Pollen of wet evergreen forests of the Western Ghats, India

Colette Tissot, Hafida Chikhi, T.S. Nayar

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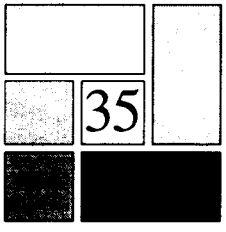

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Foreword

The Western Ghats region with its rich diversity of flora and fauna is recognized as an area with many "hot-spots" for biodiversity conservation. Both the French Institute of Pondicherry and the Tropical Botanic Garden and Research Institute of Thiruvananthapuram have been focusing their attention since several years on the vegetation of this range of mountains. Among the woody formations, the wet evergreen forests have particularly drawn the interest of our teams as is evidenced by the large number of our publications dealing with them. Today, we are pleased to release the *"Pollen of wet evergreen forests of the Western Ghats, India"*, an outcome of the collaboration between our two Institutes.

The present volume by C. Tissot, H. Chikhi and T.S. Nayar is particularly welcome as an essential manual for many research workers using palynology. Botanists who wish to understand the present stage of such a dynamic ecosystem need to know its evolution in the recent past. Paleontologists interested in the change in its floristic composition through time (out of 162 species studied, 77 are endemic to the Western Ghats), from periods as ancient as Late Cretaceous and Early Tertiary when India was still far from its present location, can derive useful data from this work. Since wet evergreen forests require strict climatic conditions for their development, paleoclimatic changes have sometimes been tentatively reconstructed through the evolution of these forests, which are reliable climatic markers on the whole, and through some of their components such as *Cullenia exarillata*, a characteristic species, with moreover a confidently identifiable pollen. Thus, the publication is most timely as palynological data are expected to play a key role within the framework of the International Geosphere-Biosphere Programme (IGBP). Ecologists, archaeologists and ethnobotanists will find in this atlas the basic data necessary for their investigations. To biologists also, the atlas will be useful for a wide range of studies such as pollination procedures, phenology calendar, bee botany, foraging strategies, quality of honey, etc.

We are confident that everyone will appreciate that a long-standing lacuna in the field of palynological studies has at last been filled.

The publication of this book, which will serve many useful purposes, adequately fulfils the main task of our two Institutes, which is to produce fundamental work for applied studies.

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Introduction

The Western Ghats constitute a series of mountain ranges that extend from the mouth of the river Tapti in Gujarat to Cape Kumarin (Kanniyakumari) in Tamil Nadu. They dominate the western coast of the Indian peninsula for almost 1600 km. The mountain ranges of the Western Ghats come under '*India aquosa*' of Prain (1903) and '*Malabar*' botanical province of Hooker (1907). The vegetational diversity and floristic richness of the Western Ghats are very remarkable as these hill ranges accommodate different vegetational formations such as evergreen forests, moist and dry deciduous forests, montane forests, sholas, scrubs and savannas. Secondary successions make the formations more complex. The Western Ghats have a very high proportion of endemic species: nearly 63 % of the trees. This terrain served as a refuge when the general climate became less favourable to the forest, and was at the same time a centre of speciation. However, the endemism is not uniformly distributed throughout the Ghats: the south is richer than the north.

The wet evergreen rain forests of the Western Ghats, along with those of Assam and Andamans, are the most beautiful forests of India. They are the densest, richest and the tallest, especially in the southern Western Ghats. These forests have been studied even as early as the end of the 19th century, with noteworthy inventories of the flora. Later, extensive syntheses are found in Champion (1936) in his classic *"A preliminary survey of forest types of India and Burma"*, and in Legris (1963), *"La végétation de l'Inde: écologie et flore"*. Hooker (1872-1897), Gamble (1915-1936) and Cooke (1901-1908), besides others like Blatter, Bourdillon, Dalzell and Talbot, have made significant contributions to the botany of the Western Ghats. More recently, Pascal (1984, 1988) has provided a detailed description of the ecology, structure, floristic composition and succession of these formations, as well as the vegetation maps of the forests of South India (1982, 1984, 1986).

Given the economic importance of these forests and the threat to their very existence due to often unorganized exploitation of forest resources, and the need for a better knowledge of the dynamics of this ecosystem leading to a sustainable management, many scientific works using modern methods of study have been undertaken in various scientific disciplines. Palynology is one of the tools currently used. The first step in palynological investigations is the preparation of a morphological atlas of the pollen of the wet evergreen forests of the Western Ghats.

The 162 species studied in this atlas, belonging to 46 families of Gymnosperms and Angiosperms, were selected mainly from Pascal's inventories of these formations (*ibid.*), as well as from the works of Ramesh (1989) and De Franceschi (1992). The selected species are generally restricted to the wet evergreen forests for which they are reliable markers and include 77 species endemic to the Western Ghats. Most of them are trees but some typical climbers and shrubs have also been included. Herbaceous species have not been considered.

Methods

The pollen slides were prepared from flowers obtained from specimens of dried plants preserved in different herbaria in India and abroad. The acronyms of these herbaria are listed below as quoted in Holmgren *et al.* (1981):

ASSAM	SHILLONG: Botanical Survey of India, Eastern Circle, "Woodlands", Shillong, Assam State, India.
BSI	PUNE: Western Circle, Botanical Survey of India, Pune, India.
DD	DEHRA DUN: Forest Research Institute & Colleges, Dehra Dun, India.
HIFP	PONDICHERRY: French Institute, Pondicherry, India.
JCB	BANGALORE: St Joseph's College, Bangalore, India.
K	KEW: Royal Botanical Gardens, Kew, U.K.
M	MÜNCHEN: Botanische Staatssammlung, München, Germany.
MH	COIMBATORE: Southern Circle, Botanical Survey of India, Coimbatore, India.
P	PARIS: Muséum National d'Histoire Naturelle, Phanérogamie, Paris, France.
PCM	MADRAS: Presidency College, Department of Botany, Madras, India.
PDA	PERADENIYA: National Herbarium, Royal Botanic Gardens, Peradeniya, Sri Lanka.
TBGT	THIRUVANANTHAPURAM: Tropical Botanic Garden and Research Institute, Thiruvananthapuram, India.

For light microcospic studies, the pollen grains were processed following the standard acetolysis method. They were then mounted in glycerine jelly and sealed with paraffin.

When necessary, the photonic observations were complemented with scanning electron microscopy. For this, pollen were examined in various laboratories of which the Swedish Museum of Natural History of Stockholm (Sweden) should be specially mentioned for its major contribution (65 % of the SEM photos), followed by: Centre de Microscopie électronique, Université de Bordeaux I, Talence, France; Birbal Sahni Institute of Palaeobotany, Lucknow, India; Laboratoire de Palynologie, Muséum National d'Histoire Naturelle, Paris, France, and Centre de Microscopie Electronique, Université de Rennes I, Rennes, France.

Pattern of description

Gymnosperms are described first, followed by Angiosperms in which Dicotyledons precede Monocotyledons. The order of families, genera and species is alphabetical. The nomenclature of the plants conforms to those in "*A dictionary of flowering plants and Ferns*" (Willis, 1988), *Index Kewensis* and recent revisions of families and genera.

The same pattern of description is followed for all the species:

— Genus, species, author(s).

— Specimen(s) examined: locality of collection, name and field number of the collector, (code of the herbarium where the specimen is stored), deposition of the slide (HIFP or TBGT) and slide number.

— Distribution: geographic area of the species.

— Western Ghats: local distribution of the species in the Western Ghats (Fig. 1). Habit of the plant, altitudinal limit, endemic nature, habitat and frequency of distribution.

— Pollen: short description of aperture(s); sculpture and structure of sexine. The morphological terms are in accordance with those defined in "*Pollen and spore terminology*" (Blackmore *et al.*, 1992).

— Dimensions of pollen: mean size (with extremes) according to the general shape:
- isopolar grain, radially symmetrical: P = polar axis, E = equatorial axis
- heteropolar grain: L = length, w = width
- spherical grain: diameter
- irregularly shaped grain: longest axis

— Bibliographic reference (when available): Name(s) of the author(s) and date of publication(s) in which a consistent description of the pollen of the species or the genus can be found along with an accurate illustration. For further literature, the "*Bibliographic Index to the pollen morphology of Angiosperms*" (Thanikaimoni, 1972; 1973; 1976; 1980; 1986; Tissot, 1990) may be consulted.

Acknowledgements

It is our pleasure to thank all the colleagues who have participated in the preparation of this atlas, particularly the ecologists and botanists J.P. Pascal, D. De Franceschi and B.R. Ramesh who helped us in the selection of the relevant species, and C. Caratini whose role was essential as a constant adviser.

Special thanks are due to S. Nilsson and E. Grafström (Stockholm), M.T. Cerceau, M.C. Carbonnier and A. Véryl (Paris) and K. Ambwani (Lucknow) for the scanning electron microscopic studies.

