tam.: *Kanali*.

Large trees, up to 12 m tall. Leaves 3-7-foliolate; leaflets elliptic-lanceolate, 5.5-9.5 x 2-4.5 cm, abruptly obtuse-acuminate, cuneate at base, serrate, glabrous, subcoriaceous. Flowers *ca* 0.3 cm long, yellowish white, in axillary or terminal panicles. Filaments hairy. Disc evenly crenate. Fruits globose, *ca* 2.5 cm across, glabrous, shortly 1-3 pointed.

Fl. & Fr. : June - Dec.

Distrib. India: Western Ghats, occasional in evergreen Shola forests, up to 1700 m. Tamil Nadu, Karnataka and Kerala.

Sri Lanka.

3. *Turpinia montana* (Blume) Kurz in J. As. Soc. Bengal 44: 182. 1875; Linden in Fl. Males. 1, 6(1): 55. 1960. *Zanthoxylum montanum* Blume, Bijdr. 248. 1825. ("Xanthoxylum").

Shrubs or trees, up to 15 m tall. Leaflets 3-7, elliptic to oblong, 3-10 x 1.5-7.5 cm, acuminate, dentate, glabrous, petiolules 0.5-3 cm; stipules 3 mm, pubescent, notched at apex. Panicles 18 cm long. Sepals ovate, 1-1.5 x 1.5-2 mm, glabrous, ciliate. Petals obovate, glabrous, ciliate, equal to sepals. Stamens 1.5-2 mm long. Ovary 3-loculed, each locule with 2 ovules. Fruit globular; pericarp less than 1 mm thin. Fruit globular.

Distrib. India : Tamil Nadu (Palni Hills).

Myanmar, Thailand, Vietnam, China, Sumatra and central and West Java.



Fig. 88. *Turpinia malabarica* Gamble

4. **Turpinia pomifera** (Roxb.) DC., Prodr. 2: 3. 1825. *Dalrympelea pomifera* Roxb., Pl. Corom. 3: 76, t. 279. 1819.

Khasi: *Dieng-ohlong antheri*.

Trees, up to 20 m tall; bark brown to greyish brown. Leaves 25-50 cm long; stipules deltoid, 4-5 mm long, caducous. Leaflets elliptic-oblong, 6-18 x 2-7 cm, acuminate, base obtuse or rounded, glabrous, margin repand, serrate; lateral petiolules 3-8 mm long; nerves up to 8 pairs. Flowers yellowish white. Inflorescence axillary or terminal panicles, up to 30 cm long. Sepals ovate to oblong, 3-3.5 x 1-1.5 mm, fleshy, unequal, not or feebly ciliate at margins. Petals oblong to oblanceolate, 3-3.5 mm long, not or obscurely ciliate at margin, thin in texture. Stamens 2.5 mm long. Fruits globose, smooth, purplish black. Nuts obscurely 2-3-grooved.

Fl. & Fr. : Jan. - Oct.

Distrib. India: In tropical evergreen forests, preferring damp habitats between, 680-2350 m. Sikkim, Assam, Arunachal Pradesh and Meghalaya.

Nepal, Bangladesh, Sumatra, Java, Celebes and Philippines.

SABIACEAE

(S.C. Majumder)

Trees, shrubs or climbers. Leaves alternate, simple or imparipinnately compound, exstipulate. Inflorescence terminal or axillary, pedunculate cymes or panicles, rarely a simple raceme. Flowers bisexual, rarely unisexual, small. Sepals 4-5 partite, imbricate, persistent. Petals 4-5, mostly free, equal or unequal, antisepalous, imbricate. Stamens as many as petals, equal or unequal, all or only 2 larger, fertile, the rest staminodial; anthers 2-loculed with a thick connective; pollen grains binucleate tricolporate. Disc annular or cupular, dented or lobed. Carpels 2-3, syncarpous; ovary superior, 2-3-loculed, each locule with 2, semianatropous ovules on axile placentation; styles 2-3, free or united; stigma simple or 2-3-lobed. Fruits drupaceous, subglobose, 1-2-loculed, 1-seeded. Seeds with or without endosperm; embryo large, oily.

South East Asia, China Japan and Mexico to Brazil, 4; genera and ca 46 species; 2 genera and 11 species in India.

Literature. MONDAL, M. S. & K. MITRA, (1982). Pollen Morphology and Systematic Relationship of Sabiaceae. *Geophytology* 12 (2): 166-180; NAYAR, M.P. & S.C. MAJUMDER (1990). Sabiaceae. *Fasc. Fl. Ind.* 20: 115-134.

KEY TO THE GENERA

- 1a. Scandent shrubs or climbers; sepals and petals equal;
stamens 4-5, equal, all fertile 2. *Sabia*
- b. Small to large trees; sepals and petals unequal; stamens 5,
unequal, outer 3 staminodial, inner 2 fertile 1. *Meliosma*

1. *Meliosma* Blume

Trees, without persistent bud scales. Leaves alternate, simple or imparipinnate; leaflets subopposite. Inflorescence terminal, sometimes axillary panicles. Flowers numerous, small, bisexual, irregular. Sepals distinct, sometimes surrounded by several persistent small bracts, indistinguishable, altogether (4) 5-13. Petals 5, outer 3 larger, convex, inner 2 smaller, entire or bifid, opposite and more or less adherent to the base of fertile stamens. Disc smaller, annular, more or less irregularly 5-dentate. Stamens 5: 3 staminodial, 2 fertile; anthers

large, globose. Ovary 2-loculed, each locule with 2 superposed ovules; styles and stigmas simple. Fruits drupaceous, oblong to globose, 1-loculed, 1-seeded. Seeds exalbuminous.

Central & S. America, S.E. Asia, China, Japan; *ca* 25 species, 5 in India.

Note. In primary and secondary forests, especially in hills and mountains up to 3300 m, but also in lowlands. Majority of the species prefer everwet to moist, tropical to subtropical countries; these are deciduous and grow flash-wise.

Literature. BEUSEKOM C.F. VAN (1971). Revision of *Meliosma* (Sabiaceae), Section *Lorenzanea* excepted, living and Fossil, Geography and phylogeny. *Blumea* 19: 355-529.

KEY TO THE SPECIES

- | | |
|--|--|
| 1a. Leaves simple | 2 |
| b. Leaves compound | 4 |
| 2a. Nerves straight | 1. <i>M. dilleniifolia</i> |
| b. Nerves curved | 3 |
| 3a. Inner petals bifid | 4. <i>M. simplicifolia</i> |
| b. Inner petals entire | 2. <i>M. henryi</i> spp. <i>mannii</i> |
| 4a. Leaflets glabrous or pubescent, usually dentate; inner petals 0.5-1 mm, always distinctly and deeply bifid; ovary glabrous or pubescent. | 3. <i>M. pinnata</i> |
| b. Leaflets glabrous, entire; inner petals 0.5-2 mm, emarginate to retuse; ovary glabrous | 5. <i>M. sumatrana</i> |

1. ***Meliosma dilleniifolia*** (Wallich ex Wight & Arn.) Walp., Rep. Bot. Syst. 1; 423. 1842 ("*dilleniaefolia*"); Hook.f., Fl. Brit. India 2: 4. 1876. *Millingtonia dilleniifolia* Wallich ex Wight & Arn. in Edinb. New Phil. J. 15: 179. 1833. Fig. 89.

Hindi: *Gwep, Gweb, Gulpha, Goguna, Goi, Shapra, Bakarshang*; Nep.: *Lekhgogun, Rani gogun, Maigoza*; Punj.: *Kanna, Karkon*.

Small trees, *ca* 10 (-15) m tall. Leaves obovate or elliptic to oblong, 7-30 x 4-15 cm, cuneate, acute or attenuate at base, closely and finely dentate

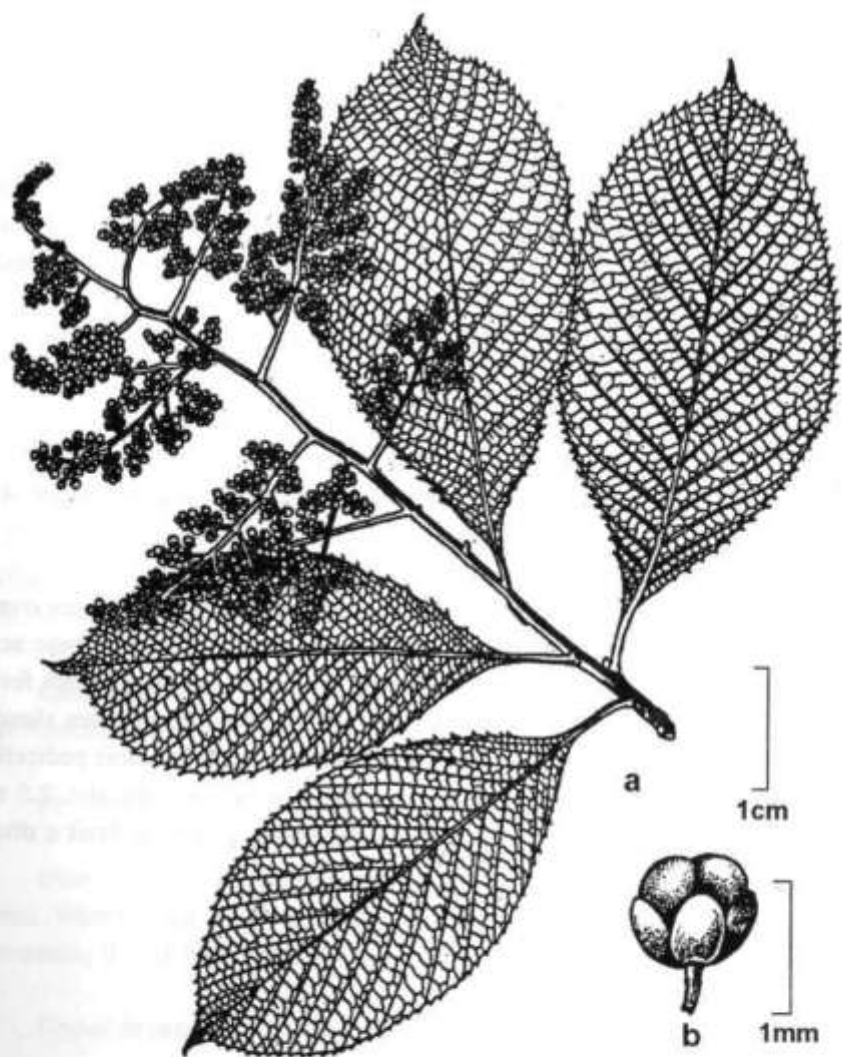


Fig. 89. *Meliosma dilleniifolia* (Wallich ex Wight & Arn.) Walp. : a. Flowering twig, b. A flower.

along margins, never repand, sparsely to densely pubescent, nerves 13-27 pairs. Panicles erect, 14-28 cm long with straight main and lateral axes. Sepals 5-4, broadly ovate, more or less unequal, the outer 2 or 1 usually smaller, often very minute. Petals 5; outer ones glabrous; inner ones *ca* half way bifid, lobes acute, glabrous. Stamens 5, inner 2 fertile and outer 3 staminodial. Ovary 0.5-0.7 mm, glabrous.

Fl. & Fr. : May - Oct.

Distrib. India : Himalayan region, in evergreen forests at 2000-2300 m altitude; reported to be found in thickets by streams and in shady forest ravines. Himachal Pradesh, Uttar Pradesh, Sikkim and Arunachal Pradesh.

North Myanmar and Nepal.

Note. The leaves are used as fodder.

2. *Meliosma henryi* Diels ssp. *mannii* (Lace) Beus. in *Blumea* 19: 451, 1971. *Meliosma mannii* Lace in *Kew Bull.* 1915: 113. 1915.

Trees, up to 15 m tall; lenticells scattered on stems. Leaves ovate-oblong, sometimes oblong, 18 x 6 cm, apex acuminate to subacute, base acute or somewhat attenuate, upper surface shining, glabrous, sometimes with feeble domatia in the axils of nerves beneath; nerves 10-18 pairs; petioles slender. Panicles terminal, 15-25 cm long. Flowers crowded, sessile or short pedicelled. Sepals 4, unequal, hairy. Petals glabrous, outer 3 orbicular, concave, 2.5 mm long, inner 2 lanceolate, entire, *ca.* 2 mm long. Ovary glabrous. Fruit a drupe, ovoid, 4-6 mm across.

Fl. & Fr. : June - July.

Distrib. India : Meghalaya.

China and N. Myanmar.

3. *Meliosma pinnata* (Roxb.) Maxim. in *Bull. Acad. Sci. St. Pet.* 12: 64 in *Obs.* 1867; *Hook.f., Fl. Brit. India* 2: 6. 1876. *Millingtonia pinnata*

Roxb., Fl. Ind. 1: 103. 1820. *Meliosma rhoifolia* Maxim. ssp. *barbulata* Cufod., Oest. Bot. Z. 88: 254. 1939.

Small to large trees, up to 20 m tall; flowering twigs glabrous to densely pubescent. Leaves 3-11-jugate; leaflets ovate, ovate-oblong, elliptic or lanceolate, more or less increasing in size towards leaf top, up to 20 x 5 cm, entire to dentate, with or without domatia in axils of nerves beneath; nerves 3-15 pairs. Panicles terminal, erect, profusely branched. Sepals 5 or 4, ovate, unequal; inner 3 or 4 bigger. Petals 5, glabrous or pubescent; inner petals more or less deeply bifid and glabrous. Filaments ca 1 mm long. Ovary 0.5-1 mm, glabrous to densely pubescent. Fruit globose to ovoid, 4-10 mm across when ripe.

KEY TO THE SUBSPECIES

- | | |
|--|---------------------------|
| 1a. Ovary glabrous; leaves 6-10 jugate, glabrous | 3.2 ssp. <i>pinnata</i> |
| b. Ovary densely pubescent; leaves 3-7 jugate, pubescent | 3.1 ssp. <i>barbulata</i> |

3.1 ssp. *barbulata* (Cufod.) Beus. in Dassanayake & Fosberg, Rev. Handb. Fl. Ceylon 3: 384. 1981. *Meliosma rhoifolia* Maxim. ssp. *barbulata* Cufod. in Oest. Bot. Z. 88: 254. 1939. *Meliosma arnottiana* (Wight.) Walp. Rep. Bot. Syst. 1: 423. 1842; Hook.f., Fl. Brit. India 2: 6. 1876.

Kan.: *Massivala*, Kh.: *Dieng-sngit*, Mal.: *Kalavi*, Tam.: *Kusavi*, *Thagari*, *Huli Makai*, *Koli*.

Fl. & Fr. : May - Sept.

Distrib. India : South Western Ghats and Eastern Himalaya, in evergreen forests. West Bengal, Sikkim, Assam, Nagaland, Manipur, Mizoram, Meghalaya, Karnataka, Tamil Nadu and Kerala.

Upper Myanmar, Thailand, China and Japan.

Note. The timber is used for rafters, clogs, boxes and small objects. The young leaves may be eaten and are used as fodder for pigs.

3.2. ssp. *pinnata*

Fig. 90.



Fig. 90. *Meliosma pinnata* (Roxb.) Maxim. ssp. *pinnata* : a. Flowering twig, b. A flower, c. Stamens with gynoecium, d. Gynoecium.

Asm.: *Banpasola*, *Hingoni*, *Hengnua*, *Mamori*, *Seonia*; Beng.: *Bativa*; Garo.: *Bolmichik*, *Gopenda*; Kh.: *Dieng-Soh-naior*; Lep.: *Dabdabe*, *Dhabdabia*, *Dagdakti*.

Fl. & Fr. : April - Sep.

Distrib. India : In tropical rain and hill forests at rather low altitudes, usually up to ca 1000 m, occasionally higher up to ca 1500 m. West Bengal, Sikkim, Arunachal Pradesh, Assam, Nagaland, Manipur, Mizoram, Meghalaya and Andhra Pradesh.

Bangladesh and Myanmar.

Note. In Assam young leaves cooked with fish are eaten by Miris. Timber is used in constructing house. Fruit is edible.

4. *Meliosma simplicifolia* (Roxb.) Walp., Rep. Bot. Syst. 1: 103. 1842. *Millingtonia simplifolia* Roxb., Pl. Corom. 3: 50, t. 254. 1820. *Millingtonia pungens* Wallich ex Wight & Arn. in Edinb. New Phil. J. 15. 178. 1833. *Meliosma yunnanensis* Franchet in Bull. Soc. Bot. Fr. 33. 465. 1886. *Meliosma thomsonii* King ex Brandis, Indian trees 195. 1906. **Fig. 91.**

Evergreen trees, up to 20 m tall. Leaves elliptic to lanceolate or ovate-lanceolate to obovate-oblong, 3-50 x 1-18 cm, entire or dentate, glabrous or pubescent, sometimes with domatia; nerves 7-25 pairs. Panicles terminal, very rarely axillary, usually profusely branched, sparsely pubescent to densely tomentose, many-flowered. Flowers crowded, sessile. Sepals 4-5; empty bracts 0.6 (-8), ovate, more or less unequal; inner ones 0.8-2 mm; outer ones smaller, often minute, glabrous to pubescent, entire, margin usually ciliolate. Petals 6; outer ones glabrous; inner ones shallowly to deeply bifid, 0.6-1.5 mm, glabrous, sometimes ciliolate. Ovary 0.5-0.75 mm, glabrous, sometimes pubescent. Fruits globose, 4-10 mm across when ripe.

KEY TO THE SUBSPECIES

- 1a. Sepals 4-5; empty bracts absent
b. Sepals 4-5; empty bracts 1-6.

4.2. ssp. *simplicifolia*

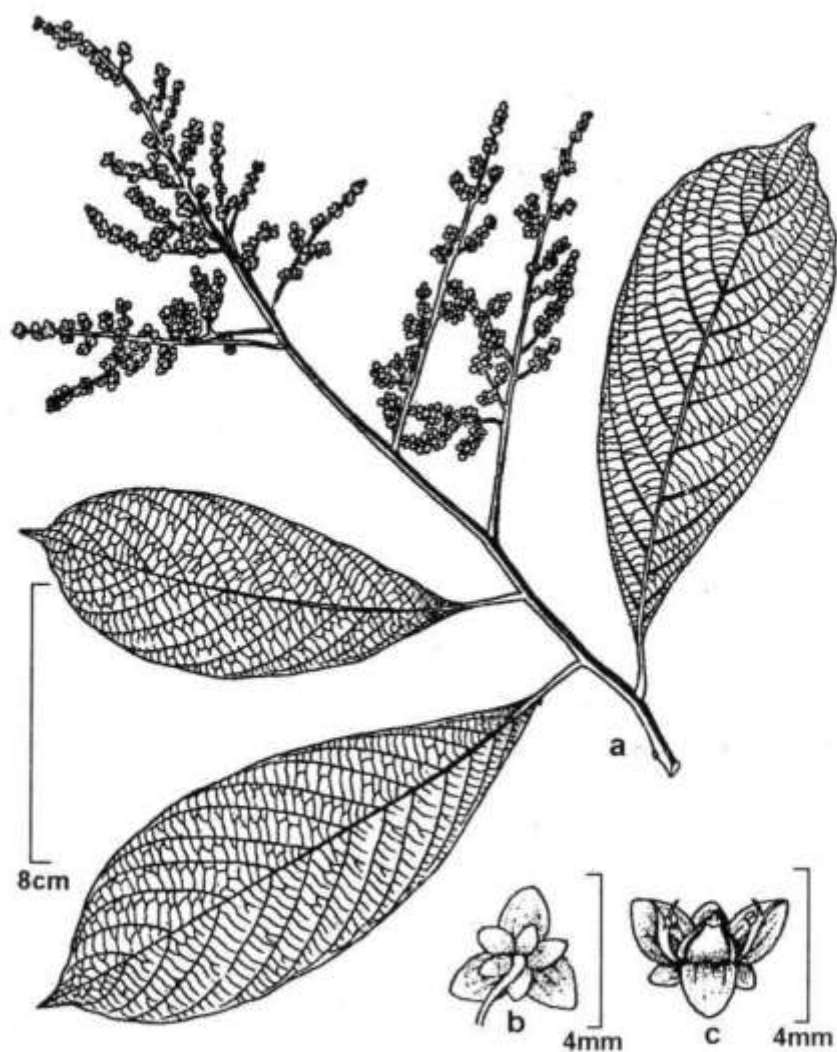


Fig. 91. *Meliosma simplicifolia* (Roxb.) Walp. : a. Flowering twig, b. A flower showing calyx, c. Flower.

- 2a. Leaves of flowering twigs oblong to lanceolate, usually entire, rarely dentate; empty bracts 4-6 4.1. ssp. **pungens**
- b. Leaves of the flowering twigs oblong to oblong-lanceolate, usually dentate, rarely entire; empty bracts 1-3. 3
- 3a. Leaves 7-32 cm long, midrib distinctly pubescent above; panicles 15-50 cm long 4.3. ssp. **thomsonii**
- b. Leaves 3-15 cm long, usually glabrous; panicles 4-20 cm long 4.4. ssp. **yunnanensis**

4.1 ssp. pungens (Wallich ex Wight & Arn.) Beus. in Blumea 19: 466. 1971. *Millingtonia pungens* Wallich ex Wight & Arn. in Edinb. New Phil. J. 15: 178. 1833. *Meliosma pungens* (Wallich & Wight & Arn.) Walp. Rep., 1: 423. 1842 *p.p.* Hook.f., Fl. Brit. India 2: 4. 1876. *Meliosma wightii* Planchon ex Brandis, For. Fl. 116. 1874; Hook.f., Fl. Brit. India 2: 4. 1876.

Tam.: *Tode, Toudet.*

Fl. & Fr. : May - Sept.

Distrib. India : In tropical hill-forests of South Western Ghats, from 1500 to 2100 m. Karnataka, Tamil Nadu and Kerala.

Sri Lanka and Sumatra.

Note. It is commonly known as "Hill-Mango".

4.2. ssp. simplicifolia

Asm: *Hengunia, Thowthawa, Pichala, Larubandha*; *Beng.:* *Patpati, Dant-rangi, Dibru*; *Gar.:* *Barbethipa*; *Naga:* *Kaoso*; *Nep.:* *Kosru, Churii, Swartalahara*; *Tam.:* *Chembavu, Kallavi.*

Fl. & Fr. : Nov. - June.

Distrib. India : In primary and secondary moist evergreen-tropical forests, from sea level up to about 1200 m, exceptionally up to 1500 m. Uttar Pradesh, Bihar, West Bengal, Sikkim, Arunachal Pradesh, Assam, Nagaland, Manipur, Tripura, Meghalaya, Orissa, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Nepal, Bhutan, Bangladesh, Myanmar, Sri Lanka, Vietnam, Thailand, Sumatra, Java and China.

Note. Flowers and young leaves are eaten by natives. The timber is used for various purposes.

4.3 ssp. thomsonii (King ex Brandis) Beus. in *Blumea* 19: 469. 1971. *Meliosma thomsonii* King ex Brandis, *Indian Trees*. 195. 1906. *Meliosma pungens* (Wallich ex Wight & Arn.) Walp., *Rep. Bot. Syst.* 1: 423. 1842, *p.p.* Brandis, *For. Fl.* 116. 1874.

Nep.: *Sinduri dabdebi*.

Fl. & Fr. : June - Sept.

Distrib. India : In evergreen forests, often found near streams, in open thickets, road sides and ravines. Punjab, Uttar Pradesh, Sikkim, Assam and Nagaland.

Nepal, Bhutan, Upper Myanmar, North Vietnam and China.

Note. Wood is used as timber.

4.4. ssp. Yunnanensis (Franchet) Beus. in *Blumea*, 19: 471. 1971. *Meliosma yunnanensis* Franchet, in *Bull. Soc. Bot. Fr.* 33: 465. 1886.

Hindi: *Gogua, Busha, Bushkua, Bekesh, Kapper*; Nep.: *Koda khebade*; Punj.: *Gogsha, Charcharya, Ghogsha*.

Fl. & Fr. : April - Sept.

Distrib. India : In evergreen forests. Punjab, Uttar Pradesh, Sikkim, Arunachal Pradesh and Assam.

Nepal, Bhutan, Upper Myanmar, Tibet and China.

5. Meliosma sumatrana (Jack) Walp. in *Ann.* 1: 135. 1848; Hook.f.,

Fl. Brit. India. 2: 6. 1876; Nayar & Majumder in Fasc. Fl. Ind. 20: 126. 1990. *Millingtonia sumatrana* Jack, Mal. Misc. 2 (7): 30. 1822.

Evergreen trees; flowering twigs terete, glabrous. Leaves 2-5-jugate, glabrous with distinctly swollen base; leaflets usually elliptic to lanceolate, sometimes ovate to ovate-lanceolate, 5-35 x 3-15 cm, apex acuminate to caudate, entire, glabrous above, slightly pubescent beneath along the nerves, without domatia, midrib slightly prominent above, very prominent beneath; nerves 7-13 pairs, ascending, reticulate, distinctly swollen at the base. Panicles usually terminal, puberulous, bearing numerous crowded flowers. Sepals 4 or 5, ovate, unequal; outer 2-3 smaller; inner 3-4 larger, glabrous with ciliate margins. Inner petals reduced, attached with two fertile stamens 1-1.5 mm long. Ovary 0.5-1 mm, glabrous; style 0.5-1 mm long, glabrous.

Fl. & Fr. : Oct - Dec.

Distrib. India : In evergreen, dense, mixed tropical rain forests on various soils, by stream as well as on hill-tops and ridges. Great Nicobar.

Malay Peninsula, Malesia, Sumatra, Java, Borneo, Celebes, Anambas Islands, Banka and Philippines.

Note. On Mindanao the triturated bark and leaves are reported to be in use as a medicine applied for wounds, to smooth itchy skin or charred and put in water against tympanites. The fruits are reported to be edible.

2. *Sabia* Colebr.

Deciduous or evergreen, woody climbers or scandent shrubs with persistent bud scales at the base of branches. Leaves alternate, simple, ovate or elliptic to lanceolate, entire, petiolate, exstipulate. Inflorescence an axillary cyme, rarely a panicle or raceme, sometimes flowers solitary. Flowers small, bisexual, 5-merous, actinomorphic. Sepals 5, equal, basally connate, somewhat orbicular-ovate, persistent. Petals 5-7, equal, imbricate. Disc 5-lobed. Stamens 5, all fertile, inserted on the disc and adnate to petals at base; anthers globular. Carpels 2; ovary ovoid or conical, 2-loculed; styles 2, slightly united. Fruit of 1 or 2, almost free, reniform or subglobose drupelets; endocarp pitted or reticulate, bony. Seeds reniform, testa brittle.

Mainly confined to South East Asia and Malesian regions, distributed from Kashmir to East Asia to Solomon Islands; about 19 species, 6 in India.

Literature. CHEN, L. (1943) A revision of the Genus *Sabia* Colebr. *Sargentia* 3: 1-75. WATER, V.D. (1980). A Taxonomic revision of the Genus *Sabia* (Sabiaceae). *Blumea* 26 (1): 1-64.

KEY TO THE SPECIES

- | | |
|--|---------------------------------|
| 1a. Flowers solitary | 1. <i>S. campanulata</i> |
| b. Flowers few to many | 2 |
| 2a. Inflorescence few-flowered, simple cymes | 6. <i>S. purpurea</i> |
| b. Inflorescence many-flowered, compound cymes | 3 |
| 3a. Petals 3.5-5 mm long | 2. <i>S. lanceolata</i> |
| b. Petals 2-3 mm long | 4 |
| 4a. Inflorescence 10-20-flowered, shorter than leaves | 5. <i>S. parviflora</i> |
| b. Inflorescence many-flowered, generally larger than leaves | 5 |
| 5a. Lateral cymes simple, glabrous. | 3. <i>S. limoniacea</i> |
| b. Lateral cymes compound, pubescent | 4. <i>S. paniculata</i> |

1. *Sabia campanulata* Wallich in Roxb., Fl. Ind. 2: 311. 1824; Hook.f., Fl. Brit. India 2: 1. 1876. *S. leptandra* Hook.f. & Thoms., Fl. Ind. 1: 209. 1855; Hook.f., fl. Brit. India 2: 2. 1876.

Hindi: *Bakalpata, Lohari*; Lep.: *Payongrik*; Nep.: *Simali*.

Woody climbers or scandent shrubs; young shoots pubescent. Leaves oblong or oblong-ovate to lanceolate, 1-10(-15) x 0.5-3.5 cm, acuminate, acute at base; nerves 4-6 pairs; petioles 5-12 mm long, pubescent. Sepals 5, united at the base, 0.75-3 mm long. Petals 5, free, subrounded-obovate or ovate-oblong, 3-12 mm long. Stamens 5; filaments somewhat dilated towards base, extrorse or introrse. Carpels 2; ovary bilobed, each lobe unilocular, biovulate. Drupes one or two lobed, reniform, 5-6 mm in diam. wrinkled.

KEY TO THE VARIETIES

- | | |
|--|-------------------------------------|
| 1a. Flowers 3.3 m long; petals subrounded to obovate, 6-12 x 4-7 mm; stamens shorter than petals | 1.1. var. <i>campanulata</i> |
|--|-------------------------------------|

- b. Flowers 14 m long; petals ovate to oblong, 3-3.5 x 2-2.5 mm;
stamens longer than petals

1.2. var. *kingiana*

1.1 var. *campanulata*

Fl. & Fr. : March - June.

Distrib. India : Throughout the Himalayan region, usually between 1500-3000 m. Jammu & Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh, West Bengal, Sikkim, Arunachal Pradesh and Assam.

Nepal, Bhutan, Myanmar, China and Taiwan.

1.2 var. *kingiana* Nayar & Majumder in Bull. Bot. Surv. India 24: 219. 1982.

Fl. : March.

Distrib. India : Sikkim.

2. *Sabia lanceolata* Colebr., Trans. Linn. Soc. London 12: 355. 1818; Hook.f., Fl. Brit. India 2: 2. 1876. *S. tomentosa* Hook.f., Fl. Brit. India 2: 3. 1876.

Beng.: *Sabja-lat*, *Soobja*; Garo: *Miri*, *Mandri*; Kh.: *Samtameh*.

Evergreen, woody climbers or scandent shrubs. Twigs glabrous or pubescent. Leaves elliptic-oblong to lanceolate, 5-22 x 1.5-10 cm, apex acute, base acute to obtuse or rounded, sometimes herbaceous, sparsely to laxly pubescent beneath; nerves 5-12 pairs; petioles up to 2.5 cm long. Cymes solitary, or in thyrses, axillary, pubescent or glabrous, 15-30-flowered; pedicels up to 13 mm long. Flowers greenish white. Sepals ovate, sometime oblong-ovate, 0.75-1.25 x 0.6-1.5 mm. Petals oblong-ovate to oblong, 3-5.5 x 1.4-2 mm. Stamens 1.5-2 mm; filaments flattened; anthers globular to ellipsoid. Disc crown shaped. Pistil 1.25-1.75 mm; ovary glabrous. Druplets distinctly obovoid to oblong-obovoid, somewhat compressed, with or without persistent petals and stamens at the base.

KEY TO THE VARIETIES

- 1a. Leaves glabrous beneath; inflorescence glabrous 2.1. var. **lanceolata**
 b. Leaves sparsely to laxly pubescent beneath; inflorescence
 pubescent 2.2. var. **siamensis**

2.1. var. lanceolata

Fl. & Fr. : Oct. - April.

Distrib. India : Occurs mainly between 200-1500 m. Uttar Pradesh, Arunachal Pradesh, Assam, Nagaland, Manipur, Mizoram, Tripura and Meghalaya.

Bhutan, Bangladesh (Silhet) and N. Myanmar.

Note. The leaves are used by the Garos for fomenting in case of swellings and pain on the ankle and wrist.

2.2. var. siamensis V.D. Water in Blumea 26; 43. 1980.

Fl. : July.

Distrib. India : from 200-700 m. Arunachal Pradesh.

Thailand.

Note. This variety differs from var. *lanceolata* in its pubescence, its large but still herbaceous leaves which have curved and fewer nerves and smaller flowers.

3. Sabia limoniacea Wallich ex Hook.f. & Thoms., Fl. Ind. 1: 210. 1855; Hook.f., Fl. Brit. India 2: 3. 1876. *Sabia malabarica* Beddome, Ic. Pl. Ind. 1: 39. 1874; Hook.f., Fl. Brit. India 2: 2. 1876.

Evergreen, woody climbers, up to 10 m tall. Leaves oblong-ovate to oblong-lanceolate, 4-18 x 1.5-6.5 cm, apex acute, base acute to rounded, nerves 5-9 pairs, glabrous to sparsely pubescent. Panicles 7-15 cm long, often subtended

by small leaves, axillary, solitary, glabrous, many-flowered. Sepals 5, glabrous, broadly ovate to elliptic, 0.7-1.2 x 0.6-1 mm, margin ciliolate. Petals elliptic to ovate, 1.75-2.5 x 1.25-2 mm, 5-nerved. Stamens 5, unequal, 1.5-2 mm; filaments somewhat flattened. Ovary ovoid or conical, glabrous; styles 0.5 m long; stigma minute. Druplets globular to obovoid.

Fl. & Fr. : Sept. - April.

Distrib. India : In thickets and woods mainly at 300-1200 m. West Bengal, Sikkim, Assam, Nagaland, Tripura, Meghalaya, Tamil Nadu and Kerala.

Bhutan, Bangladesh, Myanmar, Laos, Vietnam, Thailand, Malay Peninsula, Sumatra, Borneo and China.

4. *Sabia paniculata* Edgew. ex Hook.f. & Thom., *Fl. Ind.* 1: 211. 1855; Hook.f., *Fl. Brit. India* 2: 3. 1876.

Hindi: *Bakalpata*.

Evergreen, woody climbers. Leaves oblong or oblong-ovate to sublanceolate, 8-22 x 2.5-8 cm, apex acute, base acute to rounded, glabrous; nerves 5-7 pairs; petioles up to 2.5 cm. Cymes solitary, axillary but often arranged in a thyrsoid inflorescence. Sepals ovate, 1-1.3 x 0.7-1 mm, densely pubescent, ciliolate. Petals oblong, sometime oblong-ovate, 2.25-3.5 x 0.75-1.25 mm, obtuse. Stamens 1.5-2.75 mm; filaments flattened, 1-1.75 mm long. Pistil 1.5-1.75 mm; ovary glabrous. Druplets globular to obovoid.

Fl. & Fr. : June - Aug.

Distrib. India : In shady and swampy localities; mainly between 250-1400 m. Uttar Pradesh, Bihar, West Bengal, Sikkim, Arunachal Pradesh, Assam and Nagaland.

Nepal and Myanmar.

5. *Sabia parviflora* Wallich in Roxb., *Fl. Ind.* 2: 310. 1824; Hook.f., *Fl. Brit. India* 2: 2. 1876.

Evergreen climbers or scandent shrubs, up to 6 m tall. Leaves oblong or sometimes oblong-ovate to lanceolate, 3-12 x 1-5 cm, apex acute to acuminate, base acute to rounded, margin elegantly waved; nerves 6-9 pairs, patent, straight or curved; petioles up to 1.5 cm. Cymes solitary, axillary, 2-8 cm long, 10-20-flowered, sometimes up to 35-flowered, widely spreading. Sepals broad-ovate to ovate, 0.7-1.5 x 0.5-1 mm, acute to rounded, glabrous to pubescent, ciliolate. Petals oblong to lanceolate, 2-3 x 0.7-1.3 mm, acute to obtuse, nerves up to 7 pairs. Stamens 1.2-2.25 mm; filaments flattened. Ovary globular to subreniform, glabrous. Druplets globular to obovoid.

Fl. & Fr. : Throughout the year.

Distrib. India : Eastern Himalaya, often along road sides, in thickets and forests, mainly between 600-2000 m. Uttar Pradesh, West Bengal, Sikkim, Arunachal Pradesh, Assam and Meghalaya.

Nepal, Bhutan, Myanmar, Thailand, Vietnam, Laos, Borneo and China.

6. *Sabia purpurea* Hook.f. & Thoms., Fl. Ind. 1: 209. 1855; Hook.f., Fl. Brit. India 2: 2. 1876.

Asm.: *Jermineirang-Chhai*, *Kh.*: *Dieng-jermeri*.

Shrubs or climbers, up to 4.5 m. Leaves oblong, oblong-ovate to sub lanceolate, 3-12 x 1.5-4.5 cm, apex long acuminate, base rounded; nerves 4-6 pairs. Cymes solitary, axillary, up to 4.5 cm, 3-6-flowered, glabrous. Sepals subequal to unequal, up to 1.5 mm. Petals 5, ovate or elliptic to oblong-ovate, 3-4.5 x 1.25-2.25 mm. Stamens 5, 1.5-1.75 mm. Pistil 1.3-1.7 mm; styles narrow-conical to conical; ovary ovoid, glabrous. Druplets globular to somewhat obovoid.

Fl. & Fr. : Feb. - June.

Distrib. India : In thickets and forests, between 1200-2100 m. Uttar Pradesh, West Bengal, Sikkim, Assam, Arunachal Pradesh and Meghalaya.

Nepal, Myanmar and Thailand.

Note. Chromosome number $n=24$ (Malla *et al.* in Taxon 26: 561. 1977).

ANACARDIACEAE

(Dali Chandra and S.K. Mukherjee)

Trees or shrubs, rarely lianas, usually oleoresinous (often acrid), monoecious, dioecious or polygamous. Leaves alternate, rarely opposite, simple or pinnately compound; stipules absent or vestigial. Flowers small, bracteate, di- or monochlamydeous, regular, unisexual and or bisexual, usually in terminal or axillary panicles. Sepals 3 - 5 (-7), usually connate below, rarely wholly connate into a calyx, closed in bud and irregularly splitting at anthesis, often valvate, caducous or persistent, rarely accrescent. Petals 3 - 5 (-7), distinct, imbricate, rarely valvate, sometimes accrescent, rarely absent. Disc annular or cupular, entire or lobed, rarely produced into a gynophore or obsolete. Stamens as many as petals, or fewer or more to numerous, some often abortive forming staminodes, biseriate or uniseriate, distinct or basally connate, inserted on or beneath disc; anthers tetrasporangiate, basi- or dorsifixed; pollen tricolporate or triporate. Carpel in male flower obsolete or absent, in female or bisexual flowers (2-) 3 - 5 (-12), syncarpous (often 1, rarely 5 locules develop), rarely apocarpous, usually 1 fertile; ovary superior or inferior, sometimes semi-inferior; ovule 1 in each locule, pendulous from top or side or from an ascending funicle arising from base of ovary wall; styles connate, or distinct and divergent; stigmas as many as carpels. Fruit usually a Drupe, rarely a false Drupe with 2-5 stones, or sometimes a nut placed on or more or less embedded within fleshy hypocarp. Seeds exalbuminous; cotyledons 2, plano-convex.

Mainly tropical and subtropical, a few temperate; *ca* 77 genera and 700 species, 23 genera and 68 species in India.

Literature. BARKLEY, F.A. (1957) Generic key to the sumac family (Anacardiaceae). *Lloydia* 20: 255-265. DING HOU, (1978) *Florae Malesianae Praecursores* LVI. Anacardiaceae. *Blumea* 24: 1 - 41. DING HOU, (1978). Anacardiaceae. In: *Fl. Malesiana*. 8: 395 - 548. NASIR, Y.J. (1983). Anacardiaceae. In: *Fl. Pak.* 152: 1 - 22. MUKHERJEE S.K. & DALI CHANDRA (1983). An outline of the revision of Indian Anacardiaceae. *Bull. Bot. Surv. India* 25: 52-61.

KEY TO THE GENERA

- | | |
|--|---|
| 1a. Carpels free or solitary; leaves simple | 2 |
| b. Carpels united (rarely one); leaves rarely simple | 9 |

- | | |
|---|--------------------------|
| 2a. Carpels 5, free | 3. Buchanania |
| b. Carpel solitary | 3 |
| 3a. Leaves opposite | 4 |
| b. Leaves alternate | 5 |
| 4a. Leaves serrate; flowers unisexual | 6. Dobinea |
| b. Leaves entire; flowers male and bisexual | 2. Bouea |
| 5a. Fruit fleshy; one stamen fertile, rest sterile | 12. Mangifera |
| b. Fruit not fleshy; all or most stamens fertile | 6 |
| 6a. Fruits a reniform nut, on a fleshy hypocarp; one stamen sterile, rest fertile | 1. Anacardium |
| b. Fruits a Drupes; all stamens fresh | 7 |
| 7a. Petals caducous, not enlarging in fruit | 9. Gluta |
| b. Petals accrescent | 8 |
| 8a. Gynophore present; Drupes stipitate | 13. Melanorrhoea |
| b. Gynophore absent; fruit sessile | 23. Swintonia |
| 9a. Carpels usually 5; ovary 5-(rarely 1)-loculed | 10 |
| b. Carpels 3, (rarely 4); ovary 1-loculed | 14 |
| 10a. Fruit 5-loculed; styles 5 | 11 |
| b. Fruit 1-loculed; style 1, (rarely 5) | 13 |
| 11a. Styles cunnate | 7. Dracontomelon |
| b. Styles free above | 12 |
| 12a. Leaflets with submarginal veins; mesocarp fibrous; petals valvate | 22. Spondias |
| b. Leaflets without submarginal veins; mesocarp not fibrous; petals, imbricate | 4. Choerospondias |
| 13a. Climbing shrubs; flowers both unisexual and bisexual; petals imbricate | 16. Pegia |
| b. Trees; flowers bisexual; petals valvate | 21. Solenocarpus |
| 14a. Ovary inferior (superior in <i>Semecarpus</i>) or semiinferior; fruit sunken in a cupular or tubular hollow receptacle; leaves simple | 15 |
| b. Ovary superior; fruit without fleshy peduncle; leaves simple and compound | 17 |
| 15a. Drupes seated on enlarged hypocarp | 20. Semecarpus |
| b. Drupes enclosed within enlarged fleshy hypocarp | 16 |
| 16a. Styles 3; petals valvate | 10. Holigarna |
| b. Style 1; petals imbricate | 8. Drimycarpus |
| 17a. Flowers haplochlamydeous or naked | 17. Pistacia |
| b. Flowers diplochlamydeous | 18 |

- | | |
|--|-----------------------|
| 18a. Flowers 4-merous | 19 |
| b. Flowers 5-merous | 21 |
| 19a. Sepals accrescent; drupes globose | 15. Parishia |
| b. Sepals not accrescent; drupes laterally compressed | 20 |
| 20a. Leaves simple; stamens 4 | 14. Nothopegia |
| b. Leaves compound; stamens 8 | 11. Lannaea |
| 21a. Pedicels plumose; styles lateral; leaves simple | 5. Cotinus |
| b. Pedicels not plumose; styles terminal; leaves pinnate | 22 |
| 22a. Stamens 5; rachis not winged | 18. Rhus |
| b. Stamens 10; rachis winged | 19. Schinus |

I. *Anacardium* L.

Shrubs or trees. Leaves simple, alternate, entire, petiolate. Panicles terminal. Flowers small, unisexual (male) and bisexual (plants polygamous), bracteate. Calyx 5-lobed. Petals 5, free, imbricate. Stamens 7-10, all fertile, one usually much stouter and longer than others. Torus stipitate. Carpel solitary; ovary superior, 1-loculed, 1-ovuled; style eccentric. Fruits crescent shaped nuts on large, fleshy hypocarps, 1-seeded; cotyledons palano-convex.