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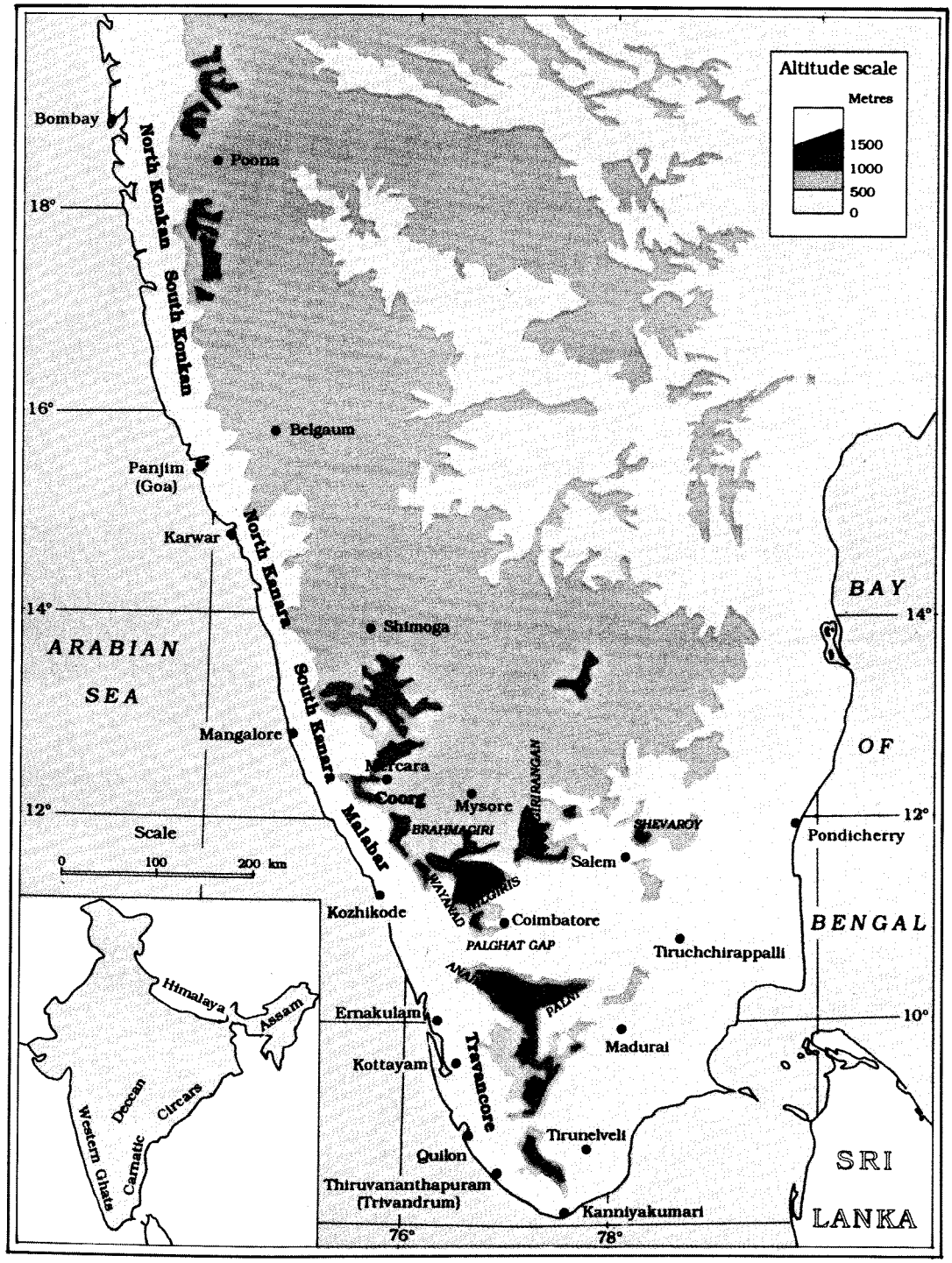

Fig. 1. Map of Peninsular India.

List of species studied

(*in alphabetical order of the families*)

Gymnospermae

Gnetaceae
Gnetum ula Brong.

Podocarpaceae
Decussocarpus wallichianus (Presl.) de Laubenf.

Angiospermae Dicotyledoneae

Anacardiaceae
Gluta travancorica Bedd.
Holigarna arnottiana Hook. f.
Holigarna nigra Bourd.
Mangifera indica L.
Nothopegia beddomei Gamble
Nothopegia travancorica Bedd. ex Hook. f.
Semecarpus auriculata Bedd.
Semecarpus travancorica Bedd.

Annonaceae
Goniothalamus cardiopetalus (Dalz.) Hook. f. & Th.
Goniothalamus wightii Hook. f. & Th.
Metogyne pannosa (Dalz.) Sinclair
Polyalthia fragrans (Dalz.) Bedd.

Apocynaceae
Tabernaemontana gamblei Subr. & Henry

Aristolochiaceae
Thottea siliquosa (Lam.) Ding Hou

Asteraceae
Vernonia travancorica Hook. f.

Bignoniaceae
Pajanelia longifolia (Willd.) Schum.

Bombacaceae
Cullenia exarillata A. Robyns

Burseraceae
Canarium strictum Roxb.

Celastraceae
Bhesa indica (Bedd.) Ding Hou
Euonymus indicus Heyne
Lophopetalum wightianum Arn.
Microtropis stocksii Gamble

Clusiaceae
Calophyllum apetalum Willd.
Calophyllum austroindicum Kosterm. ex Stevens
Calophyllum polyanthum Wall. ex Choisy
Garcinia gummi-gutta (L.) Robson
Garcinia morella (Gaertn.) Desr.
Garcinia talbotii Raiz. & Sant.
Garcinia travancorica Bedd.
Mesua ferrea L.
Poeciloneuron indicum Bedd.
Poeciloneuron pauciflorum Bedd.

Cornaceae
Mastixia arborea (Wt.) Bedd.

Dichapetalaceae
Dichapetalum gelonioides (Roxb.) Engl.

Dipterocarpaceae
Dipterocarpus bourdillonii Brandis
Dipterocarpus indicus Bedd.
Hopea parviflora Bedd.
Hopea ponga (Dennst.) Mabberly
Hopea utilis (Bedd.) Bole
Vateria indica L.

Ebenaceae
Diospyros assimilis Bedd.
Diospyros bourdillonii Brandis
Diospyros buxifolia (Bl.) Hiern
Diospyros paniculata Dalz.
Diospyros sylvatica Roxb.

Elaeocarpaceae
Elaeocarpus serratus L.
Elaeocarpus tuberculatus Roxb.

Erythroxylaceae
Erythroxylum moonii Hochr.

Euphorbiaceae
Agrostistachys indica Dalz.
Agrostistachys meeboldii Pax & K. Hoffm.
Baccaurea courtallensis Muell.-Arg.
Bischofia javanica Bl.
Blachia denudata Benth.
Croton gibsonianus Nimmo
Croton malabaricus Bedd.
Dimorphocalyx lawianus Hook. f.
Drypetes elata (Bedd.) Pax & Hoffm.
Drypetes malabarica (Bedd.) Airy Shaw
Drypetes oblongifolia (Bedd.) Airy Shaw
Excoecaria crenulata Wt.
Fahrenheitia zeylanica (Thw.) Airy Shaw
Macaranga peltata (Roxb.) Mueller
Mallotus beddomei Hook. f.
Mallotus distans Muell.-Arg.
Mallotus philippensis (Lam.) Muell.-Arg.
Mallotus stenanthus Muell.-Arg.
Sauropus androgynus Merr.

Fabaceae: Caesalpinioideae
Bauhinia phoenicea Heyne ex Wt. & Arn.
Humboldtia brunonis Wall.
Humboldtia decurrens Bedd.
Humboldtia unijuga Bedd.
Humboldtia vahliana Wt.
Kingiodendron pinnatum (DC.) Harms

Fabaceae: Mimosoideae
Entada pursaetha DC.

Fabaceae: Faboideae
Derris heyneana (Wt. & Arn.) Benth.
Ormosia travancorica Bedd.

Flacourtiaceae
Casearia ovata (Lam.) Willd.
Flacourtia montana Grah.
Hydnocarpus alpina Wt.
Hydnocarpus pentandra (Buch.-Ham) Oken
Scolopia crenata (Wt. & Arn.) Clos
Taraktogenos macrocarpa (Bedd.) Balakr.

Icacinaceae
Gomphandra coriacea Wt.
Gomphandra tetrandra (Wall.) Sleumer
Nothapodytes foetida (Wt.) Sleumer

Loganiaceae
Fagraea ceilanica Thunb.

Melastomataceae
Memecylon angustifolium Wt.
Memecylon malabaricum (Cl.) Cogn.
Memecylon talbotianum Brandis

Meliaceae
Aglaia barberi Gamble
Aglaia elaeagnoidea (Juss.) Benth. var. *bourdillonii* (Gamble) K.K.N. Nair
Aglaia simplicifolia (Bedd.) Harms
Aphanamixis polystachya (Wall.) Parker
Dysoxylum malabaricum Bedd.
Reinwardtiodendron anaimalaiense (Bedd.) Mabberly
Toona ciliata Roemer
Trichilia connaroides (Wt. & Arn.) Benth.
Walsura trifolia A. Juss. Harms

Moraceae
Antiaris toxicaria Lesch.
Artocarpus heterophyllus Lam.
Ficus nervosa Heyne ex Roth.

Myristicaceae
Gymnacranthera canarica Warb.
Knema attenuata (Hook. f. & Th.) Warb.
Myristica dactyloides Gaertn.
Myristica fatua Houtt. var. *magnifica* (Bedd.) Sinclair
Myristica malabarica Lam.

Myrtaceae
Eugenia thwaitesii Duthie
Syzygium gardneri Thw.
Syzygium laetum (Buch.-Ham.) Gandhi
Syzygium mundagam (Bourd.) Chithra
Syzygium occidentale (Bourd.) Gandhi

Olacaceae
Strombosia ceylanica Gardn.

Oleaceae
Olea dioica Roxb.

Polygalaceae
Xanthophyllum flavescens Roxb.

Rhizophoraceae
Blepharistemma membranifolia (Miq.) Ding Hou
Carallia brachiata (Lour.) Merr.

Rosaceae
Prunus ceylanica (Wt.) Miq.

Rubiaceae
Ixora elongata Heyne ex G. Don
Ixora nigricans Wt. & Arn.
Lasianthus acuminatus Wt.
Neonauclea purpurea (Roxb.) Merr.
Octotropis travancorica Bedd.

Psychotria anamallayana Bedd.
Psychotria flavida Talbot
Psychotria nigra (Gaertn.) Alston
Tricalysia aptocarpa (Dalz.) Gamble

Rutaceae
Atalantia wightii Tanaka
Clausena dentata (Willd.) R. & S.
Clausena heptaphylla Wt. & Arn.
Clausena indica (Dazl.) Oliver
Glycosmis macrocarpa Wt.
Luvunga eleutherandra Dalz.
Murraya paniculata (L.) Jack.
Toddalia asiatica (L.) Lam. var. *floribunda* Gamble
Vepris bilocularis (Wt. & Arn.) Engl.
Zanthoxylum ovalifolium Wt.