Indigenous to S. America wherefrom *A. occidentale* L. has been introduced to Africa, Madagascar, West Indies and several countries of S. E. Asia; ca 15 species, 1 in India.

***Anacardium occidentale* L.**, Sp. Pl. 1: 385. 1753; Hook.f., Fl. Brit. India 2: 20. 1876. **Fig. 92.**

Asm.: *Kaju-badam*; Beng.: *Aijli-badam*; Hindi: *Kaju*; Or.: *Lanka-badam*; Tam.: *Mindiri*; Tel.: *Muntha-mamidi*.

Small trees. Leaves coriaceous, obovate, 5-14 x 3.5-8.5 cm, apex obtuse, base acute; petioles 1-2 cm long. Panicles 7-20 cm, axillary and terminal. Flowers 1.5 mm across, pedicellate, fragrant. Sepals ovate, 4 x 1 mm. Petals linear-lanceolate, 13 x 2 mm. Stamens 7-10, 10 mm long, fertile, smaller ones, 1 mm long. Torus stipitate. Carpel solitary; ovary 1-loculed, 1-ovuled; style eccentric; stigma simple. Fruit a kidney shaped nut, 2.5-3.5 x 1.5-2 cm; hypocarp 2-3 x 1-2 cm, fleshy, obconic; cotyledons large.

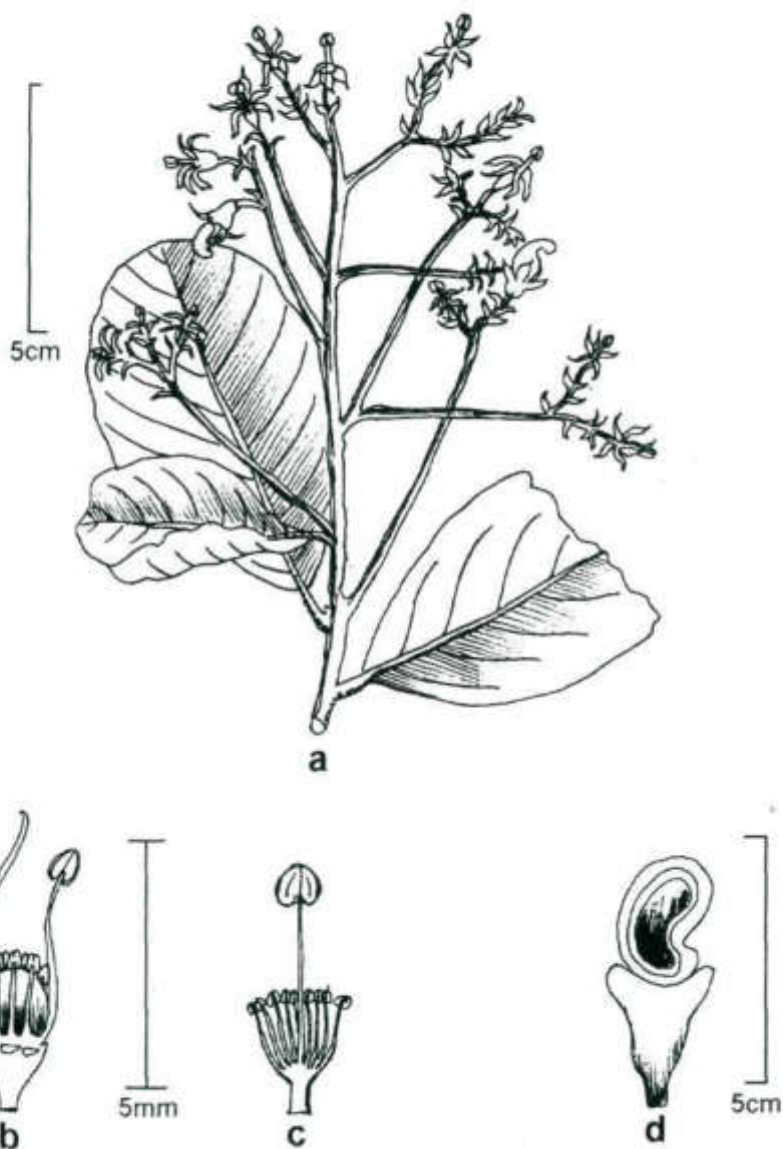


Fig. 92. *Anacardium occidentale* L. : a. Habit; b. Bisexual flower, sepals and petals removed; c. Male flower, sepals and petals are removed; d. L. S. of fruit.

Fl. & Fr. : Jan. - May.

Distrib. India : Cultivated in coastal areas; also naturalized at places on sandy coast and hills near the sea. Bihar, Orissa, Madhya Pradesh, Gujarat, Maharashtra, Andhra Pradesh, Tamil Nadu, Kerala and Andaman & Nicobar Islands.

Bangladesh, Myanmar, Sri Lanka, Philippines, Africa and Tropical Amreica.

2. *Bouea* Meissner

Trees. Leaves simple, opposite, petiolate. Panicles axillary and terminal. Flowers small, bracteate, polygamous. Calyx 3-5-lobed, caducous, valvate. Petals 3-5, free, imbricate. Stamens 3-5, all fertile. Disc lobed. Ovary superior, 1-loculed, 1-ovuled; style terminal; stigma unequally 3-lobed. Fruit a fleshy Drupes. Seed suberect; cotyledons fleshy.

Tropical S. E. Asia and Maleasia; *ca* 4 species, 1 in India.

Bouea oppositifolia (Roxb.) Meissner, Pl. Vasc. Gen. 75, Comment. 55, 1837. *Mangifera oppositifolia* Roxb. Fl. Ind. 2. 434. 1824. *Bouea burmanica* Griffith, Pl Cantor. 14. 1841. Hook.f., Fl. Brit India 2: 21. 1876.

Beng.: *Meriam, Uriam.*

Evergreen trees, up to 30 m tall. Leaves oblong-lanceolate, 6-20 x 2-6 cm, apex acuminate, base cuneate, entire; petioles 1-2.5 cm long. Panicles 4-10 cm long, puberulous. Flowers bisexual, 3 mm across, pedicellate. Sepals 4-lobed; lobes ovate-oblong, 0.7 x 0.5 mm. Petals oblong, 4, 2 x 0.6 mm, keeled on ventral surface. Stamens 4, 0.8 mm long; filaments short; anthers sagittate, mucronate at apex. Disc 4-lobed, 1 mm in diam. Carpel 1 mm long; ovary conical; style short, indistinguishable; stigma obscurely and unequally 3-lobed. Drupes ovoid, 2-3 x 1.5-2 cm, obliquely compressed, glabrous.

Fl. & Fr. : Dec. - April.

Distrib. India : In forests up to 300 m, sometimes cultivated at higher altitudes. West Bengal (cultivated) and Andaman Islands.

Bangladesh, Myanmar and Malesia.

Uses. Fruits are eaten both fresh and in curry; taste sharply acidic but not disagreeable one.

3. *Buchanania* Sprengel

Trees. Leaves simple, alternate, entire petiolate. Panicles terminal and axillary. Flowers bisexual, calyx 5-lobed, persistent, imbricate. Petals 5, free, reflexed, imbricate. Stamens 8-10. Disc urceolate, 8-10-lobed. Carpels 5, free, usually 1 fertile, the rest sterile; ovary superior, 1-loculed, 1-ovuled; style subulate; stigma truncate. Fruit compressed, lenticular drupes with bony stone. Seeds with testa free from the endocarp.

Tropical Asia, Malesia, Australia, Micronesia, Melanesia and Polynesia; ca 25 species; 8 in India.

KEY TO THE SPECIES

- | | |
|---|---------------------------|
| 1a. Leaf apex obtuse or rounded | 2 |
| b. Leaf apex acuminate | 5 |
| 2a. Panicles glabrous; leaves oblong-lanceolate to elliptic-lanceolate | 2. <i>B. axillaris</i> |
| b. Panicles pubescent or tomentose; leaves not lanceolate | 3 |
| 3a. Leaves obovate or obovate-oblong, glabrous beneath | 1. <i>B. arborescens</i> |
| b. Leaves oblong, rusty-villous beneath | 4 |
| 4a. Flowers sessile; petals pubescent; leaves usually 5-10 cm wide | 6. <i>B. lanzan</i> |
| b. Flowers pedicelled; petals glabrous; leaves usually 3-5 cm wide | 3. <i>B. barberi</i> |
| 5a. Carpels glabrous; anthers not sagittate | 8. <i>B. splendens</i> |
| b. Carpels densely ferruginous; anthers sagittate | 6 |
| 6a. Leaves sessile, obovate-oblong, oblanceolate or spatulate, abruptly acuminate; flowers subsessile; petals erect | 7. <i>B. sessilifolia</i> |
| b. Leaves petioled, lanceolate, acuminate; flowers pedicelled; petals reflexed | 7 |
| 7a. Petals ovate; petioles 1-1.5 cm long | 4. <i>B. lanceolata</i> |
| b. Petals oblong; petioles 2-3.75 cm long | 5. <i>B. lancifolia</i> |

1. *Buchanania arborescens* (Blume) Blume, Mus. Bot. 1: 183. 1850. *Coniogeton arborescens* Blume, Bijdr. 1156. 1826. *Buchanania lucida* Blume,

Mus. Bot. 1: 184. 1850; Hook.f., Fl. Brit. India 2: 23. 1876; Ding Hou in Fl. Males. 8: 416. 1978.

Trees, 10-20 m tall, sometimes buttressed, glabrous throughout. Leaves obovate to obovate-oblong, 10-18 x 3.5-5 cm, apex obtuse or rounded, base attenuate; petioles 2.5-4 cm long. Panicles sparsely pubescent, up to 20 cm long; pedicels 2-3 mm long. Flowers white, 3-4 mm across. Sepals caducous, lobes orbicular, 1 mm long. Petals elliptic, obtuse, 2-3 mm long. Stamens 2-3 mm long; anthers sagittate, 1 mm long. Drupes 10 mm in diam., purple-red.

Distrib. India : Andamans.

Myanmar, Indo-China, Thailand, Taiwan and Malesia.

2. *Buchanania axillaris* (Desr.) Ramamurthy in Saldanha & Nicholson, Fl. Hassan Dist. 374. 1976. *Mangifera axillaris* Desr. in Lam., Encycl. Meth. Bot. 3: 687. 1789. *Buchanania angustifolia* Roxb., Corom. Pl. 3: 79. t. 262. 1819; Hook.f., Fl. Brit. India 2: 23. 1876.

Trees, 12-15 m tall, glabrous throughout. Leaves elliptic-oblong, 4-13 x 1.5-4.5 cm, entire; petioles 0.5-2 cm long. Panicles axillary and terminal, 4-13.5 cm long. Flowers bisexual 3-4 mm across; pedicels short. Calyx lobes ovate, glabrous. Petals, 5 x 3 mm, oblong, reflexed. Stamens 10, 3 mm long; filaments subulate; anthers oblong. Disc 1.5 mm in diam. Ovary sub-oval, 1 mm long; style short; stigma truncate. Drupes 1.2 x 0.4 cm.

Fl. & Fr. : March - July.

Distrib. India : Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Sri Lanka.

Uses. The kernels of the seeds are best among the species of *Buchanania* and are edible.

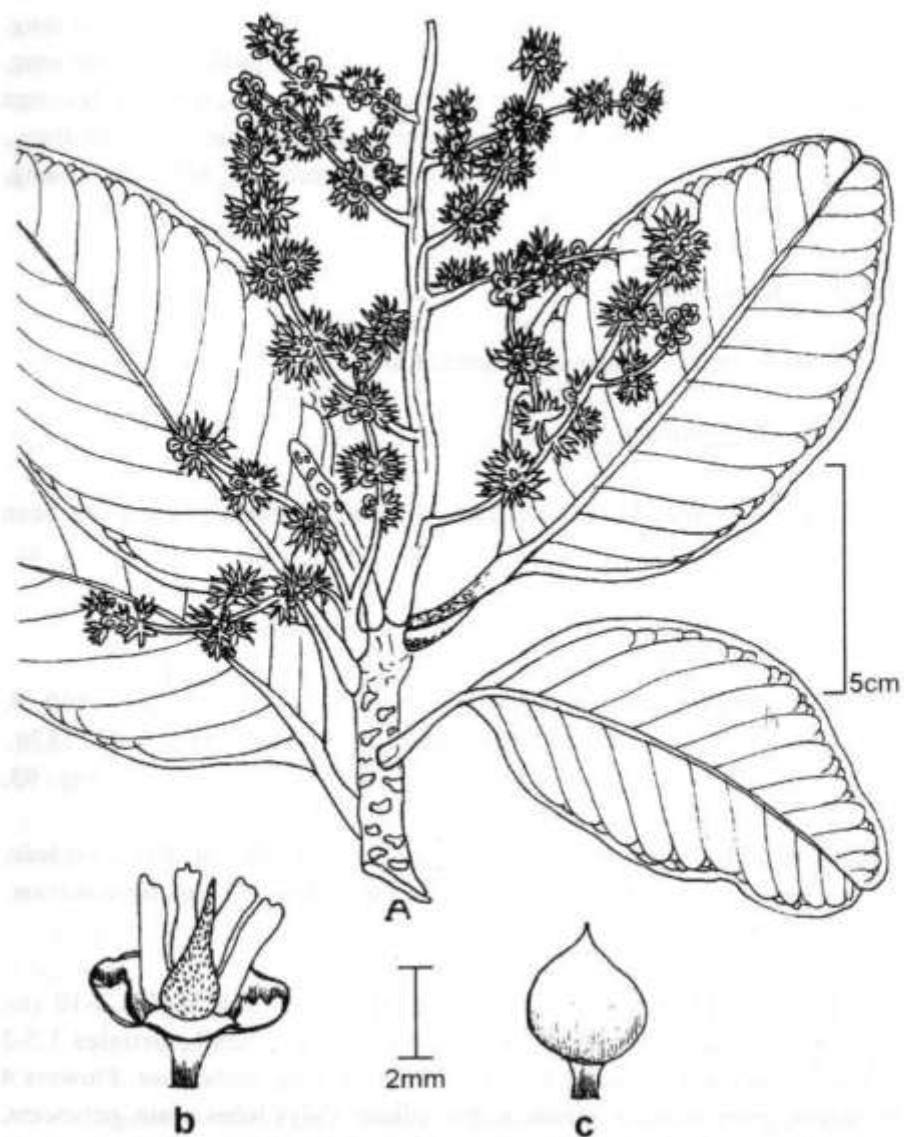


Fig. 93. *Buchanania lanzan* Sprengel : a. Habit; b. Bisexual flower, showing disc and carpels- a. Fertile carpel, b. Pistillode; c. Fruit.

Fl. & Fr. : Jan. - May.

Distrib. India : Throughout the drier parts of the country, in deciduous forests, ascending up to 1300 m in the sub-Himalayan tract, central India and hills of peninsula.

Myanmar.

Uses. Fruits are edible. It tastes somewhat like *Pistacio* nuts and used in sweet-meats. The stem juice is of medicinal value and used for controlling diarrhoea. Leaves are used as fodder. The wood is used in frame work.

7. ***Buchanania sessilifolia*** Blume, Mus. Bot. 1: 185. 1850; Balakr. & Rao in Jain & Rao, Threatened Pl. India 194. 1983. *B. acuminata* Turcz. in Bull. Mosc. 1: 472. 1858; Hook.f., Fl. Brit. India 2: 24. 1876.

Trees, up to 10 m tall. Leaves obovate-oblong, oblanceolate, spatulate or elliptic-oblong, 8-25 x 5.5-7 cm, apex abruptly acuminate, coriaceous, glabrous; petioles absent, rarely up to 1 cm long. Panicles 18-20 cm long, rusty tomentose. Flowers 1.5 mm across, subsessile. Calyx lobes ovate, pubescent. Petals oblong, 2 x 1 mm, glabrous. Stamens 8, 1.2 mm long; filaments subulate; anthers sagittate. Disc 1 mm in diam., 8-crenated. Ovary 1 mm long. Drupes obliquely ovoid, 12 x 8-10 mm.

Fl. & Fr. : July - Aug.

Distrib. India : Assam and Andaman & Nicobar Islands.

Myanmar, Malesia, Indonesia and Thailand.

8. ***Buchanania splendens*** Miq., Fl. Ind. Bot. Suppl. 1: 524. 1861. *B. platyneura* Kurz in J. As. Soc. Bengal 45: 125. 1876; Parkinson, For. Fl. Andaman Isls. 139. 1923.

Trees, 12-18 m tall. Leaves elliptic-lanceolate or oblong-lanceolate, 10-20 x 4-7 cm, apex acuminate, base cuneate, coriaceous; petioles 1.5-3 cm long. Panicles terminal, 14-19 cm long. Flowers 2 mm across, rusty brown; pedicels 0.7-1 mm long, puberulous. Calyx lobes ovate, puberulous outside.

Petals oblong, 1.2 x 0.8 mm, glabrous. Stamens 8, 1 mm long. Disc 1 mm in diam., 8-crenated. Ovary 1 mm long. Drupes 1 cm in diam., laterally compressed.

Fl. & Fr. : Aug. - Jan.

Distrib. India : Andaman & Nicobar Islands.

Sumatra and Borneo.

4. *Choerospondias* Burtt.

Trees. Leaves imparipinnate; leaflets entire, without intramarginal veins. Flowers unisexual; male flowers in panicles; female flowers solitary. Calyx 5-lobed. Petals 5, free, imbricate. Stamens 10. Disc 10-lobed. Carpels 5, syncarpous; ovary superior, 5-loculed, 1-ovule in each locule; styles 5, free, sublateral. Drupes ovoid.

South-East Asia; 2 species in India.

KEY TO THE SPECIES

- | | |
|---|-------------------------|
| 1a. Leaflets pubescent; lamina with auricle; panicles terminal | 1. <i>C. auriculata</i> |
| b. Leaflets glabrous; lamina without auricle; panicles axillary | 2. <i>C. axillaris</i> |

1. *Choerospondias auriculata* D. Chandra in *J. Bombay Nat. Hist. Soc.* 75: 457. 1978; Mukherjee & Chandra in *Bull. Bot. Surv. India* 25: 53. 1983. Fig. 94.

Trees, up to 30 m tall. Leaves 20-24 cm long; leaflets 4-6 pairs, ovate, caudate-acuminate, entire, 6-9 x 2.5 cm, base obliquely rounded, membranous, pubescent, a prominent auricle on each side; petioles 8-10 cm long. Panicles terminal, 16-19 cm long, glabrous. Male flowers 5 mm across, pedicellate. Calyx lobes ovate, pubescent. Petals oblong-lanceolate, 2 x 0.6 mm, hirsute on ventral side. Stamens 10, 3 mm long; filaments hirsute at base; anthers dorsifixed. Disc 1 mm in diam.

Fl. : May.

Distrib. India : Uttar Pradesh (Mussoorie). Endemic.



Fig. 94. *Choerospondias auriculata* D. Chandra : a. Habit; b. Single leaf with auriculate base; c. Male flower showing arrangement of floral-members.

2. Choerospondias axillaris (Roxb.) Burtt & Hill. in Ann. Bot. n.s. 1: 254. 1937. *Spondias axillaris* Roxb., Fl. Ind. 2: 453. 1832; Hook.f., Fl. Brit. India 2: 42. 1876.

Asm.: *Delam-asing*; Kh.: *Dieng-salait*; Lep.: *Silah-kung*; Nep.: *Lapshi*.

Trees, up to 30 m tall. Leaves 20-32 cm long; petioles 5-8.5 cm long; leaflets 3-7 pairs, oblong-lanceolate or ovate-lanceolate, 2.5-12 x 2.5 cm, caudate-acuminate, base obliquely rounded; serrate to crenate, petiolule 2-5 mm long. Panicles 5-15 cm long. Male flowers 3 mm across; pedicel 3 mm long. Calyx lobes ovate, margin ciliate. Petals oblong, 2 x 1 mm. Stamens 10, 2 mm long. Disc 1 mm in diam. Female flowers 5 mm across. Sepals and petals as in male flowers. Stamens much reduced forming staminodes. Ovary superior, 2.5 x 1.8 mm; stigma capitate. Drupes oblong, 1.5-2.5 x 0.8-1.5 cm, yellow when ripe.

Fl. & Fr. : Feb. - Dec.

Distrib. India : West Bengal, Sikkim, Assam, Arunachal Pradesh and Meghalaya.

Nepal, Thailand and China.

Uses. The wood is used in making tea chests and as fuel. The finer bark is chewed by some people as a substitute for areca nut.

5. *Cotinus* Miller

Deciduous shrubs or trees, usually dioecious. Leaves simple, alternate, petiolate. Panicles terminal. Flowers both unisexual and bisexual, bracteate, pedicellate. Calyx 5-lobed, persistent. Petals 5, imbricate. Stamens 5, rarely 10. Disc intrastaminal, usually 5-lobed. Carpels 3, syncarpous; ovary superior, 1-loculed, 1-ovuled; styles 3, lateral; stigma simple. Fruiting panicles usually furnished with long and plumose pedicels of numerous sterile flowers. Drupes obliquely ovoid. Seeds reniform.

North America, Europe, Africa, Asia; ca 3 species, 2 in India.

KEY TO THE SPECIES

- 1a. Stamens 5; styles 3; pedicels of sterile flowers plumose;
fruits obliquely ovoid; fruits and leaves tomentose **1. *C. coggygria***
- b. Stamens 10; style 1; feathery structure absent in pedicels;
fruits orbicular; fruits and leaves glabrous **2. *C. kanaka***

1. *Cotinus coggygria* Scop., Fl. Carn. ed. 2. 1: 220. 1772. *Rhus cotinus* L., Sp. Pl. 1: 265. 1753; Hook.f., Fl. Brit. India 2: 9. 1876. **Fig. 95.**

Engl.: Wig plant, Smoke tree; Hindi: *Tungla, Turtunga*; Punj.: *Bhan, Tung*;

Small trees, up to 6 m tall. Leaves obovate or elliptic, 8-15 x 3 cm, obtuse, entire, finely tomentose beneath; petioles 2.5-5 cm long. Panicles 10-15 cm long, finely tomentose. Flowers unisexual. Male flowers 1.5 mm across. Calyx 5-lobed; lobes ovate, pubescent. Petals oblong, 2 x 0.8 mm. Stamens 5, 2 mm long. Disc 1 mm in diam., obscurely 5-lobed. Female flowers 3 mm across; pedicels 3 mm long, plumose. Sepals and petals as in male flowers. Staminodes 5. Carpels 3, syncarpous; ovary 2 mm in diam., densely pubescent; styles 3, eccentric; stigmas capitate. Drupes obliquely obovate, 5 x 4 mm; epicarp thin, pubescent when young and glabrous when ripe.

Fl. & Fr. : Apr. - Oct.

Distrib. India : Western Himalaya, 1000-1650 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Nepal, Tibet, China, Pakistan, Africa, Italy, France and N. America.

2. *Cotinus kanaka* (De) Chandra *comb. nov.* *Rhus kanaka* De in Indian For. 68: 65. 1942.

Trees. Leaves obovate, elliptic-ovate, 4-20 x 1-10.5 cm, acute, broadly cuneate at base, glabrous, petiolate. Panicles fascicled at branch tips, 22 cm long, puberulous. Bisexual flowers 1.5 mm across; pedicels glabrous. Calyx 5-lobed; lobes ovate. Petals 5, free, ovate-lanceolate, 2 x 1 mm, glabrous. Stamens 10, 1.5 mm long; filaments subulate; anthers oblong. Disc 1 mm



Fig. 95. *Cotinus coggygia* Scop. : a. Habit; b. Bisexual flower, front petals are removed; c. Fruit.

in diam., erect, furrowed. Carpel solitary, 2 mm long; ovary 1 mm in diam., conical, glabrous; style 1, lateral; stigma obliquely truncate. Drupes orbicular, 6-10 x 5-8 mm, glabrous; epicarp thin.

Fl. & Fr. : May - Aug.

Distrib. India : Meghalaya. Endemic.

6. *Dobinea* Hamilt.

Shrubs with virgate branches. Leaves simple, petioled, opposite, exstipulate, serrate. Inflorescence terminal, pyramidal panicles. Flowers unisexual. Calyx 4-dentate, absent in female flowers. Petals 4, longer than the calyx, absent in female flowers. Disc absent in male, annular in female flowers. Stamens 8, exserted, alternate ones shorter, absent in female flowers. Ovary 1-loculed. Fruit compressed, borne on bracteate pedicels. Seed solitary, compressed, exarillate.

India, Nepal and China; 2 species, 1 in India.

Dobinea vulgaris Buch. - Ham. ex D. Don, Prodr. Fl. Nep. 249. 1825; Hiern in Fl. Brit. India 1: 696. 1875.

Shrubs, up to 3 m tall; branchlets pubescent. Leaves elliptic to lanceolate, 7-17.5 x 2-5.5 cm, acutely acuminate at apex, rounded at base, minutely hairy on veins. Flowers 2-3 mm across, glabrous; bracts linear. Calyx cup shaped, subturbinate at base. Petals lanceolate to spatulate. Fruits indehiscent, ciliated along margin, 3 mm in diam. Seeds exarillate.

Distrib. India : Eastern Himalaya, between 1400-2400 m. Sikkim and Arunachal Pradesh.

Nepal.

Note. Branches are aromatic, smelling of ivy plant.

7. *Dracontomelon* Blume

Trees. Leaves alternate, imparipinnate. Panicles axillary and terminal. Flowers bisexual, hypogynous. Calyx 5-lobed. Petals 5, free, subvalvate. Stamens 10, those opposite the calyx lobes longer. Disc cupular. Carpels 5, syncarpous; ovary superior, 5-loculed, 1-ovule in each locule; styles 5, connate at apical part; stigmas capitate. Drupes 5-celled, each cell with a distinct operculum. Seed with testa free from the endocarp.

South East Asia and Pacific Islands; *ca* 8 species, 1 in India.

Dracontomelon dao (Blanco) Merr. & Rolfe, in Philip. J. Soc. 3: 108. 1908. *Paliurus dao* Blanco, Fl. Philip.: 174, 1837. *Dracontomelum mangiferum* Blume, Mus. Bot. 1: 131. t. 42. 1850; Hook.f. Fl. Brit. India 2: 43. 1876.

Fig. 96.

Trees, up to 55 m tall. Leaves 30-45 cm long; petioles 5-15 cm long; leaflets 6-7-pairs, oblong-lanceolate, 10-18.5 x 3-6.5 cm, apex acuminate, base obliquely rounded, entire, pubescent beneath. Panicles 14-30 cm long. Flowers 3.5 mm across; pedicels 1-2 mm long. Calyx lobes ovate, 3-4 mm long. Petals ovate-oblong, 4 x 2 mm. Stamens 10, 3 mm long. Disc 1.5 mm in diam., 10-lobed, pubescent. Carpels 2 mm long; ovary ovoid, 1.5 mm in diam., 5-loculed, with a single ovule in each locule; styles 5, connate at tip; stigmas capitate. Drupes 2 cm in diam., depressed polewise, with 5 marginal pores on upper side.

Fl. & Fr. : Nov. - March.

Distrib. India : Arunachal Pradesh and Andaman & Nicobar Islands.

Myanmar, Thailand, Cambodia, S. China, Malay Peninsula, Malesia and Soloman Islands.

8. *Drimycarpus* Hook.f.

Trees; plants dioecious or polygamous. Leaves simple, alternate, entire, petiolate. Panicles axillary or terminal. Flowers unisexual or rarely bisexual.



Fig. 96. *Dracontomelon dao* (Blanco) Merr. & Rolfe : a. Habit; b. Bisexual flower showing disc, stamens and carpels; sepals and petals are removed; c. Top view of a fruit; d. Side view of a fruit.

Calyx 5-lobed, lobes imbricate. Petals 5, free, imbricate. Stamens 5. Disc annular, concave. Carpels 3, syncarpous; ovary inferior, 1-loculed, 1-ovuled; style 1; stigmas obscurely 3-lobed. Fruit a Drupe, crowned with persistent sepals.

South East Asia; ca 2 or more species, 1 in India.

Note. When sterile, specimens of *Drimycarpus* are similar to *Mangifera* and *Semecarpus* in appearance, but can be distinguished by the presence of a distinct marginal vein which does not occur in the latter two.

Drimycarpus racemosus (Roxb.) Hook.f., Fl. Brit. India 2: 36. 1876.
Holigarna racemosa Roxb., Fl. Ind. 2: 82. 1832. **Fig. 97.**

Asm.: *Amdali*; Beng.: *Tebur*; Nep.: *Kagi*; Sylheti: *Amijour*.

Trees, 5-24 m tall. Leaves lanceolate or oblanceolate, 12-27 x 3-7 cm, abruptly acuminate, base cuneate, margin entire, coriaceous, puberulous beneath, with distinct marginal veins; petioles 12-17 mm long. Panicles 4-19 cm long, rusty villous. Flowers unisexual. Male flowers 1.5 mm across. Calyx lobes ovate, puberulous. Petals oblong, 1.5 x 1 mm, glabrous. Stamens 1 mm long. Disc 1.2 mm in diam. Female flowers 3 mm in diam. Sepals and petals as in male flowers. Ovary 1.5 mm in diam., ovoid; style terminal, short; stigma obscurely 3-lobed. Drupes transversely oblong or ovoid, 1.5-2 x 2.5 cm, yellowish red; epicarp puberulous.

Fl. & Fr. : Sept. - April.

Distrib. India : In forests up to 1000 m, rarely up to 2000 m. West Bengal, Sikkim, Arunachal Pradesh, Assam, Nagaland, Manipur, Mizoram and Andaman Islands.

Bangladesh and Myanmar.

Uses. The wood takes polish well. It is also used for making planks and canoes in Assam and Bangladesh.

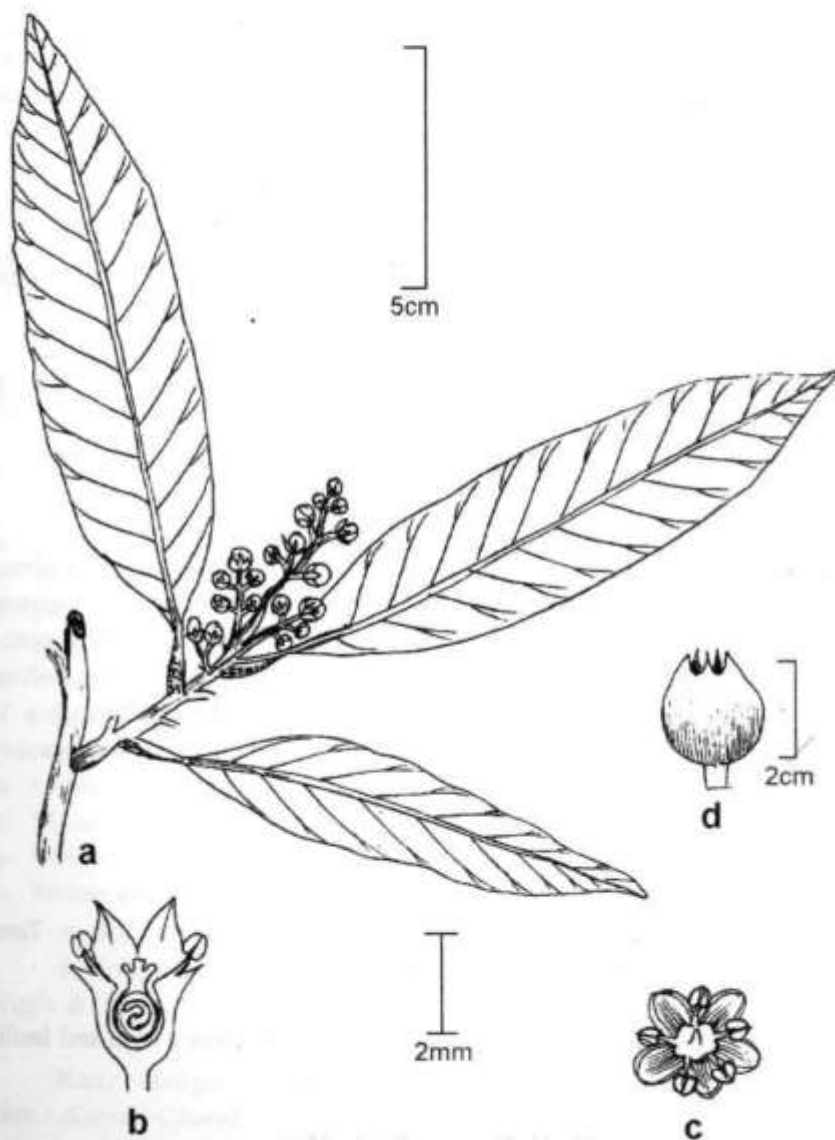


Fig. 97. *Drimycarpus racemosus* (Roxb.) Hook.f. : a. Habit; b. L.S. of bisexual flower showing arrangement of floral leaves; c. Bisexual flower; d. A fruit.

9. *Gluta* L.

Trees. Leaves simple, alternate, entire. Panicles axillary and terminal. Flowers bisexual. Calyx caducous, gamosepalous, calypteriform, circumscissile, spathaceous or splitting irregularly at anthesis. Petals 4-6, free, imbricate. Stamens 4-6, inserted on the disc; filaments filiform; anthers dorsifixed. Disc cylindrical. Carpel solitary on carpophore; ovary superior, 1-loculed, 1-ovuled; style terminal; stigma simple. Fruit a globose and stipitate Drupes.

South East Asia; *ca* 12 species, 1 in India.

Note : According to Ding Hou (*l.c.*), there is no disc but an elongated torus.

Gluta travancorica Beddome, Fl. Sylv. 1: t. 60. 1870; Hook.f., Fl. Brit. India 2: 22. 1876.

Mal.: *Thodappei*; Tam.: *Shenkurani*.

Trees, up to 36 m tall. Leaves spatulate, 10-15 x 4-4.5 cm, apex obtuse, glabrous, subsessile to shortly petioled. Panicles 8-10 cm long, tomentose. Flowers 1.5 mm across, bracteate. Sepals ovate, 1 x 0.5 mm, irregularly toothed or lobed, spathaceous, densely pubescent. Petals oblong, 3 x 1.2 mm, villous. Stamens 2.2 mm long; filaments subulate, pubescent at base. Disc 1 x 1.5 mm, on short carpophore. Ovary obliquely ovoid, pubescent. Drupes *ca* 2 cm in diam.

Fl. : March - May.

Distrib. India : Western Ghats, in mixed forests, up to 1100 m. Tamil Nadu and Kerala. Endemic.

Uses. The timber is used in making furniture and takes a high and lasting polish.

10. *Holigarna* Buch.-Ham.

Trees; plants polygamous. Leaves simple, alternate, entire, petiolate; leaf bases with spur like deciduous or persistent appendages. Panicles axillary

and terminal. Flowers both bisexual and male, bracteate, perigynous. Calyx 5-lobed, cupular, lobes imbricate. Petals 5, free valvate. Stamens 5. Disc 5-lobed, cupular. Carpels 3-5, syncarpous; ovary inferior, 1-loculed, 1-ovuled; styles terminal, 3-5; stigma clavate. Drupes wholly or partly enclosed within obconic and turbinate hypocarp.

Restricted to India, Bangladesh and Myanmar; ca 7 species, all in India.

Literature. BENNET, S.S.R. & K.C. SAHNI (1976) A note on the name *Holigarna grahamii*. *Indian For.* 102: 89. KADAMBI, K. (1955) *Holigarna arnottiana* Hook.f. (Syn. *H. longifolia* Wight & Arn.). *Indian For.* 81: 103-106.

KEY TO THE SPECIES

- | | |
|---|--------------------------------|
| 1a. Leaves quite glabrous beneath; Drupes fully enclosed by hypocarp | 2 |
| b. Leaves pubescent or tomentose beneath; Drupes half embeded within hypocarp | 6 |
| 2a. Petiolar spurs persistent (two-pairs in number, glabrous) | 6. <i>H. longifolia</i> |
| b. Petiolar spurs caducous | 3 |
| 3a. Drupes glabrous | 1. <i>H. arnottiana</i> |
| b. Drupes tomentose | 4 |
| 4a. Flowers unisexual (plants dioicous); petals glabrous | 3. <i>H. kurzii</i> |
| b. Flowers both unisexual and bisexual (plants polygamous); petals pubescent | 5 |
| 5a. Leaves obovate, apex obtuse; stigma simple | 3. <i>H. ferruginea</i> |
| b. Leaves spathulate, apex notched; stigma flagged | 7. <i>H. nigra</i> |
| 6a. Petiolar spurs early caducous; leaf apex acuminate | 2. <i>H. beddomei</i> |
| b. Petiolar spurs persistent; leaf apex acute | 4. <i>H. grahamii</i> |

1. *Holigarna arnottiana* Hook.f., Fl. brit. India 2: 36. 1876. *H. longifolia* Wight & Arn., Prodr. 1: 69. 1834. (*non* Roxb.). **Fig. 98.**

Kan.: *Holigar, Hulgeri, Kudugeru*; Mal.: *Cheru*; Mar.: *Bibu, Holgeri*, Tam.: *Karun, Charei*.

Trees, up to 12 m tall. Leaves obovate-oblongate, 10-23 x 3.5-8 cm, acute or obtuse, glaucous beneath; petioles 1.5-2 cm long, stout, spurs early caducous. Panicles axillary and terminal, 12-24 cm long, rusty tomentose.

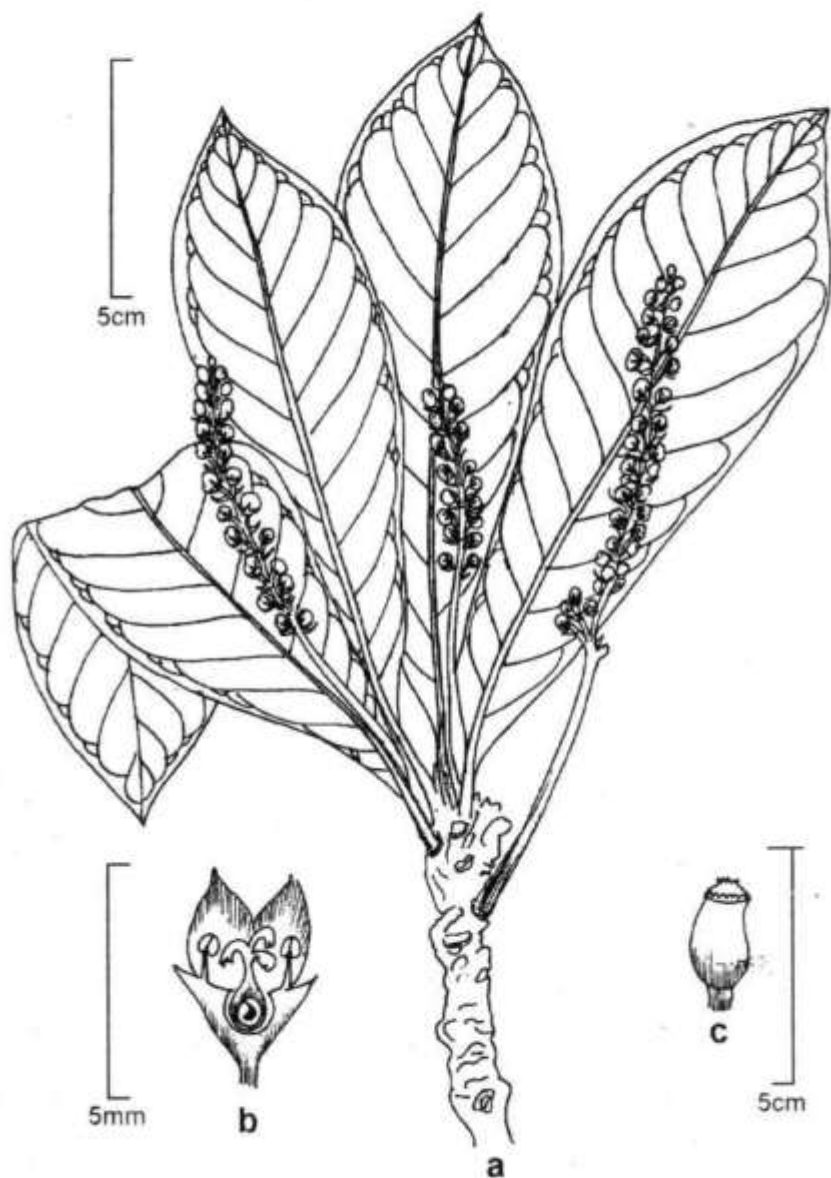


Fig. 98. *Holigarna arnottiana* Hook.f. : a. Habit; b. L.S. of bisexual flower showing arrangement of floral-members; c. A fruit.

Flowers polygamous. Male flowers 3 mm across. Calyx cupular, lobes 2 x 1 mm. Petals oblong, 2 x 1 mm, pubescent. Stamens 2.5 mm long. Disc cupular, 1.5 mm in diam. Bisexual flowers 4 mm in diam.; pedicel 2-3 mm long. Calyx cup 3 mm long. Petals ovate-orbicular, 2.5 x 1.4 mm, pubescent. Stamens 1 mm long; filaments subulate. Carpels, 3, recurved; stigmas flagged. Drupes obliquely ovoid or oblong, 1.8 x 0.8 cm, almost entirely included within hypocarp, quite glabrous; peduncle 1-1.5 cm long, finely tomentose.

Fl. & Fr. : Jan. - June.

Distrib. India : In coastal areas and in forests of Western Ghats at lower altitudes. Karnataka, Tamil Nadu and Kerala.

Uses. the acrid, oleoresin extract from stem and fruit rind is used as a black varnish by the painters. The wood is used in making boats and household requirements. Though the actual therapeutical properties are not known, the fruits and bark are used in medicine.

2. *Holigarna beddomei* Hook.f., Fl. Brit. India 2: 38. 1876.

Tam.: *Pal vidinyan*.

Trees, dioecious. Leaves ovate or oblanceolate, 25-27 x 11-12.5 cm, acuminate, base cuneate, with ciliate hairs on the margin and the midrib on the upper surfaces, rusty tomentose beneath; petioles 2-2.5 cm long, tomentose; spurs slender, caducous. Flowers 2 mm across. Calyx cupular, 1 x 2 mm, rusty tomentose. Petals oblong, 2 x 0.8 mm, pubescent. Stamens 5, 1.5 mm long. Disc cupular, 1.5 mm in diam., with a tuft of hairs at the centre. Drupes obliquely ovoid, 0.5-0.6 x 1 cm, partly enclosed within hypocarp, tomentose; hypocarp 1.5 x 1 cm, obconic; peduncle 1-1.5 cm long, tomentose.

Fl. & Fr. : Jan. - June.

Distrib. India : Western Ghats, in forests up to 1000 m. Karnataka, Tamil Nadu and Kerala. Endemic.

3. *Holigarna ferruginea* Marchand, Rev. Anacard. 171. 1869; Hook.f., Fl. Brit. India 2: 37. 1876.

Tam.: *Haisikutti, Chaeri*

Trees, polygamous. Leaves obovate, 8-21 x 3.5-7 cm, obtuse, glabrous; petioles 1-2 cm long, spurs caducous. Panicles axillary and terminal, 5-15 cm long. Male flowers 4 mm across. Calyx cupular, 1 x 2 mm, pubescent. Petals oblong, 2 x 1 mm, pubescent. Stamens 5, 3.5 mm long; filaments filiform. Disc 5-lobed, 1.5 mm in diam., rusty tomentose at centre. Bisexual flowers 6 mm in diam.; pedicels 3 mm long. Calyx cup 3 x 4 mm, rusty tomentose. Petals 3 x 1.5 mm, pubescent. Stamens 1.5 mm long. Disc 5-lobed, 2 mm in diam., tomentose. Carpels 2 mm long; ovary inferior, 1-loculed, 1-ovuled; styles 3; stigma simple. Drupes oblong, 2 x 1 cm, included within hypocarp, rusty tomentose; peduncle 1.5 cm, glabrous.

Fl. & Fr. : Feb. - June.

Distrib. India : Western Ghats. Karnataka, Tamil Nadu and Kerala. Endemic.

Uses. the acrid juice from the stem and fruit-rind is used as a black varnish by the painters.

4. *Holigarna grahamii* (Wight) Kurz in J. As. Soc. Bengal 41: 306. 1872. *Semecarpus grahamii* Wight, Ic. Pl. Ind. Orient. t. 235. 1840. *Holigarna grahamii* Hook.f., Fl. Brit. India 2: 37. 1876. (*non* Kurz, 1872). *H. wightii* Balakr. in J. Bombay Nat. Hist. Soc. 63: 327. 1966. *nom. superfl.*

Mal.: *Bipti, Balwuli.*

Trees, 6-9 m tall, dioecious. Leaves ovate-lanceolate or oblanceolate, 23-55 x 8-23 cm, apex acute to acuminate, base long cuneate, tomentose beneath; petioles 2.5-5 cm long, stout, rusty tomentose; spurs 1-2 pairs, subulate, tomentose. Panicles axillary and terminal, 12-22 cm long, rusty tomentose. Male flowers 2 mm across, sessile. Calyx tomentose. Petals oblong, 2 x 1 mm, tomentose. Stamens 5, 2 mm long. Disc 5-lobed, 1.5 mm in diam., cupular. Female flowers 8 mm across, rusty tomentose. Drupes obliquely ovoid, 0.5-0.6 x 1 cm; hypocarp 1.5-2 x 1-1.5 cm, rusty tomentose; peduncle 1-1.5 cm long, rusty tomentose.

Fl. & Fr. : Jan. - May.

Distrib. India : Hills of Western Ghats. Maharashtra, Karnataka, Tamil Nadu and Kerala. Endemic.

5. *Holigarna kurzii* King in J. As. Soc. Bengal 65: 512. 1896; Brandis, Indian Trees 190. 1906. *Semecarpus albescence* Kurz in J. As. Soc. Bengal 40: 51. 1871; Hook.f., Fl. Brit. India 2: 35. 1876.

Large, evergreen trees. Leaves oblanceolate, 18-30 x 6.5-8 cm, acute, glabrous; petioles 2-3 cm long, glabrous, spurs early caducous. Panicles terminal, 8-40 cm long, tomentose. Flowers unisexual, sessile, bracteate. Male flower buds 1 mm across. Calyx pubescent. Petals 0.8 x 0.4 mm, glabrous. Stamens 5, 0.8 mm long. Disc 5-lobed, 1 mm in diam., tomentose at the centre. Drupes obliquely ovoid, 1.5-2.2 x 1.5-2 cm, tomentose; hypocarp 0.3-0.4 cm long, longitudinally striate, puberulous; peduncle 0.5 cm long, tomentose.

Fl. & Fr. : Jan - May.

Distrib. India : Manipur, Tripura and Andaman Islands.

Myanmar.

6. *Holigarna longifolia* Roxb., Fl. Ind. 2: 80. 1824; Hook.f., Fl. Brit. India 2: 37. 1876.

Beng.: *Barola*; Kash.: *Bonsubuphang*; Kan.: *Kherai*; Kh. : *Khreik*; Mar.: *Hulugiri*; Nag.: *Ng-gai*; Tipp.: *Pholoikung*.

Trees, up to 8 m tall; dioecious. Leaves oblanceolate, 28-45 x 7-10 cm, abruptly short acuminate, base cuneate, glabrous; petioles 1-1.5 cm long, glabrous, spurs 2-pairs, narrow-lanceolate, glabrous. Panicles axillary and terminal, 16-30 cm long, finely rusty tomentose. Flowers unisexual, sessile, bracteate. Male flowers 1.5 mm across. Calyx cupular, densely tomentose. Petals oblong, 1.2 x 0.8 mm, base truncate, tomentose. Stamens 5, 1 mm long. Disc 5-lobed, 1.2 mm in diam., rusty tomentose at the centre. In female flowers ovary hairy; style 3, recurved. Drupes oblong, 2-2.5 x 0.8-1.4 cm,

subcompressed, almost embedded within hypocarp except apex, margin tomentose; peduncle 1.2 cm long, glabrous.

Fl. & Fr. : Dec. - May.

Distrib. India : Assam, Arunachal Pradesh, Manipur, Tripura, Maharashtra, and Karnataka.

Bangladesh and Myanmar.

Note. The resinous, acrid and poisonous juice of the plant on drying forms the well known black-lacquer-varnish. The wood is used in house-building and boat making.

7. **Holigarna nigra** Bourd. in Indian For. 30: 95. t. 1. 1904; Gamble, Fl. Pres. Madras 1: 268. 1918.

Mal.: *Cherei*.

Small trees. Leaves spatulate, 10.5-13 x 3-3.5 cm, notched at apex, glabrous; petioles 1-1.5 cm long, spurs early deciduous. Panicles axillary and terminal, 6-11 cm long. Bisexual flowers bracteate, pedicellate, 4 mm in diam. Calyx cupular; lobes 2 x 3 mm. Petals ovate, 3.5 x 1.8 mm, pubescent inside. Stamens 5, 1.5 mm long. Disc 2 mm in diam., 5-lobed. Ovary inferior, 2 mm in diam., obconic, tomentose; styles 3, recurved; stigma flagged. Fruits not seen.

Fl. : Apr.

Distrib. India : Western Ghats, in evergreen forests between 650-1300 m. Karnataka, Tamil Nadu and Kerala. Endemic.

Uses. The black and caustic juice of the plant is used as varnish.

11. **Lannea** A. Rich.

Dioecious trees. Leaves few, alternate, compound, imparipinnate; leaflets opposite, entire. Panicles axillary or terminal. Flowers unisexual. Calyx 4-

lobed, persistent, imbricate, Petals 4, free, imbricate. Stamens 8. Disc annular, lobed. Carpels 4, syncarpous; ovary superior, 1-loculed, 1-ovuled; styles 4. Drupes compressed laterally, with crown of persistent styles, 1 seeded. Seed with testa free from the endocarp; cotyledons linear, planoconvex.

Tropical Asia and Africa, ca 13 species, 1 in India.

1. *Lannea coromandelica* (Houtt.) Merr. in J. Arn. Arb. 19: 353. 1938. *Dialium coromandelicum* Houtt., Nat. Hist. 2: 39. t.5.f.2. 1774. *Odina wodier* Roxb., Fl. Ind. 2: 293. 1832; Hook.f., Fl. Brit. India 2: 29. 1876. **Fig. 99.**

Asm.: *Jia*; Beng.: *Jiyal*; Hindi: *Jhingan*; Kan.: *Godda, Gugul*; Kh.: *Dieng-lang-leng*; Mal.: *Kalasan*; Nep.: *Hulushe*; Or.: *Indramai*; Sans.: *Jhangri*; Sant.: *Dhoka*; Tam.: *Wodier*; Tel.: *Gumpin*.

Trees, 12-20 m tall; bark dark brownish grey with longitudinal furrows; branchlets greyish black, lenticellate. Leaves 20-40 cm long; petioles, 7-13 cm long; leaflets 3-8 pairs, elliptic-oblong, 9-15 x 5-7 cm, acuminate, base obliquely rounded, entire, tomentose; petiolules up to 2 mm long. Panicles 15-27 cm long, tomentose; bracts ovate, 1 mm long. Flowers unisexual, yellowish green, subsessile; male flowers 3 mm across. Calyx lobes ovate, ciliate. 1 mm long. Petals oblong, 2 x 1 mm. Disc 1.5 mm in diam., 8-notched. Stamens 8, 2 mm long. Carpels in female flowers 2-2.5 mm long; ovary superior, oblong, 1-loculed, 1-ovuled; styles 4; stigmas papillose. Drupes subreniform, 1 x 0.7 cm, red when ripe, with persistent sepals and styles.

Fl. & Fr. : Arp. - Dec.

Distrib. India : Throughout the country, up to 1000 m in the Himalayas; often planted along avenues. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Tripura, Orissa, Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, Karnataka Tamil Nadu, Kerala and Andaman & Nicobar Islands.

Nepal, Bangladesh, Myanmar, Sri Lanka, Malesia and Pakistan.

Note. The gum exuded from bark is used in medicine, calico-printing and in confectioneries. Leaves are used as fodder for cattle. Wood is used

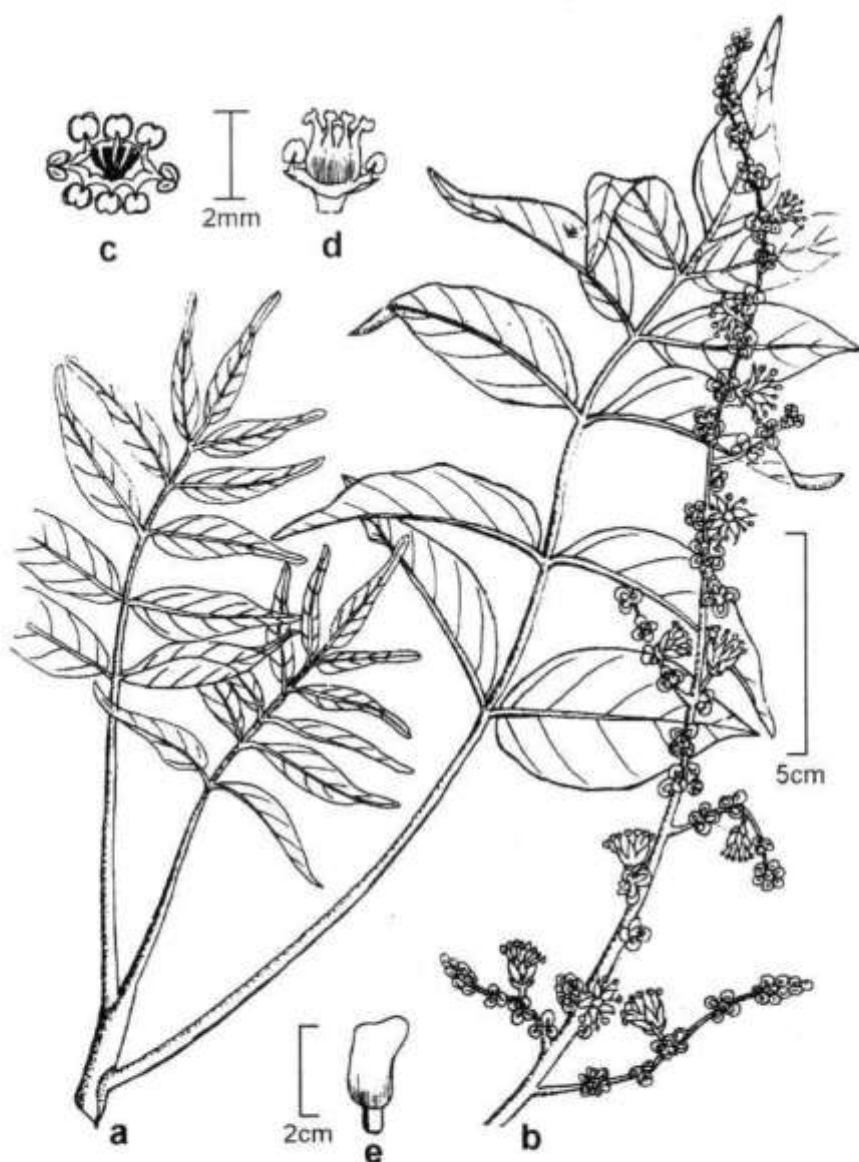


Fig. 99. *Lannaea coromandelica* (Houtt.) Merr. : a. Habit; b. Inflorescence axis; c. Male flower; sepals and petals removed; d. Bisexual flower, showing disc, 2-stamens and carpels.

in house building. The plant is easily propagated by cuttings and often planted for fencing.

12. *Mangifera* L.

Trees. Leaves simple, alternate, entire, petiolate. Panicles terminal or axillary, often crowded at the apices of twigs. Flowers small, male and bisexual (polygamous), 4-5-merous; bracts caducous. Calyx 4-5 lobed. Petals 4-5, free, imbricate. Disc usually extra, rarely intrastaminal, often 4-5-lobed, sometimes obsolete in male flowers. Stamens usually 5, rarely 10-12, usually 1-2 fertile, the others much smaller (with imperfect or sterile anthers), rarely all 5 fertile. Carpel solitary; ovary superior, 1-loculed, 1-ovuled; style excentric or lateral; stigma simple. Fruit usually a fleshy Drupes.

Tropical Asia; ca 43 species, 6 in India.

Literature. MUKHERJEE, S.K. (1949) A monograph on the genus *Mangifera* L. *Lloydia* 12: 73-136.

KEY TO THE SPECIES

- | | |
|---|---------------------------|
| 1a. Flowers 4-merous | 2 |
| b. Flowers 5-merous | 3 |
| 2a. Sepals ovate; petals broadly ovate-lanceolate; leaves up to 23 x 7 cm | 1. <i>M. andamanica</i> |
| b. Sepals triangulate; petals spatulate; leaves up to 15 x 5 cm | 5. <i>M. nicobarica</i> |
| 3a. Drupes distinctly flat | 2. <i>M. camptosperma</i> |
| b. Drupes only slightly compressed | 4 |
| 4a. Drupes acute or obtuse at tip | 3. <i>M. indica</i> |
| b. Drupes acuminate, with protruded tip | 4 |
| 5a. Panicles peduncled, pyramidal, 20-30 cm or more; leaves 25-30 x 5-7 cm; petals lanceolate, tips reflexed | 6. <i>M. sylvatica</i> |
| b. Panicles sessile with fascicles of branches at the base, 5-10 cm long; leaves 7-13 x 2-3 cm.; petals ovate-oblong, tips not reflexed | 4. <i>M. khasiana</i> |

1. *Mangifera andamanica* King in J. As. Soc. Bengal 65: 470. 1896; Parkinson, For. Fl. Andaman Isls. 139. 1923.

Trees, 9-12 m tall. Leaves elliptic-oblong, 9-23 x 4-6.5 cm, apex notched, base cuneate, thinly coriaceous; petioles 1-2 cm long. Panicles 10-12 cm long, terminal. Bisexual flowers 4 mm across; pedicel 3 mm long. Sepals 4, 3 x 1 mm. Petals 4, 4 x 1.8 mm, with 4-5 prominent ridges, confluent at base. Disc 4-lobed, cupular, fleshy, 1.5 mm in diam. Stamens 4, 1 fertile, 2.5 mm long, rest 3 short, teeth-like, sterile. Ovary 1 mm in diam., 1-loculed, 1-ovuled. Drupes ovate, 2.5 x 1.7 cm, apex subacute.

Fl. & Fr. : Feb. - Oct.

Distrib. India : Assam and Andaman Islands.

2. **Mangifera camptosperma** Pierre, Fl. Cochinch. t. 363A, 1897. Thothathri & Balakr. in Bull. Bot. Surv. India 24: 175. 1982.

Large trees up to 30 m tall. Leaves oblong, 14-45 x 4-8 cm, apex acuminate to caudate, cuneate at base, entire, glabrous; lateral nerves 15-20 pairs; petioles 1.5-2.8 cm, glabrous, pulvinate. Panicles up to 30 cm long, pubescent. Fruits flat, elliptic, 6-9 x 6-8 cm, green when unripe and yellow when ripe; epicarp thin; mesocarp fibrous, 0.8-3 cm thick; endocarp woody. Seeds reniform, 5 x 3 cm, filling most of the cavity of the stone.

Fl. & Fr. : Jan. - July.

Distrib. India : Andaman & Nicobar Island.

Myanmar, Vietnam and Thailand.

3. **Mangifera indica** L., Sp. Pl. 1: 200. 1753; Hook.f., Fl. Brit. India 2: 13. 1876. **Fig. 100.**

Beng.: *Am*; Hindi: *Amb*; Kan.: *Mavu*; Mar.: *Ambi*; Tam.: *Mao*, *Mangas*; Tel.: *Mamadi*

Trees, 20-45 m tall, glabrous except the inflorescence. Leaves oblong-lanceolate, thinly coriaceous, 15-30 x 3.5-6.5 cm, apex acute-acuminate, petioles 1.5-6 cm. Panicles 15-35 cm long, terminal, rarely axillary. Flowers male and bisexual, 5 mm across; pedicel 1.5-3 mm long. Calyx 5-lobed; lobes



Fig. 100. *Mangifera indica* L. : a. Habit; b. Bisexual flower showing disc, stamen and carpel; sepals and petals removed; c. L.S. of a fruit.

2 x 1 mm, tomentose. Petals elliptic, 5, 3 x 1.2 mm, with branched ridges, tips reflexed. Stamens 5, 1 fertile, 2.5 mm long, rest sterile, small, teeth like; Disc 1.5 mm in diam., distinctly 5-lobed. Ovary 1 mm in diam. obliquely ovoid, 1-loculed, 1-ovuled; styles 2 mm long, lateral. Drupes of variable size, oblong or subreniform, fleshy with sweet juice.

Fl. & Fr. : Aug. - July.

Distrib. India : SubHimalayan tract up to 1000 m, and other hilly areas of Central, Eastern and South India. Cultivated in greater part of the country for its fruits and planted as an avenue tree.

Nepal, Bangladesh, Myanmar and Malesia.

Uses. The tree is well known for its delicious fruits, the mangoes and for several other uses. The unripe fruits are used in making chutneys, jellies, pickles, etc. The bark yields a dye which is used in dyeing cotton, silk wool, etc. The wood is used for making furniture, planks, ceiling, floor, boards, tea-chests, boxes, etc. The fruit juice is considered as a restorative tonic and astringent and is used in diarrhoea. The powdered seeds are used as an astringent in bleeding of piles and in menorrhagia.

4. *Mangifera khasiana* Pierre, Fl. Cochinch. t. 364C 1897; Mukherjee in Lloydia 12: 97. 1949.

Trees. Leaves lanceolate, 7.5-13 x 1.8-3 cm, apex acuminate, thinly coriaceous; petioles 0.8-2 cm long, slender. Panicles 5-10 cm long, terminal, glabrous. Flowers 4 mm across; pedicel 2-3 mm long. Calyx 5-lobed; lobes ovate, 2 x 1 mm, glabrous. Petals 5, 3.5 x 1.3 mm, concave, with 3-prominent swellings, tips not reflexed. Stamens 5, 1 fertile, 3 mm long, rest teeth like staminodes. Disc fleshy, erect, 0.7 x 1 mm, with 5-ridges and furrows. Ovary 1 mm in diam., conical; style lateral, 2 mm long. Fruit not known.

Fl. & Fr. : Apr. - May.

Distrib. India : Sikkim and Meghalaya. Endemic.

5. **Mangifera nicobarica** Kosterm. in Kosterm. & Bompard., The Mangoes 52. 1993; Lakshimn. in Hajra *et al.*, Fl. Adaman-Nicobar Isls. 1: 338. 1999.

Trees, up to 20 m tall; branches reddish-brown. Leaves oblong or elliptic-oblongate, *ca* 15 x 5 cm, apex acute-shortly acuminate, gradually tapering and decurrent at base; lateral nerves 8-12 pairs; petioles up to 2.5 cm long. Inflorescence pseudo-terminal panicles, fascicled; peduncles pseudo-racemoid, 9-15 cm long. Flowers white or yellowish, 4-merous. Sepals triangulate, up to 1.25 mm long. Petals spatulate, *ca* 1.5 mm long.

Distrib. India : South Nicobar. Endemic.

Note. The species is closely allied to *M. andamanica* and *M. quadrifida*, but differs from them in leaf characteristics, and in case of latter in floral details as well.

6. **Mangifera sylvatica** Roxb., Fl. Ind. 2: 644. 1824.

Asm.: Ban-am, Lakshmi am; Chittagong.: Basam, Kosam; Lep.: Katur; Nep.: Chuchi-am; Sans.: Kosamra; Tipp. : Haibamin.

Trees, 30-40 m tall. Leaves lanceolate, 25-30 x 5-7 cm, apex acuminate, thinly coriaceous; petioles 5 cm or more. Panicles 30-40 cm, terminal, glabrous, laxly flowered. Flowers 4 mm across; pedicel 3 mm long. Calyx 5-lobed, 1.5 x 0.5 mm, glabrous. Petals 5, linear-lanceolate, 4 x 0.8 mm, with 3-longitudinal swellings. Stamens 5, 1 fertile, 3 mm long, rest teeth like staminodes. Disc 1 x 0.8 mm, erect, with 5-ridges and furrows. Ovary globose, 2 mm in diam., style sub terminal. Drupes 4.5-6 x 2.5-3 cm, obliquely acuminate, beak much drawn out; flesh thin, white, slimy, without any fibres.

Fl. & Fr. : Sept. - June.

Distrib. India : In forests between 1200-1400 m. Sikkim, Assam, Arunachal Pradesh, Meghalaya and Andaman & Nicobar Islands.

Nepal, Bangladesh and Myanmar.

13. *Melanorrhoea* Wallich

Trees. Leaves simple, alternate, entire, petiolate. Panicles axillary. Flowers bisexual. Calyx 5-lobed. Petals 5-6, free, imbricate, accrescent. Stamens 5 or numerous. Disc cylindrical. Carpel solitary on carpophore; ovary superior, 1-loculed, 1-ovuled; style sub-lateral; stigma simple. Fruit a globose Drupes with stellately spreading accrescent petals.

South-East Asia and Malesia; ca 20 species, 1 in India.

Melanorrhoea usitata Wallich, Pl. As. Rar. 1: 9. t. 11, 12. 1830; Hook.f., Fl. Brit. India 2: 25. 1876. *Gluta usitata* (Wallich) Ding Hou in Blumea 24: 15. 1978. **Fig. 101.**

Man.: *Kheu*.

Trees, 12-18 m tall. Leaves oblong, 9-27 x 5-16 cm, obtuse; petioles 1.5-2.5 cm long, villous. Panicles 18-25 cm, axillary, villous. Flowers 1 cm in diam. Calyx calyptiform, 5-lobed; lobes ovate, 1 x 0.5 mm, caducous. Petals oblong, 2.5 x 1 mm. Stamens numerous, unequal in size, 1-2 mm long. Carpel 1.5 mm long, on carpophore; ovary obliquely ovoid. Drupes 1.2 cm in diam.

Fl. & Fr. : Nov. - Apr.

Distrib. India: Manipur.

Myanmar.

Uses. The timber is used in making furniture. The natural varnish known as 'black varnish' is used as a water-proof paint. The oleoresin is a good anthelmintic.

14. *Nothopegia* Blume

Trees, dioecious. Leaves simple, alternate or subopposite, entire, petiolate. Inflorescence an axillary or extra-axillary raceme. Flowers unisexual, rarely male and bisexual, bracteate, 4-merous. Calyx 4-lobed, persistent. Petals 4,

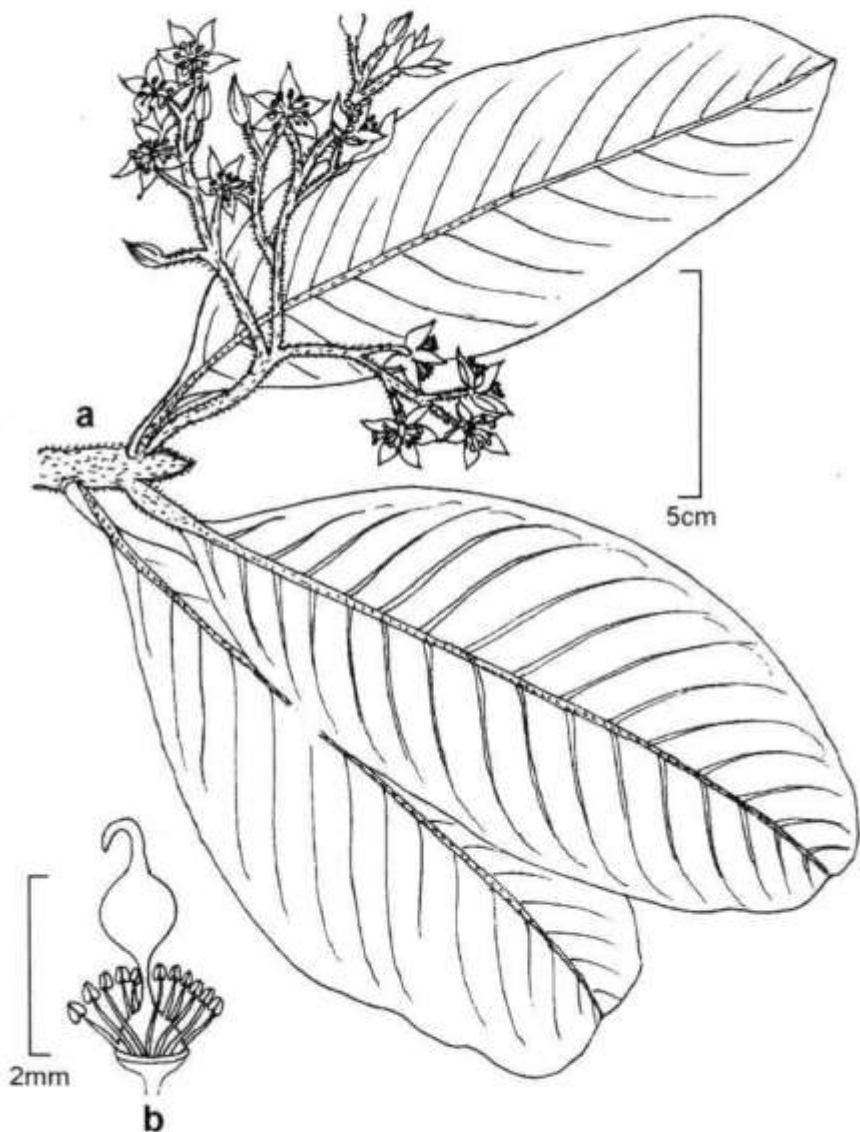


Fig. 101. *Melanorrhoea usitata* Wallich : **a.** Habit; **b.** Bisexual flower showing disc, stamens and carpel with a carpophore; sepals and petals removed.

free, twisted. Stamens 4-5. Disc 4-5-lobed, fleshy. Carpels 3, syncarpous; ovary superior, 1-loculed, 1-ovuled; style terminal; stigma indistinctly 3-lobed. Fruit a Drupes with persistent sepals and style.

India and Sri Lanka; ca 10 species, 7 in India.

Literature. ELLIS, J.L. & V. CHANDRASEKHARAN, (1970) A new variety of *Nothopegia beddomei* Gamble (Anacardiaceae) from Kerala, South India. *Bull. Bot. Surv. India* 12: 257-258.

KEY TO THE SPECIES

- | | |
|---|----------------------------|
| 1a. Branchlets and petioles rusty villous; lamina with 25-30 pairs of nerves | 2 |
| b. Branchlets and petioles quite glabrous; lamina with 12-13 pairs of nerves | 3 |
| 2a. Leaves alternate, apex abruptly acuminate; petals densely villous inside | 6. <i>N. travancorica</i> |
| b. Leaves subopposite, apex caudate-acuminate; petals glabrous on both sides | 1. <i>N. aureofulva</i> |
| 3a. Leaf apex acuminate | 4 |
| b. Leaf apex acute or obtuse | 6 |
| 4a. Leaves usually lanceolate, thinly coriaceous; petals ovate | 2. <i>N. beddomei</i> |
| b. Leaves usually obovate, thickly coriaceous; petals oblong | 5 |
| 5a. Flowers ca 3 mm in diam.; sepals pubescent above | 5. <i>N. racemosa</i> |
| b. Flowers ca 7 mm in diam.; sepals glabrous | 7. <i>N. vajravelui</i> |
| 6a. Leaves obovate-oblong, margin thin, not revolute on ventral side; petioles stout; petals and stamens glabrous; Drupes ovoid, pericarp thick | 3. <i>N. colebrookiana</i> |
| b. Leaves variable from linear to linear-lanceolate or elliptic to elliptic-oblong, margin thick, revolute on ventral side; petioles slender; petals and stamens pubescent; Drupes compressed polewise, pericarp thin | 4. <i>N. heyneana</i> |

1. *Nothopegia aureofulva* Beddome ex Hook.f., Fl. Brit. India 2: 40. 1876.

Trees, with rusty villous branches. Leaves subopposite, oblong-lanceolate, 10-25 x 1.8-4.8 cm, membranous, rusty villous; petioles 0.75 - 1 cm long. Racemes condensed, 1 cm long, axillary from lower leaves. Male flowers

1.5 mm in diam.; pedicels short, pubescent. Calyx 4-lobed; lobes ovate-orbicular, 1.5 x 2 mm, sparsely pubescent. Petals oblong, 4, 0.8 x 0.4 mm. Stamens 4, as long as petals, glabrous. Disc 4-lobed, 1 mm in diam., tomentose outside, glabrous within. Carpels rudimentary, represented by 3 small subulate bodies at the centre of disc. Female flowers and fruits not seen.

Fl. & Fr. : Feb. - Sept.

Distrib. India : Hills of Western Ghats. Tamil Nadu and Kerala. Endemic.

2. *Nothopegia beddomei* Gamble, *Fl. Pres. Madras* 1: 265. 1918 & in *Kew Bull.* 1918: 227. 1918.

Trees, 10-12 m tall. Leaves lanceolate or oblanceolate, 9.5-14 x 2.5-5.5 cm, caudate-acuminate, puberulous beneath, thinly coriaceous; petioles 0.8-1 cm long, glabrous. Racemes axillary and extra-axillary, 1.5-4 cm long, pubescent. Male flowers 2 mm in diam. Calyx 4-lobed; lobes 1 x 0.8 mm with many dark, longitudinal swelling on ventral side, pubescent above. Petals 4, 3 x 1 mm, recurved, glabrous, with 3-7 longitudinal swellings on ventral side. Stamens 4, 2 mm long; filaments subulate, villous. Disc 4-lobed, 1 mm in diam., glabrous. Carpels absent. Female flowers not seen. Drupes oval, 1-1.3 cm in diam., compressed.

KEY TO THE VARIETIES

- | | |
|---|-----------------------------------|
| 1a. Leaf apex caudate-acuminate; sepals and filaments villous | 2.1. var. <i>beddomei</i> |
| b. Leaf apex shortly acuminate; sepals and filaments glabrous | 2.2. var. <i>wynaedica</i> |

2.1 var. *beddomei*

Fl. & Fr. : Mar. - July.

Distrib. India : Western Ghats, up to 1650 m. Karnataka, Tamil Nadu and Kerala.

Sri Lanka.

2.2 var. *wynaedica* Ellis & Chandrasekharan in *Bull. Bot. Surv. India* 12. 257. 1970.

Fl. & Fr. : Apr. - July.

Distrib. India : Kerala. Endemic.

3. *Nothopegia colebrookiana* (Wight) Blume, Mus. Bot. Lugd. Bot. 1: 203. 1850; Hook.f., Fl. Brit. India 2: 40. 1876. *Pegia colebrookiana* Wight, Ic. t. 236. 1839. **Fig. 102.**

Kan.: *Ulagera*; Mal.: *Sonemous*; Mar.: *Amberi*.

Trees, 4-9 m tall; branchlets glabrous; scars at lower portion of twigs, rusty pubescent. Leaves obovate to elliptic-lanceolate, 5-20 x 2.5 - 3.75 cm, acute to short acuminate, glabrous above, puberulous beneath, coriaceous; petioles 1-1.5 cm long, glabrous, longitudinally channelled. Racemes axillary, 3-4 cm long, arising from axes of leaf. Male flower buds 1 mm in diam. Calyx 4-lobed, lobes 0.5 x 0.7 mm, densely pubescent above. Petals oblong, 4, 0.8 x 0.5 mm, incurved, ciliate. Stamens 4, 0.5 mm long, glabrous. Disc 0.5 mm in diam. Carpels absent. Female flowers not seen. Drupes ovoid, 1.25 cm in diam.

Fl. & Fr. : Jan. - May.

Distrib. India : Western Ghats. Tamil Nadu and Kerala.

Sri Lanka.

4. *Nothopegia heyneana* (Hook.f.) Gamble, Fl. Pres. Madras 1: 180. 1918. *N. colebrookiana* (Wight) Blume var. *heyneana* Hook.f., Fl. Brit. India 2: 40. 1876.

Trees, 4-5 m tall; branches glabrous. Leaves elliptic to elliptic-oblong, 4-14 x 0.7-3.5 cm, obtuse to obtusely acute, puberulous beneath, coriaceous; petioles 0.4-0.7 cm long, glabrous. Racemes axillary, 1.5-3 cm long, rusty, puberulous. Flowers unisexual. Male flowers 2 mm across, sessile. Calyx 4-lobed; lobes 0.8 x 0.6 mm, margin ciliate with many dark longitudinal swellings on ventral surface. Petals 4, 1.5 x 0.8 mm, incurved, pubescent beneath. Stamens 4, 1.2 mm long, pubescent. Disc 1 mm in diam., 4-lobed. Female flowers 3 mm across; pedicels 1.5 mm long, pubescent. Ovary 3 mm in diam., sessile,

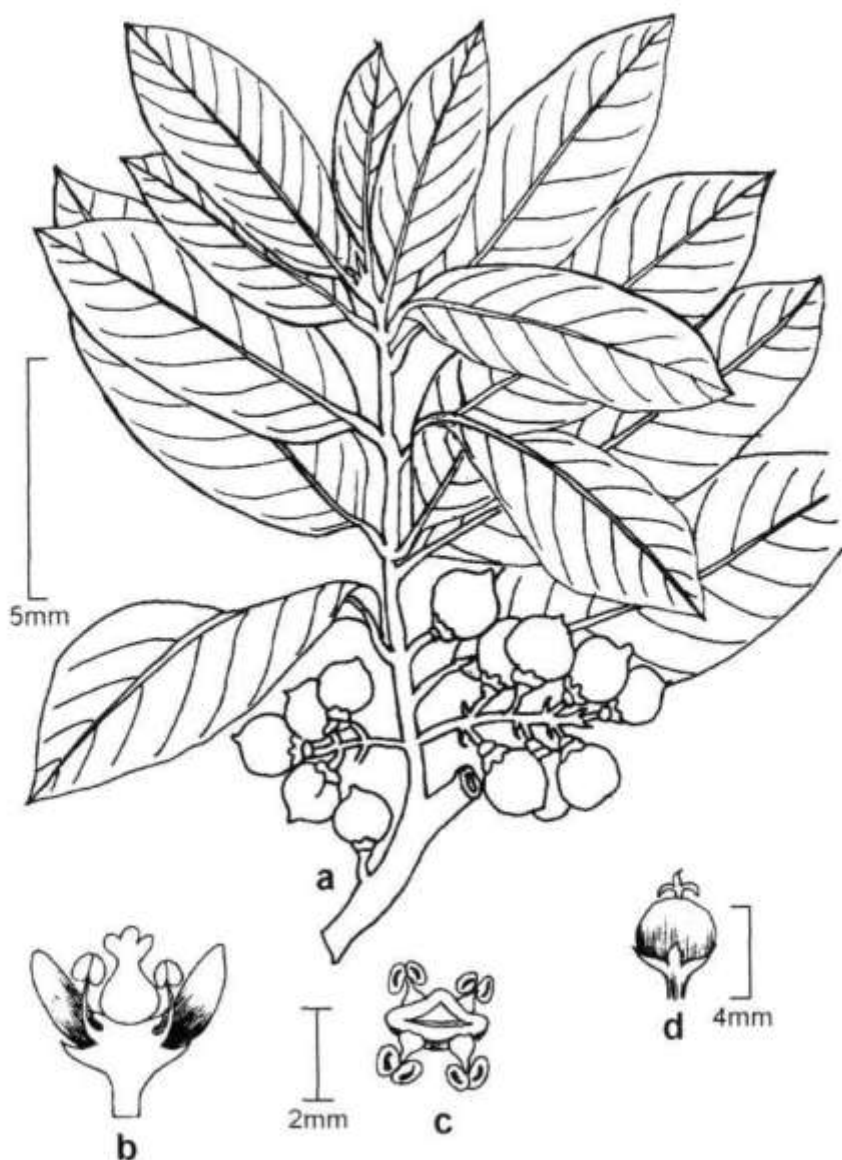


Fig. 102. *Nothopegia colebrookiana* (Wight) Blume : a. Habit; b. Bisexual flower showing arrangement of floral-members; c. Male flower; sepals and petals removed; d. A fruit.

glabrous; style short, thick; stigma globose. Drupes 1-1.5 cm in diam., compressed.

KEY TO THE VARIETIES

- 1a. Leaves elliptic or elliptic-oblong; petioles *ca* 0.7 cm long; racemes 3 cm or more in length 4.1. var. **heyneana**
- b. Leaves linear-lanceolate; petioles *ca* 0.4 cm long; racemes less than 2.5 cm 4.2. var. **linearifolia**

4.1. var. **heyneana**

Fl. & Fr. : June - Sept.

Distrib. India : Andhra Pradesh, Tamil Nadu and Kerala. Endemic.

Note. Logs are used for posts and props. The fruit is edible. The pale juice of bark becomes permanent black on drying and is used as ink.

4.2 var. linearifolia Chandra & Ghosh in *Bangladesh J. Bot.* 9(2): 173-175. 1980.

Fl. & Fr. : July.

Distrib. India : Tamil Nadu. Endemic.

5. *Nothopegia racemosa* (Dalz.) Ramamurthy in Saldanha & Nicholson, *Fl. Hassan Dist.* 377. 1976. *Glycyarpus racemosus* Dalz. in *J. As. Soc. Bombay* 3: 69. 1849. *Nothopegia dalzellii* Gamble, *Fl. Pres. Madras.* 1: 265. 1918. *N. colebrookiana* Hook.f., *Fl. Brit. India* 2: 40. 1876. (*non* Blume, 1850). *N. dalzellii* Gambel var. *angustifolia* Gamble, *Fl. Pres. Madras* 1: 265. 1918.

Small trees; branches glabrous. Leaves variable in shape, obovate, oblanceolate, oblong, or elliptic-lanceolate, 15-19 x 4.5-5 cm, abruptly acuminate, puberulous beneath, coriaceous; petioles 1.5-2 cm long, glabrous. Racemes axillary, 2-4 cm long, rusty pubescent. Male flower buds 1 mm in diam. Calyx lobes broadly ovate, pubescent above with many longitudinal swellings beneath. Petals oblong, 0.5 x 0.3 mm, incurved, with a single, thick, mid nerve, glabrous,

except ciliated hairs on the midnerve. Stamens 0.5 mm long. Disc 0.5 mm in diam. Bisexual flowers 2 mm across. Sepals as in male flowers. Petals 3 x 1 mm, with many longitudinal swellings. Stamens 1.5 mm long. Ovary 2 mm in diam., sessile; stigma obscurely 3-lobed. Drupes subconic oval, 3 mm in diam., compressed.

Fl. & Fr. : Nov. - March.

Distrib. India : Western ghats, ascending up to 1650 m. Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala. Endemic.

Note. Almeida (*Fl. Maharashtra* 1: 290. 1996) considers this species as a synonym of *Nothopegia castaneaefolia* (Roth) Ding Hou.

Uses. The wood is used as timber. The fruit is edible.

6. *Nothopegia travancorica* Beddome ex Hook.f., *Fl. Brit. India* 2: 40. 1876.

Small trees; branches rusty tomentose. Leaves elliptic-oblong, 9-16 x 2.5-4 cm, caudate-acuminate, midrib pubescent at base, coriaceous; petioles 1-1.2 cm long, rusty pubescent. Racemes supra-axillary, 1 cm long. Male flowers 2 mm across. Calyx 4-lobed; lobes broadly ovate-lanceolate, 2 x 0.5 mm, glabrous with 5-6 thick, dark swellings on ventral side. Petals 4, oblong, 2.5 x 0.8 mm, glabrous above, villous at base. Stamens 4, 2 mm long; filaments villous; anthers sagittate, sparsely villous. Disc 4-lobed, 0.8 mm in diam., glabrous. Female flowers 5 mm across. Sepals and petals as in male flowers. Stamens much shorter, 0.8 mm long. Ovary 1.5 mm in diam., sessile; style indistinct; stigma slightly lobed. Drupes oval, 1 x 1.8 cm, compressed.

Fl. : Jan.

Distrib. India : Southern Western Ghats, ascending up to 1000 m. - Karnataka, Tamil Nadu and Kerala. Endemic.

7. *Nothopegia vajravelui* Ravikumar & Lakshmanan in *Rheedia* 9(1): 56. 1999.

Tam. : *Paal vellayil, Mullai maram.*

Trees, up to 10 m tall; branches glabrous, terete. Leaves alternate, obovate or elliptic-oblong to oblanceolate, 6-15 x 1.5-5 cm, obtusely acuminate at apex, acute-obtuse at base, entire, wavy, thickly coriaceous, glabrous; petioles up to 1.3 cm long, twisted, canaliculate. Racemes axillary up to 2 cm long, 7-12 (1-2) flowered; peduncles up to 2 cm long, 4-5-angled, rusty hairy. Flowers unisexual, then male, or bisexual, *ca* 7 mm across. Calyx 4-5-lobed; lobes ovate-triangulate, *ca* 1 mm long, glabrous, greenish yellow. Petals oblong, *ca* 5.5 x 2 mm, glabrous. Stamens 4-5, alternating with petals; filaments equal or subequal, *ca* 2 mm long, pilose up to 3/4 of its length. Disc annular, *ca* 2 mm across, 4-5-lobed. *Bisexual flowers* : Sepals, petals, stamens and disc as in male or unisexual flowers. Ovary globose, up to 2.5 mm in diam.; styles cylindrical, stout; stigma capitate. Drupes globose or ovoid, up to 2.2 x 1.2 cm, acute at both ends, glabrous, vertically striate, 1-seeded. Seeds ovoid-globose, pale yellow.

Fl. & Fr. : April - July.

Distrib. India : Dominant along the slopes of dense, evergreen forests, particularly along perennial streamlets. Tamil Nadu.

EXCLUDED SPECIES

Nothopegia castaneaefolia (Roth) Ding Hou in *Blumea* 24: 33. 1978.
Ficus castaneaefolia Roth., Nov. Pl. Sp. 389. 1821.

The species, recorded from Goa, has never been subsequently reported in any flora.

15. *Parishia* Hook.f.

Deciduous trees; Leaves spiral, imparipinnate, petiolate; Leaflets entire. Panicles axillary or terminal. Flowers unisexual. Calyx 4-lobed, greatly enlarged in fruits. Petals 4, free, imbricate. Stamens 4. Disc annular, 4-lobed. Carpels 3, syncarpous; ovary superior, 1-loculed, 1-ovuled; style terminal; stigma unequally 3-lobed. Drupes, ovoid, densely tomentose, with 4, wing like foliaceous, accrescent sepals.