Sapindaceae
Dimocarpus longan Lour.
Filicium decipiens (Wt. & Arn.) Thw.
Harpullia arborea (Blanco) Radlk.
Otonephelium stipulaceum (Bedd.) Radlk.
Thraulococcus erectus Radlk.

Sapotaceae
Chrysophyllum lanceolatum (Bl.) DC.
Isonandra lanceolata Wt.
Madhuca neriifolia (Moon) Lam.
Mimusops elengi L.
Palaquium ellipticum (Dalz.) Baillon
Xantolis tomentosa (Roxb.) Raf.

Staphyleaceae
Turpinia malabarica Gamble

Sterculiaceae
Heritiera papilio Bedd.
Leptonychia moacurroides Bedd.
Pterospermum diversifolium Bl.
Pterygota alata R.Br.

Theaceae
Eurya japonica Thunb.
Gordonia obtusa Wall. ex Wt. & Arn.

Urticaceae
Villebrunea integrifolia Gaud.

Verbenaceae
Clerodendrum viscosum Vent.

Violaceae
Rinorea bengalensis (Wall.) O. Kuntze

Angiospermae Monocotyledoneae

Arecaceae
Bentinckia condapanna A. Berry
Caryota urens L.
Pinanga dicksonii (Roxb.) Scheffer

Description of species

Gymnospermae

GNETACEAE

Gnetum ula Brong. **Pl. 1**

Mollem (N. Goa), SAHNI 6089, (DD).
Slide HIFP 11627.

Distribution: Peninsular India.

Western Ghats: in upper Ghats. A large robust climber on forest trees. Occasional.

Pollen: inaperturate, sexine microechinate.
D = 16 µm (15 to 18).

PODOCARPACEAE

Decussocarpus wallichianus (Presl.) de Laubenf. **Pl. 1**

Nilgiri hills (Nilgiri Dt.), BEDDOME s.n., (MH).
Slide HIFP 21865.

Distribution: Indo-Malaysia.

Western Ghats: Southern most part of Western Ghats. A tall tree, above 1000 m. Sporadic.

Pollen: disaccate.
Corpus: L = 36 µm (33 to 39), w = 30 µm (28 to 32), h = 24 µm (22 to 27).
Sacci: L = 36 µm (34 to 40), w = 25 µm (23 to 27).

SIVAK, 1975.

Angiospermae Dicotyledoneae

ANACARDIACEAE

Gluta travancorica Bedd. **Pl. 2**

Mundanthorai (Tirunelveli Dt.), BARBER 2873, (PCM).
Slide HIFP 1007.

Distribution: Western peninsular India.

Western Ghats: Tirunelveli hills and Travancore, restricted to south of Kottayam. Canopy tree, up to 1100 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine finely grano-rugulate.
P = 34 µm (32 to 36), E = 22 µm (19 to 23).

BAKSI, 1976.

Holigarna arnottiana Hook. f. **Pl. 2**

Gersoppa (North Kanara Dt.), PASCAL 1201, (HIFP).
Slide HIFP 21864.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara to Malabar and Travancore. A large tree in medium elevation forests. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine striato-reticulate.
P = 44 µm (40 to 47), E = 32 µm (30 to 35).

Holigarna nigra Bourd. **Pl. 3**

Pirmed (Idukki Dt.), collector unknown, (MH).
Slide HIFP 21852.

Distribution: Western peninsular India.

Western Ghats: Travancore. A large tree, from 700 to 1300 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine striato-reticulate.
P = 44 µm (42 to 45), E = 38 µm (36 to 40).

Mangifera indica L. **Pl. 3**

Pondicherry (Pondicherry State), BLASCO s.n., (HIFP).
Slide HIFP 21572.
Arkalgud (Hassan Dt.), SALDANHA 16316, (JCB).
Slide HIFP 12271.

Distribution: Pantropical.

Western Ghats: in all districts. A large tree, up to 1300 m. Universally cultivated. The mango tree.

Pollen: 3-colporate, sexine striato-reticulate.
P = 35 µm (33 to 37), E = 25 µm (24 to 28).

YBERT, 1979.

Nothopegia beddomei Gamble **Pl. 4**

Kavunthamalai (Madurai Dt.), collector unknown, (HIFP).
Slide HIFP 21849.

Distribution: Western peninsular India.

Western Ghats: Coorg, Nilgiris, Anaimalai, Palni and Tirunelveli hills. A small tree, from 250 to 1350 m, usually along streams in evergreen and semi-evergreen forests. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine reticulate to striato-reticulate.
P = 32 µm (29 to 37), E = 28 µm (25 to 30).

Nothopegia travancorica Bedd. ex Hook. f. **Pl. 4**

Virajpet (Coorg Dt.), ARAVALY 27A (HIFP).
Slide HIFP 21702.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara to Malabar, Tirunelveli hills and Travancore. A medium-sized tree, up to 1000 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine reticulate to striato-reticulate.
P = 30 µm (28 to 33), E = 26 µm (25 to 30).

Semecarpus auriculata Bedd. **Pl. 5**

Locality unknown, BOURDILLON 390, (K).
Slide HIFP 21765.

Distribution: Western peninsular India.

Western Ghats: from Coorg southwards. A medium-sized tree, up to 1000 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine striato-reticulate.
P = 38 µm (31 to 42), E = 29 µm (26 to 34).

Semecarpus travancorica Bedd. **Pl. 5**

Travancore hills, BEDDOME 187, (K).
Slide HIFP 21866.

Distribution: Western peninsular India.

Western Ghats: in Travancore and Tirunelveli hills. A large tree, from 600 to 1000 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine striato-reticulate.
P = 38 µm (35 to 43), E = 30 µm (25 to 32).

ANNONACEAE

Goniothalamus cardiopetalus (Dalz.) Hook. f. & Th. **Pl. 6**

Mercara (Coorg Dt.), PASCAL 830, (HIFP).
Slide HIFP 21760.

Distribution: Peninsular India.

Western Ghats: Kanara, Coorg, Wayanad and Anaimalai. A shrub or small tree in forest undergrowth of the ghats, from 300 to 1300 m. Endemic to South India. Common.

Pollen: monosulcate, sexine smooth to scabrate.
Longest axis: 115-124 µm, mean size 120 µm.

Remark: see *G. wightii*.

WALKER, 1971.

Goniothalamus wightii Hook. f. & Th. *(not illustrated)*

Sengalteri (Tirunelveli Dt.), FYSON 5832, (PCM).
Slide HIFP 1273.

Distribution: Western peninsular India.

Western Ghats: Anaimalai, Travancore and Tirunelveli hills. A small tree, up to 1500 m. Endemic to Western Ghats. Occasional.

Remark: pollen of *G. wightii* and *G. cardiopetalus* are very similar.

Meiogyne pannosa (Dalz.) Sinclair **Pl. 6**

Kalkad RF (Tirunelveli Dt.), RAMESH & DE FRANCESCHI K686, (HIFP).
Slide HIFP 21830.

Distribution: Western peninsular India.

Western Ghats: Malabar, Anaimalai and Travancore. A small tree attaining 9 m, from 350 to 1400 m. Endemic to Western Ghats. Common in Travancore.

Pollen: inaperturate, sexine globular.
Longest axis: 62-79 µm, mean size 68 µm.

WALKER, 1971.

Polyalthia fragrans (Dalz.) Bedd. **Pl. 6**

Shiradi (Hassan Dt.), HOOPER & SALDANHA 2544, (JCB).
Slide HIFP 12375

Distribution: Western peninsular India.

Western Ghats: from N. Kanara southwards. A tall and straight tree, up to 1300 m. Endemic to Western Ghats. Common. Wood used for the masts of native craft.

Pollen: inaperturate, sexine verrucate.
Longest axis: 34-43 µm, mean size 39 µm.

WALKER, 1971; LE THOMAS, 1981; SCHATZ & LE THOMAS, 1990.

APOCYNACEAE

Tabernaemontana gamblei Subr. & Henry **Pl. 7**

Valparai Estate (Coimbatore Dt.), R.S. RAO, s.n., (BSI).
Slide HIFP 21847.

Distribution: South India.

Western Ghats: Anaimalai, Tirunelveli and Coimbatore hills. A shrub. Endemic to South India. Common.

Pollen: 4-colporate, sexine smooth, perforate.
P = 47 µm (43 to 52), E = 53 µm (47 to 56).

VAN CAMPO *et al.*, 1979; NILSSON, 1986; NILSSON, 1990.

ARISTOLOCHIACEAE

Thottea siliquosa (Lam.) Ding Hou **Pl. 7**

Vellapathy (Coimbatore Dt.), collector unknown, (MH).
Slide HIFP 2915.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: in all districts. An erect shrub in forest undergrowth, up to 1300 m. Common.

Pollen: inaperturate, sexine surface composed of more or less circular subunits.
D = 32 µm (30 to 35).

WALKER, 1974; DING HOU, 1981.

ASTERACEAE

Vernonia travancori[illegible] Hook. f. **Pl. 7**

Agastyarmala (Thiruvananthapuram Dt.).
PASCAL 688, (HIFP).
Slide HIFP 21845.

Distribution: Western peninsular India.

Western Ghats: Travancore and Tirunelveli hills. A small tree, above 1000 m. Endemic to Western Ghats. Occasional.

Pollen: 3-porate, fenestrate, sexine echinolophate.
D = 60 µm (55 to 64).

KINGHAM, 1976; VASANTHY, 1985; BLACKMORE, 1986.

BIGNONIACEAE

Pajanelia longifolia (Willd.) Schum. **Pl. 8**

Bisle Ghats (Hassan Dt.), SALDANHA 16030, (JCB).
Slide HIFP 21867.
Minhole (Shimoga Dt.), RAGHAVAN, s.n., (BSI).
Slide HIFP 16521.