South East Asia; *ca* 5 species, 1 in India.

Parishia insignis Hook.f. in Trans. Linn. Soc. 23: 170.t.26. 1860 & Fl. Brit. India 2: 30. 1876. **Fig. 103.**

Trees, up to 50 m tall. Leaves 30 cm or more in length; leaflets 6-8 pairs, oblong-ovate, 5-7 x 4-5.5 cm, acute to acuminate, base obliquely rounded, margin undulate. Panicles 30-32 cm long, rusty tomentose. Male flowers 6 mm across. Sepals ovate, 2 x 2 mm. Petals elliptic-orbicular, 4 x 3 mm. Stamens 3 mm long; anthers sagittate. Disc 2 mm in diam. In female flowers sepals and petals as in male flowers. Ovary 2 mm in diam., tomentose; style terminal; stigma 3-lobed, capitate. Drupes 11 x 8 mm, densely tomentose, accrescent sepals wing like, 6 x 1.5 cm, tomentose.

Fl. & Fr. : Jan. - March.

Distrib. India : Andaman Islands.

Myanmar, Thailand and Malesia.

Uses. It yields a valuable board-wood known as 'red-dhup' which is used chiefly in making plywood, tea-chests, matches, backing of cup-boards, drawers, bottoms, chip-boards, etc.

16. **Pegia** Colebr.

Scandent shrubs or woody climbers; plants polygamous. Leaves alternate, imparipinnate, petiolate; leaflets numerous, subopposite, serrate. Panicles axillary or terminal. flowers unisexual and bisexual. Calyx 5-lobed. Petals 5, free, imbricate. Stamens 10. Disc annular, slightly notched. Carpels 5, united; ovary embedded in the disc. 5 loculed, 1-ovuled; styles 5, connate; stigmas simple. Drupes 1-loculed, obliquely-ovoid.

South East Asia; more or less 3 species, 1 in India.

Pegia nitida Colebr. in Trans. Linn. Soc. 15: 364. 1827. *Tapiria hirsuta* (Roxb.) Hook.f., Fl. Brit. India 2: 28. 1876; *Robergia hirsuta* Roxb., Fl. Ind. 2: 455. 1832.

Asm.: Hang-dieng; *Nep.*: Mashul; *Sylhet*: Pegi; *Tam.*: Kakawalsuka.

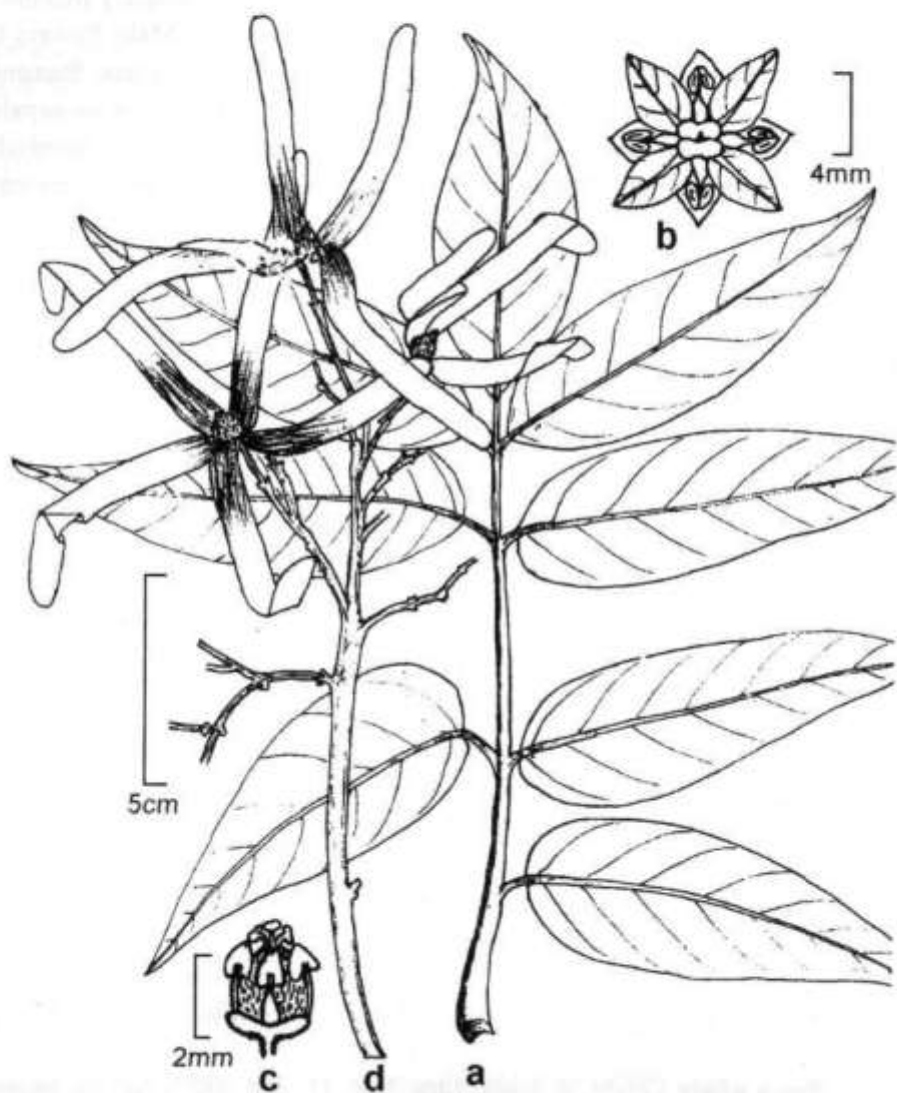


Fig. 103. *Parishia insignis* Hook.f. : a. Habit; b. Male flower; c. Bisexual flower; sepals and petals are removed.

Scandent shrubs, villous throughout. Leaves 15-30 cm long. Leaflets ovate-elliptic to oblong, 2.5-9 x 1.5-3.5 cm, apex acute or acuminate, base rounded, margin serrate, tomentose on both sides; petiolules 3-5 mm long. Panicles 20-30 cm long. Flowers fragrant, 1 mm in diam.; pedicel 1-3 mm long. Calyx lobes ovate, 1 x 0.4 mm, persistent. Petals, elliptic-oblong, 1 x 0.6 mm, whitish. Stamens 0.2 mm long. Disc 1 mm in diam., 5-lobed. Pistil 1.5 mm long; ovary conical. Drupes obliquely oblong, 2 x 0.4 cm, black when ripe, with persistent calyx.

Fl. & Fr. : Feb. - May.

Distrib. India: In forests up to 1500 m. West Bengal, Sikkim, Arunachal Pradesh, Assam, Nagaland, Tripura and Meghalaya.

Nepal, Bhutan, Bangladesh, Myanmar and China.

Uses. Fruits are edible. The juice is applied to cuts and wounds as an antiseptic.

17. *Pistacia* L.

Trees or shrubs, dioecious. Leaves spiral, imparipinnate; leaflets opposite or subopposite, entire. Panicles axillary or terminal. Flowers unisexual. Sepals free, 2-5. Stamens 3-5 in male flower, absent in female flower. Disc minute. In female flowers carpels 3, syncarpous; ovary superior, 1-loculed, 1-ovuled; style short; stigmas 3. Drupes obliquely compressed; stone bony.

Southern USA and Central America, Tropical Africa, Mediterranean region, Asia minor, Eastern Asia to Malesia; ca 10 species, 3 in India.

KEY TO THE SPECIES

- | | |
|------------------------------------|---|
| 1a. Leaf rachis winged | 1. <i>P. atlantica</i> ssp. <i>cabulica</i> |
| b. Leaf rachis not winged | 2 |
| 2a. Leaflets ovate or ovate-oblong | 3. <i>P. khinjuk</i> |
| b. Leaflets lanceolate | 2. <i>P. chinensis</i> ssp. <i>integerrima</i> |

1. *Pistacia atlantica* Desf., Fl. Atlant. 2. 364. 1800. ssp. ***cabulica*** (Stocks) Reichb.f., Fl. Iran. 63: 5. 1969; Nasir & Ali in Fl. W. Pak. 152:

15. 1983. *Pistacia cabulica* Stocks in Hook.f., Kew J. Bot. 4: 143. 1852; H.B. Naithani in J. Bombay Nat. Hist. Soc. 85 (2): 461. 1988. **Fig. 104.**

Trees, up to 7 m tall, rarely shrubs; deciduous. Leaves imparipinnate; rachis margined or narrowly winged; leaflets 2-4 pairs, variable in size and shape, rotundate-ovate, oblong or lanceolate (2-) 2.5-8 x 0.7-2 (-2.5) cm, obtuse or blunt, margin ciliolate otherwise glabrous, nerves indistinct; middle costa underneath pale green when dry. Drupes variable in size and shape, (4.5-) 5-8 x 5-6 (-8) mm. Seeds wider than long, when dry longitudinally as well as transversely striate.

Distrib. India : Himachal Pradesh (Kinnaur).

Southern Iran, Afghanistan and Pakistan.

2. *Pistacia chinensis* Bunge ssp. *integerrima* (Stewart) Reichb.f., Fl. Iran. 63: 8. 1969. *P. integerrima* Stewart in Brandis, For. Fl. 122. t. 22. 1874; Hook.f., Fl. Brit. India 2: 13. 1876.

Trees, up to 18 m tall. Leaves 18-30 cm long, petiolate; leaflets 4-5 pairs, lanceolate, 10-16 x 3-4 cm, caudate-acuminate, entire, base obliquely cuneate, ventral surface villous. Panicles 6-18 cm long, pubescent. Flowers unisexual, bracteate, pedicellate. Male flowers 2 mm across; bracts pubescent. Sepals 2, 3 x 1 mm, deciduous. Petals absent. Stamens 5-8, 1 mm long; filaments short, filiform; anthers deep red in colour. Female flowers 2 mm across, bracts 2, 1.5 x 0.5 mm, pubescent. Sepals 4, linear, 1 x 0.3 mm, deciduous. Petals absent. Carpels 3, syncarpous; ovary 1.5 mm, conical; style short, trifid; stigmas capitate. Drupes 7 x 6 mm, obliquely compressed, glabrous.

Fl. & Fr. : March - Oct.

Distrib. India : Himachal Pradesh, Punjab, Uttar Pradesh and Arunachal Pradesh.

Pakistan, Afghanistan, China and Russia.

3. *Pistacia khinjuk* Stocks in Hook.f., Kew J. Bot. 4: 143. 1852; Chowdhery & Wadhwa, Fl. Himachal Pradesh 1: 165. 1984. **Fig. 105.**

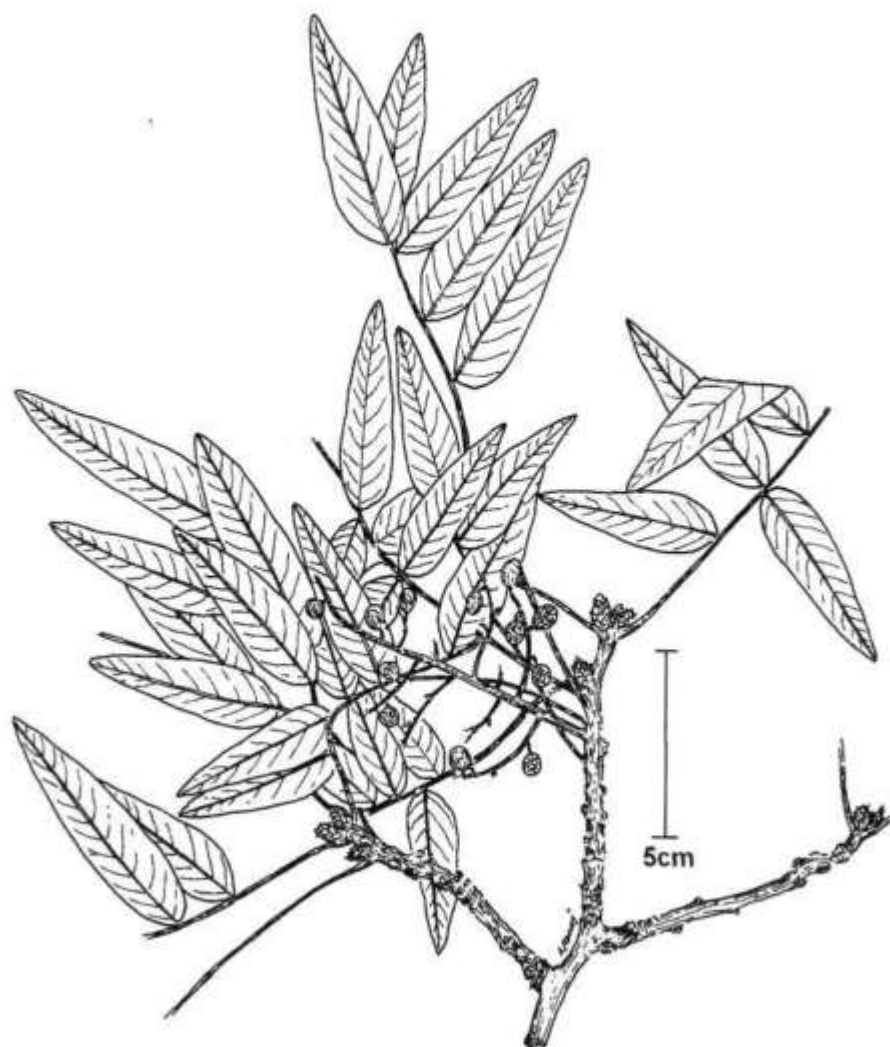


Fig. 104. *Pistacia atlantica* Desf. ssp. *cabulica* (Stocks) Reichb.f.

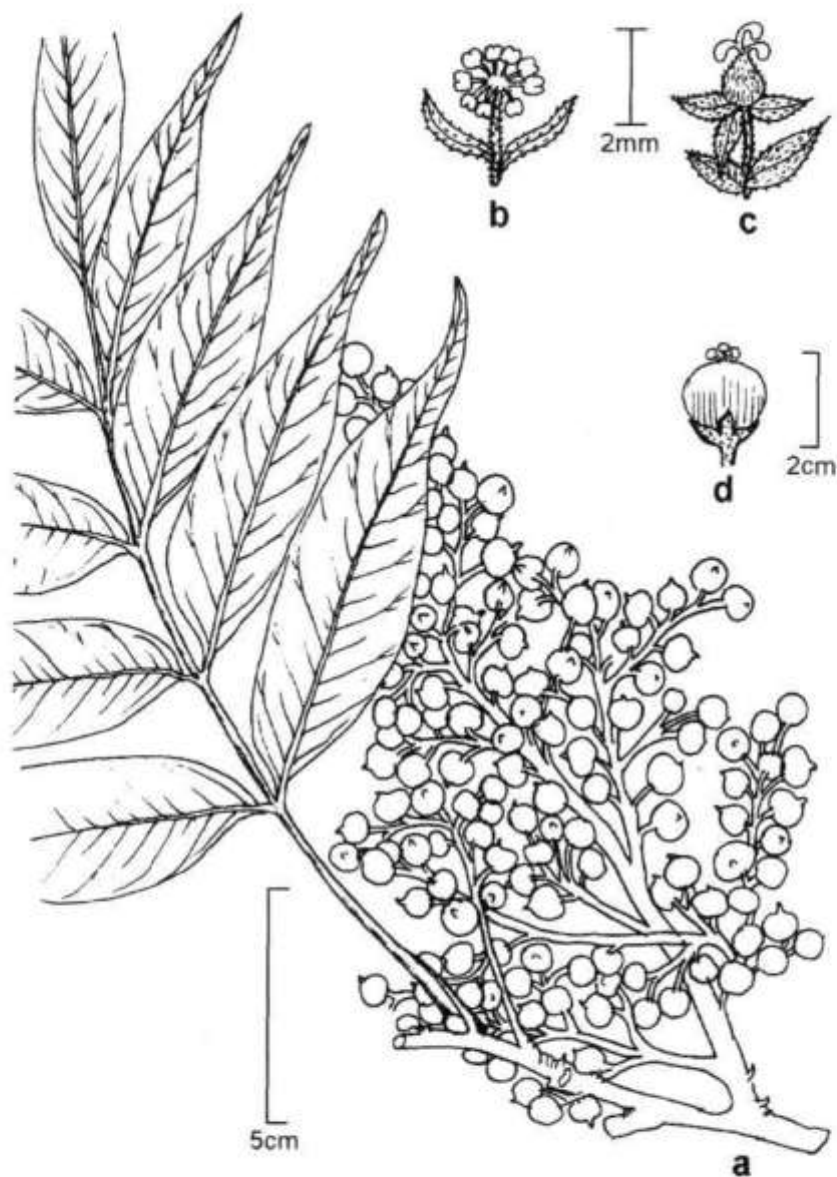


Fig. 105. *Pistacia khinjuk* Stocks : a. Habit; b. Male flower; c. Female flower; d. A fruit

Trees or shrubs, up to 5 m tall; young branchlets, leaves and rachis often pubescent. Leaflets 3-7, ovate or ovate-oblong, 4.5-8 x 2.5-5 cm, acute to shortly acuminate, oblique at base; glabrous, coriaceous; nerves on the under surface obscure. Panicles 15-20 cm long. Drupes subglobose, 5-7 mm long, compressed.

Fl. & Fr. : July - Nov.

Distrib. : Jammu & Kashmir and Himachal Pradesh.

Pakistan, Afghanistan and Asia Minor.

18. *Rhus* L.

Shrubs, trees or lianas, mostly deciduous; plants dioecious, sometimes polygamous. Leaves spiral, imparipinnate or trifoliolate, petioled. Panicles terminal or axillary. Flowers unisexual or bisexual. Calyx 5-lobed. Petals 5, free, imbricate. Stamens 5, rarely 10. Disc 5-lobed, intrastaminal, cupular or annular. Carpels 3, syncarpous; ovary superior, 1-loculed, 1-ovuled; styles 3, usually free; stigmas capitate. Drupes globose or compressed.

Subtropical and temperate regions of the world; *ca* 250 species, 12 in India.

Literature. BRIZICKY, G.K. (1963) Taxonomic and Nomenclatural notes on the genus *Rhus* (Anacardiaceae). *J. Arn. Arb.* 44: 60-80.

KEY TO THE SPECIES

- | | |
|---|---------------------------------|
| 1a. Stamens 10 | 3. <i>R. himalaica</i> |
| b. Stamens 5 | 2 |
| 2a. Leaves imparipinnate | 3 |
| b. Leaves trifoliolate | 9 |
| 3a. Fruits indehiscent | 4 |
| b. Fruits dehiscent (epicarp bursting irregularly) | 6 |
| 4a. Drupess obliquely ovoid, glabrous; leaflets glabrous to puberulous beneath, margin entire | 10. <i>R. succedanea</i> |
| b. Drupess orbicular, tomentose; leaflets tomentose beneath, margin serrate | 5 |

- | | |
|--|---------------------------------|
| 5a. Petioles usually winged above; panicles equaling the leaves; petals pubescent on the upper surface | 1. <i>R. chinensis</i> |
| b. Petioles not winged; panicles much smaller than the leaves; petals glabrous | 8. <i>R. punjabensis</i> |
| 6a. Panicles terminal; leaflets serrate | 5. <i>R. khasiana</i> |
| b. Panicles axillary; leaflets entire | 7 |
| 7a. Panicles and leaflets densely tomentose beneath | 12. <i>R. wallichii</i> |
| b. Panicles and leaflets glabrous to sparsely pubescent | 8 |
| 8a. Disc cupular; petals with a single median ridge; panicles 25-40 cm long | 2. <i>R. griffithii</i> |
| b. Disc annular; petals with branched median ridge; panicles 16-25 cm long. | 4. <i>R. hookeri</i> |
| 9a. Armed shrubs | 9. <i>R. sinuata</i> |
| b. Unarmed shrubs | 10 |
| 10a. Leaflets sparsely pubescent beneath; petals glabrous | 6. <i>R. paniculata</i> |
| b. Leaflets densely tomentose beneath; petals hairy | 11 |
| 11a. Leaflets with white tomentum; petals tomentose all over | 11. <i>R. tomentosus</i> |
| b. Leaflets with rusty tomentum; petals sparsely pubescent | 7. <i>R. parviflora</i> |

1. *Rhus chinensis* Miller, Gard. Dict. ed. 8. sub.n.7. 1768. *R. semialata* Murray in Comm. Soc. Goett. 5: 27.t.3. 1784; Hook.f. Fl. Brit. India 2: 10. 1876. *R. javanica* Thunb., Fl. Jap. 121. 1785 (*non* L.). **Fig. 106.**

Asm.: *Nagatenga*; Garo.: *Khetma*; Kh.: *Sabma*, *Dieng-sohma*; Lep.: *Takhril*; Nep.: *Bakkiawela*, *Bhakimlo*, Punj.: *Titar*, *Tatri*, *Arkhar*.

Trees, 5-10 m tall. Leaves 18-38 cm long; rachis winged; leaflets 3-5-pairs, elliptic-oblong, 6-14 x 2.5-7 cm, margin serrate, tomentose beneath. Panicles terminal and axillary, 10-40 cm long; tomentose. Male flowers 1.5 mm across. Calyx lobes triangular. Petals oblong, 1 x 0.8 mm. Stamens 5, 1.5 mm long. Disc 1 mm in diam., broadly 5-lobed. Female flowers 2 mm across. Ovary globose, pubescent; styles 3; stigmas lobed. Drupes 4-5 mm in diam., obconic to globose with persistent styles; epicarp thin, mesocarp non-fibrous; endocarp hard; epicarp separating from mesocarp in ripe fruits.

Distrib. India : Temperate Himalaya, between 1000-2000 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, West Bengal, Sikkim, Assam, Arunachal Pradesh, Nagaland, Manipur, Meghalaya and Rajasthan.



Fig. 106. *Rhus chinensis* Miller

Nepal, Bhutan, Myanmar, Thailand, Indo-China, Malesia, China, Japan and Pakistan.

Uses. Fruits are edible and used as a medicine in dysentery and in colic. It is also used as a substitute for rennet in preparing curds. The galls of various shapes and sizes produced on branches are used in making ink and native medicines.

2. *Rhus griffithii* Hook.f., Fl. Brit. India 2; 12. 1876.

Mar.: *Dari-asing*; Nep.: *Bhalaya*.

Trees, up to 10 m tall. Leaves imparipinnate, petiolate; leaflets 4-6 pairs, ovate-oblong, 1.5-7 x 0.5-2.5 cm, caudate-acuminate, base obliquely rounded, entire, glabrous except the mid-vein and veinlets beneath. Panicles axillary, 25-40 cm long, pubescent. Flowers sessile. Male flowers 2-2.5 mm in diam. Calyx lobes ovate, pubescent. Petals oblong, 1.5 x 0.8 mm, glabrous. Stamens 5, 1.5 mm long. Disc 1.5 mm in diam., 5-lobed. *Female flowers* : Ovary globose; styles 3, short; stigma clavate. Drupes 4-7 mm in diam., laterally compressed; epicarp tomentose, bursting irregularly; stone bony.

Fl. & Fr. : March - October.

Distrib. India : Eastern Himalaya, between 1300-2000 m. West Bengal, Sikkim, Arunachal Pradesh, Assam and Meghalaya.

Myanmar.

Uses. The young leaves are locally used as vegetable.

3. *Rhus himalaica* (Hook.f.) Chandra & Mukherjee stat. nov. *R. succedanea* L. var. *himalaica* Hook.f., Fl. Brit. India 2; 12. 1876.

Trees, 8-18 m tall. Leaves 20-50 cm long, imparipinnate, petiolate; leaflets 3-5 pairs, ovate-oblong, 9-12 x 4-5 cm, acuminate, base obliquely rounded, entire, puberulous beneath. Panicles axillary, 8-18 cm long, puberulous. Male flowers 3-4 mm across, pedicellate. Calyx lobes ovate, pubescent. Petals oblong, 2 x 1 mm. Stamens 10, 1-1.5 mm long; filaments subulate; anthers sagittate.

Drupes globose to obliquely orbicular, 6-8 mm in diam.; epicarp thin, glabrous; mesocarp fibrous, waxy.

Fl. & Fr. : Apr. - Sept.

Distrib. India : Himalayas, from 1000-2000 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, West Bengal, Sikkim and Manipur.

Pakistan and Nepal.

Note. The stem juice causes blisters on the skin and makes black stains on papers. The fruit is used in Kashmir in the treatment of Phthisis.

4. *Rhus hookeri* Sahni & Bahadur Indian For. 96: 769. 1970. *R. insignis* Hook.f., Fl. Brit. India 2: 11. 1876 [*non* (Del.) Oliver, 1868].

Beng.: *Momphulati*; Lep.: *Sehr-Kung*; Nep.: *Kagphulai, Khagbalay*.

Trees, 15 m tall. Leaves 30 cm long, imparipinnate; leaflets 7-9, elliptic-oblong, 6.5-19 x 3.5-8 cm, acuminate, entire, smooth above, rusty puberulous beneath. Panicles axillary, 16-25 cm long, glabrous. Flowers pedicelled, 2-3 mm across. Petals oblong, 1.5 x 0.6 mm. Stamens 5, 1 mm long. Disc 1 mm in diam., concave, broadly 5-lobed. Drupes globose, 6-7 mm in diam.; epicarp bursting irregularly; mesocarp fibrous with waxy coating.

Fl. & Fr. : June - Dec.

Distrib. India : Eastern Himalaya, from 1000-2000 m. West Bengal, Sikkim, Arunachal Pradesh and Meghalaya.

Nepal.

Uses. The fruits contain a juice, which is a powerful vesicant and is used in colic.

5. *Rhus khasiana* Hook.f., Fl. Brit. India 2: 10. 1876.

Chittagong: *Kakrasingha*.

Trees, upto 13.5 m tall. Leaves 30-45 cm long, petiolate; leaflets 5-12 pairs, lanceolate, 7.5-12.5 x 1.5-4.5 cm, acuminate, base obliquely cuneate, serrate, pubescent along veins and veinlets beneath; petiolules *ca* 5 mm long. Panicles terminal. Drupes ovate-orbicular, 0.7 cm in diam.; epicarp thin; mesocarp fibrous.

Distrib. India : Meghalaya.

Bangladesh.

6. *Rhus paniculata* Wallich ex Don, Gen. Syst. 2: 74. 1832; Hook.f. Fl. Brit. India 2: 10. 1876.

Burmese: *Bye-gyin*.

Shrubs, 2-6.5 m tall. Leaves 10-30 cm long, 3-foliolate; petioles 3-5 cm long; leaflets obovate to elliptic-ovate, 2-12 x 1.5-5 cm, apex notched, sinuately lobed upwards, puberulous beneath, sessile. Panicles axillary and terminal, 10-22 cm long, puberulous. Male flowers 1-1.5 mm across. Calyx lobes orbicular. Petals, oblong, 1 x 0.5 mm, glabrous. Stamens 5, 0.8 mm long. Disc 0.6 mm in diam., 5-lobed, concave. Drupes orbicular, 3.5-5 mm in diam.

Distrib. India : Ascending to 1000 m. Madhya Pradesh, Andhra Pradesh (Eastern Ghats), Tamil Nadu and cultivated in West Bengal.

Bhutan, Myanmar and China.

Uses. It is a dye-yielding-plant. The juice, which is deep brown in colour, is used in dyeing cotton material.

7. *Rhus parviflora* Roxb., Fl. Ind. 2: 100. 1832 & in DC., Prodr. 2: 70. 1825. Hook.f. Fl. Brit. India 2: 9. 1876. **Fig. 107.**

Kh.: *Samak*; Punj.: *Rai, Tung, Tumra*; Hindi: *Dungla, Ninas, Rannel*.

Shrubs; branchlets, undersurface of leaves and inflorescence rusty tomentose. Leaves 5-16 cm long, 3-foliolate; leaflets elliptic, oblong-obovate,



Fig. 107. *Rhus parviflora* Roxb.

4-16 x 2.5-5 cm, obtuse, base cuneate, crenate in the upper half. Panicles axillary and terminal, 10-26 cm long. Male flowers 2-3 mm in diam., pedicellate. Calyx lobes ovate. Petals linear-oblong, 1 x 0.5 mm. Stamens 5, 0.8 mm long. Disc 0.6 mm in diam., cupular, deeply 5-notched. *Female flowers* : Ovary subconical. Drupes globose; 0.3-0.4 cm in diam., epicarp glabrous, wrinkled, indehiscent.

Fl. & Fr. : May - Aug.

Distrib. India : Western Himalaya, between 650-1650 m. Himachal Pradesh, Uttar Pradesh and Madhya Pradesh.

Nepal.

Uses. Fruits are edible, when mixed with salt taste like tamarind and the juice has vermifuge property. Dried leaves are either mixed with or substituted for tobacco. The wood is used for fence-post and as fuel. It is suitable for turnery and also for small tool-handles. The plant affords poor quality of fodder. It produces root suckers profusely and is useful for afforestation.

8. *Rhus punjabensis* Stewart in Brandis, For. Fl.: 120. 1874; Hook.f. Fl. Brit. India 2: 10. 1876. **Fig. 108.**

Hindi: *Amtara, Dashmila*; Punj.: *Dor, Kangar, Palai, Rastu*.

Trees, 9-12 m tall. Leaves 28-42 cm long, petiolate; leaflets 4-6 pairs, sessile, ovate-lanceolate, 6-14 x 3-6 cm, acute to acuminate, base obliquely rounded, obscurely serrulate, tomentose beneath. Panicles terminal, 10-23 cm long, densely tomentose. Male flowers 1.5-2 mm across. Calyx 5-lobed. Petals oblong, 5, 1.5 x 0.8 mm. Stamens 5, 1.2-1.5 mm long. Disc 1 mm in diam., broadly 5-lobed. Female flowers 3 mm in diam. Ovary conical, 1 mm in diam., pubescent; styles 3, stigma capitate. Drupes globose, 3-4 mm in diam., tomentose.

Fl. & Fr. : Apr. - Sept.

Distrib. India : N.W. Himalaya, 1000-2650 m. Jammu & Kashmir (Kishtwar), Himachal Pradesh and Uttar Pradesh.



Fig. 108. *Rhus punjabensis* Stewart

Pakistan.

Uses. The plant juice is a powerful vesicant. Fruits are edible having acidic taste and used in making 'sharbats'. The leaves contain tannin.

9. *Rhus sinuata* Thunb., Prodr. Pl. Cap. 52. 1794. *R. mysorensis* Don, Gen. Syst. 2: 74. 1832; Hook.f., Fl. Brit. India 2: 9. 1876.

Mar.: *Amooni*; Pujb.: *Dahsara, Dansara*; Raj.: *Dononia, Dasarni*; Tam.: *Chippamarum, Sabale, Sitha*.

Shrubs, up to 5 m tall; branches often spiny, pubescent all over. Leaves 3-foliolate; petioles pubescent, 1-1.5 cm; leaflets obovate, 1-3 x 1-1.5 cm, obtuse, base cuneate, the terminal largest, sinuately lobed, sparsely hairy above pubescent beneath. Panicles axillary and terminal, 3-10 cm long. Male flowers 1.5 mm across; pedicel up to 5 mm long, pubescent. Calyx lobes ovate. Petals oblong, 1 x 0.5 mm. Stamens 5, 1 mm long. Disc 1 mm in diam., 5-lobed. Female flowers 2 mm across. Ovary 0.8 x 0.6 mm, glabrous, obconic; styles 3; stigma capitate. Drupes subglobose, 4-5 mm in diam., epicarp thin and glabrous.

Fl. & Fr. : Apr. - May.

Distrib. India : North western India and Deccan, ascending up to 900 m. Punjab, Delhi, Uttar Pradesh, Rajasthan, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Pakistan.

Uses : The plant is usually planted for fencing. The wood is used for fence-posts, as fuel, in turnery and in making small tool-handles. Bark gives a splendid buff or brown colour to leather. Leaves are used for tanning and as fodder. Fruits are edible.

10. *Rhus succedanea* L., Mant. Pl. 2: 221. 1771; Hook.f., Fl. Brit. India 2: 12. 1876. *R. succedanea* L. var. *acuminata* (DC) Hook.f., Fl. Brit. India 2: 12. 1876. *R. acuminata* DC., Prodr 2: 68. 1825.

Asm.: *Amsilika*; Beng.: *Kakrasinghi*, Garo.: *Bolmicheng*, *Bolkhatthi*; Hindi: *Shat*; Kh.: *Ding-keon*, *Kakain*; Lep.: *Serhnyok*, Mar.: *Kakada shingi*; Nep.: *Raniwhalaya*; Punj.: *Choklu*, *Holashi*, *Lakhar*, *Habatul-khizra*; Tam.: *Kekeera-sryngi*, *Karkadagasurgi*.

Trees, 10-18 m tall. Leaves 17-48 cm long; petioles 9-14 cm long; leaflets 3-6 pairs, ovate-lanceolate, 6-12 x 2.5-4.5 cm, caudate-acuminate, base cuneate, entire, glabrous to puberulous beneath. Panicles axillary, 6-15 cm long, glabrous. Male flowers 1-2 mm in diam., pedicellate. Calyx lobes ovate, obtuse. Petals oblong, 1 x 0.5 mm. Stamens 5, 1 mm long. Disc 1 mm in diam. Female flowers 2-3.5 mm in diam. Ovary 1.5 x 0.6 mm, conical; styles 3; stigma globose. Drupes obliquely ovoid, 5-8 mm in diam.; epicarp leathery, wrinkled; mesocarp fibrous, enclosing a waxy mass; epicarp separating from mesocarp in ripe fruits.

Fl. & Fr. : Jan. - Dec.

Distrib. India : Throughout Himalaya, from 700-2600 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, West Bengal, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram and Meghalaya.

Nepal, Bhutan, Bangladesh, Myanmar, Thailand, Vietnam, China and Pakistan.

Uses. A valuable wax is obtained from mesocarp of fruits, known as Japanese wax or tallow. It is used in manufacturing candles, waxy-matches, pencils, drawing lubricants, leather and furniture polish.

11. *Rhus tomentosus* L., Sp. Pl. 1: 266. 1753; Chandra & Ghosh in Indian J. For. 2: 264. 1979; Chithra in Fl. Tamil Nadu 1: 89. 1983.

Shrubs or small trees, glabrous. Leaves 3-foliolate, 4.5-6 cm long, petiolate; leaflets elliptic, 2.5-5 x 1-2.5 cm, both ends acute, slightly serrate from middle to apex, clothed with white tomentum beneath. Male flowers 1 mm in diam., pedicellate, bracteate. Calyx pubescent; lobes ovate. Petals oblong, 1 x 0.5 mm, pubescent. Stamens 5, 1.5 mm long. Disc 1 mm in diam., distinctly 5-lobed.

Fl. : Dec.

Distrib. India : Tamil Nadu.

Africa.

12. *Rhus wallichii* Hook.f., Fl. Brit. India 2: 11. 1876. Fig. 109.

Nep.: *Bhalao, Chori*; Punj.: *Arkhar, Arkhul, Godambal, Kambal*.

Trees, up to 15 m tall. Leaves 20-60 cm long; petioles 8-20 cm long, tomentose; leaflets 3-7 pairs, ovate-oblong, 7-18 x 3.5-9 cm, acuminate, entire, densely clothed beneath with reddish-orange tomentum. Panicles much shorter than the leaves, densely rusty tomentose. *Male flowers* : 1.5 mm across. Calyx lobes ovate, obtuse, pubescent. Petals oblong, 1.5 x 0.6 mm, glabrous. Stamens 5, 1.5 mm long. Disc 1 mm in diam., 5-lobed. *Female flowers* : Ovary 1.5 x 0.8 mm, conical, tomentose; styles 3; stigma capitate. Drupes globose, 5-7 mm in diam.; epicarp thin, tomentose, dehiscent, bursting irregularly; mesocarp waxy.

Fl. & Fr. : May - Nov.

Distrib. India : Himalayas, in temperate region between 1950-2300 m. Himachal Pradesh, Uttar Pradesh and West Bengal.

Nepal.

Uses : The wood is used for making frames and handles. The stem juice is a powerful vesicant which turns black on exposure and can be used as varnish.

19. *Schinus* L.

Dioecious; small trees or shrubs. Leaves alternate, pinnate. Leaflets opposite, sessile; rachis usually winged. Panicles axillary and terminal. Flowers small, unisexual, bracteate. Calyx 5-lobed. Petals 5, free, longer than the calyx lobes. Stamens 10, in 2 rows. Disc intrastaminal. Carpels 3, united; ovary 1-loculed, 1-ovuled; styles 3, connate below; stigmas 3. Drupes globose.



Fig. 109. *Rhus wallichii* Hook.f. : a. Habit; b. Bisexual flower; front petals removed; c. A fruit.

Warm temperate and tropical South America; *ca* 30 species, 1 cultivated in India.

Schinus terebinthifolius Raddi in Man. Mod. 18: 399. 1820.

Fig. 110.

Shrubs, 2-3 m tall. Leaves 12-15 cm long; leaflets 5-13 in number, elliptic, 2-4 x 1-1.5 cm, acute, entire. Panicles 10-15 cm long. Flowers greenish white, 2 mm across. Calyx persistent. Petals ovate, 1.5 x 0.5 mm. Stamens 1 mm long. Disc 1 mm in diam. Ovary 1 mm in diam., sessile. Drupes 4 mm in diam., globose, red coloured.

Fl. : January.

Distrib. A native of Brazil. But grown as a hedge in public gardens and around bungalows for its ornamental value.

Note. The white inflorescence is very attractive when in full bloom.

20. *Semecarpus* L.f.

Trees, rarely shrubs; plants dioecious, rarely polygamous. Leaves simple, alternate, entire, petiolate. Panicles terminal or axillary. Flowers small, unisexual, rarely bisexual; male flowers smaller than the female or bisexual flowers. Calyx 5-lobed caducous, imbricate. Petals 5, imbricate. Stamens 5; filaments subulate, glabrous. Disc broad, 5-lobed. Carpels 3, syncarpous; ovary superior or semi inferior, 1-loculed, 1-ovuled; styles 3, divergent, pubescent at base; stigma clavate. Drupes laterally compressed, seated on a fleshy hypocarp made up of accrescent disc and calyx base.

Tropical South East Asia, Australia, Micronesia, New Caledonia, Fiji; *ca* 60 species, 7 in India.

KEY TO THE SPECIES

- | | |
|--------------------------------|--------------------------------------|
| 1a. Leaves auricled at base | 2. <i>S. auriculata</i> |
| b. Leaves not auricled at base | 2 |
| 2a. Leaves subpanduriform | 6. <i>S. subpanduriformis</i> |
| b. Leaves not as above | 3 |

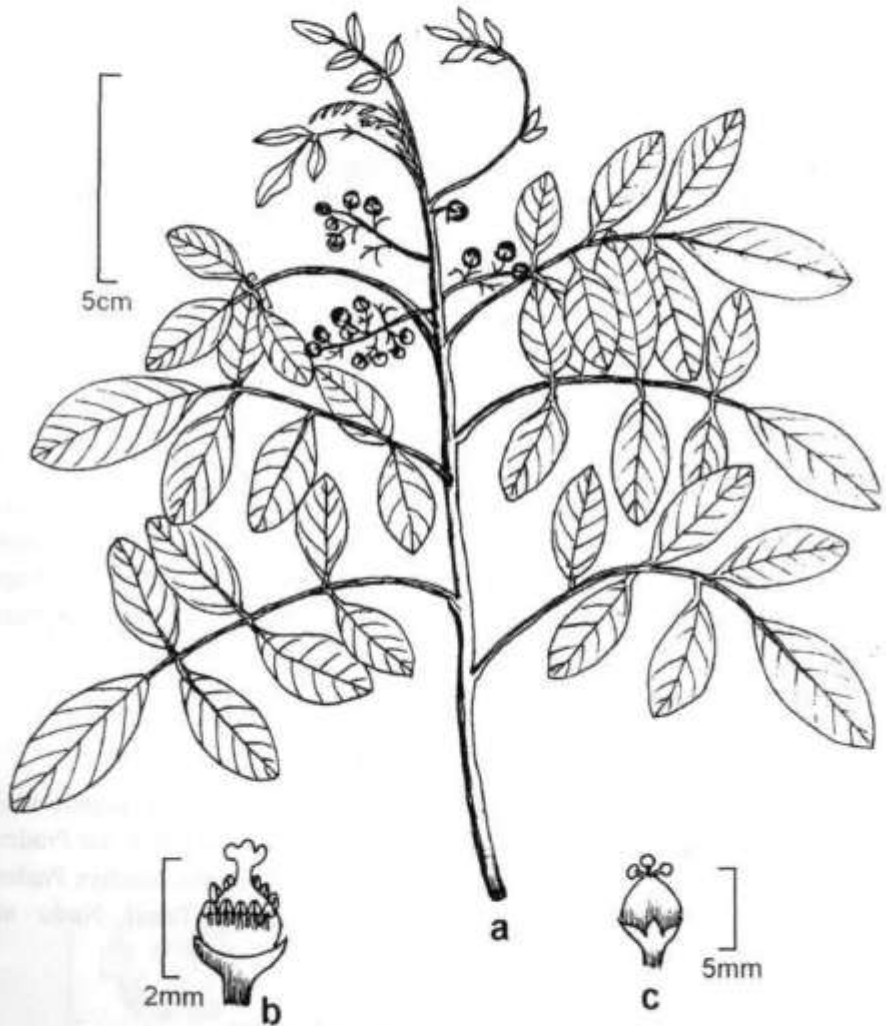


Fig. 110. *Schinus terebinthifolius* Raddi : a. Habit; b. Bisexual flower showing disc, stamens and carpels; sepals and petals removed; c. A fruit.

- | | |
|---|------------------------------|
| 3a. Branches and leaves rusty tomentose or pubescent | 4 |
| b. Branches and leaves glabrous | 5 |
| 4a. Leaves obovate-oblong, apex rounded | 1. <i>S. anacardium</i> |
| b. Leaves oblanceolate-oblong, apex shortly acuminate | 4. <i>S. kurzii</i> |
| 5a. Panicles pubescent; leaf apex acuminate | 5. <i>S. prainii</i> |
| b. Panicles glabrous; leaf apex obtuse | 6 |
| 6a. Leaves 13-24 x 6-12 cm; petioles 3-5 cm long | 7. <i>S. travancorica</i> |
| b. Leaves (25-) 45-100 x (6-) 15-22 cm; petioles 5-10 cm long | 3. <i>S. kathalekanensis</i> |

1. *Semecarpus anacardium* L.f., Suppl. Pl.: 182. 1781; Hook.f. Fl. Brit. India 2: 30. 1876. Fig. 111.

Beng.: *Bhela*; Engl.: *Marking-nut*; Kan.: *Karigeru*; Mal.: *Thenkotta*; Mar.: *Bhilawa*; Or.: *Bholia*; Sans.: *Bhallataka*; Tam.: *Thembara*.