Distribution: India, Burma.

Western Ghats: South Kanara to Travancore. A tall deciduous tree, up to 700 m. Common.

Pollen: 3-colpate, sexine reticulate.
P = 52 µm (50 to 66), E = 40 µm (37 to 43).

BUURMAN, 1977.

BOMBACACEAE

Cullenia exarillata A. Robyns **Pl. 8**

Kakki forest (Quilon Dt.), PASCAL 732, (HIFP).
Slide HIFP 14679.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: from Brahmagiri Ghats southwards. A tall buttressed tree, up to 1300 m. Common.

Pollen: 3-colporate, ectoaperture very short, sexine smooth.
P = 68 µm (65 to 70), E = 69 µm (64 to 74).

NILSSON & ROBYNS, 1986; THANIKAIMONI *et al.*, 1984b.

BURSERACEAE

Canarium strictum Roxb. **Pl. 9**

Devarunde (Hassan Dt.), SALDANHA 16579, (JCB).
Slide HIFP 12403.

Distribution: Western peninsular India.

Western Ghats: Konkan and Anaimalai. A very large tree, up to 1600 m. Common in moist evergreen forests.

Pollen: 3-colporate, sexine finely grano-rugulate.
P = 35 µm (34 to 37), E = 31 µm (30 to 33).

LOBREAU-CALLEN *et al.*, 1975.

CELASTRACEAE

Bhesa indica (Bedd.) Ding Hou **Pl. 9**

Palni (Madurai Dt.), BLASCO 1231, (HIFP).
Slide HIFP 21817.
Monica (Coimbatore Dt.), BARBER 3878, (MH).
Slide HIFP 1459.

Distribution: Indo-Malaysia.

Western Ghats: Anaimalai, Tirunelveli and Travancore hills. A large tree, from 1000 to 2000 m. Common.

Pollen: 3-colporate, sexine smooth to scabrate. Fine striation visible on SEM.
P = 29 µm (27 to 30), E = 20 µm (18 to 24).

LOBREAU-CALLEN, 1977.

Euonymus indicus Heyne **Pl. 10**

Shiradi Ghat (Hassan Dt.), SALDANHA 13670, (JCB).
Slide HIFP 12410.

Distribution: Western peninsular India.

Western Ghats: South Kanara, Coorg, Wayanad, Nilgiris southwards. A small tree at about 1000 m, rarely at higher elevations. Endemic to Western Ghats. Common.

Pollen: 3-colporate with periapertural thinning, sexine reticulate.
P = 26 µm (25 to 27), E = 29 µm (28 to 33).

LOBREAU-CALLEN, 1977.

Lophopetalum wightianum Arn. **Pl. 10**

Shiradi (Hassan Dt.), SALDANHA 16208, (JCB).
Slide HIFP 12412.

Distribution: Indo-Malaysia.

Western Ghats: from S. Kanara southwards. A lofty tree, at low elevations and up to 1000 m. Common along river banks.

Pollen: tetrad, 3-4-porate, sexine verrucate.
D = 60 µm (54 to 70).

LOBREAU-CALLEN, 1977.

Microtropis stocksii Gamble **Pl. 10**

Devarunde (Hassan Dt.), SALDANHA 13013, (JCB).
Slide HIFP 12413.

Distribution: Western peninsular India.

Western Ghats: in all districts. A medium-sized tree, also common in semi-evergreen to moist deciduous forests of lower and upper Ghats, near the banks of streams. Endemic to Western Ghats.

Pollen: 3-colporate with periapertural thinning, sexine reticulate.
P = 19 µm (18 to 21), E = 21 µm (20 to 23).

GUINET, 1962; LOBREAU-CALLEN, 1977.

CLUSIACEAE

Calophyllum apetalum Willd. **Pl. 11**

Kempuhole (Hassan Dt.), JARRETT, SALDANHA & RAMAMOORTHY 11617, (JCB).
Slide HIFP 12731.

Distribution: Western peninsular India.

Western Ghats: South Kanara to Travancore. A tree common along banks of rivers and backwaters. Usually at low elevations. Endemic to Western Ghats.

Pollen: 3-colporate, sexine reticulate.
P = 42 µm (38 to 45), E = 34 µm (30 to 40).

SEETHARAM, 1985.

Calophyllum austroindicum Kosterm. ex Stevens **Pl. 11**

Pirmed (Idukki Dt.), collector unknown, (MH).
Slide HIFP 21851.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: South Kanara, South Travancore and Tirunelveli hills. A large tree, at about 1300 m. Occasional.

Pollen: 3-colporate, sexine reticulate.
P = 38 µm (36 to 40), E = 40 µm (38 to 44).

SEETHARAM, 1985.

Calophyllum polyanthum Wall. ex Choisy **Pl. 12**

Silent Valley (Palghat Dt.), BALASUBRAMANIAN s.n., (HIFP).
Slide HIFP 21749.

Distribution: Western peninsular India.

Western Ghats: Nilgiris, Travancore and Tirunelveli hills and coastal regions from S. Kanara southwards. A tall tree, from 300 to 1500 m. Common.

Pollen: 3-colporate, sexine reticulate.
P = 35 µm (33 to 36), E = 31 µm (28 to 35).

SEETHARAM, 1985.

Garcinia gummi-gutta (L.) Robson **Pl. 12**

Anmode (N. Goa), SAHNI 6117, (DD).
Slide HIFP 11612.
Munnar (Idukki Dt.), PASCAL 1429, (HIFP).
Slide HIFP 21818.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: from Coorg to Travancore. A small tree, up to 2000 m, common in evergreen and lower shola forests.

Pollen: 4-colporate, sometimes 5-colporate, sexine reticulate.
P = 25 µm (22 to 26), E = 27 µm (23 to 29).

SEETHARAM, 1985.

Garcinia morella (Gaertn.) Desr. **Pl. 12**

Munnar (Idukki Dt.), DE FRANCESCHI 321, (HIFP).
Slide HIFP 21832.

Distribution: Indo-Malaysia.

Western Ghats: from S. Kanara to Travancore. A medium-sized tree, up to 1000 m. Very common.

Pollen: 4-colporate, sometimes 5-colporate, sexine reticulate.
P = 25 µm (23 to 26), E = 28 µm (27 to 30).

SEETHARAM, 1985.

Garcinia talbotii Raiz. ex Sant. **Pl. 13**

Bisle Ghats (Hassan Dt.), SALDANHA 16027, (JCB).
Slide HIFP 12729.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: S. Kanara and Coimbatore hills. A small or medium-sized tree, up to 800 m. Common.

Pollen: 5-6-colporate, sexine smooth to scabrate.
P = 41 µm (35 to 44), E = 42 µm (35 to 48).

SEETHARAM, 1985.

Garcinia travancorica Bedd. **Pl. 13**

Tirunelveli Dt., VAJRAVELU 29280, (MH).
Slide HIFP 16533.

Distribution: Western peninsular India.

Western Ghats: S. Travancore and Tirunelveli hills. A medium-sized ornamental tree, at about 1000 m. Endemic to Western Ghats. Occasional.

Pollen: 4-5-porate, exceptionally 6-porate, sexine echinate.
P = 40 µm (37 to 48), E = 47 µm (43 to 50).

SEETHARAM, 1985.

Mesua ferrea L. **Pl. 14**

Agumbe (Shimoga Dt.), SEETHARAM 28, (HIFP).
Slide HIFP 21870.

Distribution: Indo-Malaysia.

Western Ghats: from S. Kanara to Travancore. A very tall tree, from 300 to 1600 m. Very common.

Pollen: 3-colporate, sexine reticulate.
P = 45 µm (40 to 49), E = 45 µm (38 to 49).

SEETHARAM, 1985.

Poeciloneuron indicum Bedd. **Pl. 14**

Govardhangiri R.F. (Shimoga Dt.), SEETHARAM 38, (HIFP).
Slide HIFP 16018.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara to Travancore. A large evergreen tree sometimes gregarious, up to 1300 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine microreticulate.
P = 11 µm (10 to 14), E = 12 µm (11 to 15).

SEETHARAM, 1985.

Poeciloneuron pauciflorum Bedd. **Pl. 14**

Mahendra Giri (Tirunelveli Dt.), DUNN, s.n., (MH).
Slide HIFP 21861.

Distribution: Western peninsular India.

Western Ghats: Travancore to Tirunelveli hills. A large evergreen tree, from 700 to 1400 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine microreticulate.
P = 10 µm (9 to 11), E = 11 µm (10 to 12).

SEETHARAM, 1985.

CORNACEAE

Mastixia arborea (Wt.) Bedd. **Pl. 15**

Poonachi (Coimbatore Dt.), BARBER 5989, (MH).
Slide HIFP 21850.
Anaimalai (Coimbatore Dt.), BARBER 5778, (K).
Slide HIFP 21772.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: from S. Kanara southwards. A large tree, from 400 to 1500 m. Common.

Pollen: 3-colporate, sexine smooth, tectum perforate.
P = 49 µm (46 to 51), E = 40 µm (38 to 43).

FERGUSON, 1977.

DICHAPETALACEAE

Dichapetalum gelonioides (Roxb.) Engl. **Pl. 16**

Bisle Ghat (Hassan Dt.), SALDANHA & RAMAMOORTHY 1660, (HIFP).
Slide HIFP 21871.

Distribution: Indo-Malaysia.

Western Ghats: from S. Kanara to Anaimalai and Travancore. A small tree, up to 1300 m, usually in undergrowth or at the margins. Common.

Pollen: 3-colpate, sexine micro-reticulate.
P = 16 µm (13 to 18), E = 21 µm (19 to 25).

PUNT, 1975; PUNT, 1976.

DIPTEROCARPACEAE

Dipterocarpus bourdillioni Brandis **Pl. 17**

Achancovil Range, Thenmalai Division (Quilon Dt.), DE FRANCESCHI, MONTFRAIX & PASCAL RD822, (HIFP).
Slide HIFP 21872.

Distribution: Western peninsular India.

Western Ghats: Carcoor Ghats in Malabar, North and Central Travancore. A large tree attaining 50 m, at low elevations (below 700 m). Endangered species. Endemic to Western Ghats. A good timber for plywood.

Pollen: 3-colpate, tilioid sexine structure.
P = 80 µm (72 to 90), E = 57 µm (45 to 66).

MAURY *et al.*, 1975.

Dipterocarpus indicus Bedd. **Pl. 17**

South Kanara, collector unknown, (MH).
Slide HIFP 1394

Distribution: Indo-Malaysia.

Western Ghats: from N. Kanara to Kanniyakumari District. A very large tree, up to about 1000 m. Common. A good timber for plywood.

Pollen: 3-colpate, tilioid sexine structure.
P = 79 µm (73 to 85), E = 53 µm (48 to 59).

MAURY *et al.*, 1975.

Hopea parviflora Bedd. **Pl. 18**

Anaimalai (Coimbatore Dt.), collector unknown, (MH).
Slide HIFP 21853.

Distribution: Western peninsular India.

Western Ghats: In all districts. A large resinous tree of moist forests, up to 1200 m, often gregarious in hill forests, sporadic on river banks in plains. Endemic to Western Ghats.

Pollen: 3-colpate, sexine grano-rugulate.
P = 23 µm (23 to 25), E = 23 µm (21 to 25).

MAURY *et al.*, 1975.

Hopea ponga (Dennst.) Mabberly **Pl. 19**

Vanagur (Hassan Dt.), RAMAMOORTHY, s.n., (JCB).
Slide HIFP 21822.

Distribution: Western peninsular India.

Western Ghats: From S. Kanara southwards. An important timber tree, up to 1000 m, common in coastal and Ghats forests. Endemic to Western Ghats.

Pollen: 3-colpate, sexine grano-rugulate.
P = 33 µm (30 to 37), E = 31 µm (30 to 35).

MAURY *et al.*, 1975.

Hopea utilis (Bedd.) Bole **Pl. 20**

Kakachi (Tirunelveli Dt.), SEBASTINE, s.n., (MH).
Slide HIFP 21890.

Distribution: Western peninsular India.

Western Ghats: Tirunelveli hills. A large tree at low elevations, from 300 to 1200 m. Endemic to Western Ghats. Common.

Pollen: 3-colpate, sexine grano-rugulate.
P = 23 µm (20 to 25), E = 25 µm (22 to 28).

MAURY *et al.*, 1975.

Vateria indica L. **Pl. 20**

Bisle Ghats (Hassan Dt.), SALDANHA 16509, (JCB).
Slide HIFP 12521.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara to Tirunelveli hills. A very large resinous tree at low elevations, up to 1200 m, very often planted. Endemic to Western Ghats. Common. Timber is used for plywood.

Pollen: 3-colpate, sexine grano-rugulate.
P = 25 µm (21 to 26), E = 24 µm (21 to 25).

MAURY, 1978; MAURY *et al.*, 1975.

EBENACEAE

Diospyros assimilis Bedd. **Pl. 21**

Uppangala (Coorg Dt.), DE FRANCESCHI 1980, (HIFP).
Slide HIFP 21735.

Distribution: South India.

Western Ghats: in all districts. A large tree, from 300 to 1000 m. Common.

Pollen: 3-colporate, sexine smooth to scabrate.
P = 28 µm (26 to 33), E = 25 µm (23 to 28).

DE FRANCESCHI, 1992.

Diospyros bourdillonii Brandis **Pl. 21**

Periyar Valley (Idukki Dt.), DE FRANCESCHI 329, (HIFP).
Slide HIFP 21739.

Distribution: Western peninsular India.

Western Ghats: from Coorg to Tirunelveli hills and Travancore. A large tree, up to 1000 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine smooth.
P = 45 µm (42 to 47), E = 33 µm (32 to 36).

DE FRANCESCHI, 1992.

Diospyros buxifolia (Bl.) Hiern **Pl. 22**

Uppangala (Coorg Dt.), RAMESH & DE FRANCESCHI 1981, HIFP).
Slide HIFP 21737.

Distribution: Indo-Malaysia.

Western Ghats: S. Kanara, Malabar, Travancore and Anaimalai. A large tree, up to 1000 m. Common.

Pollen: 3-colporate, sexine smooth.
P = 35 µm (32 to 37), E = 26 µm (22 to 29).

DE FRANCESCHI, 1992.

Diospyros paniculata Dalz. **Pl. 23**

Mahendragiri (Kanniyakumari Dt.), DE FRANCESCHI & MONTFRAIX 891, (HIFP).
Slide HIFP 21876.

Distribution: Western peninsular India.

Western Ghats: Malabar and Travancore. A medium-sized tree, up to 1400 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine smooth, microperforate.
P = 29 µm (27 to 32), E = 29 µm (28 to 31).

DE FRANCESCHI, 1992.

Diospyros sylvatica Roxb. **Pl. 23**

Uppangala (Coorg Dt.), RAMESH & DE FRANCESCHI 1964, (HIFP).
Slide HIFP 21873

Distribution: Indo-Malaysia.

Western Ghats: in all districts. A medium-sized tree, up to 1600 m. Common.

Pollen: 3-colporate, sexine smooth.
P = 38 µm (33 to 41), E = 26 µm (24 to 28).

DE FRANCESCHI, 1992.

ELAEOCARPACEAE

Elaeocarpus serratus L. **Pl. 24**

Ponmudi hills (Thiruvananthapuram Dt.).
PASCAL 501, (HIFP).
Slide HIFP 21809.

Distribution: India (including Tropical Himalayas), Malaysia and Sri Lanka.

Western Ghats: in all districts. A small tree to medium-sized tree, up to 1500 m. Common.

Pollen: 3-colporate, sexine smooth.
P = 9 µm (8 to 10), E = 9 µm (8 to 10).

CHEN, 1988.

Elaeocarpus tuberculatus Roxb. **Pl. 24**

Shiradi (Hassan Dt.), SALDANHA 12271, (JCB).
Slide HIFP 12488.

Distribution: Indo-Malaysia.

Western Ghats: in all districts. A large tree on river banks, up to 1500 m. Common.

Pollen: 3-colporate, sexine smooth.
P = 9 µm (8 to 10), E = 9 µm (8 to 10).

STRAKA & SIMON, 1967.

ERYTHROXYLACEAE

Erythroxylum moonii Hochr. **Pl. 24**

Peradeniya, Royal Botanic Gardens (Sri Lanka).
WIJESUNDARA, s.n., (HIFP).
Slide HIFP 21874.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: in Wayanad and Palni hills. A small tree, up to 1300 m. Occasional.

Pollen: 3-colporate, sexine reticulate.
P = 39 µm (37 to 43), E = 38 µm (36 to 43).

LOBREAU-CALLEN *et al.*, 1975.

EUPHORBIACEAE

Agrostistachys indica Dalz. **Pl. 25**

Agastyarmala (Thiruvananthapuram Dt.). MOHANAN 10239, (TBGT). Slide TBGT 1247.

Distribution: Central and Western peninsular India, Sri Lanka.

Western Ghats: in all districts. A shrub to small tree reaching 2 m in height, usually on the banks of streams in evergreen and wet deciduous forests, up to 1800 m. Common.

Pollen: 3-colporate, sexine reticulate. P = 33 µm (29 to 38), E = 28 µm (27 to 32).

PUNT, 1962.

Agrostistachys meeboldii Pax & K. Hoffm. **Pl. 25**

Agastyarmala (Thiruvananthapuram Dt.). MOHANAN 9196, (TBGT). Slide TBGT 1238. Madurai Dt., Blasco HW-50, (HIFP). Slide HIFP 21757.

Distribution: Western peninsular India.

Western Ghats: in Wayanad, Anaimalai, Travancore and Tirunelveli hills. A small tree, from 600 to 1500 m. Endemic to Western Ghats. Common in southern districts.

Pollen: 3-colporate, sexine reticulate. P = 31 µm (28 to 35), E = 29 µm (27 to 32).

PUNT, 1962.

Baccaurea courtallensis Muell.-Arg. **Pl. 26**

Adiparambu (Thiruvananthapuram Dt.). NAZARUDEEN 13657, (TBGT). Slide TBGT 1205. Coorg Dt., PASCAL 760, (HIFP). Slide HIFP 17665.

Distribution: Western peninsular India.

Western Ghats: from South Kanara southwards. A medium-sized cauliflorous tree, abundant in the moist deciduous and evergreen forests. Endemic to Western Ghats.

Pollen: 3-colporate, sexine microreticulate. P = 17 µm (15 to 20), E = 13 µm (12 to 18).

PUNT, 1962.

Bischofia javanica Bl. **Pl. 26**

Attayar (Thiruvananthapuram Dt.). MOHANAN 7863, (TBGT). Slide TBGT 1210. Bisle Ghat (Hassan Dt.). SALDANHA 12558, (JCB). Slide HIFP 12530.

Distribution: Peninsular India. Tropical Himalayas and Assam, Malaya and Pacific islands

Western Ghats: Konkan, Kanara, Nilgiri hills. A large deciduous tree, up to 1200 m. Common.

Pollen: 3-colporate, sexine microreticulate. P = 25 µm (23 to 28), E = 24 µm (22 to 26).

PUNT, 1962; CHEN, 1988.

Blachia denudata Benth. **Pl. 27**

Megani Valley (South Kanara Dt.), PASCAL 1260, (HIFP). Slide TBGT 1287.

Distribution: Western peninsular India.

Western Ghats: Konkan, Goa and Kanara. A shrub to small tree in the deciduous jungles and evergreen forests. Endemic to Western Ghats. Common.

Pollen: inaperturate, sexine with crotonoid pattern. D = 50 µm (45 to 60).

PUNT, 1962.

Croton gibsonianus Nimmo **Pl. 27**

South Badra, Bhagavati (Chikmagalur Dt.). SURESH 291, (HIFP). Slides TBGT 1286 and HIFP 21756.