Trees, 6-12 m tall. Leaves obovate-oblong or elliptic-oblong, 6.5-40 x 3.5-21 cm, apex rounded, base cuneate or rounded, sometimes contracted below the middle, pubescent beneath; petioles 2-5 cm long. Panicles 15-40 cm long, pubescent. Male flowers 2.5 mm in diam., sessile. Calyx pubescent outside. Petals 2 x 1 mm. Stamens 2 mm long. Disc 1 mm in diam. Female flowers 3 mm in diam. Ovary 1.5 mm in diam.; styles densely hairy. Drupes obliquely ovoid or oblong, 1.5-3.5 x 1-1.8 cm, glabrous, glossy, black; hypocarp fleshy, turbinate, 1-2 x 1-1.5 cm, pubescent.

Fl. & Fr. : March - Jan.

Distrib. India : Tropical outer Himalaya and Shiwaliks, Gangetic Plain, Deccan, Konkan, in deciduous forests, ascending up to 1000 m. Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Arunachal Pradesh, Orissa, Madhya Pradesh, Gujarat, Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Kerala.

Myanmar, Singapore, Malaya, China and Africa.

Note. A native of India, cultivated in gardens in Singapore and Malaya. Also introduced in eastern Asia as far as China and westwards in Africa.

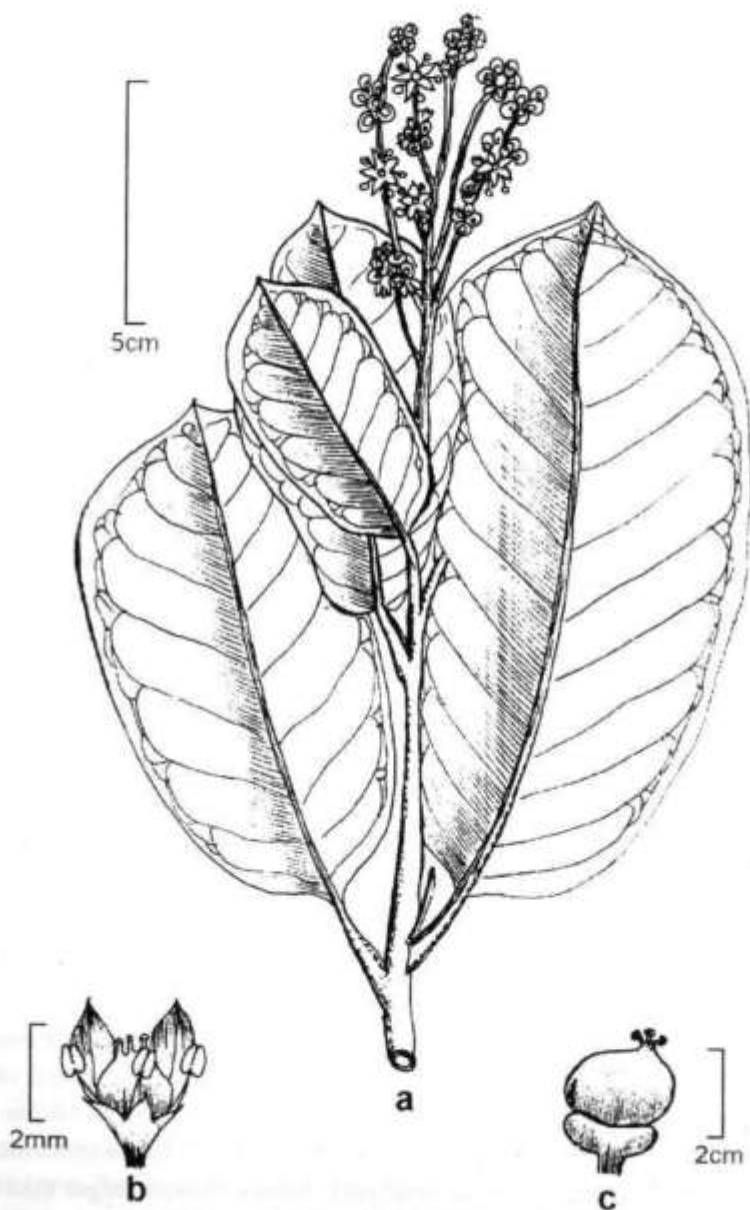


Fig. 111. *Semecarpus anacardium* L.f. : a. Habit; b. Bisexual flower; front petals removed; c. A fruit.

Uses : Hypocarp of fruits is eaten when ripe. Pericarp juice is used for marking linen, in varnish, paints, plastics and allied industries and also as wood preservative. The extract obtained by boiling the nuts is useful in the treatment of 'sciatica'.

2. *Semecarpus auriculata* Beddome, Fl. Sylv. 2: t. 232. 1870; Hook.f., Fl. Brit. India 2: 32. 1876.

Mal.: *Charae*; Tam.: *Vellei Cheri*.

Trees, up to 24 m tall. Leaves oblanceolate, 9-23 x 2.5-6 cm, acuminate, gradually attenuated below and provided with 2 rounded lobes above the petioles; petioles, 4-6 mm long, sometimes leaves sessile. Panicles 7-15 cm long, axillary. Petals ovate 3 x 2 mm. Stamens 1.5 mm long. Disc 1.5 mm in diam. Ovary superior, conical, 2 mm in diam., glabrous. Drupes obliquely oval, 0.8 x 1 cm, black; hypocarp obconic, 0.5 x 0.6 cm.

Fl. & Fr. : Nov. - Feb.

Distrib. India : In evergreen forests of Western Ghats, up to 1000 m. Tamil Nadu and Kerala. Endemic.

Uses. The black resinous juice of the plant usually causes blisters on skin. Wood is suitable for match boxes.

3. *Semecarpus kathalekanensis* Dasappa & Swaminath in Indian For. 126(1): 78. 2000.

Kan. : *Dodda ele holegara, Hedagalu*.

Trees, up to 20 m tall. Leaves alternate, oblong-lanceolate or obovate, (25-) 45-100 x (6-) 15-22 cm, obtusely acuminate at apex, cuneate and oblique at base, entire, wavy, thickly coriaceous, glabrous; petioles 5-10 cm long. Panicles axillary, 5-15 (in female inflorescence) or 30-50 (male inflorescence) cm long, many-flowered. Flowers unisexual, female flowers larger than male. Sepals 4 to 5, glabrous. Petals 4 or 5, ovate, ca 1 mm long, glabrous. Stamens 4 or 5, alternating with petals; filaments up to 1 mm long, glabrous. Ovary laterally compressed, ca 2 mm long, 2-lobed; styles 3(-1); stigma capitate.

Drupes obliquely reniform, *ca* 2 cm long, with more than 15, distinct concentric lines; hypocarp pyriform, *ca* 2 cm in diam., ash green turning orange yellow. Seed reniform, brown.

Fl. & Fr. : Nov. - May.

Distrib. India : In *Myristica* swamps and water-logged areas, at *ca* 560 m alt. Karnataka.

4. *Semecarpus kurzii* Engl. in DC. Mon. Phan. 4: 489. 1883; Parkinson, For. Fl. Andaman Isls. 140. 1923.

Burmese.: *Chayben.*; Hindi: *Barabhilawa.*

Trees, 5-30 m tall. Leaves oblanceolate, 22-35 x 6.9 cm, acuminate. Panicles 20-28 cm long. Male flowers 1 mm in diam. Calyx pubescent. Petals elliptic, 1 x 0.5 mm, puberulous. Stamens 1 mm long. Disc 1 mm in diam. Bisexual flowers 6 mm in diam. Ovary superior, 2 mm in diam., pubescent. Drupes obliquely ovoid, 1.5-2.5 x 1-2 cm; hypocarp 0.7 x 1 cm, turbinate. black, glabrous.

Fl. & Fr. : July - March.

Distrib. : Andaman Islands.

5. *Semecarpus prainii* King in J. As. Soc. Bengal 66: 511. 1896; Parkinson, For. Fl. Andaman Islands. 140. 1923. *S. heterophylla* Hook.f. Fl. Brit. India 2: 35. 1876 (*non* Blume).

And.: *Chaiban, Chaij-da.*

Trees, 12-15 m tall. Leaves oblanceolate or obovate-oblong, 12-30 x 3-6 cm, abruptly acuminate, base gradually tapered downwards; petioles 2-3.5 cm long. Panicles 25-32 cm long. *Male Flowers* : 1.5 mm in diam., sessile. Calyx lobes ovate to ovate-oblong, 0.5-1 mm long. Petals ovate-oblong, 1.5 x 0.8 mm. Stamens 1.5 mm long. Disc flat, 1 mm in diam. *Female flowers*: Ovary 1 mm across, densely hairy. Drupes obliquely horizontally ovoid or

ovoid-oblong; 2 x 2.5 cm; hypocarp obconic, 0.5 cm long, forming a minute podocarp.

Fl. & Fr. : July - Feb.

Distrib. India : Assam, Meghalaya and Andaman Islands (Baren and Little Cocos Islands).

Bangladesh, Myanmar and Malay Peninsula.

Note. The black resinous exudation is poisonous and toxic causing skin eruptions.

6. *Semecarpus subpanduriformis* Wallich ex Hook.f., *Fl. Brit. India* 2: 35. 1876.

Trees, 12-18 m tall. Leaves oblanceolate-obovate, subpanduriform, 19-32 x 6.5-8.5 cm, shortly acuminate, dark on the upper surface, whitish underneath, thin membranous; petioles 5-10 mm long. Panicles 15-33 cm long, sparsely pubescent. Male flowers 4 mm in diam. Petals ovate, 1.5 x 0.7 mm. Stamens 2 mm long. Disc 1 mm in diam. Bisexual flowers 6 mm in diam. Ovary superior, conical, 1.5 x 2 mm. Drupes 1.5 x 2 cm, laterally compressed; hypocarp 0.5 x 1.5 cm, glabrous.

Fl. & Fr. : July - Oct.

Distrib. India : West Bengal (cultivated).

Bangladesh and Myanmar.

7. *Semecarpus travancorica* Beddome, *Fl. Sylv.* 2: t. 232. 1870; Hook.f., *Fl. Brit. India* 2: 31. 1876.

Kan.: *Kadu-gobbi*; Mal.: *Avukaram*; Tam.: *Kattu Shon-Kottai*; Tel.: *Malu-sengote*.

Trees, up to 30 m tall. Leaves obovate-oblong, 13-24 x 6-12 cm, obtuse or rounded at apex, base cuneate or rounded; petioles 3-5 cm long. Panicles

21-28 cm long, axillary, glabrous. Male flowers 1 mm across. Petals ovate. 1 x 0.8 mm, glabrous. Stamens 1 mm long; anthers oblong. Disc 1 mm in diam. Drupes obliquely oblong; 2.5 cm long; hypocarp broad and short.

Fl. & Fr. : Aug. - March.

Distrib. India : Southern Western Ghats, in evergreen forests, ascending up to 1350 m. Tamil Nadu and Kerala. Endemic.

Uses. The black resinous juice from pericarp is used in marking linen. The caustic black juice which is transformed into solid resin is used in making lacquers, varnish, water proof agents, etc.

21. *Solenocarpus* Wight & Arn.

Small trees. Leaves alternate, imparipinnate; leaflets crenulate. Panicles terminal. Flowers bisexual. Calyx 5-lobed, caducous, imbricate. Petals 5, free, valvate. Stamens 10. Disc annular, 10-crenated. Carpel solitary; ovary superior, 1-loculed, ovule 1, pendulous from above; style simple. Drupes 1-loculed.

Monotypic genus, endemic to India.

Solenocarpus indica Wight & Arn., Prodr. 1: 172. 1834; Hook.f., Fl. Brit. India 2: 27. 1876. *Spondias indica* (Wight & Arn.) Airy Shaw & Forman in Kew Bull. 21: 16. 1967. **Fig. 112.**

Small trees. Leaves 9-15 cm long, petioled; leaflets 4-6-pairs, oblong, 3.5 x 2.5 cm, apex acuminate, margin crenate, glabrous. Panicles 15-17 cm long. Flowers bisexual, 2.5 mm across, white. Petals oblong, 2 x 1 mm, apex reflexed. Stamens 1.5 mm long. Disc 1.5 mm in diam. Carpel 2 mm long; ovary sessile, superior; style thick, furrowed longitudinally; stigma obliquely lobed. Drupes 5 x 3 mm, oval; pericarp hard and pubescent; mesocarp fleshy; endocarp thin.

Fl. & Fr. : May - Sept.

Distrib. India : Western Ghats, up to 800 m. Tamil Nadu, Karnataka and Kerala. - Endemic.

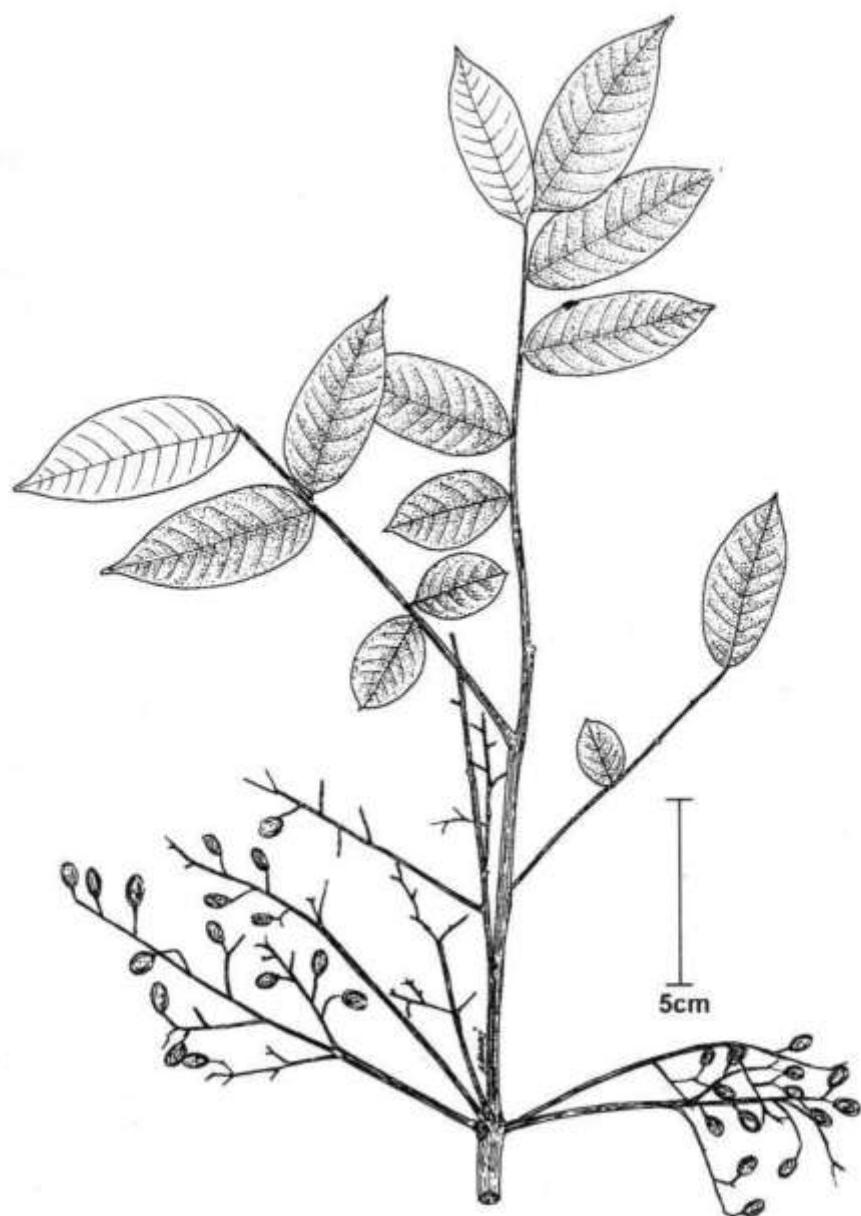


Fig. 112. *Solenocarpus indica* Wight & Arn.

Note. An ornamental plant. When in full blossom forms a crown of white flowers, which look very attractive.

22. *Spondias* L.

Trees, plants polygamous, wholly or partly deciduous. Leaves alternate, imparipinnate, petiolate; leaflets entire, serrate to crenulate, with intramarginal veins. Panicles terminal and axillary. Flowers bisexual or unisexual. Calyx 5 or 4-lobed, caducous, imbricate. Petals 5 or free, valvate. Stamens 10 or 8. Disc cupular, broadly lobed. Carpels 5 or 4, syncarpous; ovary superior, 5 or 4 or 1-loculed, 1-ovule in each locule; styles 5-4, free. Drupes 5 or 1-loculed. Seed with testa free from the endocarp.

Mainly in Tropical America and South-East Asia; 10-12 species, 1 in India.

Literature. AIRY SHAW, H.K. & L.L. FORMAN (1967) The genus *Spondias* L. (Anacardiaceae) in tropical Asia. *Kew Bull.* 21: 1-19.

Spondias pinnata (L.f.) Kurz, Prelim. Rep. For. & Veg. Pegu, App. A. 44 & B. 42. 1875. *Mangifera pinnata* L.f., Suppl. 156. 1781. *Spondias mangifera* Willd., Sp. Pl. 2: 751. 1799; Hook.f., Fl. Brit. India 2: 42. 1876.

Fig. 113.

And.: *Gue*; Asm.: *Amora*; Beng.: *Amra*; Eng.: *Hog-plum*; Guj.: *Ranamba*; Hindi: *Jangli am*; Mal.: *Manpuli*; Or.: *Amodo*; Punj.: *Ambara*; Tam.: *Pullipullamh*; Tel.: *Kondamanidi*.

Desiduous trees, up to 27 m tall. Leaves 18-50 cm long; petioles 5-15 cm long; leaflets 4-5 pairs, elliptic-oblong, 6-18 x 5-8.5 cm, candate-acuminate, base obliquely rounded, entire, membranous or subcoriaceous, with intramarginal veins; petiolules up to 1 cm long. Panicles 14-28 cm long. Flowers bisexual, 5 mm across, subsessile. Calyx pubescent. Petals 2.5 x 1 mm, glabrous. Stamens 1.5-2 mm, long. Disc 1 mm in diam., deeply 5-lobed, thick, fleshy. Ovary sessile, 2-2.5 mm in diam., obconic-globose; styles, short; stigmas capitate. Drupes ovoid-oblong, 1.5-5 x 1-3.5 cm, 5-loculed; pulp soft, acidic, aromatic; stone semiwoody, fibrous with many cavities outside.

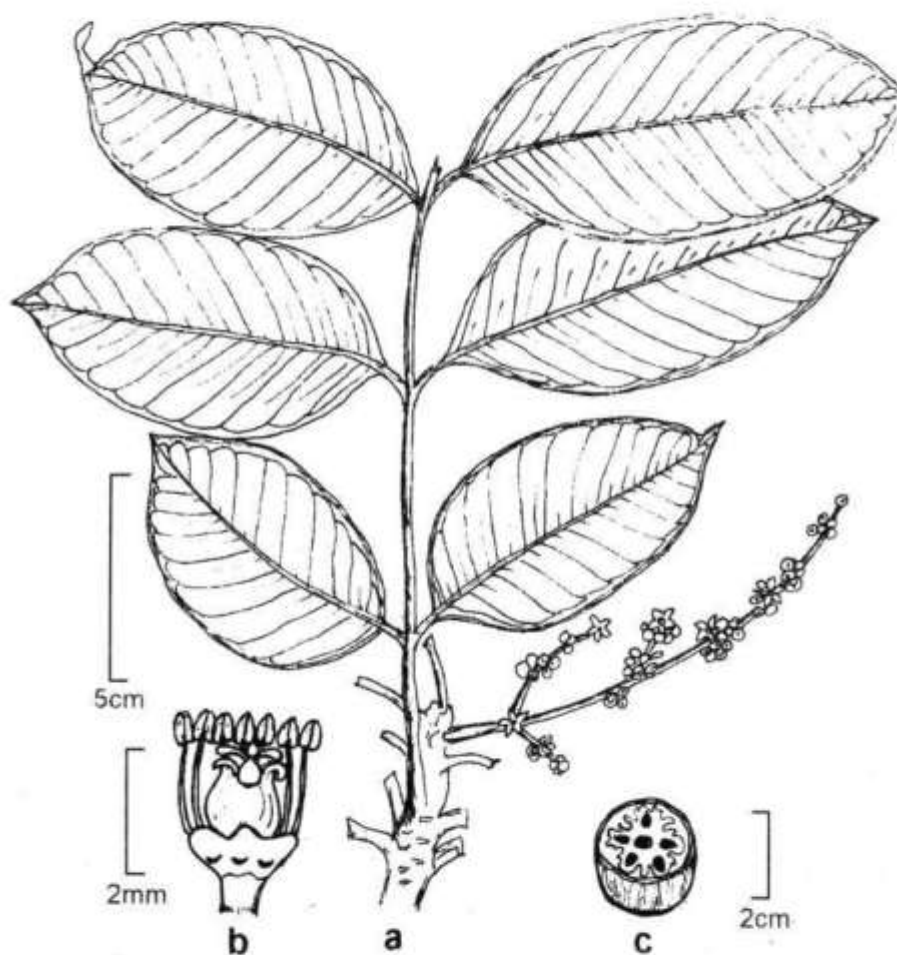


Fig. 113. *Spondias pinnata* (L.f.) Kurz. : **a.** Habit; **b.** Bisexual flower showing disc, stamens and carpels, **c.** Half of a fruit in T.S.

Fl. & Fr. : April. - Dec.

Distrib. India : Widely distributed in deciduous forests ascending up to 1650 m in Himalayas. Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Meghalaya, Tripura, Karnataka, Tamil Nadu and Andaman Islands.

Pakistan, Nepal, Myanmar, Sri Lanka, Java, Philippines, Malay Peninsula and Thailand.

Uses. Fruit edible, both raw and in ripe condition. Wood is used in making packing-boxes. Root is useful in regulating menstruation. The bark is used as medicine for dysentery and diarrhoea. It is also used for tanning.

23. *Swintonia* Griffith

Tall trees; plants polygamous. Leaves simple, alternate, entire, long petioled. Panicles axillary and terminal. Flowers male and bisexual or bisexual only. Calyx 5-lobed. Petals 5, free, imbricate, persistent, accrescent, usually much enlarged and reflexed in fruits. Disc extrastaminal, 5-lobed. Stamens 5; filaments subulate; anthers dorsifixed. Carpel solitary; ovary superior, 1-loculed; 1-ovuled; style distinct, cylindrical; stigma capitate. Drupes 1-loculed, supported by 5, usually much enlarged, reflexed, wing like petals. Seed with testa fused with the endocarp.

South-East Asia; ca 16 species, 1 in India.

Swintonia floribunda Griffith in Proc. Linn. Soc. Lond. 1: 283. 1846; C.E.C. Fischer in Kew Bull. 1931: 282. 1931. *S. griffithii* Kurz in J. As. Soc. Bengal 39 (2): 75. 1870; Hook.f., Fl. Brit. India 2: 26. 1876. *S. helferi* Hook.f., Fl. Brit. India 2: 26. 1876.

Bangladesh: *Chandul*; Beng.: *Bailam*; Burmese.: *Thayet-kin*.

Trees, 30-40 m tall. Leaves elliptic or elliptic-lanceolate, 11-21 x 2.5-5.5 cm, acuminate, base acute, glabrous; petioles 2-4 cm long. Panicles 15-30 cm long, profusely branched, glabrous. Bisexual flowers 3-4 mm across; pedicels 2-4 mm long. Calyx lobes 1 mm long. Petals ovate-oblong, 2 x 1 mm, puberulous on both sides. Disc elongate. 0.5 x 0.8 mm. Stamens,

2-3 mm long; anthers oblong. Ovary subconical, 1 mm in diam.; style 1.5 mm long, simple; stigma disciform. Male flowers elongate, 2.5 x 1.5 mm. Drupes 3 x 1.5 cm, oblong; epicarp smooth; enlarged petals oblong, 4-6 x 1.5-2.5 cm, glabrous, reddish in colour.

Fl. & Fr. : Nov. - April.

Distrib. India : In lowlands or hill forests, sometimes in swamp or peat up to 750 m. Mizoram and Andaman Islands.

Myanmar, Thailand, Vietnam and Malesia.

Uses. The wood is sometimes used in making boats which last longer in saline water than those made of other kind of woods.

CORIARIACEAE

(M.A. Rau)

Shrubs, undershrubs or perennial herbs, rarely small trees with winged, angular branchlets. Leaves opposite, rarely ternate or sometimes alternate at ends of shoots, simple, generally exstipulate, but stipules, if present, minute, caducous. Flowers small, hermaphrodite or unisexual, in axillary or terminal racemes. Bracts deciduous. Sepals 5, free, persistent. Petals 5, shorter than sepals, keeled inside, accrescent in fruit and then fleshy. Stamens 10, in alternating whorls of 5 each, inner whorl usually adnate to keel; anthers exerted, dithecous, opening by longitudinal slits (introrse). Carpels 5-10(-12), superior, free, 1-loculed with a single pendulous ovule; styles distinct, glandular. Fruit, a collection of dry achenes enclosed in accrescent, fleshy, coloured petals. Seeds compressed; embryo straight, oily, exarillate; endosperm scanty or absent.

Central and S. America, S.W. Europe, N. Africa, Asia, in warm temperate and tropical regions, disjunct in distribution. 1 genus and 15 species; 2 species in India.

Literature. Rau, M.A. (1978) *Coriariaceae. Fasc. Fl. India.* 1-4.

Note. Hutchinson (Evoln. & Phyl. Fl. Pl. 45. 1969; Fam. Fl. Pl. 3rd ed.: 136. 1973), stated that it is a difficult family to be placed satisfactorily in any system. He included it in a distinct order, Coriariales, and placed it between the Dilleniales and Rosales.

Coriaria L.

Description and distribution same as the family.

Note. Nitrogen-fixing root nodules are known in some species of *Coriaria* (Bond in Nature 193: 1103. 1962).

KEY TO THE SPECIES

- 1a. Woody shrubs; leaves usually prominently 3-nerved from base; racemes in clusters or fascicles produced usually on old wood in axils of leaf scars and leaves or at ends of short lateral branches; anthers equal to or shorter than filaments

1. *C. nepalensis*

- b. Herbaceous perennials; leaves usually prominently 7-nerved from base; racemes terminal, always solitary; anthers much longer than filaments

2. *C. terminalis*

1. *Coriaria nepalensis* Wallich, Pl. As. Rar. 3: 67. t. 289. 1832; Hook.f., Fl. Brit. India 2: 44. 1876. Fig. 114.

Hindi: *Makela, Masuri*; Jaun: *Cangeru*.

Shrubs, up to 4 m tall; bases of lateral branches surrounded by persistent bud scales. Leaves ovate, oblong or elliptic, 3-8 x 1-3 cm, glabrous, shortly petioled, 3-5-nerved. Racemes 3-12 cm long. Flowers *ca* 5 cm diam. Petals greenish-yellow. Stamens 5 + 5; inner whorl adnate to keel; anthers coral red. Carpels 5, free, glandular in the upper part. Achenes enclosed in enlarged fleshy, reddish petals.

Fl. & Fr. : Feb. - July.

Distrib. India : Outer Himalaya throughout up to 2800 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim and Arunachal Pradesh.

Nepal, Bhutan, Myanmar, China and Pakistan.

Uses. Handsome mottled wood is reported to take good polish, which is suitable for various small articles. Wood and leaves are rich in tannin. Fleshy petals in the fruit are edible, but achenes are poisonous.

Note. Chromosome number : $n = 20$ (Mehra & Khosla in Taxon 18: 217. 1969).

2. *Coriaria terminalis* Hemsley in Hook., Ic. Pl. 23. t. 2220. 1892; Skog in Rhodora 74: 245. 1972.

Perennials, with underground rhizomes producing annual, herbaceous stems upto 1.2 m high, sparingly branched; bases of lateral branches mostly without bud scales. Leaves opposite to subopposite, sessile or subsessile, ovate but very often rounded, 3-8 cm long, shortly acuminate, with cordate or semiamplexicaul base, (5-)7 (-9)-nerved, puberulous on veins beneath, ciliato-

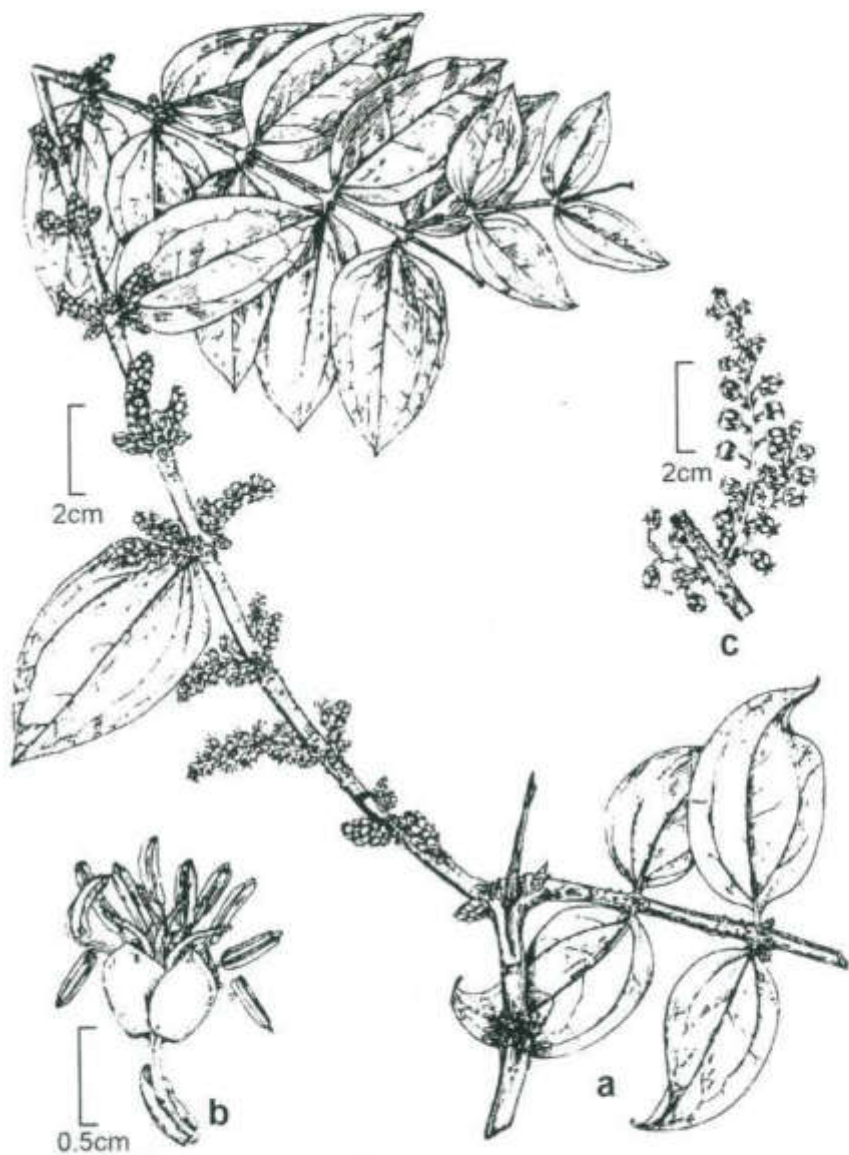


Fig. 114. *Coriaria nepalensis* Wallich

glandular along margins. Racemes 10-20 cm long. Stamens 5 + 5; inner whorl free; anthers linear. Carpels 5, eglandular; styles stigmatic all over. Achenes enclosed in the fleshy corolla, black-purple or orange-yellow when ripe.

KEY TO THE VARIETIES

- | | |
|------------------------------|-----------------------------|
| 1a. Ripe fruits black-purple | 2.1 var. terminalis |
| b. Ripe fruits orange-yellow | 2.2 var. xanthocarpa |

2.1 var. terminalis

Distrib. India : Sikkim.

Bhutan and China.

2.2 var. xanthocarpa Rehder & Wilson in Sarg., Pl. Wilson. 2: 171. 1916; Rehder in L.H. Bailey, Standard Cyclop. Hort. 1: 847. 1942; Graf in Exotica 3. pt. 1: t. 648. pt. 2: 1584. 1963. *C. terminalis auct.* Sprague in Bot. Mag. 139.t. 8525. 1913 (*non* Hemsley, 1892).

Distrib. India : Sikkim.

Introduced into cultivation in Europe and North America for ornamental beauty.

Note. Two well preserved fossils discovered from the Oligocene beds of southern France, described as *Coriaria longaeva* Saporta (Ann. Sci. Nat. Bot. ser. 5.t.4.122. 1865) and attributed by Good (New Phytol. 29: 170-198. 1930) to *C. terminalis* Hemsley point to the past distribution of *C. terminalis*.

MORINGACEAE

(B.P. Uniyal)

Deciduous trees. Leaves alternate, imparipinnately bi-or tripinnate. Inflorescence axillary panicles. Flowers zygomorphic, bisexual, red or white. Calyx cup shaped, 5-cleft; segments petaloid, reflexed. Petals 5, free, unequal; upper two smaller; lateral ascending; anterior larger. Stamens 5, declinate, opposite to petals, alternating with staminodes, inserted on the edge of disc; filaments villous and thickened at base; anthers dorsifixed, monothealous. Ovary stipitate, superior, 1-loculed; style slender, tubular; stigma perforated. Fruit capsular, elongated, angled or ribbed, beaked. Seeds many, large, 3-winged or wingless; embryo straight, oily; endosperm mostly lacking.

Monogeneric, Widely introduced; *ca* 14 species, 2 in India.

Literature. QAISER, M. (1973): Flora of West Pakistan 38: 1-4. VERDCOURT, B. (1985). A synopsis of the Moringaceae. *Kew Bull.* 40(1): 1-23.

Moringa Adans.

Description and distribution same as the family.

KEY TO THE SPECIES

- 1a. Leaves usually bipinnate; petals yellow with red or pink streaks 1. *M. concanensis*
b. Leaves usually tripinnate; petals white 2. *M. oleifera*

1. ***Moringa concanensis*** Nimmo in Graham, Cat. Bombay Pl. 43. 1839, *nomen tantum*; Dalz. & Gibson, Bombay Fl. 311. 1861; Hook.f., Fl. Brit. India 2: 45. 1876.

Raj.: *Sarquuro*. Tam.: *Kattu moringa*; Tel.: *Manda munga*.

Large trees; stems glabrous. Leaves usually bipinnate; leaflets oblong-broadly obovate, upto 3.4 x 2.5 cm, rounded at tips or retuse, darker above.

paler beneath, nerves fairly marked. Flowers in minutely pubescent panicles. Calyx thinly tomentose; segments white, oblong, reflexed. Petals yellowish white, oblong, spathulate, reddish or pink-streaked. Stamens 5; filaments hairy at base. Staminodes 4-5. Fruits long, 3 angled. Seeds winged.

Fl. & Fr. : Oct. - June.

Distrib. India : Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, Goa, Andhra Pradesh and Tamil Nadu.

Uses. The unripe fruits are eaten by natives.

2. *Moringa oleifera* Lam., *Encycl. Meth. Bot.* 1: 398. 1785. *M. pterygosperma* Gaertner., *Fruct.* 2: 314. 1791; Hook.f., *Fl. Brit. India* 2: 45. 1876. **Fig. 115.**

Asm.: *Sajina*; *Beng.*: *Schajna*; *Eng.*: *Horse Radish tree*; *Hindi*: *Sohajna*; *Mar.*: *Sheuga* *Tam.*: *Moringa*; *Tel.*: *Munga*.

Large trees; branches pubescent. Leaves usually tripinnate; leaflets 3-11, sparsely tomentose above, glabrous beneath, up to 2.4 x 1.8 cm; terminal larger than the laterals, obovate, oblique sided at base, rounded at tip, laterals elliptic. Flowers *ca* 2.5 cm across. Calyx tube hairy; lobes petaloid, linear-lanceolate, reflexed. Petals white, the anterior erect, others reflexed. Stamens 5; filaments villous at base. Ovary oblong; style cylindrical. Fruits up to 45 cm long, 9-ribbed when young, 3-angled on maturity. Seeds winged.

Fl. & Fr. : Feb. - June.

Distrib. India : Jammu & Kashmir, Himachal Pradesh, Punjab, Delhi, Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Arunachal Pradesh, Tripura, Orissa, Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, Goa, Andhra Pradesh, Karnataka, Tamil Nadu and Andaman Islands.

Bangladesh, Myanmar, Vietnam, Philippines and Pakistan.

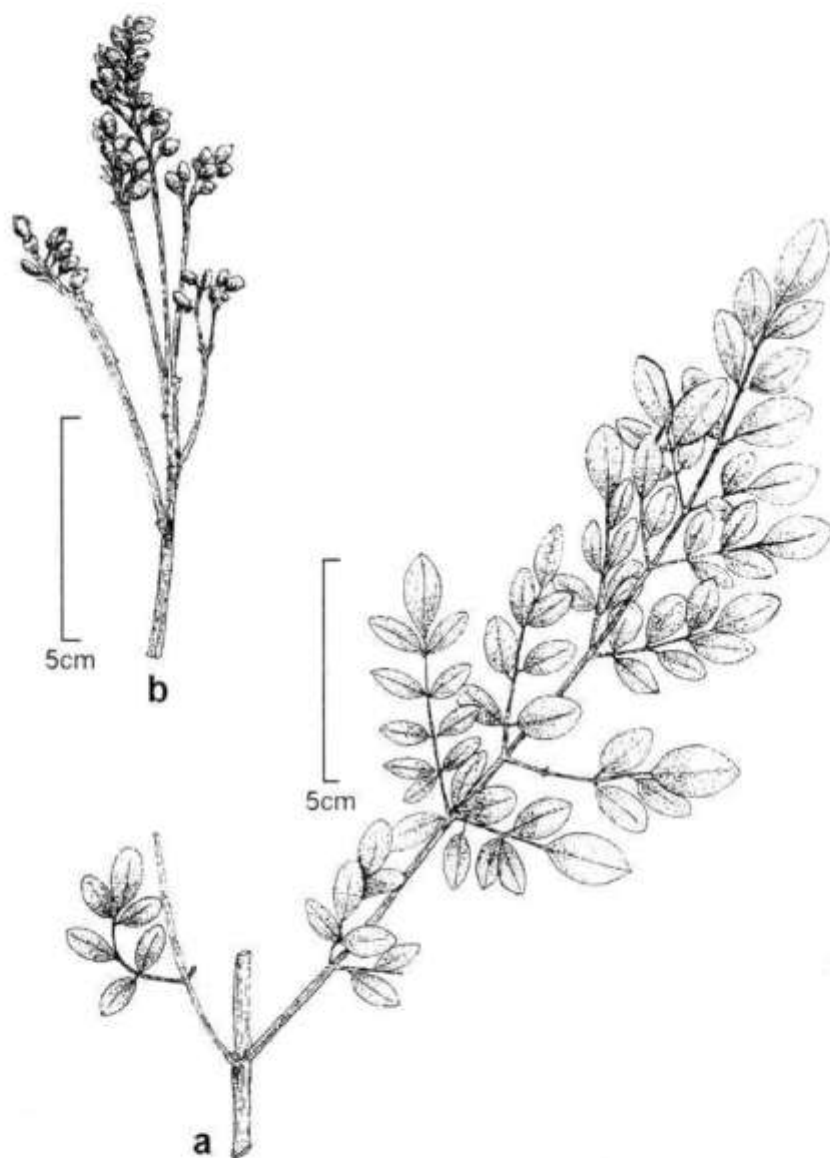


Fig. 115. *Moringa oleifera* Lam. : a. Twig; b. Inflorescence.

Uses. The leaves, flowers and young fruits are cooked as vegetables. Gum is also obtained. Seeds yield Ben Oil, used as lubricant and in perfume industry.

CULTIVATED SPECIES

Moringa peregrina (Forssk.) Fiori in Agric. Colon. 5: 59. 1911.
Hyperanthera peregrina Forssk., Fl. Aegypt. Arab. 67. 1775. *M. aptera* Gaertner, Fruct. 2: 315. 1791.

A native of Nubia and Arabia, cultivated in India.

CONNARACEAE

(M.S. Mondal)

Shrubs, lianas or rarely small trees. Leaves alternate, imparipinnate, sometimes unifoliolate, exstipulate; petiole pulvinate at base; leaflets subopposite, entire, base often slightly peltate. Inflorescence axillary, pseudoterminal or terminal panicles or racemes, bracteate. Flowers 5-merous, rarely 4-merous, hypogynous, bisexual, rarely unisexual and then plants dioecious, regular; pedicels articulated near the apex. Sepals free or connate at the very base only, persistent, imbricate or valvate. Petals free, or connate at base, imbricate, rarely valvate. Stamens 10, in 2 whorls, free or coherent at the base, inner whorl often shorter and imperfect; anthers dorsifixed in the lower half, curving outwards in anthesis, dehiscent lengthwise and introrse; pollen grains oblate-spheroidal to prolate-spheroidal to prolate, medium sized, tricolporate; colpus long slit like or tapering; endoaperture simple, with granules or with definite operculum; exine ruguloreticulate to finely or coarsely reticulate. Disc absent or poorly developed. Pistils 5, rarely 1-3, free, episepalous; ovary 1-loculed, with 2, nearly basal to axile, collateral, orthotropous or anatropous ovules, usually 1 maturing; style (in each carpel), subulate or filiform; stigma capitellate, simple or 2-lobed. Fruit dry, one-seeded follicle, usually opening by a ventral slit, sometimes indehiscent. Seeds large, often with an aril, endospermous or not; cotyledons thick, flat.

Circumtropical, predominantly developed in Africa and S.E. Asia, (Malesia, Myanmar, Thailand and Sri Lanka); 16 genera and about 300-350 species; 4 genera and 16 species in India.

Literature. SCHELLENBERG, G. (1938). In Engl., Das Pflanzenr. Heft. 103: 1-326. LEENHOUTS, P.W. (1958). *Flora Malesiana* Ser. I, 5: 495-541. MONDAL, M.S. (1990). Pollen morphology and systematic relationships of the families Sabiaceae (*s.l.*) and Connaraceae. New Delhi.

KEY TO THE GENERA

- 1a. Calyx accrescent; pistils 4-5 2
- b. Calyx not accrescent; pistil 1 3

- 2a. Calyx imbricate, immediately after flowering conically contracted or so, appressed and hard in fruit; petals 2-3 times longer than the sepals; seeds enveloped by a loose ariloid **4. Rourea**
- b. Calyx valvate, not conically contracted and not appressed to the fruit; petals almost equal or slightly longer than the sepals; seeds provided with sarcotesta **1. Cnestis**
- 3a. Leaves tri to multifoliolate; inflorescence a large, terminal, panicle; sepals, petals and stamens glandular; floral epidermis with glandular-capitate hairs; seeds non endospermous **2. Connarus**
- b. Leaves unifoliolate; inflorescence axillary, small, often glomerulate; floral parts non glandular; floral epidermis devoid of glandular-capitate hairs; seeds endospermous **3. Ellipanthus**

1. *Cnestis* A.L. Juss.

Lianas or scandent shrubs, rarely small trees. Leaves imparipinnate. Inflorescence axillary or terminal, solitary or in fascicles arising from knobs on the branches; bracts minute, scale like or lanceolate. Flowers bisexual, 5-merous. Sepals slightly confluent at the base, lanceolate, acute, valvate. Petals with indented and incurved tips. Stamens 10, free, in two whorls; inner ones slightly shorter, all fertile. Pistils 5; ovary pubescent. Fruits 1-3 per flower, straight, beaked, opening by a longitudinal ventral slit, densely minutely tomentose outside, hairy within; pericarp thick. Seed 1, flattened, bean shaped, partly surrounded by a sarcotesta in the basal part opposite to the hilum; endospermous.