Distribution: Western peninsular India and Northwest of Deccan.

Western Ghats: Konkan and Kanara. A large shrub to small tree in the moist deciduous and evergreen forests. Common.

Pollen: inaperturate, sexine with crotonoid pattern. D = 60 µm (52 to 70).

PUNT, 1962; THANIKAIMONI *et al.*, 1984a.

Croton malabaricus Bedd. **Pl. 28**

Adherpally (Thrissur Dt.), collector unknown, (PCM). Slide HIFP 1171.

Distribution: Western peninsular India.

Western Ghats: Konkan, Kanara, Malabar and Travancore. A medium-sized tree in the evergreen forests from 900 to 1200 m.

Pollen: inaperturate, sexine with crotonoid pattern. D = 52 µm (45 to 57).

PUNT, 1962; THANIKAIMONI *et al.*, 1984a.

Dimorphocalyx lawianus Hook. f. **Pl. 28**

Kannikattai (Tirunelveli Dt.). HENRY 19897, (MH). Slide TBGT 1225.

Walaiyar (Tirunelveli Dt.), KOSTERMANS 26308, (HIFP).
Slide HIFP 21759.

Distribution: Western peninsular India.

Western Ghats: North Konkan, Kanara, Anaimalai, Travancore and Tirunelveli hills. A small to medium-sized tree, from 900 to 1200 m. Endemic to Western Ghats. Common.

Pollen: inaperturate, sexine with crotonoid pattern.
D = 52 µm (50 to 62).

PUNT, 1962.

Drypetes elata (Bedd.) Pax & Hoffm. **Pl. 29**

Tambacheri (Wayanad Dt.), BARBER 5657, (HIFP).
Slide TBGT 1288.

Distribution: Western peninsular India.

Western Ghats: Wayanad, Anaimalai, Travancore and Tirunelveli hills. A lofty straight tree, from 600 to 1200 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine reticulate.
P = 40 µm (35 to 45), E = 31 µm (29 to 45).

PUNT, 1962.

Drypetes malabarica (Bedd.) Airy Shaw **Pl. 30**

Tirunelveli Ghats (Tirunelveli Dt.), BEDDOME, s.n., (HIFP).
Slide HIFP 21776.

Distribution: Western peninsular India.

Western Ghats: Travancore and Tirunelveli hills. A medium-sized to large tree, from 900 to 1500 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine microreticulate to reticulate.
P = 35 µm (25 to 40), E = 35 µm (24 to 35).

PUNT, 1962.

Drypetes oblongifolia (Bedd.) Airy Shaw **Pl. 30**

Borampatty Hills (Coimbatore Dt.), BEDDOME s.n., (HIFP).
Slides TBGT 1294 and HIFP 21773.

Distribution: Western peninsular India.

Western Ghats: in southern districts. A tree reaching 10 m in height, generally in the shade of large trees on river banks, from 600 to 1200 m. Endemic to Western Ghats. Very common.

Pollen: 3-colporate, sexine microreticulate to reticulate.
P = 38 µm (36 to 42), E = 30 µm (26 to 34).

PUNT, 1962.

Excoecaria crenulata Wt. **Pl. 31**

Devalkere (Hassan Dt.), SALDANHA 13494, (JCB).
Slide HIFP 12741.
Carrington (Nilgiri Dt.), SHETTY 34274, (MH).
Slide TBGT 1234.

Distribution: Peninsular India and Sri Lanka.

Western Ghats: from Coorg southwards. A small tree mainly in shola forests and margins of wet deciduous forests, up to 2100 m. Common.

Pollen: 3-colporate, sexine reticulate.
P = 41 µm (35 to 46), E = 34 µm (28 to 37).

PUNT, 1962; TISSOT, 1980.

Fahrenheitia zeylanica (Thw.) Airy Shaw **Pl. 32**

Mahaoya (Kandy Dt., Sri Lanka), JAYASURIYA 957, (HIFP).
Slides TBGT 1289 and HIFP 21770.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: Wayanad, Anaimalai and hills of Malabar and Travancore. A lofty tree in evergreen and semi-evergreen forests, from 600 to 1200 m. Common.

Pollen: inaperturate, sexine with crotonoid pattern.
D = 72 µm (66 to 84).

PUNT, 1962.

Macaranga peltata (Roxb.) Mueller **Pl. 32**

Punalur (Quilon Dt.), collector unknown, (SN College Herbarium, Quilon). Slide TBGT 1217.
Vanagur (Hassan Dt.), SALDANHA 15490, (JCB).
Slide HIFP 12931.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: in all districts. A quick growing resinous tree, common in the ghats along roadsides and forest clearings, up to 900 m.

Pollen: 3-colporate, sexine microechinate.
P = 17 µm (15 to 21), E = 16 µm (13 to 20).

PUNT, 1962.

Mallotus beddomei Hook. f. **Pl. 33**

Anaimalai hills (Anaimalai Dt.), BEDDOME 8, (K).
Slide HIFP 21781.

Distribution: Western peninsular India.

Western Ghats: Wayanad, Anaimalai, and Travancore, Tirunelveli and Coimbatore hills. A shrub or small tree, up to 1500 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine scabrate.
P = 23 µm (20 to 28), E = 24 µm (20 to 28).

PUNT, 1962.

Mallotus distans Muell.-Arg. **Pl. 33**

Kannikatty (Tirunelveli Dt.), SHANAVASKHAN 5324, (TBGT).
Slide TBGT 1285.

Distribution: Southern Deccan of India and Sri Lanka.

Western Ghats: Anaimalai and hills of Travancore and Tirunelveli. A straggling shrub, up to 1000 m. Occasional.

Pollen: 3-colporate, sexine scabrate.
P = 27 µm (22 to 30), E = 27 µm (23 to 30).

PUNT, 1962.

Mallotus philippensis (Lam.) Muell.-Arg. **Pl. 33**

Kulathupuzha (Quilon Dt.), MATHEW DAN 4084, (TBGT).
Slide TBGT 1285.

Distribution: Indo-Malaysia, China and Australia.

Western Ghats: in all districts. A medium-sized tree, up to 1500 m, very common in open scrub jungles and deciduous forests, common in evergreen forests.

Pollen: 3-colporate, sexine scabrate.
P = 24 µm (20 to 26), E = 24 µm (21 to 27).

PUNT, 1962.

Mallotus stenanthus Muell.-Arg. **Pl. 34**

Pallur forests (Nilgiri Dt.), VAJRAVELU 46379, (MH).
Slide TBGT 1228.
Madurai Dt., BLASCO 1823, (HIFP).
Slide HIFP 11467.

Distribution: Western peninsular India.

Western Ghats: from Konkan southwards. A small tree in the deciduous and evergreen forests, up to 1200 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sometimes 4-colporate, sexine scabrate.
P = 20 µm (18 to 24), E = 24 µm (20 to 28).

PUNT, 1962.

Sauropus androgynus Merr. **Pl. 34**

Cholaipalam (Tirunelveli Dt.), RAMESH & DE FRANCESCHI 1801, (HIFP).
Slide HIFP 21904.

Distribution: Western peninsular India.

Western Ghats: from Wayanad southwards. A shrub, from 600 to 1200 m. Common.

Pollen: periporate, sexine reticulate.
D = 31 µm (28 to 33).

PUNT, 1962.

FABACEAE

Caesalpinioideae

Bauhinia phoenicea Heyne ex Wt. & Arn. **Pl. 35**

Uppangala (Coorg Dt.), DE FRANCESCHI 461, (HIFP).
Slide HIFP 21819.

Distribution: Western peninsular India.

Western Ghats: from Coorg to Anaimalai and Travancore. A very large climber, up to 600 m. Endemic to Western Ghats. Very common.

Pollen: tetrad, 3-porate, sexine smooth, tectum microperforate.
D = 107 µm (90 to 120).

LARSEN, 1975; SCHMITZ, 1973; FERGUSON, 1990; FERGUSON & PEARCE, 1986.

Humboldtia brunonis Wall. **Pl. 35**

Malgod (Hassan Dt.), SALDANHA 16598, (JCB).
Slide HIFP 14398.

Distribution: Western peninsular India.

Western Ghats: S. Kanara, Coorg, Malabar and West Nilgiris. A diffuse shrub or small tree, up to 800 m. Endemic to Western Ghats. Very common.

Pollen: 3-colporate, sexine roughly striate.
P = 53 µm (50 to 57), E = 48 µm (44 to 50).

Remark: see *H. vahliana*.

Humboldtia decurrens Bedd. **Pl. 36**

Travancore, BOURDILLON 92, (HIFP).
Slide HIFP 21842.

Distribution: Western peninsular India.

Western Ghats: Central Travancore and Tirunelveli hills. A medium-sized tree, up to 1000 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine roughly striate.
P = 57 µm (56 to 60), E = 49 µm (44 to 52).

Humboldtia unijuga Bedd. **Pl. 36**

Agastyarmala (Thiruvananthapuram Dt.),
PASCAL 700, (HIFP).
Slide HIFP 21762.

Distribution: Western peninsular India.

Western Ghats: South Travancore and Tirunelveli hills. A medium-sized tree in dense evergreen forests, from 1000 to 1300 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine roughly verrucate.
P = 63 µm (61 to 67), E = 48 µm (45 to 50).

Humboldtia vahliana Wt. *(not illustrated)*

Tirunelveli Dt., BEDDOME, (MH).
Slide HIFP 2641.

Distribution: Western peninsular India.

Western Ghats: Malabar, Travancore, Tirunelveli hills and Nilgiris. A medium-sized tree on low ground near rivers, up to 650 m. Endemic to Western Ghats. Occasional.

Remark: pollen of *H. vahliana* and *H. brunonis* are very similar.

Kingiodendron pinnatum (DC.) Harms **Pl. 37**

Botanical garden, Calcutta, collector unknown, (K).
Slide HIFP 21763.

Distribution: Western peninsular India.

Western Ghats: S. Kanara, Malabar, Travancore and Tirunelveli hills. A very large handsome tree, up to 1000 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine scabrate.
P = 26 µm (24 to 27), E = 21 µm (20 to 23).

Mimosoideae

Entada pursaetha DC. **Pl. 38**

North Kanara Dt., BELL 5753, (K).
Slide HIFP 21764.

Distribution: Pantropical.

Western Ghats: from S. Kanara to Travancore. A gigantic climber. Very common.

Pollen: 3-colporate, sexine smooth, tectum perforate.
P = 57 µm (55 to 59), E = 43 µm (39 to 45).

GUINET, 1969; MULLER *et al.*, 1989.

Faboideae

Derris heyneana Benth. **Pl. 39**

Locality unknown, BEDDOME, s.n., (MH).
Slide HIFP 21857.

Distribution: Western peninsular India.

Western Ghats: S. Kanara, Konkan and hills of Travancore. A large climber, up to 1700 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine smooth.
P = 29 µm (27 to 30), E = 29 µm (27 to 30).

Ormosia travancorica Bedd. **Pl. 39**

Bisle Ghat (Hassan Dt.), SALDANHA 16248, (JCB).
Slide HIFP 13565.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara to the Anaimalai and the hills of Travancore and Tirunelveli. A lofty tree, up to 1200 m. Endemic to Western Ghats. Scattered and not common.

Pollen: 3-colporate, sexine reticulate.
P = 35 µm (26 to 39), E = 23 µm (21 to 26).

FLACOURTIACEAE

Casearia ovata (Lam.) Willd. **Pl. 40**

Coimbatore Dt., JACOB 388, (MH).
Slide HIFP 21877.

Distribution: Peninsular India and Sri Lanka.

Western Ghats: S. Kanara and Malabar. A small tree in the forests and coastal regions. Common.

Pollen: 3-colporate, exceptionally 4-colporate, sexine smooth.
P = 24 µm (23 to 25), E = 20 µm (19 to 21).

KEATING, 1973.

Flacourtia montana Grah. **Pl. 40**

Charmadi Ghats (Hassan Dt.), SALDANHA 16285, (JCB).
Slide HIFP 12533.

Distribution: Western peninsular India.

Western Ghats: in all districts. A very thorny tree in evergreen and semi-evergreen forests, up to 1000 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine microreticulate.
P = 21 µm (18 to 23), E = 14 µm (13 to 15).

KEATING, 1973.

Hydnocarpus alpina Wt. **Pl. 40**

Munnar (Idukki Dt.), De Franceschi 315, (HIFP).
Slide HIFP 21752.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara to Travancore. A medium-sized tree on hill forests, up to 2000 m. Common.

Pollen: 3-colporate, sexine reticulate.
P = 31 µm (30 to 33), E = 29 µm (28 to 31).

SCHAEFFER, 1972.

Hydnocarpus pentandra (Buch.-Ham) Oken **Pl. 41**

Yettinahalla (Hassan Dt.), NICHOLSON, SALDANHA & RAMAMOORTHY, s.n., (JCB).
Slide HIFP 12527.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara southwards. A large tree, up to 1400 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine reticulate.
P = 31 µm (28 to 33), E = 29 µm (28 to 33) .

SCHAEFFER, 1972.

Scolopia crenata (Wt. & Arn.) Clos **Pl. 41**

Devalkere (Hassan Dt.), RAMAMOORTHY, s.n., (JCB).
Slide HIFP 12490.

Distribution: South India, Sri Lanka, China and Philippines.

Western Ghats: in all districts. A medium-sized tree in hilly regions, above 700 m. Occasional.

Pollen: 3-colporate, sexine microreticulate.
P = 23 µm (21 to 26), E = 18 µm (16 to 20).

Taraktogenos macrocarpa (Bedd.) Balakr. **Pl. 41**

Merchiston (Thiruvananthapuram Dt.), NARAYANA IYER 1511, (TBGT).
Slide HIFP 21788.

Distribution: Western peninsular India.

Western Ghats: Travancore. A medium-sized tree of lower storey, up to 1000 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine reticulate.
P = 40 µm (37 to 43), E = 33 µm (31 to 35).

ICACINACEAE

Gomphandra coriacea Wt. **Pl. 42**

Silent Valley (Palghat Dt.), RAMESH 897, (HIFP).
Slide HIFP 21775.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: Nilgiris, Palnis, Anaimalai and Travancore hills. A small tree, from 450 to 2300 m, common in the shola forests.

Pollen: 3-porate, sexine granulate.
P = 15 µm (13 to 17), E = 22 µm (20 to 25).

LOBREAU-CALLEN, 1973.

Gomphandra tetrandra (Wall.) Sleumer **Pl. 42**

Ponmudi (Thiruvananthapuram Dt.), RIDSDALE 81, (HIFP).
Slide HIFP 17646.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: Wayanad, Nilgiris and Anaimalai. A shrub in low-level sholas, usually as undergrowth, up to 1000 m. Common.

Pollen: 3-porate, sexine granulate.
P = 13 µm (12 to 15), E = 23 µm (21 to 24).

LOBREAU-CALLEN, 1973.

Nothapodytes foetida (Wt.) Sleumer **Pl. 43**

Byra (Hassan Dt.), SALDANHA 14344, (JCB).
Slide HIFP 21878.

Distribution: India, China, Malaysia.

Western Ghats: from the Nilgiri hills southwards. A small or medium-sized tree. Common.

Pollen: 4-5-colpate, sexine echinate.
P = 54 µm (51 to 60), E = 49 µm (41 to 55).

LOGANIACEAE

Fagraea ceilanica Thunb. **Pl. 43**

Pathamale (Idukki Dt.), RINSDALE 151, (HIFP).
Slide HIFP 21755.

Distribution: Indo-Malaysia.

Western Ghats: open forests of Travancore and Tirunelveli hills. A small tree, up to 1000 m, occasional in wet forests.

Pollen: 3-porate, sexine reticulate with wide meshes.
P = 37 µm (36 to 38), E = 40 µm (38 to 42).

GUINET, 1962; PUNT, 1978; PUNT, 1980.

MELASTOMATACEAE

Memecylon angustifolium Wt. **Pl. 44**

Kempuhole (Hassan Dt.), RAMAMOORTHY 1695, (HIFP).
Slide HIFP 13488.

Distribution: Peninsular India and Sri Lanka.

Western Ghats: Tirunelveli hills. A tree common in semi-evergreen and occasional in evergreen forests, usually on river banks.

Pollen: heterocolpate, sexine smooth.
P = 14 µm (14 to 15), E = 11 µm (10 to 13).

Memecylon malabaricum (Cl.) Cogn. **Pl. 44**

Kalkad RF (Tirunelveli Dt.), RAMESH & DE FRANCESCHI K16, (HIFP).
Slide HIFP 21778.

Distribution: Western peninsular India.

Western Ghats: in moist sholas of the Nilgiri, Palni and Tirunelveli hills. A small tree, from 350 to 2400 m. Endemic to Western Ghats. Common.

Pollen: heterocolpate, sexine smooth.
P = 19 µm (17 to 20), E = 17 µm (15 to 18) .

Memecylon talbotianum Brandis **Pl. 44**

Vanagur (Hassan Dt.), SALDANHA 16233, (JCB).
Slide HIFP 13492.

Distribution: Western peninsular India.

Western Ghats: Coorg and Nilgiris, S. Kanara, and Biligirirangan hills. A small tree common in semi-evergreen forests, up to 1750 m. Endemic to Western Ghats.

Pollen: heterocolpate, sexine smooth to scabrate.
P = 20 µm (19 to 21), E = 16 µm (15 to 17).

MELIACEAE

Aglaia barberi Gamble **Pl. 44**

Uppangala (Coorg Dt.), RAMESH 1306, (HIFP).
Slide HIFP 21824.

Distribution: Western peninsular India.

Western Ghats: Anaimalai, Travancore and Tirunelveli hills. A small tree, up to 1000 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine smooth.
P = 15 µm (14 to 16), E = 11 µm (9 to 11) .

Aglaia elaegnoidea (Juss.) Benth. **Pl. 45**
var. ***bourdillonii*** (Gamble) K.K.N. Nair

Attaymallay (Travancore Dt.), collector unknown, (MH).
Slide HIFP 21879.

Distribution: Indo-Malaysia.

Western Ghats: from Konkan southwards. A small tree in lower Ghats, common in semi-evergreen and occasional in evergreen forests.

Pollen: 3-colporate, sexine smooth.
P = 18 µm (17 to 19), E = 9 µm (8 to 10) .

Aglaia simplicifolia (Bedd.) Harms **Pl. 45**

Coorg Dt., GAMBLE, s.n., (MH).
Slide HIFP 21858.

Distribution: Western peninsular India.

Western Ghats: from Coorg to Travancore and Tirunelveli hills. A small tree, from 300 to 1300 m. Endemic to Western Ghats. Occasional.

Pollen: 3-4 colporate, sexine microgranulate.
P = 19 µm (17 to 20), E = 19 µm (16 to 20).

Aphanamixis polystachya (Wall.) Parker **Pl. 45**

Cochinchina, PIERRE 1794, (P).
Slide HIFP 2790.

Distribution: Indo-Malaysia.

Western Ghats: from S. Kanara to Tirunelveli hills. A medium-sized tree in moist forests, up to 1700 m. Common.

Pollen: 3-colporate, sexine smooth.
P = 25 µm (19 to 30), E = 18 µm (14 to 23).

Dysoxylum malabaricum Bedd. **Pl. 45**

Travancore, collector unknown, (MH).
Slide HIFP 21891

Distribution: Western peninsular India.

Western Ghats: from Wayanad southwards. A very large tree, up to 1000 m. Frequency increases with altitude. Endemic to Western Ghats. The white cedar.

Pollen: 4-colporate (60 %) and 5-colporate (40 %). Sexine smooth, tectum perforate. Perforations round to elongate.
P = 35 µm (33 to 39), E = 35 µm (31 to 37).