Mostly in Tropical Africa and Madagascar; fewer in S.E. Asia; 40 species, 1 in India.

Cnestis palala (Lour.) Merr. ssp. *palala* in J. As. Soc. Str. Br. no. 85: 201. 1922. *Thysanus palala* Lour., Fl. Cochinch. 284. 1790. *Cnestis ramiflora* Griffith, Notul. 4: 432. 1854; Hook.f., Fl. Brit. India 2: 54. 1876. *p.p.*

Climbing shrubs; branches stout, woody; branchlets, petioles, rachises, petiolules and the inflorescences mostly crispately tomentose. Leaves odd pinnate, 16-30 cm long, petioles slender; leaflets in 8 pairs, all elliptical to lanceolate, sharply or bluntly acuminate at the apex, rounded or somewhat cordate at the base and oblique; middle leaflets 3-9.5 x 0.4-2.5 cm; lower leaflets smaller,

thin chartaceous, upper surface pilose to glabrous, shining, lower surface tomentose, dull; nerves 6-8 pairs. Inflorescence in axillary fascicles of 5 or more, many-flowered peduncles, generally 3 of them 4-6 cm long, the others shorter, up to 1.5-2.5 cm long. Sepals oblong to lanceolate, *ca* 4 mm long, outer surface densely pilose, inside sparsely appressed hairy. Petals elliptic to lanceolate, *ca* 5 mm long, rounded or obtuse at the top, membranaceous, mostly pilose. Stamens all equal, glabrous, 1-1.2 mm long. Pistils 5, all equal, 0.75-1.75 (-2.25) mm long with profuse tuft of hairs at the base forming cushions, either entire carpel or only the ovary embedded within the tuft of hairs. Fruits 1 (-4) per flower, *ca* 4 x 1.5 cm, straight, distinctly beaked, pilose. Seeds with a black seed coat and basal sarcotesta.

KEY TO THE VARIETIES

- 1a. Styles more than 1 mm long; about half of the carpel exposed above the tuft of hairs; pollen grains spheroidal to oblate spheroidal with reticulate exine ornamentation; P/E ratio 0.95-1.27 **1.2. var. palala**
- b. Styles up to 1 mm long (0.75-1 mm), whole carpel immersed within the tuft of profuse stiff hairs; pollen grains oblate with rugulo-reticulate exine ornamentation; P/E ratio 0.91-0.95 **1.1. var. brevistylis**

1.1. var. brevistylis Mondal in J. Econ. Tax. Bot. 15: 493-494. 1991.

Fig. 116.

Fl. & Fr. : Jan. - July.

Distrib. India : S. Andamans.

1.2. var. palala

Fl. & Fr. : Nov. - July.

Distrib. India : Andaman & Nicobar islands.

Myanmar, Thailand and Indo-China.



Fig. 116. *Cnestis palala* (Lour.) Merr. ssp. *palala* var. *brevistylis* Mondal
a. Habit; b. Flower; c. Pistil.

2. *Connarus* L.

Lianas, shrubs or small trees. Leaves imparipinnate; leaflets 3-5 or more, mostly pellucid-glandular punctate, entire. Inflorescence terminal or axillary panicles. Flowers bisexual, 5-merous, fragrant. Sepals, petals and stamens punctate by glands appearing as dark dots in the herbarium specimens. Sepals slightly connate at the base, thick and fleshy. Petals free, pubescent or glabrous, sometimes glandular-ciliate at the margin. Stamens 10, united at base; inner whorl shorter and usually sterile to staminodial; filaments sparsely glandular-pubescent. Carpel 1; ovary and basal half of style pilose; stigma capitate. Fruits pod like, with persistent calyx, somewhat compressed, opening longitudinally, often stalked, apex with a short, triangular beak; pericarp dry, chartaceous to woody. Seed 1, bean shaped, shining black, basal part partly enveloped by a fleshy, yellow, 2-lobed arillode; endosperm absent.

Pantropical, mainly in S. America and S.E. Asia, *ca* 100 species, 10 in India.

KEY TO THE SPECIES

- | | |
|---|-----------------------------|
| 1a. Twigs always glabrous | 2 |
| b. Twigs pubescent, at least at the young stage | 5 |
| 2a. Sepals linear | 4. <i>C. nicobaricus</i> |
| b. Sepals ovate to ovate-oblong or orbicular | 3 |
| 3a. Leaflets with 3-5 pairs of nerves; sepals orbicular-obtuse, keeled | 1. <i>C. andamanicus</i> |
| b. Leaflets with 5-8 pairs of nerves; sepals ovate to ovate-oblong, not keeled | 4 |
| 4a. Leaflets ovate-elliptic to lanceolate, caudate acuminate | 3. <i>C. monocarpus</i> |
| b. Leaflets oblong-lanceolate, obtusely acuminate | 10. <i>C. wightii</i> |
| 5a. Twigs densely tomentose with stellate hairs | 6. <i>C. parameswaranii</i> |
| b. Twigs minutely ferruginous tomentose with simple hairs | 6 |
| 6a. Petals linear, glabrous; pericarp glabrous within | 2. <i>C. kingii</i> |
| b. Petals lanceolate-spathulate, glabrous punctate or tomentose; pericarp pubescent to tomentose or woolly within | 7 |
| 7a. Leaflets ovate; follicles oblong | 8. <i>C. sclerocarpus</i> |
| b. Leaflets oblong to elliptic-lanceolate; follicles ovoid to ellipsoid | 8 |
| 8a. Follicles 4-6 cm long | 7. <i>C. planchonianus</i> |
| b. Follicles less than 4 cm long | 9 |

- 9a. Twigs tomentose at the tips only; follicles semi-ovoid, convex 5. *C. paniculatus*
 b. Twigs tomentose throughout; follicles semi ellipsoid to pyriform 8. *C. semidecandrus*

1. *Connarus andamanicus* Mondal in J. Econ. Tax. Bot. 15: 459-460. 1991. **Fig. 117.**

Scandent shrubs; branches and leaves perfectly glabrous. Leaves trifoliolate, rarely 5-foliolate; leaflets elliptic to ovate, 6-9 x 3.5-5 cm, apex obtusely acuminate, base rounded, coriaceous, glossy above; petiolules stout, 0.5 cm long; nerves 3-5 pairs, reticulations obscure. Panicles much branched and spreading; bracts scaly, minute. Flowers bisexual, 6-6.5 mm long. Sepals orbicular-obtuse, 1.5-2 x 0.75-1 mm, keeled, both sides covered with densely appressed tomentum. Petals fleshy, linear, 5.5-6 x 1 mm, margin wavy, both sides densely appressed tomentose. Stamens 10, 5' shorter and sterile, connate at the base, filaments sparsely glandular-pubescent. Ovary and half of the style densely pilose; style slender; stigma capitate.

Fl. & Fr. : Sept. - March.

Distrib. India : Andaman & Nicobar Islands.

2. *Connarus kingii* Schellenb. in Candollea 2: 96. 1925; Vasud. in J. Econ. Tax. Bot. 8: 121. 1986. *C. gibbosus* Wallich ex King in J. As Soc. Bengal 66: 6. 1897. (*non* Wallich ex Hook.f., 1876.)

Shrubs, semi scandent; branches densely verrucose, lenticelled, distinctly rusty puberulous. Leaves imparipinnate, 1-3-jugate; rachis 4.5-11 cm long, caducous, younger ones puberulous, glabrous on maturity; leaflets elliptic to elliptic-oblong, 8-15 x 4-7 cm, apex acute-acuminate, rigid papery, upper surface glabrous, waxy; main nerves 4-6 pairs, curved up to margin with indistinct reticulation. Inflorescence terminal, densely branched, many-flowered; rachis adpressedly tomentose, bracts scaly. Flowers bisexual, *ca* 6.5 mm long. Sepals ovate to obovate, *ca* 3 x 1.5 mm, dorsal surface densely tomentose, basally subglabrous glandular. Petals linear, *ca* 6 x 1.5 mm, glabrous, glandular. Stamens *ca* 4.5 mm long, connate at the base only; filaments with scattered glands at the base. Fruits 3.5-4 x 2 cm, laterally compressed, oblique, stalked, apex rounded, apiculate; pericarp woody with oblique striations on the outer surface, sparsely short pubescent within. Seeds 2-2.3 x 1.5 cm, testa hard, basally arillate.



Fig. 117. *Connarus andamanicus* Mondal : a. Habit; b. Flower; c. Stamens and pistil.

Fl. & Fr. : Jan. - March (next year).

Distrib. India : Andaman & Nicobar Islands and Manipur.

Myanmar.

3. *Connarus monocarpus* L., Sp. Pl. 675. 1753; Hook.f., Fl. Brit. India 2: 50. 1876; Schellenb. in Engl., Das Pflanzenr. 103: 284. 1938.

Scandent shrubs, up to 5 m tall or lianas, up to 25 (-40) m; outer bark striate-reticulate, minutely pustular with numerous lenticels; young branches glabrous or ferruginous-tomentose. Leaves 1-4-jugate, obscurely pulvinate and wrinkled at the base; leaflets ovate-oblong or ovate-elliptic to lanceolate, 4-14 x 2.5-7 cm, apex caudate-acuminate, often twisted, cuneate, obtuse or rounded to subcordate at base, glabrous, shiny on the upper surface, pale with many, minute, brown scales beneath, juveniles flush coppery brown; nerves 3-8 pairs, venation inconspicuously or distinctly reticulate; petiolules up to 5 mm long. Flowers in terminal, erect, irregularly pyramidal paniculate cymes, ferruginous tomentose; bracts less than 1 mm long. Sepals narrowly triangular or ovate-oblong, 2-3.5 x 1.25-1.5 mm, outer surface densely pubescent or puberulous, margin ciliate. Petals linear-oblong, 6-10 mm long, cuneate to tapering at base, acute to slightly rounded at apex, densely minutely tomentose or pubescent, a few stipitate glands present on the inner surface, margin ciliate. Stamens in 2 whorls; outer whorl antisealous, up to 8 mm long; inner shorter, up to 2 mm long, all fertile or inner sterile. Ovary globose-subglobose, densely pubescent, brownish; style slender. Follicles obliquely ellipsoid-fusiform, compressed, 3-5 x 1-2 cm, apiculate, tapering below into a narrow stalk, surrounded at the base by the persistent calyx and petals; pericarp leathery, naviculate, outer surface with longitudinal striations, glabrous or densely pubescent within, pale yellow. Seed single, ovoid, 2 x 1.2 cm, compressed, reniform, shining, with lobed aril at the base.

KEY TO THE SUBSPECIES

- 1a. Lianas, up to 25 (-40) m; young branches glabrous; leaves 2-4-jugate; leaflets ovate-elliptic to lanceolate; venation inconspicuously reticulate; sepals up to 2 mm long; valves of follicles densely pubescent within

3.1. ssp. *malayensis*

- b. Scandent shrubs, up to 5 m; young branches ferruginous-tomentose; leaves 1-2-jugate; leaflets ovate-oblong; venation distinctly reticulate; sepals 3-3.5 mm long; valves of follicles glabrous within

3.2. ssp. monocarpus

3.1. ssp. malayensis Leenh. in Fl. Males. Ser 1, 5: 538. 1958. *C. oligophyllus* Wallich ex Planchon in Linnaea 23: 427. 1850; Hook.f., Fl. Brit. India 2: 53. 1876. *C. maingayi* Hook.f., Fl. Brit. India 2: 53. 1876.

Fl. & Fr. : Jan. - April (next year).

Distrib. India : Nicobar Islands.

Malesia.

Uses. Fruit pulp is used in eye-troubles. Roots yield oil which is applied to swellings. Bark and wood find use in the treatment of ulcers. Seeds yield a fatty oil.

3.2. ssp. monocarpus

Fl. & Fr. : Dec. - April (next year).

Distrib. India : Maharashtra, Karnataka, Tamil Nadu and Kerala.

Sri Lanka.

4. Connarus nicobaricus King, in J. As. Soc. Bengal 66: 6. 1897.

Fig. 118.

Lianas; all parts except the inflorescence glabrous; young branches with pale smooth bark. Leaves 1-2-jugate, 20-25 cm long; leaflets broadly ovate, 7-12 x 3.8-7.25 cm, with a very short blunt apex, the base broad and rounded, thinly coriaceous, upper surface shining, the lower pale; nerves, 6-7 pairs, faint, curving upwards; terminal leaflets larger; petiolules about 0.75 cm long. Inflorescence a terminal, sometimes axillary panicle, as long as the leaves, rusty pubescent; flowering branches suberect. Flowers crowded near the ends of the branchlets, ca 1 cm long on a short pedicel. Sepals linear, 2-2.5 mm



Fig. 118. *Connarus nicobaricus* King : **a.** Habit; **b.** Flower; **c.** Stamens and pistil.

long, outer surface tomentose, inner glabrous. Petals linear, 6-8 mm long, pubescent on both surfaces. Stamens 10, in two whorls, much shorter than the style and petals; filaments sparsely pubescent, swollen near the base. Pistil as long as the petals; ovary broadly ovoid, tomentose; style sparsely pubescent; stigma sub capitate. Follicles broad, slightly compressed, obtuse; 3.75-4.5 x 2.5 cm; pericarp thick, outer surface faintly longitudinally striate, pubescent within.

Fl. & Fr. : Sept. - May.

Distrib. India : Andaman & Nicobar islands. Endemic.

Note. A rare and endangered species, represented by only a few old collections in CAL.

5. *Connarus paniculatus* Roxb., Fl. Ind. 3: 139. 1832; Hook.f., Fl. Brit. India 2: 52. 1876. Schellenb. in Engl., Das Pflanzenr. 103: 260. 1938.

Large lianas; bark rough, branchlets minutely ferruginous tomentose at the apex only, early glabrescent. Leaves 2-3-jugate, glabrous; leaflets oblong to lanceolate, 10-16 x 3.5-6 cm, apex blunt to obtusely acuminate, base rounded, to obtuse; chartaceous to coriaceous; nerves 5-6 pairs, curved; veins inconspicuous; petiolules 0.5 cm long. Panicles pyramidal, up to 30 cm long, densely rusty tomentose, glabrescent; bracts minute. Sepals elliptic to obovate, ca 4 x 1-1.5 mm, obtuse, obscurely keeled, outer surface densely rusty pubescent, inner surface glabrous. Petals lanceolate-spathulate, ca 8 mm long, obtuse, densely to sparsely pubescent or tomentose on both sides. Stamens united at the base, all fertile. Follicles ovoid, slightly compressed, 3-4 x 1-1.25 cm, narrowed at base; stipe 4 mm long, beak lateral; pericarp thin, outer surface striato-granulate, densely short pubescent within.

Fl. & Fr. : Oct. - May.

Distrib. India : Assam, Arunachal Pradesh, Meghalaya, Mizoram, Tripura, Andhra Pradesh, Karnataka, Kerala and Andaman Islands.

Bangladesh, S. China, Indo-China and Malay Peninsula

Uses : Seeds yield an oil suitable for soap making.

6. *Connarus parameswaranii* Ramamurthy et Rajan in J. Bombay Nat. Hist. Soc. 85: 390-391. 1988.

Lianas; branches spreading, densely stellate-plumose, brownish velvety, greyish on maturity, warted and lenticelled. Leaves 1-2-jugate; rachis 5-13 cm long, brownish velvety; leaflets ovate to obovate, 4-14 x 3-7 cm, apex abruptly acuminate, base rounded, rarely narrow, coriaceous, leathery; nerves 4-7 pairs, ascending, jointed near the margin with inconspicuous reticulation above, distinct in abaxial surface, midrib brownish hairy; petiolules 3-4 mm long, densely tomentose. Panicles 16-17 cm long, terminal, brownish velvety with numerous flowers; bracts subulate, lanceolate, densely pubescent on outer surface only. Sepals linear, 4-5 x 1-2 mm, connate at the base, persistent. Petals linear, 4-5 x 1-2 mm long, glabrous. Stamens 10, connate at the base, epipetalous with short filaments. Pistil 1; ovary hairy; style slender; stigma capitate. Follicles ellipsoid, oblique, inflated, stipitate, beaked; pericarp brownish tomentose within. Seed solitary, arillate at the base.

Fl. & Fr. : Jan. - May.

Distrib. : India : Kerala.

7. *Connarus planchonianus* Schellenb. in Kew Bull. 1927: 375. 1927; Leenh. in Fl. Males. Ser. 1, 5: 528. 1958; Hore in Bull. Bot. Surv. India 26: 21. 1984; Lakshimn. in Hajra *et al.*, Fl. Andaman-Nicobar Isls. 1: 351. 1999. *C. grandis* Hook.f., Fl. Brit. India 2: 153. 1876 (*non* Jack, 1822).

Large lianas, rarely shrubs or small trees, up to 2.5 m tall; branches minutely tomentose, turning glabrous with age. Leaves 1-2-jugate, imparipinnate, 5-foliate, glabrous; leaflets elliptic or oblong-lanceolate, 10-30 x 3.5-12 cm, apex obtuse to obtusely acuminate, cuneate or rounded at base, coriaceous; nerves 8-14 pairs, slightly curved, veins conspicuous, transverse to the midrib; petiolules up to 1.8 cm long. Inflorescence terminal or axillary panicles, up to 40 cm long, densely ferruginous tomentose; bracts minute, scale like. Sepals elliptic-lanceolate, ca 3 x 1.5 mm, obtuse or acute, not keeled, outer surface densely tomentose, inner surface minutely pubescent. Petals lanceolate-spathulate, ca 6 mm long, obtuse, glabrous, punctate. Stamens united up to 1 mm towards

base; filaments glandular-pubescent. Follicles ellipsoid-obovoid, *ca* 6 x 3 cm, compressed; stipe up to 1.5 cm long, beak apical, inconspicuous; pericarp woody, coarsely wrinkled obliquely, outer surface glabrous, sparsely pubescent within.

Fl. & Fr. : May - April.

Distrib. India : In littoral forests and the road side slopes. Great Nicobar Islands. Rare.

Malesia.

8. *Connarus sclerocarpus* (Wight & Arn.) Schellenb. in *Candollea* 2: 98. 1925. *Rourea sclerocarpa* Wight & Arn., *Prodr. Fl. Ind. Or.* 1: 262. 1834.; Schellenb. in *Engl., Das Pflanzenr.* 103: 253. 1938.

Scandent shrubs, with rusty pubescent, drooping, lenticelled branches. Leaves 1-2-jugate, 5-12 cm long, glabrous; leaflets ovate to subovate, 6-15 x 3-8 cm, apex abruptly shortly acuminate, base rounded, coriaceous; main nerves 4-5 pairs, confluent with the margin, thinly transversely reticulate. Panicles *ca* 15 cm long, terminal; rachis tomentose. Flowers numerous. Sepals 3.5 x 2 mm, acute, thickly coriaceous, outer surface tomentose, inner surface glabrous, glandular-punctate. Petals 8 x 1.5 mm, acute, outer surface tomentose, inner surface glabrous. Stamens 10, all fertile; filaments glandular. Follicles oblong, 5 x 2.5 cm, laterally compressed, obliquely apiculate; stipe 1 cm long, deeply contracted; pericarp thick, outer surface glabrous, woody, valves woolly inside. Seeds solitary, arillate.

Fl. & Fr. : Nov. - April.

Distrib. India : Karnataka, Tamil Nadu and Kerala.

9. *Connarus semidecandrus* Jack. in *Mal. Misc.* 2: 39. 1822; Hook.f., *Fl. Brit. India* 2: 52. 1876; Leenh. in *Fl. Males. Ser.* 1. 5: 534. 1958. *C. gibbosus* Wallich ex Hook.f., *Fl. Brit. India* 2: 52. 1876 *p.p.* *C. griffithii* Hook.f., *Fl. Brit. India* 2: 52. 1876. *C. ellipticus* King in *J. As. Soc. Bengal* 66: 7. 1897.

Lianas or large scandent shrubs; young branchlets rusty puberulous, verrucose-lenticellate on maturity. Leaves 1-3-jugate; leaflets elliptic to lanceolate, 4-25 x 2-9 cm, base cuneate to rounded, apex obtuse to obtusely acuminate, thinly coriaceous, glabrous or pubescent beneath on midrib and main nerves; nerves 4-12 pairs; petiolules 2.5-7.5 mm long. Panicles terminal, broad, up to 25 cm long, rusty pubescent, many-flowered; bracts minute. Sepals ovate-elliptic, 2-4 mm long, acute or obtuse, outer surface pubescent, inner surface glabrous. Petals lanceolate to linear, 3-8 mm long, obtuse, outer surface glabrous, sparsely glandular-pubescent within. Stamens united at the base, inner whorl sterile or all fertile, sparsely glandular-pubescent. Follicles oblique-pyriform to semi-ellipsoid, compressed, 1.5-3.75 x 1-2 cm; stipe shortly stalked indistinctly beaked; pericarp thin, outer surface rusty pubescent, brownish, woolly pubescent within.

Fl. & Fr. : Jan. - July.

Distrib. India : Andaman & Nicobar islands.

Thailand, Indo-China and Malesia.

10. *Connarus wightii* Hook.f., Fl. Brit. India 2: 51. 1876. Gamble, Fl. Pres. Madras 273. 1918; Schellenb. in Engl., Das Pflanzenr. 103: 227. 1938. *C. ritchiei* Hook.f., Fl. Brit. India 2: 51. 1876.

Shrubs or medium sized lianas; branches glabrous. Leaves 1-3-jugate; rachis 4-21 cm long, glabrous; leaflets elliptic to oblong-elliptic, 6-12 x 2.5-5 cm, abruptly acuminate with blunt tip, rounded at the base, coriaceous, glabrous; main nerves 5-8 pairs, finely reticulate. Inflorescence terminal or pseudoterminal panicles, rusty pubescent. Flowers crowded, *ca* 5 mm long. Sepals ovate-oblong, 2-3 mm long, obtuse, both sides tomentose. Petals *ca* 6 mm long, obtuse, outer surface puberulous inside, glandular, punctate. Follicle 3.5 x 2 cm, compressed, narrowed at the base, slightly oblique; stipe about 5 mm long, shining; pericarp striate on the outer surface, chestnut coloured, narrowly keeled at the sutures, valves glabrous within. Seeds shining black with an aril.

Fl. & Fr. : Oct. - May.

Distrib. India : Western Ghats, in evergreen forests up to 400 m. Maharashtra, Karnataka, Tamil Nadu and Kerala.

3. *Ellipanthus* Hook.f.

Shrubs or small trees. Leaves unifoliolate, entire. Flowers in short axillary, racemes or clusters, 5-merous, protandrous, bisexual or unisexual, and then plants dioecious; bracts caducous. Sepals valvate, outer surface pilose. Petals free, creamy white. Stamens 10, twice as long as petals, united at the base, inner whorl staminodial, much smaller; tube glabrous outside, pubescent within. Carpel 1, pubescent; ovary flattened, ovoid; style short; stigma disc shaped to bilobed. Fruit densely tomentose, yellowish to brownish when ripe, apex shortly pointed, stipitate, with persistent calyx. Seed 1, flattend; arillode yellowish orange, deeply lobed covering the basal part; endosperm thick, hard.

Tropical Africa, Madagascar, Sri Lanka, continental S.E. Asia and Malesia; *ca* 10 species, 2 in India.

KEY TO THE SPECIES

- 1a. Leaves glabrous on both surfaces; inflorescence axillary raceme 1. *E. calophyllus*
 b. Leaves tomentose on under surface; inflorescence glomerulous 2. *E. tomentosus* ssp. *tomentosus*

1. *Ellipanthus calophyllus* Kurz in J. As. Soc. Bengal 41: 305. 1872; Hook.f., Fl. Brit. India 2: 55. 1876; Parkinson, For. Fl. Andaman Isls. 144. 1923. **Fig. 119.**

Small trees, 6-10 m tall; branchlets and buds pubescent. Leaves entire, elliptic-lanceolate to ovate-lanceolate, 10-18 x 5-6.25 cm, gradually narrowed to the obtusely acuminate apex, coriaceous, pale, glabrous; venation finely reticulate; nerves 6-7 pairs; petioles 1.5-2.25 cm long, slender, articulated near the leaf base. Racemes up to 2.5 cm long, densely pubescent. Flowers small. Sepals 5, linear-oblong, 1.5-2.5 mm long. Petals 5, 5-6 mm long, densely pubescent. Stamens 10, 5 non fertile. Fruits obovoid-ellipsoid, 2-2.5 x 2 cm, subacute; pericarp densely velvety tomentose on the outer surface.

Fl. & Fr. : March - July.

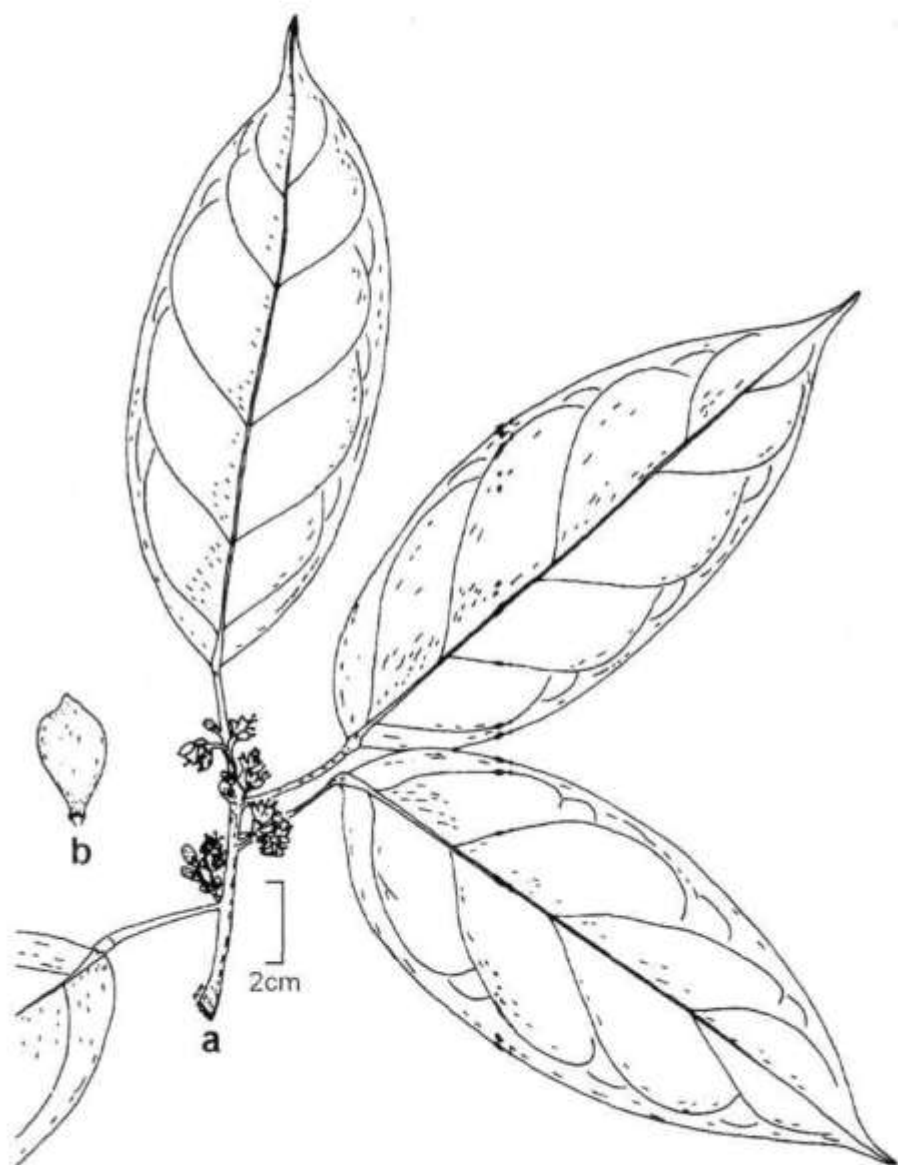


Fig. 119. *Eillipanthus calophyllus* Kurz : a. Habit; b. A fruit.

Distrib. India : Andaman islands. Endemic.

2. *Ellipanthus tomentosus* Kurz, in J. As. Soc. Bengal 41: 305. 1872; Leenh. in Fl. Males. Ser. 1, 5: 521. 1958. Srinivasan in Nair & Henry, Fl. Tamil Nadu 1: 90. 1983. ssp. **tomentosus**.

Shrubs or small trees, rarely tall trees, usually up to 10 m tall; branchlets tomentose, at least when young. Leaves elliptic to lanceolate or obovate, 7-22 x 4-8 cm, apex pointed to obtusely acuminate, base acute to rounded or subpeltate, papyraceous to thinly coriaceous, subglabrous to tomentose below; nerves 5-10 pairs; petiole 0.5-3 cm long. Flowers in axillary clusters on young twigs, white, densely hairy. Sepals ovate or acute, 1.5-2 mm long, inner surface tomentose to glabrous. Petals ovate-oblong to linear, 2-5 x 1-2 mm, obtuse, tomentose to pubescent outside, glabrous inside. Fertile stamens pubescent, staminodes glabrous. Ovary strigose; stigma bilobed. Fruits oblique-ovoid, flattened, 2-4 x 0.75-1.25 cm, apex shortly pointed, tomentose; stalk 0.5-3 cm, long. Seeds 12-20 x 6-10 mm, often flattened; arillode obscurely lobed to rounded, covering 1/4 to 1/3 portion at base.

KEY TO THE VARIETIES

- 1a. Fruit stalk 1.25 to 2 cm long; branchlets pubescent when young, glabrous afterwards; leaves 10-22 x 4-8 cm, glabrous below, papyraceous; petiole 0.75-1.5 cm long; nerves not joined near the margin 2.1. var. **gibbosus**
- 1b. Fruit stalk 6-7 mm long; branchlets always tomentose; leaves 8-12 x 3-5 cm, coriaceous, tomentose below; petiole 0.5-0.75 cm long; nerves joined near the margin 2.2. var. **tomentosus**

2.1. var. *gibbosus* (King) Leenh. in Fl. Males. Ser. 1, 5: 523. 1958
Ellipanthus gibbosus King in J. As. Soc. Bengal 66: 10. 1897. *E. halferi* Hook.f
Fl. Brit. India 2: 55. 1876. **Fig. 120.**

Fl. & Fr. : April - Oct.

Distrib : India : Andamans.

Myanmar, Thailand, Indo-China and Malay Peninsula.

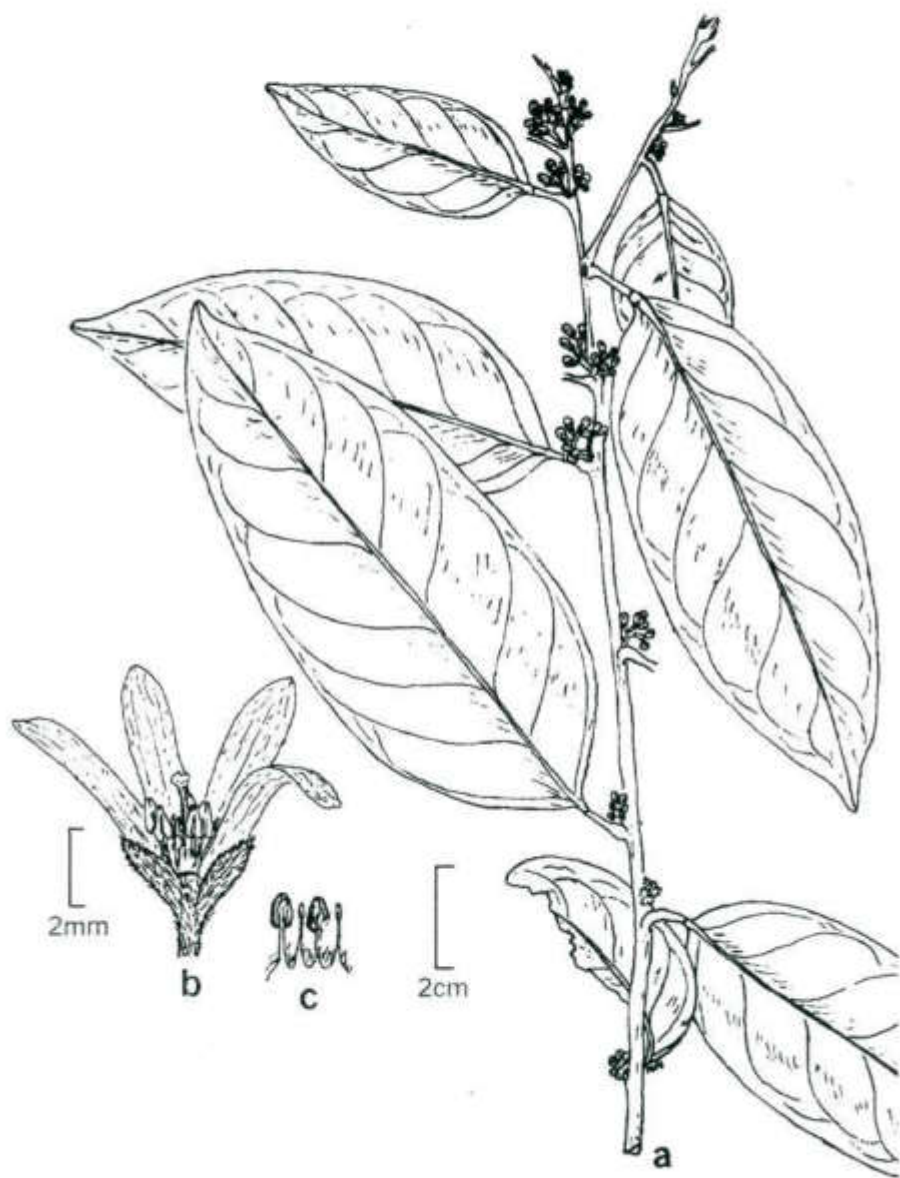


Fig. 120. *Ellipanthus tomentosus* Kurz ssp. *tomentosus* var. *gibbosus* (King) Leenh. : a. Habit; b. Flower; c. Stamens and staminodes.

2.2. var. tomentosus. *Ellipanthus griffithii* Hook.f. Fl. Brit. India 2. 56. 1876. *E. neglectus* Gamble in Kew Bull. 1917: 26. 1917 & Fl. Pres. Madras 1: 195. 1956 (Repr. ed.).

Mal. *Padappen*

Fl. & Fr. : Throughout the year.

Distrib. : India : upto 650 m in hills of Western Ghats. Kerala. Rare.

Myanmar, Thailand, Cochinchina, Cambodia, Laos and Malesia.

Note : In India it is so far known from the type of *E. neglectus*, collected by Bourdillon in 1895 from Colatoorpolay (Kerala). There are no further collections in the herbarium.

4. *Rourea* Aubl., *nom. cons.*

Lianas, shrubs or small trees. Leaves imparipinnate. Panicles axillary, rarely pseudoterminal, bracteate; bracteoles small, fimbriate. Flowers bisexual, 5-merous. Sepals usually minutely pubescent outside, ciliate along the margin, glabrous on the inner surface, enlarged and clasping the base of the fruit. Petals lanceolate, 2-3 times longer than sepals, glabrous within. Stamens 10, united at base, glabrous, outer whorl longer; filaments filiform. Carpels 5; ovary pubescent or glabrous; style slender; stigma capitate, obscurely 2-lobed. Fruit usually 1 per flower, ellipsoid to ovoid, usually slightly recurved, finely longitudinally striate, opening by a ventral longitudinal slit, rarely pericarp tearing loose irregularly; pericarp thin, coriaceous to very hard. Seed 1, usually flattened; testa fleshy or seed enveloped by a fleshy arillode; endosperm lacking.

Tropical Central and S. America, Africa, S.E. Asia, N.E. Australia and Melanesia; ca 90-100 species, 3 in India.

KEY TO THE SPECIES

- | | |
|--|--------------------------------|
| 1a. Leaflets 10-25 pairs, up to 3.5 cm long, mimosoid, pubescent | 1. <i>R. mimosoides</i> |
| b. Leaflets 1-6 pairs, 8-15 cm long, glabrous | 2 |
| 2a. Pericarp breaking loose irregularly around base | 3. <i>R. prainiana</i> |
| b. Fruits dehiscing by a ventral slit | 2. <i>R. minor</i> |

1. *Rourea mimosoides* (Vahl) Planchon in *Linnaea* 23: 420. 1850; Leenh. in *Fl. Males. Ser. 1, 5: 517.* 1958. *Conarus mimosoides* Vahl, *Symb.* 3: 87. 1794. *R. villosa* Planchon. in *Linnaea* 23: 422. 1850; Hook.f., *Fl. Brit. India* 2: 48. 1876; *R. concolor* Blume in *Mus. Bot.* 1: 264. 1850; Hook.f., *Fl. Brit. India* 2: 49. 1876. *R. similis* Blume in *Mus. Bot.* 1: 264. 1850; Hook.f., *Fl. Brit. India* 2: 49. 1876. *R. wallichiana* Planchon in *Linnaea* 23: 421. 1850; Hook.f., *Fl. Brit. India* 2: 49. 1876.

Large lianas, up to 50 m tall, rarely an erect shrub with drooping branches; branchlets velvety tomentose. Leaves 10-25-jugate; petiole, rachis and petiolules pubescent; leaflets elliptic to oblong, 1.5-3.5 x 0.5-1.5 cm, apex emarginate or obtuse, base cordate to subcordate, slightly oblique, chartaceous, upper surface shining, lower surface dull and minutely papillose, midrib deeply sunken above; nerves 2-10 pairs, inconspicuous, looped and joined; petiolules up to 0.5 mm long. Inflorescence axillary, each consisting of usually 3 narrow panicles, central one up to 10 cm long, lateral ones shorter, densely hairy, many-flowered. Sepals 1.5-2 mm long, hairy. Petals 3-5 mm long. Fruits narrowly ellipsoid, curved, 1-1.5 x 0.5 cm.

Fl. & Fr. : Jan. - Dec.

Distrib. India : Andaman & Nicobar Islands.

Cambodia, Malesia, Myanmar and Thailand

2. *Rourea minor* (Gaertner) Leenh. in *Fl. Males. Ser. 1, 5: 514.* 1958. *Aegicerus minus* Gaertner, *Fruct.* 1: 216. t. 46. 1788. *Rourea santaloides* Wight & Arn., *Prodr.* 144. 1834; Hook.f., *Fl. Brit. India* 2: 47. 1876. *R. caudata* Planchon in *Linnaea* 23: 419. 1850; Hook.f. *Fl. Brit. India* 2: 48. 1876. *R. commutata* Planchon in *Linnaea* 23: 420. 1850, *nom. illeg.*; Kanjilal *et al.* *Fl. Assam* 2: 2. 1938. *R. pulchella* Planchon in *Linnaea* 23: 419. 1850; Hook.f. *Fl. Brit. India* 2: 48. 1876. *R. acuminata* Hook.f., *Fl. Brit. India* 2: 48. 1876. *R. humilis* Blume, *Mus., Bot.* 1: 262. 1850; Brandis, *Indian Trees* 211. 1906.

Fig. 121.

Large lianas or climbing shrubs. Leaves 3-11-jugate, glabrous, shining; leaflets oblanceolate or ovate to lanceolate, terminal ones sometimes obovate, 4-15 x 2-8 cm, apex caudate-acuminate, rarely acute, sometimes slightly oblique, membranous to coriaceous, smooth and glossy on both sides; base rounded;



Fig. 121. *Rourea minor* (Gaertner) Leenh. : a. Habit; b. Leaves with long acumen.

nerves 4-9 pairs, joined near the margin, reticulation inconspicuous. Inflorescence consisting of 1-5 panicles or racemes, central one up to 20 cm long, others shorter, many-flowered, glabrous. Sepals broadly ovate to orbicular, 2-3.5 mm long, minutely tomentose. Petals oblong, 3-6 mm long, glabrous. Stamens pubescent to glabrous. Fruits oblique, ellipsoid to ovoid, 1-2.5 x 0.5-1.3 cm, mostly acute. Seed 1, with aril.

Fl. & Fr. : Jan. - Dec.

Distrib. India : Assam, Arunachal Pradesh, Meghalaya, Maharashtra, Karnataka, Tamil Nadu, Kerala, and Andaman & Nicobar Islands.

Bangladesh, Sri Lanka and Malesia.

Uses : The branches are used for making ropes. The decoction of roots and wood is used in medicines as bitter tonic, in rheumatism, scurvy, pulmonary complaints, diabetes and as febrifuge. Arils are eaten.

3. *Rourea prainiana* W.S. Talbot, For. Fl. Bombay Pres. Sind. 1: 368. 1909; Leenh. in Fl. Males. Ser. 1, 5: 520. 1938. *Roureopsis scortechinii* King in J. As. Soc. Bengal 66: 16. 1897. *Santaloides prainianum* Schellenb. in Engl., Das Pflanzenz. 103: 127. 1938.

Stout, evergreen, climbing shrubs; branches circinate-coiled, glabrous. Leaves 3-6-jugate, glabrous; leaflets opposite or alternate, oblong-ovate, 5-8 x 1.5-3 cm; obtusely acuminate, usually obtuse at the base, coriaceous, surface glabrous, dull; nerves 4-6 pairs, reticulations obscure; petiolules 2-3 mm long. Inflorescence in fascicles of 4-5 panicles of equal length. Flowers small, long stalked. Sepals orbicular-ovate; outer surface thinly pubescent, inner surface glabrous, 1.7-2.5 cm. Petals obovate, ca 8 mm long. Stamens glabrous. Pistils glabrous; ovary ovoid-conical; stigma shortly lobed. Fruits elliptic-ovoid, 2.5-3 x 1 cm, acute, straight, dehiscing irregularly around the base. Seed 1, with aril.

Fl. & Fr. : Dec. - Aug.

Distrib. India : Maharashtra, Karnataka and Kerala.

Myanmar, Sri Lanka and Malay Peninsula.

INDEX

(Botanical Names)

A

Acer L. 392

acuminatum Wallich ex D. Don 393, 394

caesium (Reinw. ex Blume) Kosterm. 394

caesium Wallich ex Brandis 394, 395

campbellii Hook.f. & Thomson ex Hiern
394, 396, 405

var. *campbellii* 397

var. *serratifolium* Banerji 397

cappadocicum Gleditsch 394, 397, 398

caudatum sensu Hiern 394

caudatum Wallich 394, 399

forma *pectinatum* Hiern 405

hookeri Miq. 393, 400

var. *hookeri* 400

var. *majus* Pax 400, 401

laevigatum Wallich 393, 401, 405

laurinum Hassk. 393, 402

niveum Blume 402

oblongum Wallich ex DC. 393, 402

var. *membranaceum* Banerji 403

var. *microcarpum* Hiern 403

var. *oblongum* 403, 404

osmastonii Gamble 393, 405

pectinatum Wallich ex Pax 394, 405

pentapomicum J.L. Stewart ex Brandis
393, 406

pictum sensu Hiern 397

pinnatinervium Merr. 393, 406

sikkimense Miq. 393, 407

var. *serrulatum* Pax 407

var. *sikkimense* 407

stachyophyllum Hiern 393, 408

sterculiaceum Wallich 394, 408

thomsonii Miq. 393, 409, 410

villosum sensu Wallich 408

var. *thomsonii* (Miq.) Hiern 410

ACERACEAE 392

Aegiceras minus Gaertner 538

Aegiphila viburnifolia A.L. Juss. 83

Aesculus L. 388

assamica Griffith 389

indica (Wallich ex Cambess.) Hook.f. 389,
390

punduana Wallich ex Hiern 389

Allophylus L. 344, 345

aporeticus Voigt ex Kurz 353

chartaceus (Kurz) Radlk. 344, 345, 346

cobbe (L.) Raeusch. 346, 347, 351

forma *aporetica* Hiern 353

forma *distachyus* Hiern 351, 352

forma *glaber* Hiern 351, 352

forma *racemosus* Hiern 346

forma *rheedii* Hiern 349

forma *serratus* (Roxb.) Hiern 349

forma *villosus* (Roxb.) Hiern 353

concanicus Radlk. 345, 348

var. *concanicus* 348

var. *lanceolatus* Gamble 348

dimorphus Radlk. 346, 349

distachyus Radlk. 351

glaber (Roxb.) Boerl. var. *acutissimus*
Radlk. 351, 352

rheedii (Wight) Radlk. 346, 349, 351

- serratus* (Roxb.) Kurz 346, 349, 350
subfalcatus Radlk. 346, 351
 var. *acutissimus* (Radlk.) Mukerjee 351, 352
 var. *distachyus* (DC.) Mukerjee 351, 352
 var. *subfalcatus* 351, 352
triphyllus (Burn.f.) Merr. 346, 352
villosus (Roxb.) Bl. 346, 353
 forma *aporeticus* (Voigt ex Kurz) Mukerjee 353
 forma *villosus* 353, 354
zeylanicus non L. var. *grandifolia* Hiern. 346
- Ampelocissus** Planchon 247, 254
araneosa (Dalz.) Planchon ex Gamble 248, 249, 250
arnottiana Planchon 254, 256
barbata (Wallich) Planchon 248, 251, 252
divaricata (Wallich ex M. Lawson) Planchon 248, 249, 251
eriolada Planchon 262
helferi (M. Lawson) Planchon 248, 253, 254
indica (L.) Planchon 248, 254, 255
jacquemontii (R. Parker) Raizada 322
latifolia (Roxb.) Planchon 248, 256, 257
nervosa (M. Lawson) Planchon 258
rugosa (Wallich) Planchon 248, 258
sikkimensis (M. Lawson) Planchon 248, 259, 260
tomentosa (Roth) Planchon 248, 261
wightiana Shetty & P. Singh 248, 262
- Ampelopsis** A. Rich. ex Michaux 247, 262
glandulosa (Wallich) Momiy. 248, 263, 264
heterophylla Sieb. & Zucc. 263
 var. *hancei* Planchon subvar. *wallichii* Planchon 263
himalayana Royle 302
rubifolia (Wallich) Planchon 248, 263, 265
vitifolia (Boiss.) Planchon 248, 263, 266
- ANACARDIACEAE** 435, 485, 507
Anacardium L. 436, 437
occidentale L. 437, 438
- Anacolosa** Blume 1, 2
densiflora Beddome 2
frutescens (Blume) Blume 2, 4
griffithii Masters 2, 3
ilicoides Masters 2, 3
puberula Kurz 2
 var. *andamanica* King 3
- Aphania danura** Radlk. 371
nicobarica Radlk. 371
rubra Radlk. 371
- Apodytes** E. Meyer ex Arn. 18
andamanica Kurz 20
beddomei Masters 18
benthamiana Wight 18
dimidiata E. Meyer ex Arn. 18
- AQUIFOLIACEAE** 50
Arnicratea grahamii Halle 149
- Arytera** Blume 345, 354
littoralis Blume 354
montana Blume 357
xerocarpa (Blume) Adclb. 354
- B**
Berchemia Necker ex DC. 164 165

- edgeworthii* M. Lawson 165
floribunda (Wallich) Brongn. 165, 166
lineata (L.) DC. 165, 167
Bhesa Ham. ex Arn. 75, 76
indica (Beddome) Ding Hou 77, 78
paniculata Arn. 77
robusta (Roxb.) Ding Hou 77, 79
Blighia sapida Kon. 386
Bouea Meissner 436, 439
burmanica Griffith 439
oppositifolia (Roxb.) Meissner 439
Buchanania Sprengel 436, 440 441
acuminata Turcz. 445
angustifolia Roxb. 441
arborescens (Blume) Blume 440
axillaris (Desr.) Ramamurthy 440, 441
barberi Gamble 440, 442
lanceolata Wight 440, 442
lancifolia Roxb. 440, 443
lanzen Sprengel 440, 442, 443, 444
latifolia Roxb. 443
lucida Blume 440
platyneura Kurz 445
sessilifolia Blume 440, 445
splendens Miq. 440, 445
C
Cansjera A.L. Juss. 39, 40
manillana Blume 41
rheedii J. Gmelin 40
CARDIOPTERIDACEAE 47
Cardiopteris Wallich 47
lobata R. Br. 47
quinqueloba (Hassk.) Hassk. 47, 48
Cardiospermum L. 344, 355
canescens Wallich 355, 356
halicacabum L. 355, 356
var. luridum (Blume) Adelb. 356
microcarpum Kunth 356
Cassine L. 76, 80
albens (Retz.) Kosterm. 80, 81
balae Kosterm. 80, 82
discolor Wallich 129
excelsa Wallich 55
paniculata (Wight & Arn.) Loeb.-Callen 80, 83
viburnifolia (A.L. Juss.) Ding Hou 80, 83
Catha montana G. Don 126
wallichii G. Don 128
Cayratia A.L. Juss. 246, 247, 266, 267, 270, 277, 284, 306, 320
anemonifolia (Zipp. ex Miq.) Suesseng. ex Suesseng. 267, 268
auriculata (Roxb.) Gamble 298
carnosa (Lam.) Gagnepain 275, 276
var. cinerea (Lam.) Gagnepain 275
elongata (Roxb.) Suesseng. ex Suesseng. 283
geniculata (Blume) Gagnepain 267, 268
japonica (Thunb.) Gagnepain 267, 269
var. mollis (Wallich ex M. Lawson) Momiy. 269
mollissima (Wallich) Gagnepain 267, 270
pedata (Lam.) Gagnepain 267, 271
var. glabra Gamble 272
var. pedata 272
roxburghii Gagnepain 267, 272, 273, 274,
tenuifolia (Wight & Arn.) Gagnepain 267, 270
trifolia (L.) Domin 267, 275

var. *cinerea* (Lam.) Babu 275

wrayi (King) Gagnepain 267, 277

Ceanothus asiaticus L. 169

nepalensis Wallich 187

triqueter Wallich 195

CELASTRACEAE 75

Celastrus L. 75, 84

Celastrus championii Benth 87

championii King 86

emarginatus Willd. 120

heyneana Roth 122

hindsii Benth. 84, 85

hookeri Prain. 84, 85

listeri Prain 123

membranifolius Prain 84, 86

monospermoides Loes. 84, 86

monospermus Roxb. 84, 87

opposita Wallich 134

ovatus Wallich ex Wight & Arn. 123

paniculatus Willd. 84, 87, 88

robustus Roxb. 79

rufa Wallich 125

senegalensis Lam. 126

spinosa Royle. 125

stylosa sensu M. Lawson 85

stylosus Wallich. 84, 89

venulosus Wallich 85

Champereia Griffith 39, 41

griffithiana Planchon ex Kurz 41

manillana (Blume) Merr. 41, 42

Choerospondias Burt. 436, 446

auriculata D. Chandra 446, 447

axillaris (Roxb.) Burt. & Hill. 446, 448

Cissus L. 246, 247, 267, 277, 284, 294,

298, 306

adnata auct. non Roxb. 280

adnata Roxb. 279, 281

angustifolia Roxb. 309

araneosa Dalz. 249

aristata Blume 279, 280

arnottiana Shetty & P. Singh 278, 281,

293, 297

assamica (M. Lawson) Craib 279, 282

auriculata Roxb. 298

carnosa Lam. 275

cinerea Lam. 275

cordata Roxb. 290

discolor Blume 278, 282

edulis Dalz. 288

elongata Roxb. 279, 283, 285

subsp. *elongata* 284, 285

subsp. *littoralis* (W.A. Talbot) Shetty &

P. Singh 284

feminea Roxb. 273

geniculata Blume 268

gigantea Beddome 287

glauca Roxb. 290

glauca sensu Gamble 287

glyptocarpa Thwaites 278, 285, 286

heyneana Planchon 278, 285

japonica (Thunb.) Willd. 269

javana DC. 282, 283

lanceolaria Roxb. 314

latifolia Lam. 279, 287

leucostaphyla Dennst. 314

muricata Dalz. 314

nepaulensis DC. 319

nilagirica Miq. 315

nodosa Blume 278, 288

pallida sensu Planchon 281, 297

- pedata* Lam. 271
pyrrhodasys Miq. 280
quadrangularis L. 278, 288
repanda Vahl 279, 290
repens Lam. 278, 290, 291
rosea (Royle) Walp. 290
rotundifolia Vahl 297
roxburghii Planchon 273
serrulata Roxb 319
setosa Roxb. 300
simplex Blanco 280
spectabilis (Kurz) Planchon 278, 292
subramanyamii Shetty & P. Singh 278, 293
tenuifolia. (Wight & Arn.) Heyne ex Planchon 273
thomsonii (M. Lawson) Planchon 305
thwaitesii Planchon 285
trifolia (L.) K. Schum. 275, 276
trilobata Lam. 273, 279, 293, 295
vitifolia Boiss. 266
vitiginea L. 278, 279, 294
wightii Planchon 287
woodrowii (Stapf ex T. Cooke) Santapau 278, 296
- Cnestis** A.L. Juss. 520
Cnestis palala (Lour.) Merr. ssp. *palala* 520
 var. *brevistylis* Mondal 521, 522
 var. *palala* 521
ramiflora Griffith 520
- Codiocarpus** Howard 18, 19
andamanicus (Kurz) Howard 20, 21
- Colletia cruciata** Gillies ex Hook. 245
- Colubrina** A. Rich. ex Brongn. 164, 168
asiatica (L.) Brongn. 169, 170
 var. *asiatica* 169
travancorica Beddome 169, 171, 172
- Columella japonica* (Thunb.) Merr. 269
mollissima (Wallich) Merr. 270
pedata Lour. 271
- Coniogeiton arborescens* Blume 440
- CONNARACEAE** 519
- Connarus** L. 520, 523
andamanicus Mondal 523, 524, 525
ellipticus King 531
gibbosus Wallich ex Hook.f. 531
gibbosus Wallich ex King 524
grandis Hook.f. 530
griffithii Hook.f. 531
kingii Schellenb. 523, 524
maingayi Hook.f. 527
mimosoides Vahl 538
monocarpus L. 523, 526
 ssp. *malayensis* Leenh. 526, 527
 ssp. *monocarpus* 527
nicobaricus King 523, 527, 528
oligophyllus Wallich ex Planchon 527
paniculatus Roxb. 524, 529
parameswaranii Ramamurthy et Rajan 523, 530
planchonianus Schellenb. 523, 530
ritchiei Hook.f. 532
sclerocarpus (Wight & Arn.) Schellenb. 523, 531
semidecandrus Jack. 524, 531
wightii Hook.f. 523, 532
- Coriaria** L. 511
nepalensis Wallich 511, 512, 513
terminalis auct. Sprague 514
terminalis Hemsley 512

var. *terminalis* 514

var. *xanthocarpa* Rehder & Wilson 514

longaeva Saporta 514

CORIARIACEAE 511

Cotinus Miller 437, 448

coggyria Scop. 449, 450

kanaka (De) Chandra 449

Cubilia 343

Cupania Plum. 345, 356

adenophylla Planchon ex Hook.f. 354

anacardiodes A. Rich. 386

glabrata Kurz 385

helferi Hiern 375

jackiana Hiern 357

lessertiana Cambess. 375

pentapetala Wight & Arn. 375

sumatrana Miq. 375

Cyphostemma (Planchon) Alston 247, 278, 297, 306

auriculatum (Roxb.) P. Singh & Shetty 298, 299

setosum (Roxb.) Alston 298, 300, 301

Cupaniopsis anacardioides (A. Rich.) Radlk. 386

D

Dalrympelea ponifera Roxb. 418

Dialium coromandelicum Houtt. 463

Dimocarpus Lour. 345, 357

longan Lour. 358

Dittelasma Hook.f. 344, 359

rarak (DC.) Hook.f. 359

Dobinea Hamilt. 436, 451

vulgaris Buch.-Ham. ex D. Don 451

Dodonaea L. 344, 359, 360

angustifolia L.f. 360

viseosa Jacq. 360, 361, 362

var. *angustifolia* Benth. 360

Dracontomelon Blume 436, 452

dao (Blanco) Merr. & Rolfe 452, 453

mangiferum Blume 452

Drimycarpus Hook.f. 436, 452, 454

racemosus (Roxb.) Hook.f. 454, 455

Dysoxylum binectarifarum 386

E

Ehretia umbellulata Wallich 70

Elaeodendron glaucum (Rottb.) Pers. 82

glaucum sensu M. Lawson 80, 83

paniculatum Wight & Arn. 83

subrotundum King 83

Ellipanthus Hook.f. 520, 533

calophyllus Kurz 533, 534

gibbosus King 535

griffithii Hook.f. 537

helferi Hook.f. 535

neglectus Gamble 537

tomentosus Kurz ssp. *tomentosus* 533

var. *gibbosus* (King) Leenh. 535, 536

var. *tomentosus* 535, 537

Erioglossum edule Blume 369

rubiginosa Blume 369

Erythralium Blume 1, 5

populifolium Masters 5

scandens Blume 5

vagum (Griffith) Masters 5

Euonymus Tour. ex L. 76, 90

amygdalifolius Franch. 92

angulatus Wight 92, 93

assamicus Blakelock 92, 93

attenuatus Wallich ex M. Lawson 91, 94
bullatus Wallich *et* Lodd. 91, 94
calocarpus Kurz 111
cinereus M. Lawson 92, 95
clivicolus W. Smith var. *rongchuensis*
 (Marq. *et* Airy Shaw) Blakelock 92, 95
cochinchinensis Pierre 91, 95
cornutoides Loes. 92, 96
crenulatus Wallich ex Wight & Arn. 91,
 97
dichotomus Heyne ex Wallich 92, 97
echinatus Wallich ex Roxb. 92, 98
fimbriatus Wallich ex Roxb. 92, 98
 var. *fimbriatus* 98, 99
 var. *serratus* Blakelock 98, 99
frigidus Wallich ex Roxb. 92, 99
 var. *elongatus* Cowan & Cowan 99
 var. *frigidus* 99, 100
 var. *wardtii* (W. Smith) Blakelock 99,
 100
glaber Roxb. 92, 100
grandiflorus Wallich ex Roxb. 91, 101
griffithii Kurz 92, 101
hamiltonianus Wallich 91, 102
indicus Wallich ex Heyne 91, 102, 103
javanicus Blume 90, 104
kachinensis Prain 91, 104
lawsonii C.B. Clarke ex Prain 91, 105
macrocarpus Gamble ex Oliver 91, 105
monbeigii W. Smith 110
paniculatus Wight ex M. Lawson 92,
 105
pendulus Wallich ex Roxb. 91, 106
pygmeus W. Smith 92, 106
rongchuensis Marq. *et* Airy Shaw 95

serratifolius Beddome 92, 107
taliensis Loes. 92
theifolius Wallich ex M. Lawson 92, 107
tibeticus W. Smith 91, 108
tingens Wallich 91, 100
vagans Wallich 92, 109
 ssp. *macrophyllus* Kanjilal 109
 ssp. *vagans* 109
viburnoides Prain 91, 109
wardtii W. Smith 100
Euphoria xerocarpa Blume 354

F

Ficus castaneaefolia Roth. 477
Filicium Thwaites ex Benth. & Hook.f. 344,
 361
decipiens (Wight & Arn.) Thwaites 363

G

Ganophyllum Blume 344, 363
falcatum Blume 364
Garcinia paniculata 386
Gluta L. 436, 456
travancorica Beddome 456
usitata (Wallich) Ding Hou 470
Glycyrcarpus racemosus Dalz. 476
Glyptopetalum Thwaites 76, 110
calocarpum (Kurz.) Prain 111
grandiflorum Beddome 111
griffithii Prain 111, 112
lawsonii Gamble 110, 112, 113
zeylanicum Thwaites 111, 114
Gomphandra Wallich ex Lindley 18, 20
andamanica (Kurz.) King 20
axillaris Wallich 25

- comosa* King 22, 23
coriacea Wight 22, 24
polymorpha Wight 22, 25
 var. *acuminata* Wight 25
 var. *angustifolia* Wight 25
 var. *longifolia* Wight 25
 var. *oblongifolia* Wight 25
 var. *ovalifolia* Wight 25
tetrandra (Wallich ex Roxb.) Sleumer 22, 25
Gouania Jacq. 164, 171
andamanica King 173
 var. *andamanica* 173
 var. *brevialata* Bhandari & Bhansali 173, 174
leptostachya DC. 173, 174
 var. *leptostachya* 174, 175
 var. *nainitalensis* Bhandari & Bhansali 174, 176
microcarpa DC. 173, 176, 177
napalensis Wallich 173, 176
Gymnosporia acuminata Hook.f. ex M. Lawson 123
bailadillana Narayan. & Mooney 119
championii Dunn 120
emarginata (Willd.) Thwaites 120
falconeri M. Lawson 121
 var. *kanjilalli* Raizada 122
gibsonii Kurz 122
heyneana Wight & Arn. 122
konkanensis W.S. Talbot 124
montana (Roth) Benth. 126
neglecta Wallich ex M. Lawson 89
ovata Wallich ex M. Lawson 123
puberula M. Lawson 124

- rothiana* Wight & Arn. 124
royleana Wallich ex M. Lawson 125
rufa (Wallich) M. Lawson 125
salicifolia M. Lawson 127
sikkimensis Prain 127
thomsonii Kurz 127
wallichiana Spreng. ex Wight & Arn. 128

II

- Harpullia** Roxb. 344, 364
arborea (Blanco) Radlk. 365, 366
cupanoides Roxb. 365
cupanoides auct. non Roxb. 365
Helinus E. Meyer ex Endl. 164, 178
lanceolatus Brandis 179
 var. *lanceolatus* 179
 var. *tomentella* Beddome ex Bhandari & Bhansali 179, 180
Hemigyrosa canescens Blume 372
deficiens Beddome 372
HIPPOCASIANACEAE 388
HIPOCRATEACEAE 138
Hippocratea andamanica King 139
arborea Roxb. 147
arnottiana Wight 140
bourdillonii Gamble 140
cumingii M. Lawson 141
ding-houi T. Chakrab. & Gang. 141
grahamii Wight 147
indica Willd. 149
majumdarü T. Chakrab. & Gang. 158
nicobarica Kurz 160
obtusifolia Roxb. 141
parkinsonii T. Chakrab. & Gang. 144
pauciflora DC. 144

- serrata* Griffith 146
- Holigarna** Buch.-Ham. 436, 456
- arnottiana* Hook.f. 457, 458
- beddomei* Hook.f. 457, 459
- ferruginea* Marchand 457, 459
- grahamii* (Wight) Kurz 457, 460
- grahamii* Hook.f. 460
- kurzii* King 457, 461
- longifolia* Roxb. 457, 461
- longifolia* Wight & Arn. 457
- nigra* Bourd. 457, 462
- racemosa* Roxb. 454
- wightii* Balakr. 460
- Hovenia** Thunb. 164, 180
- dulcis* Thunb. 180, 181
- Hyperanthera peregrina* Forssk. 518
- I**
- ICACINACEAE** 17, 26
- Ilex** L. 50
- aquifolium* L. 74
- crenata* Thunb. var. *thomsonii* (Hook.)
Loes. 52
- denticulata* Wallich ex Wight 52, 53
- dipyrena* Wallich 52, 54
- doniana* DC. 55
- embelioides* Hook.f. 51, 54
- excelsa* (Wallich) Hook.f. 51, 55
- fragilis* Hook.f. 51, 56
- gardneriana* Wight 51, 57
- georgei* Comber 51, 57
- godajam* Wallich ex Hook.f. 51, 58
- var. *sulcata* (Wallich ex Hook.f.) Kurz
70
- griffithii* Hook.f. 69
- hookeri* King 52, 59
- insignis* Hook.f. 52, 59, 60
- intricata* Hook.f. 52, 61
- khasiana* Purakayastha 51, 61, 62
- longicaudata* Comber 51, 63
- malabarica* Beddome 51, 63
- nothofagifolia* Ward 52, 64
- odorata* Buch.-Ham. ex D. Don 51, 64,
65
- odorata* Hook.f. 66, 68
- opaca* Ait. 74
- pernyi* Franch. var. *manipurensis* Loes.
57
- pseudo-odorata* Loes. 52, 66, 67
- sikkimensis* Kurz 52, 68
- sulcata* Wallich ex Hook.f. 70
- tadiandamolense* Murty *et al.* 51, 69
- theaeifolia* Hook.f. 64
- thomsonii* Hook.f. 52
- triflora* Blume 52, 69
- umbellulata* (Wallich) Loes. 51, 58, 70
- venulosa* Hook.f. 51, 71
- var. *simplicifrons* Hu 71
- var. *venulosa* 71, 72
- walkeri* Wight & Gard. ex Thwaites 52,
72
- wattii* Loes. 52, 72
- wightiana* Wallich. ex Wight 52, 73
- var. *peninsularis* Hook.f. 73
- var. *wightiana* 73
- Iodes** Blume 18, 26
- cirrhusa* Turcz. 26
- hookeriana* Baillon 26, 27
- oblonga* Planchon ex Masters 27
- ovalis* Blume 26, 28

- Irna glabra* Blume 379, 380
tomentosa Blume 379
tomentosa Kurz 380

J

- Johnia salacioides* Roxb. 162
Juglans regia 391

K

- Koelreuteria paniculata* Laxm. 387
Kokoona Thwaites 75, 76, 114
littoralis M. Lawson 114, 115
zeylanica Thwaites 114, 115
Kurrimia bipartita M. Lawson 77
indica Gamble 77
maingayi M. Lawson 79
paniculata Wallich ex Arn. 77
pulcherrima Wallich 79

L

- Lannea* A. Rich. 437, 462
coromandelica (Houtt.) Merr. 463, 464
Lasianthera secundiflora (Blume) Miq. 36
tetrandra Wallich ex Roxb. 25
Leea L. 325
acuminata Wallich ex C.B. Clarke 336
aequata L. 325, 326, 327
alata Edgew. 326, 328, 329
angulata Korth. ex Miq. 326, 330, 331
asiatica (L.) Ridsdale 326, 330, 333
aspera Edgew. 330
aspera Wallich ex G. Don 339
aurantiaca Zoll. & Mor. 336
bracteata C.B. Clarke 332
brunoniana C.B. Clarke 341

- cinerea* M. Lawson 339
compactiflora Kurz 326, 332, 335
coriacea M. Lawson 339
crispa L. 330
diffusa M. Lawson 339
edgeworthii Santapau 332
grandifolia Kurz 326, 334
guineensis G. Don 326, 336, 342
herbacea Buch-Ham. 330
hirta Roxb. ex Hornem. 330
indica (Burm.f.) Merr. 326, 337, 338
integrifolia Roxb. 339
kurzii C.B. Clarke 326
linearifolia C.B. Clarke 341
macrophylla Roxb. ex Hornem. 326, 339, 340
parallela Wallich ex M. Lawson 339
pumila Kurz 332
robusta Roxb. 339
rubra Blume ex Spreng. 326, 341, 342
sambucina Willd. 337
setuligera C.B. Clarke 326, 341
staphylea auct. non Roxb. 336
talbotii King ex Talbot 339
trifoliata M. Lawson 332
umbraculifera C.B. Clarke 337
venkobarowii Gamble 339
wightii C.B. Clarke 336

LEEACEAE 325

- Lepidopetalum jackiamum* Radlk. 357
montanum (Blume) Radlk. 357
Lepionurus Blume 39, 43
oblongifolius Masters 43
sylvestris Blume 43
Lepisanthes Blume 344, 367

- andamanica** King 368
assamica Radlk. 372
browniana Hiern 372
burmanica Kurz 372
cuneata Hiern 372
erecta (Thwaites) Leenh. 368
listeri King ex Radlk. 372
montana Blume 372
rubiginosa (Roxb.) Leenh. 368, 369, 370
senegalensis (A.L. Juss. ex Poir.) Leenh. 368, 371
tetraphylla (Vahl) Radlk. 368, 372, 373
Litchi 343
chinensis Sonner. 387
ramboutan-ake Labill. 377
Loeseneriella A.C. Smith 138, 139
andamanica (King) Naithani et Sas Biswas 139
arnottiana (Wight) A.C. Smith 139, 140
bourdillonii (Gamble) Raju 139, 140
cumingii (M. Lawson) Ding Hou 139, 141, 142
obtusifolia (Roxb.) A.C. Smith 139, 141, 143
parkinsonii (T. chakrab. & Gang.) B.D. Naithani 139, 144, 145
pauciflora (DC.) A.C. Smith 139, 144
serrata (Griffith) A.C. Smith 139, 146
Lophopetalum Wight & Arn. 76, 115
fimbriatum Wight 116
wallichii Kurz 116
wightianum Arn. 116, 117
M
Mangifera L. 436, 454, 465
andamanica King 465, 469
axillaris Desr. 441
camptosperma Pierre 465, 466
indica L. 465, 466, 467
 khasiana Pierre 465, 468
nicobarica Kosterm. 465, 469
oppositifolia Roxb. 439
pinnata L.f. 507
quadrifida 469
sylvatica Roxb. 465, 469
Mappia foetida (Wight) Miers 31
oblonga Miers 31
ovata Miers 31
tomentosa Miers 31
wightiana Miers 31
Mappianthus hookerianus (Baillon) Sleumer 27
Maytenus Molina 76, 118
bailadillana (Narayan. & Mooney) Raju & Babu 119
championii (Dunn) Raju & Babu 119, 120
emarginata (Willd.) Ding Hou 119, 120
falconeri (M. Lawson) M.A. Rau 119, 121
 var. **falconeri** 121
 var. **kanjilali** (Raizada) M.A. Rau 121, 122
gibsonii (Kurz) Naithani & Sas Biswas 119, 122
heyneana (Roth) Raju & Babu 119, 122
hookeri Loes. 119, 123
kurzii Bennet & Sahn 128
listeri (Prain) Raju & Babu 119, 123
ovatus (Wallich ex Wight & Arn.) Loes. 119, 123

- puberula* (M. Lawson) Loes. 119, 124
rothiana (Wight & Arn.) Bennett & Sahni
 119, 124
royleanus (Wallich ex M. Lawson) M.A.
 Rau 119, 125
rufa (Wallich) Hara 119, 125
 var. *latifolia* Haines 126
 var. *rufa* 126
senegalensis (Lam.) Exell. 119, 126
sikkimensis (Prain) Raju & Babu 119,
 127
simonsii Raju & Babu 119, 127
thomsonii (Kurz) Raju & Babu 119, 127
wallichii (G. Don) 119, 128
- Melanorrhoea** Wallich 436, 470
usitata Wallich 470, 471
- MELIANTHACEAE** 411
- Melianthus** L. 411
major L. 411
- Meliosma** Blume 419, 420
arnottiana (Wight) Walp. 424
dilleniifolia (Wallich ex Wight & Arn.)
 Walp. 420, 421
henryi Diels ssp. *mannii* (Lace) Beus.
 420, 422
mannii Lace 422
pinnata (Roxb.) Maxim. 420, 422
 ssp. *barbulata* (Cufod) Beus. 423
 ssp. *pinnata* 423, 424
pungens (Wallich ex Wight & Arn.) Walp.
 427, 428
rhoifolia Maxim. ssp. *barbulata* Cufod.
 423
simplicifolia (Roxb.) Walp. 420, 425, 426
 ssp. *pungens* (Wallich ex Wight &
 Arn.) Beus. 427
 ssp. *simplicifolia* 425, 427
 ssp. *thomsonii* (King ex Brandis) Beus.
 427, 428
 ssp. *yunnanensis* (Franchet) Beus. 427,
 428
 sumatrana (Jack) Walp. 420, 428
 thomsonii King ex Brandis 425, 428
 wightii Planchon ex Brandis 427
 yunnanensis Franchet 425, 428
- Microtropis** Wallich ex Meissner 76, 128
densiflora Wight 130
discolor (Wallich) Wallich 129
latifolia Wight ex M. Lawson 129, 130
microcarpa Wight 129, 130
 var. *densiflora* (Wight) Meissner &
 Freeman 130
 var. *microcarpa* 130, 131
ovalifolia Wight 130
ramiflora Wight 129, 131, 132
stocksii Gamble 129, 131
wallichiana Wight ex Thwaites 129, 131
- Millingtonia dilleniifolia** Wallich ex Wight
 & Arn. 420
pinnata Roxb. 422
pungens Wallich ex Wight & Arn. 425,
 427
simplifolia Roxb. 425
sumatrana Jack 429
- MIQUELIA** Meissner 18, 28
dentata Beddome 29
kleinii Meissner 29
- Mischocarpus** Blume 344, 345, 374
pentapetalus (Roxb.) Radlk. 375, 376
sundaicus Blume 375
- Modeccopsis vaga** Griff. 5

Moringa Adans. 515*aptera* Gaertner 518*concanensis* Nimmo 515*oleifera* Lam. 515, 516, 517*peregrina* (Forssk.) Fiori 518*pterygosperma* Gaertner 516**MORINGACEAE** 515*Myristica* 503**N****Natsiatum** Buch.-Ham. 18, 30*herpeticum* Buch.-Ham. ex Arn. 30**Nephelium** L. 344, 376*erectum* Thwaites 368*litchi* Cambess. 387*longan* Cambess. 358*mutabile* Blume 377*rambutan-ake* (Labill.) Leenh. 376, 377*stipulaceum* Beddome 378*unicinatum* Radlk. ex Leenh. 377**Nicobariodendron** Vasud. & T. Chakrab. 75, 133*sleumeri* Vasud. & T. Chakrab. 133**Noltea africana** (L.) Endl. 245**Nothapodytes** Blume 18, 31*foetida* (Wight) Sleumer 31*nimmoniana* (Graham) Mabb. 31, 32**Nothopegia** Blume 437, 470*aureofulva* Beddome ex Hook.f. 472*beddomei* Gamble 472, 473var. *beddomei* 473var. *wynaedica* Ellis and Chandra-
sekharan 473*castaneaefolia* (Roth) Ding Hou 477*colebrookiana* (Wight) Blume 472, 474,
475*colebrookiana* Hook.f. 476*heyneana* Hook.f. 474*dalzellii* Gamble 476var. *angustifolia* Gamble 476*heyneana* (Hook.f.) Gamble 472, 474var. *heyneana* 476var. *linearifolia* Chandra & Ghosh 476*racemosa* (Dalz.) Ramamurthy 472, 476*travancorica* Beddome ex Hook.f. 472,
477*vajravelui* Ravikumr & Lakshmanan 472,
477**O****Ochanostachys amentacea** Masters 16*Odina wodier* Roxb. 463**OLACACEAE** I, 12**Olax** L. I, 6*acuminata* Wallich ex Benth. 6*imbricata* Roxb. 6, 7var. *membranifolia* Kurz 7*nana* Wallich ex Benth. 6, 7, 8*scandens* Roxb. 6, 9, 10*wightiana* Wallich ex Wight & Arn. 6, 11var. *bracteata* Masters 11var. *nigrescens* Gamble 11*zeylanica* L. 6, 11**Opilia** Roxb. 39, 44*amentacea* Roxb. 44, 45*manillana* Baillon 41**OPILIACEAE** 39, 44*Ornitrophe serrata* Roxb. 349*villosus* Roxb. 353*Ostodes appendiculata* Hook.f. 372

- Otonephelium** Radlk. 343, 344, 378
stipulaceum (Beddome) Radlk. 378
Otophora paucijuga Hiern 371
- P**
- Paliurus** Miller 164, 182
dao Blanco 452
spina-christi Miller 182
- Parishia** Hook.f. 437, 478
insignis Hook.f. 479, 480
- Parthenocissus** Planchon 247, 263, 302
cuspidifera Planchon 302
himalayana (Royle) Planchon 302
quinquefolia (L.) Planchon 306
semicordata (Wallich) Planchon 302
 var. *roylei* (King) Raizada & Saxena 303, 304
 var. *semicordata* 303, 305
thomsonii (M. Lawson) Planchon 302, 305
tricuspidata (Sieb. & Zucc.) Planchon 306
- Pavia indica* Wallich ex Cambess. 389
- Pegia** Colebr. 436, 479
colebrookiana Wight 474
nitida Colebr. 479
- Peripterygium quinquelobum* Hassk. 47
- Phytolacca asiatica* L. 330
- Pistacia** L. 436, 481
atlantica Desf. ssp. *cabulica* (Stocks) Reichb.f. 481, 483
cabulica Stocks 482
chinensis Bunge ssp. *integerrima* (Stewart) Reichb.f. 482
integerrima Stewart 482
khinjuk Stocks 482, 484
oleosa Lour. 384
- Platea** Blume 18, 33
arborea Blanco 365
latifolia Blume 33
Platystigma myristica R. Br. 33
- Pleurostylia** Wight & Arn. 76, 134
opposita (Wallich) Alston 134, 135
wightii Wight & Arn. 134
- Podameris lanigera** Sims. 245
- Pometia** J.R. & G. Forst. 343, 344, 345, 379
pinnata J.R. & G. Forst. 379
 forma *glabra* (Blume) Jacobs 380
 forma *pinnata* 380
 forma *tomentosa* (Blume) Jacobs 380
tomentosa Kurz 379
- Premna nimmoniana* Graham 31
- Ptelea arborea* Blanco 365
- Puria* Nair 294
Puria trilobata (Lam.) Nair 293
- Pyrenacantha** Wight 18, 34
volubilis Wight 34
- R**
- Reissantia** Halle' 138, 146
arborea (Roxb.) Hara 147
grahamii (Wight) Ding Hou 146, 147, 148
indica (Willd.) Hallé 147, 149
- RHAMNACEAE** 163
- Rhamnus** L. 164, 183
collettii Bhandari & Bhansali 184
lineata L. 167
dahuricus Pallas 184, 185, 186
jujuba L. 233

- myrtina* Burm.f. 207
nepalensis (Wallich) M. Lawson 184, 187, 188
nummularia Burm.f. 236
oenoplia L. 236
parviflora Roemer & Schultes 202
pentapomica R. Parker 184, 189
persica Boiss. 184, 190, 191
persica M. Lawson 189
procumbens Edgew. 184, 190
prostrata Jacq. 184, 192
purandharensis Bhandari & Bhansali 184, 192
purpurea Edgew. 184, 193, 194
thea Osbeck. 204
theezans L. 204
triqeter (Wallich) Brandis 184, 195, 196
wightii Wight & Arn. 184, 197
xylopyrus Retz. 243
Rhus L. 437, 485
acuminata DC. 494
chinensis Miller 486, 487
cobbe L. 346
cotinus L. 449
decipiens Wight & Arn. 363
griffithii Hook.f. 486, 488
himalaica (Hook.f.) Chandra & Mukherjee 485, 488
hookeri Sahni & Bahadur 486, 489
insignis Hook.f. 489
javanica Thunb. 486
kanaka De 449
khasiana Hook.f. 486, 489
mysorensis Don 494
paniculata Wallich ex Don 486, 490
parviflora Roxb. 486, 490, 491
punjabensis Stewart 486, 492, 493
semialata Murray 486
sinuata Thunb. 486, 494
succedanea L. 485, 494
 var. *acuminata* (DC) Hook.f. 494
 var. *himalaica* Hook.f. 488
tomentosus L. 486, 495
wallichii Hook.f. 486, 496, 497
Robergia hirsuta Roxb. 479
Rourea Aubl. 520, 537
acuminata Hook.f. 538
caudata Planchon 538
commutata Planchon 538
concolor Blume 538
humilis Blume 538
mimosoides (Vahl) Planchon 537, 538
minor (Gaertner) Leenh. 537, 538, 539
prainiana W.S. Talbot 537, 540
pulchella Planchon 538
santaloides Wight & Arn. 538
sclerocarpa Wight & Arn. 531
similis Blume 538
villosa Planchon 538
Roureopsis scortechinii King 540
S
Sabia Colebr. 419, 429, 430
campanulata Wallich 430
 var. *campanulata* 430, 431
 var. *kingiana* Nayar & Majumder 431
lanceolata Colebr. 430, 431
 var. *lanceolata* 432
 var. *siamensis* V.D. Water 432
leptandra Hook.f. & Thoms. 430

- limoniacea* Wallich ex Hook.f. & Thoms.
430, 432
- malabarica* Beddome 432
- paniculata* Edgew. ex Hook.f. & Thoms.
430, 433
- parviflora* Wallich 430, 433
- purpurea* Hook.f. & Thoms. 430, 434
- tomentosa* Hook.f. 431
- SABIACEAE** 419, 420
- Sageretia* Brongn. 164, 197
- brandrethiana* Aitch. 198
- coimbatorensis* Bhandari & Bhansali 198,
199
- hamosa* (Wallich) Brongn. 198, 200, 201
- kashmirensis* Bhandari & Bhansali 198,
200
- kishtwarensis* Bhandari & Bhansali 198,
202
- oppositifolia* Brongn. 202
- parviflora* (Roemer & Schultes) G. Don
198, 202, 203
- thea* (Osbeck) Johnst. 198, 204, 205
- theezans* Brongn. 204
- var. *diospyrifolia* M. Lawson 204
- wallichii* Bhandari & Bhansali 198, 200,
206
- Salacia** L. 138, 150
- beddomei* Gamble 151
- brunoniana* Wight & Arn. 151, 152
- chinensis* L. 150, 152
- flavescens* Kurz 157
- floribunda* Wight 151, 153
- fruticosa* Heyne ex M. Lawson 151, 153,
154
- gambleana* Whiting & Kaul 151, 153
- grandiflora* Kurz 150, 155
- jenkinsii* Kurz 150, 155
- khasiana* Purkayastha 150
- korthalsiana* Miq. 151, 156
- latifolia* Wallich ex M. Lawson 152
- longifolia* Hook.f. ex M. Lawson 155
- macrophylla* Blume 150, 157
- macroserma* Wight 151, 157
- majumdarii* (T. Chakrab. & Gang.) B.D.
Naithani 151, 158, 159
- malabarica* Gamble 151, 158
- membranaceae** M. Lawson 150, 158
- nicobarica* (King) Raju 151, 160
- oblonga* Wallich ex Wight & Arn. 151,
160
- ovalis* M. Lawson 157
- platyphylla* Kurz 151, 161
- prinoides* DC. 152
- reticulata* Wight 151, 161
- roxburghii* Wallich ex Wight & Arn. 160,
162
- salacioides* (Roxb.) Rolla Rao & Hemadri
150, 162
- talbotii* Gamble 153
- verrucosa* Wight 151, 162
- Santaloides prainianum* Schellenb. 540
- SAPINDACEAE** 343, 345, 360, 374, 376,
379, 381, 385
- Sapindus** L. 344, 380, 381
- attenuatus* Wallich ex Hiern 371
- bifoliatus* Hiern 371
- danura* Voigt 371
- emarginatus* Vahl 381
- erectus* Hiern 368
- laurifolius* Vahl 382

- var. *emarginatus* (Vahl) Cooke 381
mukorossi Gaertner 382, 383
rarak DC. 359
rubiginosa Roxb. 369
rubra Kurz 371
senegalensis A.L. Juss. ex Poirét 371
tetraphylla Vahl 372
trifolius auct non L. 381
trifolius L. 382
 var. *emarginatus* (Vahl) Radlk. 381
Sarcostigma Wight & Arn. 18, 35
edule Kurz 35
kleinii Wight & Arn. 35
wallichii Baillon 35
Schinus L. 437, 496
terebinthifolius Raddi 498, 499
Schleichera Willd. 344, 384
oleosa (Lour.) Oken. 384
pentapetala Roxb. 375
trijuga Willd. 384
Schmidelia *chartacea* Kurz 346
distachya DC. 351, 352
rheedii Wight 349
Schoepfia Schreb. 1, 12
acuminata Wallich ex DC. 13
albena Retz. 80
fragrans Wallich in Roxb. 12, 13
griffithii Tiegh. ex Steenis 12, 13
jasminodora Sieb. & Zucc. 12, 14
Scutia (DC.) Comm. ex Brongn 164, 207
indica Brongn. 207
myrtina (Burm.f.) Kurz 207
 var. *emarginata* Bhandari & Bhansali
 208
 var. *myrtina* 208, 209
Semecarpus L.f. 436, 454, 498
albescence Kurz 461
anacardium L.f. 500, 501
auriculata Beddome 498, 502
grahamii Wight 460
heterophylla Hook.f. 503
kathalekanensis Dasappa & Swaminath
 500, 502
kurzii Engl. 500, 503
prainii King 500, 503
subpanduriformis Wallich ex Hook.f. 498,
 504
travancorica Beddome 500, 504
Siphonodon Griffith 75, 137
celastrineus Griffith 136, 137
Smythea Seem. ex A. Gray 164, 208, 212
bombaiensis (Dalz.) Banerjee & Mukerjee
 210, 211
calpicarpa Kurz 210, 212, 213, 214, 216
lanceata (Tul.) Summerh. 210, 214, 215,
 216
macrocarpa Hemsley 210, 214
pacifica Seem. 214
Solenocarpus Wight & Arn. 436, 505
indica Wight & Arn. 505, 506
Spondias L. 436, 507
axillaris Roxb. 448
indica (Wight & Arn.) Airy Shaw &
 Forman 505
mangifera Willd. 507
pinnata (L.f.) Kurz 507, 508
Staphylea L. 413
emodi Wallich ex Brandis 414
indica Burm.f. 337
STAPHYLEACEAE 413

Stemonurus Blume. 18, **36**

foetidus Wight 31

frutescens Blume 2

secundiflorus Blume 36, 37

Sterculia villosa 386

Strombosia Blume 1, **14**

ceylanica Gardn. 14

leprosa W.S. Talbot 14

Swintonia Griffith 436, **509**

floribunda Griffith 509

griffithii Kurz 509

helferi Hook.f. 509

Syzygium cumini 33

T

Tapiria hirsuta (Roxb.) Hook.f. 479

Terminalia 389

Tetrastigma (Miq.) Planchon 247, **306**, 316

affine (Gagnepain ex Osm.) Raizada & Saxena **308**

alcicorne Haines 311

andamanicum (King) Suesseng. ex Suesseng. 307, **308**

angustifolium (Roxb.) Planchon 307, **309**

bracteolatum (Wallich) Planchon 307, **310**

campylocarpum (Kurz) Planchon 307, **311**

canarense Gamble 312

corymbosum Long 318

dubium (M. Lawson) Planchon 307, **311**, 312

gamblei Shetty & P. Singh 307, **312**

hookeri (M. Lawson) Planchon 307, **313**

indicum Mallik **319**

lanceolarium Planchon 314, **320**

leucostaphylum (Dennst.) Alston ex Mabb. 307, **314**, 320

leucostaphylum sensu Ramamurthy 315

muricatum Gamble 314, 315

muricatum sensu Gamble 315

nilagiricum (Miq.) Shetty 307, **315**, 320

obovatum Gagnepain 307, **315**, 318

obtectum (Wallich ex M. Lawson)

Planchon ex Franch. 307, **316**

planicaule (Hook.f.) Gagnepain 307, **317**

pyrriforme Gagnepain 318

rumicispermum (M. Lawson) Planchon 307, **318**

serrulatum (Roxb.) Planchon 308, **319**

sulcatum (M. Lawson) Gamble 307, **319**, 320

thomsonianum Planchon ex Balakr. 309

Thyrsanus palala Lour. 520

Trewia nudiflora 389

Triceros cochinchinensis Lour. 415

Trochisandra indica Beddome 77

Turpinia Venetant *nom. cons.* 413, **414**, 415

cochinchinensis (Lour.) Merr. **415**

malabarica Gamble 415, **416**, 417

montana (Blume) Kurz 415, **416**

nepalensis Wight & Arn. 415

pomifera auct Hiern 415

pomifera (Roxb.) DC. 415, **418**

U

Usubis triphyllus Burm.f. 352

V

Vatica lanceifolia 389

Ventilago Gaertner 164, 212, **216**, 219

- bombaiensis* Dalz. 210
calyculata Tul. 217, 219
denticulata Willd. 217, 219
 var. *acuta* Bhandari & Bhansali 218
 var. *bifida* Bhandari & Bhansali 218
 var. *denticulata* 218
gamblei Suesseng. 217, 219
goughii Gambel 217, 220
lanceata Tul. 214
lanceolata Gamble 219
macrantha Tul. 219
madraspatana Gaertner 217, 220
 var. *calyculata* King 217
 var. *fructifida* Santapau 220, 221
 var. *madraspatana* 220, 221
smithiana Tul. 219
sulphurea Tul. 219
ITACEAE 246, 265, 311
itis L. 247, 320
adnata (Roxb.) Wallich 279, 280
affine Gagnepain ex Osm. 308
alcicorne (Haines) Haines. 311
anamalayana Beddome 302
andamanica King 308
anemonifolia Zipp. ex Miq. 267
angustifolia (Roxb.) Wight 309
araneosa (Dalz.) M. Lawson 249
assamica M. Lawson 282
auriculata (Roxb.) Wallich 298
barbata Wallich 251
bracteolata Wallich 310, 312
campylocarpa Kurz 311
canarensis Dalz. 271, 312
capreolata D. Don 319
carnosa (Lam.) Wallich 275
discolor (Blume) Dalz. 282
divaricata Wallich ex M. Lawson 251
dubia M. Lawson 311, 312
elongata (Roxb.) Wallich ex M. Lawson 283
 var. *littoralis* W.A. Talbot 284
eriolada auct. non. Witth & Arn 262
erythroclada Kurz 298
flexuosa Thunb. var. *parifolia* (Roxb.) Gagnepain 321
geniculata (Blume) Miq. 268
gigantea Beddome 287
glandulosa Wallich 263
glauca sensu Wight & Arn. 287
glyptocarpa (Thwaites) M. Lawson 285
helferi M. Lawson 253
heyneana Wallich ex Wight & Arn. 285
heyneana Roemer & Schultes 321, 322
himalayana (Royle) Brandis 302
 var. *semicondata* (Wallich) M. Lawson 302
hookeri M. Lawson 313
indica L. 254
inaequalis Wallich ex Wight & Arn. 282
japonica Thunb. 269
jacquemontii R. Parker 321, 322, 323
labrusca L. 324
lanata Roxb. 321
lanceolaria Wallich ex Wight & Arn. 314
latifolia Roxb. 256
linnaei Wight & Arn. 294
mollis Wallich ex M. Lawson 269
mollissima Wallich 270
muricata Dalz. 315
muricata sensu Wight & Arn. 315

muricata Wight & Arn. 314
neilgherriensis Wight 302
nervosa M. Lawson 258, 259
neurosa Kurz 317
nodosa (Blume) Miq. 288
obovata M. Lawson 315
obtecta Wallich ex M. Lawson 316
oxyphylla Wallich ex Prain 311, 312
pallida sensu M. Lawson 281
parkeri Gagnepain ex Osm. 311
parvifolia Roxb. 321
pedata (Lam.) Wallich ex Wight 271
persica Boiss. 266
planicaulis Hook.f. 317
quadrangularis (L.) Wallich ex Wight
 288
repanda (Vahl) Wight & Arn. 290
repens (Lam.) Wight & Arn. 290
reticulata Thwaites 320
rheedei Wight & Arn. 293
rosea Royle 290
roxburghii M. Lawson 273
roxburghii Wight & Arn. 272, 273
rubifolia Wallich 265
rugosa Wallich 258, 259
rumicisperma M. Lawson 318
semicordata Wallich 302
 var. *roylei* King 303
serratifolia Wight & Arn. 314
sikkimensis M. Lawson 259
spectabilis Kurz 292
setosa (Roxb.) Wallich ex Wight & Arn.
 300
sulcata M. Lawson 319, 320
tenuifolia Wight & Arn. 273

thomsonii M. Lawson 305
tomentosa Roth 261
trifolia L. 275
vinifera L. 324
woodrowii Stapf ex T. Cooke 296
wrayi King 277

X

Xerospermum Blume 344, 385
 glabratum (Kurz) Radlk. 385
 noronhianum auct. Hiern 385
Ximenesia L. 1, 15
 americana L. 15

Z

Ziziphus Tourn. ex Miller 164, 221
 andamanica Bhandari & Bhansali 222,
 223, 224
 apetala Hook.f. 222, 225, 226
 brunoniana Brandis 222, 225
 caracutta Roxb. 222, 227, 228
 floribunda Wallich 165
 funiculosa Buch. - Ham. ex M. Lawson
 223, 227
 glaberrima Santapau 227
 glabra King 223
 glabra Roxb. 223
 glabrata Heyne ex Roth 222, 229
 hamosa Wallich 200
 horrida Roth 222, 230
 incurva Roxb. 223, 230, 231
 jujuba Lam. 235
 var. *fruticosa* Hasines 234
 jujuba (L.) Gaertner 233
 jujuba Miller 222, 232

mauritiana Lam. 222, 233

var. *fructicosa* (Haines) Raizada & Saxena 234

var. *fructicosa* (Haines) Sebest. & Balakr. 234

var. *mauritiana* 234

var. *pedunculata* Bhandari & Bhansali 234

var. *pubescence* Bhandari & Bhansali 234, 235

nummularia (Burm.f.) Wight & Arn. 222, 235, 242

var. *glabrescens* Bhandari & Bhansali 236

var. *nummularia* 236

oenoplia (L.) Miller 222, 236, 237, 239

var. *fasciculata* Bhandari & Bhansali 238

var. *oenoplia* 238

var. *pallens* Bhandari & Bhansali 238

var. *pedicellaris* Bhandari & Bhansali 238, 239

oxyphylla Edgew. 222, 239

var. *oxyphylla* 240

var. *pedicellaris* Bhandari & Bhansali 240

pedicellaris Wallich 239

rugosa Lam. 223, 240

var. *glabra* Bhandari & Bhansali 241

var. *glabrescens* Bhandari & Bhansali 241

var. *rugosa* 241

rotundifolia Lam. 222, 236

sativa Gaertner 232

trinervia Roxb. 229

var. *glabratus* Heyne ex Roth 229

truncata Blatt. & Hallb. 222, 242

vulgaris Lam. 232

williamii Bhandari & Bhansali 223, 242

xylopyra (Retz.) Willd. 222, 243, 244

var. *glaberrima* Sedgew. 227

INDEX

(Common Names)

A

Abin (Garh.) 202
Adavi drakshi (Tel.) 256
Adavi draksha (Tel.) 272
Adavi gummodi (Tel.) 281
Adibaricham (Tam.) 87
Aglaiia (Kum.) 202
Aiiinthetaikkeerai (Tam.) 298
Aijli-badam (Beng.) 437
Ain-kimbel (Asm.) 162
Ainshi (Kan.) 141
Alam (Guj.) 80
Am (Beng.) 466
Amadai (Punj.) 239
Amalbel (Punj.) 275
Amalbel (Hindi) 275
Amallata (Beng.) 275
Amarhlata (Asm.) 282
Amb (Hindi) 466
Ambara (Punj.) 507
Ambatbel (Mar.) 275
Amberi (Mar.) 474
Ambi (Mar.) 466
Ambuj (Beng.) 371
Amdali (Asm.) 454
American Holly (Eng.) 74
Amijour (Sylheti) 454
Amili (Hindi) 167
Amnia (Punj.) 239
Amodo (Or.) 507
Amooni (Mar.) 494

Amora (Asm.) 507
Amra (Beng.) 507
Amruta (Sans.) 33, 87
Amsilika (Asm.) 495
Amtara (Hindi) 492
Ankol (Punj.) 204
Anninasha (Sans.) 87
Anpangthuam (Lus.) 43
Antuvala (Kan.) 382
Arali (Mar.) 33
Aranyavasini (Sans.) 275
Aratala (Kan.) 381
Arkhar (Punj.) 486, 496
ArkhuI (Punj.) 496
Arn (Mar.) 80
Artala (Kan.) 382
Asojapharphuta (Hindi) 258
Asthisanhara (Sans.) 288
Atari-lata (Beng.) 149
Atukulabaddu (Tel.) 261
Atyamlaparni (Sans.) 276
Avukaram (Mal.) 504

B

Babauro (Garh.) 193
Babuphala (Sans.) 120
Badaga (Tam.) 73
Badalia (Or.) 40
Bagri (Beng.) 233
Baikal (Hindi) 120
Bailam (Beng.) 509

- Bajan (Punj.) 198
 Bajiou (Asm.) 336
 Bakalpata (Hindi) 430, 433
 Bakarshang (Hindi) 420
 Bakkiawela (Nep.) 486
 Bal (Punj.) 235
 Balpale (Kan.) 116
 Balwuli (Mal.) 460
 Ban-am (Asm.) 469
 Banberi (Punj.) 232
 Ban-chalita (Beng.) 332
 Banastha (Sans.) 276
 Banpasola (Asm.) 425
 Bara-bera (Hindi) 227
 Barabhilawa (Hindi) 503
 Barain (Garh.) 320
 Barbetbipa (Garo) 427
 Barokoli (Or.) 236
 Barola (Beng.) 461
 Barrebacbali (Tel.) 300
 Basam (Chittagong) 469
 Bativa (Beng.) 425
 Bavanji (Tel.) 87
 Bedasativva (Tel.) 256
 Bekesh (Hindi) 428
 Bendervel (Mar.) 249
 Bendri (Mar.) 249
 Bepui rhui (Lus.) 311
 Ber (Hindi) 235, 240
 Ber (Punj.) 232
 Ber (Guj.) 233
 Beri (Punj.) 239
 Beri (Hindi) 243
 Berra (Hindi) 235
 Berugukay (Mal.) 381
 Bhakimlo (Nep.) 486
 Bhalαιο (Nep.) 496
 Bhalaya (Nep.) 488
 Bhallataka (Sans.) 500
 Bhamdi (Punj.) 198
 Bhan (Punj.) 449
 Bhand (Hindi) 240
 Bhandaru (Kan.) 361
 Bhandaru (Tel.) 361
 Bhander (Hindi) 243
 Bhatia-lot (Asm.) 279
 Bhela (Beng.) 500
 Bherseri (Nep.) 314
 Bhilawa (Mar.) 500
 Bhitni (Punj.) 232
 Bholia (Or.) 500
 Bhor (Raj.) 235
 Bhumlati (Asm.) 85, 87
 Bibu (Mar.) 457
 Bikha-kulia (Asm.) 70
 Bipti (Mal.) 460
 Bira (Tel.) 80
 Birari (Punj.) 232
 Bod-lar-nari (Bhoj) 279
 Bodbakka (Kan.) 40
 Bodo-Bodoria (Or.) 9
 Boguri (Asm.) 233
 Boguri (Miri) 233
 Bol-ai (Garo) 55
 Bolmicheng (Garo) 495
 Bolmichik (Garo) 425
 Bol-Mickicbnak (Garo) 70
 Bol-thajong (Garo) 70

- Bolkhatthi (Garo) 495
 Bon boguri (Asm.) 240
 Bon-gadhi (Asm.) 371
 Bon-ou (Asm.) 328
 Bons-boguri (Asm.) 229
 Bonsubuphang (Kash.) 461
 Booradipokai (Tel.) 339
 Bordi (Guj.) 233
 Born-bokul (Asm.) 58
 Brankil (Kash.) 204
 Brinkol (Punj.) 204
 Brukata (Tel.) 87
 Bundal (Beng.) 275
 Buradoni (Tel.) 281
 Burgi (Mar.) 236
 Busha (Hindi) 428
 Bushkua (Hindi) 428
 Buzimpala (Nep.) 402
 Bye-gyin (Burmese) 490
- C**
- Cangeru (Jaun.) 512
 Chadua (Punj.) 185
 Chaeri (Tam.) 460
 Chaiban (And.) 503
 Chaij-da (And.) 503
 Chakota (Kan.) 384
 Chamar-musli (Kon.) 251
 Chamhun (Chamba) 180
 Chamun (Ravi) 180
 Chandul (Bangladesh) 509
 Changalaparanda (Mal.) 288
 Chanyabor (Guj.) 235
 Chapper-tang (Hindi) 302, 303
 Charae (Mal.) 502
 Charchare (Nep.) 303
 Charchari (Nep.) 319
 Charcharyia (Punj.) 428
 Charei (Tam.) 457
 Charu (Or.) 443
 Charyula (Hindi) 189
 Charyula (Kum.) 190
 Chaterni (Punj.) 193
 Chato (Punj.) 185
 Chatra (Punj.) 185
 Chaudhari (Mar.) 288
 Chaunsh (Punj.) 204
 Chaurdha (Hindi) 185
 Chayben (Burmese) 503
 Chedwala (Punj.) 185
 Cheemat (Mar.) 207
 Cheetulo (Garh.) 190
 Chekka (Tel.) 217
 Cheknar-theng-pisuni (Mikir) 70
 Chembavu (Tam.) 427
 Chembravalli (Mal.) 254
 Chepata lata (Asm.) 317
 Cherei (Mal.) 461
 Cheru (Mal.) 457
 Chhataver (Hindi) 328
 Chhetulo Chira (Hindi) 189
 Chiaduk (Nep.) 167
 Chimati (Tam.) 207
 Chinnamoral (Tel.) 443
 Chippamarum (Tam.) 494
 Chirauli (Mar.) 443
 Chirla (Hindi) 190
 Chiru Illanthai (Tam.) 15

Chirupiyari (Tam.) 134
 Chitra (Kash.) 414
 Chittonia (Hindi) 243
 Chodhari (Guj.) 288
 Choklu (Punj.) 495
 Chont (Hindi) 243
 Chori (Nep.) 496
 Chorla (Tam.) 33
 Chuchi-am (Nep.) 469
 Chunu-koli (Or.) 240
 Churii (Nep.) 427
 Churna (Hindi) 240
 Common Jujube (Eng.) 235
 Cuddapah-almond (Eng.) 447

D

Dabdabe (Lep.) 425
 Dadur (Punj.) 185
 Dagdakti (Lep.) 425
 Dahsara (Punj.) 494
 Dansara (Punj.) 494
 Danshir (Mar.) 141
 Dant-rangi (Beng.) 427
 Danti (Tel.) 120, 125
 Danura (Beng.) 371
 Daom yatli (Lep.) 396
 Dargola (Shimla) 204
 Dari-asing (Mar.) 488
 Dasarni (Raj.) 494
 Dashmila (Hindi) 492
 Delam-asing (Asm.) 448
 Dhabdabia (Lep.) 425
 Dhehiani (Hindi) 9
 Dhoka (Sant.) 463
 Dhol-Samudra (Hindi) 339
 Dhol-Samudra (Beng.) 339
 Diang-langkyanthei (Kh.) 336
 Dibok-pak-bindu (Garo) 176
 Diboria (Or.) 290
 Dibroi (Or.) 256
 Dibru (Beng.) 427
 Dien-Chandre (Kh.) 123
 Dien-ji-rem (Kh.) 116
 Dien-Mat-wei (Kh.) 79
 Dien-Son-Set-khia (Kh.) 102
 Dieng jarthri (Kh.) 415
 Dieng-jermeri (Kh.) 434
 Dieng-Khao-Khorai (Kh.) 13
 Dieng-lali (Kh.) 55
 Dieng-lali-long (Kh.) 56
 Dieng-lalih (Kh.) 71
 Dieng-lang-leng (Kh.) 463
 Dieng-ohlong antheri (Kh.) 418
 Dieng sa Niriang (Kh.) 13
 Dieng-salait (Kh.) 448
 Dieng-Shieng (Kh.) 66
 Dieng-shlong-khlaw (Kh.) 13
 Dieng-sit-um (Kh.) 101
 Dieng-sngit (Kh.) 423
 Dieng-Soh-broi (Kh.) 233
 Dieng-soh-jmmang (Kh.) 371
 Dieng-Soh-Khru (Kh.) 402
 Dieng-Soh-naior (Kh.) 425
 Dieng-soh-Saw (Kh.) 71
 Dieng-Soh-Syrtate (Kh.) 55
 Dieng-Soh-tyrkhum (Kh.) 401
 Dieng-Soh-tyrland (Kh.) 55
 Dieng-soh-tyrlong-kynthi (Kh.) 66

Dieng-sohma (Kh.) 486
 Dieng-solignia (Kh.) 79
 Dieng-sph-lali (Kh.) 55
 Dieng-than (Kh.) 401
 Ding-keon (Kh.) 495
 Diusa (Punj.) 54
 Dodda ele holegara (Kan.) 502
 Dodru (Punj.) 54
 Dononia (Raj.) 494
 Dor (Punj.) 492
 Dotta (Tel.) 281
 Down-rang (Asm.) 279
 Drange (Punj.) 202
 Dreng-laptriyeum (Kh.) 19
 Drukri (Punj.) 275
 Drunda (Punj.) 54
 Dugithang (Garo) 176
 Dumigong (Garo) 176
 Dungla (Hindi) 490
 Dweaikali (Or.) 46
 Dyarry (Hindi) 202

E

Edakulamandulam ari (Tel.) 272
 Eieng-jali (Kh.) 70
 Elakom bullaballi (Kan.) 290
 English Holly (Eng.) 74

F

Fagora (Punj.) 195
 False sandal wood (Eng.) 15
 Fox-Grape (Eng.) 324

G

Gange-asing (Abor.) 223

Gandgisa (Kan.) 11
 Ganger (Punj.) 198
 Gangeri (Kh.) 198
 Cheetulo (Garh.) 190
 Gariki (Tel.) 207
 Gaunt (Garh.) 195
 Gelomtaru (Asm.) 87
 Gendal (Mar.) 290
 Ghanti (Punj.) 195
 Ghhui-shakki (Guj.) 102
 Ghogsha (Punj.) 428
 Ghont (Punj.) 195
 Ghoralidi (Or.) 261
 Ghorvel (Mar.) 249
 Ghoti (Sant.) 243
 Gidardak (Punj.) 202, 275
 Giggarr (Punj.) 239
 Girmal (Mar.) 281
 Girmul (Mar.) 296
 Girthan (Punj.) 202
 Goalilata (Beng.) 272
 Godambal (Punj.) 496
 Godda (Kan.) 463
 Godhuma theega (Tel.) 294
 Gogsa (Punj.) 195
 Gogsa Sindrol (Punj.) 185
 Gogsha (Punj.) 428
 Gogua (Hindi) 428
 Goguna (Hindi) 420
 Goher (Punj.) 198
 Goi (Hindi) 420
 Goldari (Nep.) 101
 Golinda (Mar.) 256
 Gonda kura (Tel.) 272

Gonta (Garh.) 202
 Gopenda (Garo) 425
 Got (Hindi) 243
 Got (Tel.) 243
 Gotaha (Hindi) 243
 Goto (Or.) 243
 Govila (Beng.) 256
 Gue (And.) 507
 Gugul (Kan.) 463
 Gulpha (Hindi) 420
 Gummadi (Tel.) 294
 Gumpin (Tel.) 463
 Gunt (Hindi) 243
 Gur-Katch (Kash.) 414
 Gurdhan (Punj.) 195
 Guter (Kum.) 233
 Gutu (Mar.) 169
 Gweb (Hindi) 420
 Gwep (Hindi) 420

II

Habatul-khizra (Punj.) 495
 Hadjora (Hindi) 288
 Haibamin (Tipp.) 469
 Haisikutti (Tam.) 460
 Halumanike (Kan.) 120
 Hang-dieng (Asm.) 479
 Harbhanga (Beng.) 288
 Harduli (Mar.) 11
 Harjora (Beng.) 288
 Harmada (Bhoj.) 339
 Harnal (Hindi) 300
 Harsankari (Hindi) 288
 Hathipau (Hindi) 339

Hati-kerepa (Asm.) 58
 Hedagalu (Kan.) 502
 Hedara (Kan.) 33
 Heggoli (Kan.) 275
 Hekikeko (Asm.) 371
 Hengnua (Asm.) 425
 Hengunia (Asm.) 427
 Chirla (Hindi) 190
 Hingoni (Asm.) 425
 Hinuri (Asm.) 79
 Hlotagbret (Lep.) 302, 303
 Hog-plum (Eng.) 507
 Holashi (Punj.) 495
 Holgeri (Mar.) 457
 Holigar (Kan.) 457
 Holly sikkimensis (Eng.) 68
 Holly (Eng.) 74
 Horse Radish tree (Eng.) 516
 Hothake-balli (Kan.) 312
 Hulgeri (Kan.) 457
 Huli Makai (Tam.) 423
 Hulugiri (Mar.) 461
 Hulushe (Nep.) 463
 Huttige balli (Kan.) 254

I

Ihanthar (Hindi) 185
 Impai-Kelok (Hindi) 43
 Indramai (Or.) 463
 Ingsudompo (Mikir) 229
 Irgoli (Tam.) 80
 Ishi rashi (Tel.) 369

J

Jaliciar (Punj.) 190

- Jaliddhar (Hindi) 125
 Jaminrei-dykhār (Kh.) 101
 Jaminreidkhar (Kh.) 102
 Jamrassi (Hindi) 80
 Jand (Bhoj.) 235
 Jangli-kajorni (Mar.) 298
 Jangli am (Hindi) 507
 Jarar (Mar.) 40
 Jarila laha (Nep.) 251
 Jarilalahara (Nep.) 275
 Jermei-ja-main (Kh.) 176
 Jermineirang-Chhai (Asm.) 434
 Jhangri (Sans.) 463
 Jhantika (Or.) 40
 Jhar-bhor (Raj.) 235
 Jhar-beri (Bhoj.) 235
 Jhar beri (Hindi) 234
 Jhari (Bhoj.) 235
 Jhingan (Hindi) 463
 Jia (Asm.) 463
 Jiyal (Beng.) 463
 Junglidrakh (Guj.) 256
 Jwarpat (Asm.) 176
- K**
- Kabashi (Beng.) 410
 Kabashi (Nep.) 176, 399, 410
 Kadamavalli (Mar.) 275
 Kadapla (Tam.) 77
 Kadelanchi (Tam.) 152
 Kadapatige (Tel.) 276
 Kadapatige (Tel.) 272
 Kadu-gobbi (Kan.) 504
 Kagadolio (Guj.) 356
 Kagi (Nep.) 454
 Kagphulai (Nep.) 489
 Kahdgu (Garh.) 204
 Kaju (Hindi) 437
 Kaju-badam (Asm.) 437
 Kak-Jhanga (Beng.) 326
 Kakada shingi (Mar.) 495
 Kakain (Kh.) 495
 Kakarlata (Kan.) 356
 Kakawalsuka (Tam.) 479
 Kakeera-sryngi (Tam.) 495
 Kakor (Hindi) 243
 Kakrasingha (Chittagong) 489
 Kakrasinghi (Beng.) 495
 Kal manikkam (Mal.) 2
 Kalabam (Tam.) 87
 Kalalag (Hindi) 174, 217
 Kalapag (Hindi) 167
 Kalasan (Mal.) 463
 Kalavi (Mal.) 423
 Kalgur (Mar.) 33
 Kalibel (Hindi) 220
 Kalivel (Mar.) 298
 Kallavi (Tam.) 427
 Kalmanakherai (Tam.) 40
 Kambal (Punj.) 496
 Kamputige (Tel.) 276
 Kamraj (Hindi) 249
 Kanak (Punj.) 202
 Kanakindeli (Kan.) 358
 Kanali (Tam.) 416
 Kand (Garh.) 202
 Kanda (Punj.) 204
 Kandage (Kan.) 281

- Kandakola (Or.) 351
 Kandaveila (Mar.) 288
 Kandawel (Hindi) 288
 Kander (Punj.) 189, 190
 Kanderu (Jaun.) 54
 Kandiari (Punj.) 232
 Kandika (Punj.) 232
 Kandura (Sans.) 276
 Kangani (Mar.) 87
 Kangar (Punj.) 492
 Kanger (Punj.) 198
 Kangu kelari (Tam.) 300
 Kanji (Punj.) 185
 Kanjiano (Or.) 256
 Kanna (Punj.) 420
 Kannem (Tel.) 272
 Kannilu (Tel.) 80
 Kannimarum (Tam.) 80
 Kannira (Kan.) 80
 Kanta (Bhoj.) 235
 Kanwail (Mar.) 220
 Kanzla (Garh.) 399
 Kaoso (Naga) 427
 Kapal-phodi (Mar.) 356
 Kapashi (Nep.) 396
 Kapper (Hindi) 428
 Kara Badalia (Bhoj.) 46
 Karantavalli (Mal.) 256
 Karegavena (Kan.) 87
 Karigeru (Kan.) 500
 Karik (Punj.) 275
 Karkadagasurgi (Tam.) 495
 Karkani (Mar.) 337
 Karkat (Sant.) 243
 Karkon (Punj.) 420
 Karpa (Mar.) 372
 Karumiraka (Mal.) 80
 Karun (Tam.) 457
 Karunauval (Tam.) 19
 Karur (Punj.) 204
 Karuvali (Tam.) 80, 135
 Kassar (Hindi) 275
 Kath Ber (Hindi) 243
 Kath-dhingia (Asm.) 336
 Kathapahasia (Bhoj.) 149
 Kathapahasia (Beng.) 149
 Katimangu-marum (Tam.) 443
 Katobhangoi (Or.) 261
 Katrain (Punj.) 204
 Katta ockkali (Tam.) 2
 Katta Puvan (Tam.) 358
 Kattanji (Tam.) 120
 Kattu moringa (Tam.) 515
 Kattu Shon-Kottai (Tam.) 504
 Kattukkodimundirigai (Tam.)
 Kattupirandai (Tam.) 272
 Kattuthiratchai (Tam.) 249
 Katucho (Punj.) 54
 Katur (Lep.) 469
 Kauli (Punj.) 204
 Kauloi (Jaun.) 167
 Kauri (Tam.) 300
 Kazurati (Kan.) 149
 Kazurati (Kon.) 149
 Keoti (Hindi) 220
 Kethera (Jaun.) 195
 Khagbalay (Nep.) 489
 Khajgolicavel (Mar.) 300

- Khajulgi (Mar.) 284
 Khalis (Kum.) 233
 Khanparchi (Kan.) 102
 Khansino (Nep.) 399
 Khanta (Or.) 174
 Kharsani (Hindi) 43
 Khat-khatamo (Guj.) 298
 Khat-khatumbo (Guj.) 275
 Kherai (Kan.) 461
 Khetma (Garo) 486
 Kheu (Man) 470
 Khreik (Kh.) 461
 Khuranchi (Kh.) 385
 Kilok (Bhut.) 396
 Kilpattar (Garh.) 399
 Kilu (Garh.) 394
 Kim (Punj.) 204
 Kinar (Kash.) 394
 Kiri (Tam.) 80
 Kirmoli (Garh.) 402
 Kochra (Hindi) 147
 Koda khebade (Nep.) 428
 Kodikkuramthu (Tam.) 112
 Kodsas (Kan.) 33
 Koelalranchi (Tam.) 9
 Kogatemara (Kan.) 382
 Koher (Punj.) 198
 Kokan ber (Punj.) 239
 Kokenber (Punj.) 235
 Koko-am (Beng.) 9
 Koli (Tam.) 423
 Kolori (Asm.) 79
 Kondamanidi (Tel.) 507
 Koni (Garh.) 192
 Konkudu (Tel.) 381
 Kontakura (Or.) 351
 Kookusee (Nep.) 230
 Korivi (Tel.) 372
 Korolio (Guj.) 356
 Kosam (Chittagong) 469
 Kosamra (Sans.) 469
 Kosimb (Mar.) 384
 Kosru (Nep.) 427
 Kotoki (Asm.) 70
 Kotta (Mal.) 243
 Kottei (Tam.) 236
 Kotteri (Tam.) 236, 243
 Kouloi (Jaun.) 167
 Krucho (Punj.) 54
 Kuchni (Punj.) 190
 Kudugeru (Kan.) 457
 Kujri (Hindi) 87
 Kukai (Punj.) 189
 Kukarbit (Mar.) 11
 Kukei (Punj.) 190
 Kukum-Jhiwa (Beng.) 337
 Kulucho (Jaun.) 54
 Kumala (Hindi) 332
 Kunglu (Hindi) 108
 Kunjar (Punj.) 198
 Kunji (Punj.) 193
 Kunku (Mar.) 108
 Kuppikodda (Tel.) 290
 Kurapalleru (Tel.) 298
 Kurkha (Garh.) 204
 Kurudinne (Tel.) 276
 Kusavi (Tam.) 423
 Kusum (Hindi) 384

Kutamu (Tel.) 298
 Kutku (Garh.) 204
 Kynja-jakrai (Kh.) 69

L

Laderi (Garh.) 302
 Laderi (Hindi) 303
 Laduli (Garh.) 302
 Lahara Kapasi (Nep.) 400
 Lakhar (Punj.) 495
 Lakshmi am (Asm.) 469
 Lal Kapasi (Nep.) 400
 Lalaunga-bupfiari thup (Lus.) 47
 Lang-Kurnu (Kh.) 334
 Lanka-badam (Or.) 437
 Lapshi (Nep.) 448
 Larubandha (Asm.) 427
 Latapal (Hindi) 217
 Lekhgogun (Nep.) 420
 Lhish (Hindi) 193
 Ling-Kermrang (Tipp.) 236
 Lohari (Kum.) 202
 Lohari (Hindi) 430
 Lokandi (Mar.) 220
 Lokhandi (Mar.) 372
 Luhish (Hindi) 193

M

Maber (Hindi) 243
 Madhu-phal (Beng.) 152
 Maigoza (Nep.) 420
 Maimarari (Punj.) 193
 Maimati (Asm.) 275
 Makai (Hindi) 236

Makela (Hindi) 512
 Makoh (Beng.) 236
 Makhora (Beng.) 236
 Makra maya (Or.) 381
 Mala-mavu (Mal.) 442
 Malkangni (Beng.) 87
 Malkengana (Guj.) 87
 Malu-sengote (Tel.) 504
 Mamadi (Tel.) 466
 Mamori (Asm.) 425
 Mamral (Punj.) 185
 Manchi (Tel.) 202
 Manda munga (Tel.) 515
 Mandar (Punj.) 394
 Mandri (Garo) 431
 Mandulamaritige (Tel.) 276
 Mangara balli (Kan.) 288
 Mangas (Tam.) 466
 Maniparandis (Mal.) 337
 Manipungu (Tam.) 381
 Manjandamaram (Tam.) 46
 Mannaikkali (Tam.) 40
 Manpuli (Mal.) 507
 Mao (Tam.) 466
 Marking-nut (Engl.) 500
 Marmarati (Asm.) 275
 Mashul (Nep.) 479
 Massivala (Kan.) 423
 Masuri (Hindi) 512
 Mavu (Kan.) 466
 Medmedia-lop (Asm.) 290
 Mei-sch-mynjiriang (Kh.) 319
 Meihurijarap (Kh.) 290
 Meijakhajrap (Kh.) 290

- Mej-jendru (Kh.) 89
 Mella (Punj.) 235
 Menthakkodi (Tam.) 141
 Mei-tein-iand (Kh.) 176
 Meriam (Beng.) 439
 Meriampulli (Mal.) 290
 Mikrum-rik (Lep.) 251
 Milyachi (Kash.) 414
 Mindiri (Tam.) 437
 Miri (Asm.) 30
 Miri (Garo) 431
 Misal-bombi (Mar.) 152
 Misal-bomdi (Konk.) 152
 Momphulati (Beng.) 489
 Mon-rik (Lep.) 176
 Morasavakkodi (Tam.) 149
 Moringa (Tam.) 516
 Mukannen peru (Mal.) 349
 Mukarti (Kan.) 80
 Mullai maram (Tam.) 477
 Mulli (Mal.) 236
 Munga (Tel.) 516
 Mungapera (Mal.) 443
 Muntha-mamidi (Tel.) 437
 Muralimaram (Tam.) 180
 Murkhur (Hindi) 332
 Mutani (Punj.) 185
- N**
- Nabar (Kuki) 402
 Nadena (Mar.) 256, 279
 Nagatenga (Asm.) 486
 Nagdaun (Hindi) 414
 Nalla drakshi (Tel.) 256
 Nallagummadi theega (Tel.) 261
 Nallar (Hindi) 288
 Nallatige (Tel.) 281
 Nalleru (Tel.) 288
 Nandunarai (Tam.) 122
 Nanaminukki (Tam.) 281
 Nar (Punj.) 190
 Naralai (Tam.) 272
 Nayaphutki (Beng.) 356
 Nekota (Tam.) 372
 Nela gummadi (Tel.) 281, 294
 Nelaboddu (Tel.) 290
 Nerasi (Tel.) 80
 Ng-gai (Nag.) 461
 Ngraurau (Kh.) 389
 Nikki (Punj.) 189, 190
 Nilta Vanchi (Tam.) 381
 Ninas (Hindi) 490
 Ningal (Tam.) 363
 Nior (Punj.) 185
 Niroli (Mal.) 363
 Nullerutigeh (Tel.) 288
 Nuncha (Beng.) 371
 Nuncha (Mani.) 371
 Nurkala (Kan.) 443
 Nyekki (Tam.) 337
 Nyeru (Mal.) 337
- O**
- Odankodi (Tam.) 149
 Odi (Mar.) 275
 Orangu (Punj.) 204
 Ottanali (Tam.) 337

P

Paal vellayil (Tam.) 477
 Padappen (Mal.) 537
 Pal vidinyan (Tam.) 459
 Palai (Punj.) 492
 Pale (Lep.) 400
 Paiegniyok (Lep.) 407
 Palkanda (Kan.) 254
 Palulavam (Mal.) 87
 Palva (Mal.) 87
 Pal vidinyan (Tam.) 459
 Pamba Vetti (Mal.) 416
 Pangar (Garh.) 389
 Panibel (Hindi) 256, 290
 Pani-lara (Nep.) 279
 Pani-Letchu (Asm.) 415
 Pannikkodi (Tam.) 272
 Paranu (Tel.) 236
 Pariki (Tel.) 236
 Pasakotta (Mal.) 382
 Patpati (Beng.) 427
 Patty chollimela (Tam.) 207
 Paviri mulei (Mal.) 378
 Payan (Kum.) 193
 Payongrik (Lep.) 430
 Peeyal (Hindi) 443
 Pegi (Sylhet) 479
 Penki tiga (Tel.) 174
 Perakudikkai (Mal.) 351
 Perumkkattukkodi (Tam.) 152
 Perumuruli (Tam.) 314
 Pharumborne (Kh.) 339
 Philuna (Garh.) 303
 Phipni (Punj.) 185

Pholoikung (Tipp.) 461
 Phompli (Punj.) 204
 Phulla (Punj.) 195
 Pichala (Asm.) 427
 Pinle-zi (And.) 15
 Pirai (Tam.) 80
 Pirandai (Tam.) 288
 Pirandaikkodi (Tam.) 315
 Pitni (Punj.) 239
 Piyala (Beng.) 443
 Piyari (Tel.) 135
 Pokitai (Miri) 87
 Ponnangottai (Tam.) 381
 Poplichukay (Kan.) 220
 Pounanga (Tam.) 381
 Psakotta (Mal.) 358
 Pulimada (Tel.) 272
 Pulimada (Tel.) 272, 276
 Pulinaralai (Tam.) 300
 Pullabachali (Tel.) 300
 Pullipullamh (Tam.) 507
 Pulusa (Tel.) 298
 Punditaballi (Kan.) 298
 Putka (Mani.) 356
 Puvam (Mal.) 384
 Puvan (Tam.) 384
 Puvatti (Tam.) 358

R

Rackat-pita (Hindi) 217
 Ragat-roda (Mar.) 197
 Ragat-rorar (Mar.) 197
 Rai (Punj.) 490
 Raidhani (Hindi) 217

Rajjehul (Beng.) 80
 Raman-bih (Asm.) 389
 Ramchana (Hindi) 275
 Ranamba (Guj.) 507
 Rangrek (Punj.) 193
 Rani gogun (Nep.) 420
 Raniwhalaya (Nep.) 495
 Rannel (Hindi) 490
 Rastu (Punj.) 492
 Reteon (Punj.) 185
 Ritha (Hindi) 381, 382
 Roggwlabot (Tel.) 290
 Romusk (Punj.) 185
 Rungyony rik (Lep.) 167

S

Sabale (Tam.) 494
 Sabja-lat (Beng.) 431
 Sabma (Kh.) 486
 Sajina (Asm.) 516
 Sakattai (Tam.) 358
 Samak (Kash.) 490
 Samarang (Garo.) 317
 Sambravalli (Tam.) 254
 Samphal-bol (Kh.) 358
 Santameh (Kh.) 431
 Sangkenrop (Kh.) 389
 Sangugelari (Tam.) 300
 Sannata (Hindi) 361
 Saraswati (Sans.) 87
 Sarjom (Sant.) 217
 Sarlok-Asing (Asm.) 389
 Sarpa-Lor (Kash.) 414
 Sarquro (Raj.) 515

Schajna (Beng.) 516
 Shanpi (Kh.) 385
 Schiongtrong-kynthei (Kh.) 101
 Sebraietam (Asm.) 162
 Sehr-Kung (Lep.) 489
 Seonia (Asm.) 425
 Serhnyok (Lep.) 495
 Setapajja (Punj.) 185
 Shamor (Punj.) 239
 Shanpi (Kh.) 385
 Shapra (Hindi) 420
 Shat (Hindi) 495
 Shempuvan (Tam.) 358
 Shenkurani (Tam.) 456
 Sheuga (Mar.) 516
 Shiakol (Beng.) 236
 Shomfol (Punj.) 185
 Shyakul (Beng.) 236
 Si-sen (Kh.) 101
 Sibjhul (Beng.) 356
 Sibjul (Mani.) 356
 Silah-kung (Lep.) 448
 Simali (Nep.) 430
 Simli (Punj.) 232
 Sindrol (Punj.) 185
 Sinduri dabdebi (Nep.) 428
 Sinjal (Punj.) 193
 Sinjli (Punj.) 232
 Sirunaralai (Tam.) 261
 Siruvalli (Mal.) 351
 Sitha (Tam.) 494
 Smoke tree (Eng.) 449
 Soh-dadin (Kh.) 105
 Soh-lar-pung (Kh.) 316

Soh-mei-boit (Kh.) 310
 Soh-mei-boyet (Kh.) 311
 Sohajna (Hindi) 516
 Sohphyrnou (Kh.) 332
 Sonemous (Mal.) 474
 Soobja (Beng.) 431
 Sorivalli (Mal.) 275
 Sugambal (Tam.) 300
 Surabi (Tel.) 202
 Suran (Hindi) 240
 Surati (Tel.) 217, 220
 Surati Chekka (Tel.) 220
 Sutrong (Asm.) 116
 Swartalahara (Nep.) 427

T

Tadru (Punj.) 185
 Takhril (Lep.) 486
 Talavaranaballi (Kan.) 300
 Tamanya (Guj.) 275
 Tamser (Mikir) 79
 Tandra (Punj.) 193
 Tang-ting (Asm.) 371
 Tanisi (Tam.) 87
 Target-rinbe (Asm.) 30
 Tatke-riubi (Abor.) 229
 Takte-riubi (Miri) 229
 Tatri (Punj.) 486
 Tbeega (Tel.) 294
 Tebur (Beng.) 454
 Tejovati (Mar.) 356
 Telitsayel (Mar.) 282
 Tella Budari (Tel.) 281
 Thagari (Tam.) 423
 Thakri-arong (Mikir) 233
 Thali kabashi (Nep.) 401
 Thayet-kin (Burmese) 509
 Thembara (Tam.) 500
 Thengkhi (Garo) 233
 Theng-ngoitkeh (Tipp.) 58
 Theng-Sang-Proth-arong (Mikir) 58
 Thenkotta (Mal.) 500
 Theno-tuni (Mikir) 58
 Thing-Khim (Lush.) 401
 Thodali (Mal.) 240
 Thodappei (Mal.) 456
 Thowthawa (Asm.) 427
 Thum (Punj.) 204
 Tikshna (Sans.) 276
 Tilpattar (Garh.) 399
 Tipan (Mar.) 346
 Titar (Punj.) 486
 Tode (Tam.) 427
 Toudet (Tam.) 427
 Trekhan (Punj.) 394
 Tripadi (Mal.) 272
 Tumari (Hindi) 55
 Tumra (Punj.) 490
 Tunani (Punj.) 193
 Tundror-rik (Lep.) 314
 Tung (Punj.) 449
 Tung (Punj.) 490
 Tungla (Hindi) 449
 Tungnyok (Lep.) 401
 Tungrutrikup (Lep.) 272
 Tungvheong (Lep.) 176
 Turani (Mar.) 240
 Turruli (Kan.) 149

Turruli (Kon.) 149
 Turtunga (Hindi) 449
 Tusamphor-doukha (Asm.) 272
 Tuvadi (Tam.) 207

U

Ucanechra (Tel.) 15
 Ulagera (Kan.) 474
 Umb (Mar.) 358
 Urchirri (Mar.) 11
 Uriam (Beng.) 439

V

Vaichigachha (Beng.) 120
 Vajravalli (Sans.) 288
 Val muriccha (Mal.) 363
 Valiyapirapitika (Mal.) 256
 Vallur (Punj.) 275
 Vedhari (Guj.) 288
 Vellei Cheri (Tam.) 502
 Velularia (Tam.) 87
 Veluttasorivalli (Mal.) 272
 Vempadam (Tam.) 220
 Venkotta (Mal.) 116

Venkottai (Tam.) 116
 Vikola (Guj.) 120
 Vilaari (Tam.) 360
 Vini (Tam.) 97, 102
 Viraali (Tam.) 360, 361
 Virali (Tam.) 361
 Vorupaku (Tel.) 294
 Vrali (Mal.) 361
 Vumb (Mar.) 358

W

Wait-a-bit (Mar.) 207
 Wig plant (Eng.) 449
 Wodier (Tam.) 463
 Wuruk (Punj.) 189

Y

Yalishin (Bhut.) 399
 Yedakula vayamu (Tel.) 272
 Yenkli (Kan.) 124

Z

Zanani (Punj.) 193