Reinwardtiodendron anaimalaiense (Bedd.) Mabberly **Pl. 46**

Balehalli-Someshwara RF (Shimoga Dt.), PASCAL 1251, (HIFP).
Slide HIFP 17641.

Distribution: Western peninsular India.

Western Ghats: Anaimalai and hills of Malabar, Travancore and Tirunelveli. A medium-sized tree, up to 1200 m. Endemic to Western Ghats. Very common.

Pollen: 3-colporate, sexine smooth.
P = 23 µm (22 to 25), E = 19 µm (17 to 21).

Toona ciliata Roemer **Pl. 46**

Saklespur (Hassan Dt.). SALDANHA 12057. (JCB).
Slide HIFP 13489.

Distribution: India to Australia. Absent from Sri Lanka.

Western Ghats: Nilgiris and Anaimalai. A tree common in upper Ghats, often near banks of streams, at about 2000 m.

Pollen: 4-colporate, rarely 5-colporate, sexine smooth.
P = 39 µm (33 to 45), E = 34 µm (30 to 38).

Trichilia connaroides (Wt. & Arn.) Benth. **Pl. 47**

Tinaighat (N. Goa). SAHNI 1683. (DD).
Slide HIFP 11600.

Distribution: Indo-Malaysia.

Western Ghats: in all districts. A small tree common along margins of semi-evergreen forests and occasional in evergreen forests, up to 2000 m.

Pollen: 4-colporate, rarely 5-colporate, sexine smooth, tectum perforate.
P = 54 µm (43 to 66), E = 44 µm (38 to 54).

Walsura trifolia (A. Juss.) Harms **Pl. 48**

Uppangala (Coorg Dt.). RAMESH 1314. (HIFP).
Slide HIFP 21837.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: in all districts. A small tree, occasional in semi-evergreen and evergreen forests.

Pollen: 4-colporate, rarely 5-colporate, sexine smooth, tectum perforate.
P = 49 µm (41 to 54), E = 44 µm (38 to 46).

MORACEAE

Antiaris toxicaria Lesch. **Pl. 49**

Kuttalam (Tirunelveli Dt.). VENKATARAMANA AYYAR 153. (K).
Slide HIFP 21774.

Distribution: Indo-Malaysia.

Western Ghats: in all districts. A large tree, up to 1000 m. Common.

Pollen: 2-porate, sometimes 3-porate, sexine scabrate.
P = 16 µm (15 to 17), E = 18 µm (17 to 19).

YU CH'EN-HUNG & LIANG YUAN-HUI. 1982

Artocarpus heterophyllus Lam. **Pl. 49**

Shiradi Ghat (Hassan Dt.). SALDANHA 16918. (JCB).
Slide HIFP 19116.

Distribution: Pantropical.

Western Ghats: in all districts. A large tree native of the Western Ghats, from 500 to 1300 m. Very common. Cultivated almost everywhere. The jack tree.

Pollen: 3-porate, sexine microgranulate.
P =16 µm (15 to 18), E = 18 µm (17 to 19).

YU CH'EN-HUNG & LIANG YUAN-HUI. 1982

Ficus nervosa Heyne ex Roth. **Pl. 49**

Monger (E. Bhutan). BALAKRISHNAN 44605. (ASSAM).
Slide HIFP 18723.

Distribution: India to Viet-Nam, China, Malay Islands.

Western Ghats: in all hilly districts, except the driest. A medium-sized to large tree, from 100 to 1500 m, usually found near streams. Common.

Pollen: 2-porate, sometimes 3-porate, sexine smooth.
P = 10 µm (9 to 11), E = 12 µm (10 to 13).

YU CH'EN-HUNG & LIANG YUAN-HUI. 1982.

MYRISTICACEAE

Gymnacranthera canarica Warb. **Pl. 50**

South Kanara, collector unknown. (MH).
Slide HIFP 2069.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara southwards to Travancore. A very large tree at low elevation at about 300 m and preferring humid regions. Endemic to Western Ghats. Occasional.

Pollen: monosulcate, sexine rugulate.
L = 42 µm (40 to 49), w = 33 µm (29 to 37).

Knema attenuata (Hook. f. & Th.) Warb. **Pl. 50**

Bisle Ghat (Hassan Dt.). SALDANHA 15891. (JCB).
Slide HIFP 13467.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara southwards. A medium-sized tree, up to 1200 m. Endemic to Western Ghats. Very common.

Pollen: monosulcate, sexine reticulate.
L = 48 µm (43 to 54), w = 33 µm (30 to 37).

SIDDIQUI & WILSON. 1975.

Myristica dactyloides Gaertn. **Pl. 51**

Karian shola RF (Coimbatore Dt.), VAJRAVELU 46070, (HIFP).
Slide HIFP 17266.

Distribution: South India and Sri Lanka.

Western Ghats: in most of the districts. A large tree, up to 1600 m. Common.

Pollen: monosulcate, sexine reticulate.
L = 48 µm (43 to 55), w = 43 µm (38 to 50).

STRAKA & FRIEDRICH, 1988.

Myristica fatua Houtt. var. ***magnifica*** (Bedd.) Sinclair **Pl. 52**

Thenmalai (Quilon Dt.), RISDALE 539, (K).
Slide HIFP 21767.

Distribution: Western peninsular India.

Western Ghats: Kanara, Travancore and parts of Tirunelveli hills. A lofty tree in swampy ground, up to 1000 m. Endemic to Western Ghats. Occasional.

Pollen: monosulcate, sexine reticulate.
L = 50 µm (44 to 54), w = 47 µm (43 to 50).

STRAKA & FRIEDRICH, 1988.

Myristica malabarica Lam. **Pl. 51**

Karwar (North Kanara), PASCAL 1164a, (HIFP).
Slide HIFP 21787.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara southwards. A large tree at low elevation, up to 750 m. Endemic to Western Ghats. Common.

Pollen: monosulcate, sexine reticulate.
L = 45 µm (43 to 47), w = 43 µm (41 to 46).

STRAKA & FRIEDRICH, 1988.

MYRTACEAE

Eugenia thwaitesii Duthie **Pl. 53**

Madurai Dt., BLASCO HW64, (HIFP).
Slide HIFP 21790.

Distribution: South India and Sri Lanka.

Western Ghats: from S. Kanara southwards. A shrub or small tree, up to 1700 m. Occasional

Pollen: 3-colporate, sexine scabrate.
P = 11 µm (10 to 12), E = 19 µm (18 to 20).

VAN WYK & DEDEKIND, 1985.

Syzygium gardneri Thw. **Pl. 53**

Shiradi Ghat (Hassan Dt.), SALDANHA 16368, (JCB).
Slide HIFP 13535.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: from Coorg southwards. A tall tree, up to 1300 m. Common.

Pollen: 3-syncolporate, sexine smooth.
P = 10 µm (9 to 11), E = 15 µm (13 to 16).

Syzygium laetum (Buch.-Ham.) Gandhi **Pl. 53**

Ugandi-Byagadhalli Rd (Hassan Dt.).
SALDANHA 15886, (JCB).
Slide HIFP 13518.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara southwards. A medium-sized tree, frequent in forest undergrowth, up to 1600 m. Endemic to Western Ghats.

Pollen: 3-syncolporate, sexine smooth.
P = 11 µm (10 to 12), E =19 µm (18 to 20).

Syzygium mundagam (Bourd.) Chithra **Pl. 53**

Mancholai (Tirunelveli Dt.), SUBRAMANYAN, s.n., (MH).
Slide HIFP 1808.

Distribution: Western peninsular India.

Western Ghats: Travancore. A medium-sized tree, up to 1100 m. Endemic to Western Ghats.

Pollen: 3-syncolporate, sexine smooth.
P = 10 µm (9 to 12), E = 17 µm (16 to 19).

Syzygium occidentale (Bourd.) Gandhi **Pl. 53**

Malayattur Division (Ernakulam Dt.), PASCAL 1409, (HIFP).
Slide HIFP 21835.

Distribution: Western peninsular India.

Western Ghats: in all districts. A small riparian tree. Endemic to Western Ghats. Common.

Pollen: 3-syncolporate, sexine smooth to scabrate.
P = 12 µm (11 to 13), E = 20 µm (19 to 21).

OLACACEAE

Strombosia ceylanica Gardn. **Pl. 54**

North Kanara, TALBOT 1736, (K).
Slide HIFP 21777.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: from S. Kanara southwards. A large tree abundant throughout the Western Ghats, especially in Travancore.

Pollen: 3-colporate, sexine smooth.
P = 20 µm (19 to 22), E = 19 µm (18 to 20).

LOBREAU-CALLEN, 1980.

OLEACEAE

Olea dioica Roxb. **Pl. 54**

Kelil mine forest (Belgaum Dt.), PASCAL 1105, (HIFP).
Slide HIFP 17656.

Distribution: NE and SW India.

Western Ghats: in all districts. A medium-sized or large tree, common both in deciduous and evergreen forests.

Pollen: 3-colporate, sexine reticulate.
P = 18 µm (17 to 21), E = 16 µm (15 to 17).

NILSSON, 1988; PUNT *et al.*, 1991.

POLYGALACEAE

Xanthophyllum flavescens Roxb. **Pl. 54**

Virajpet (Coorg Dt.), PASCAL 464, (HIFP).
Slide HIFP 21828.

Distribution: Indo-Malaysia.

Western Ghats: in the hill forests from the Nilgiris southwards. A small tree, up to 1300 m. Common.

Pollen: stephanocolporate, sexine smooth.
P = 34 µm (30 to 39), E = 27 µm (25 to 29).

SIMPSON & SKVARLA, 1981.

RHIZOPHORACEAE

Blepharistemma membranifolia (Miq.) Ding Hou **Pl. 55**

Travancore, BOURDILLON, s.n., (MH).
Slide HIFP 2826.

Distribution: Western peninsular India.

Western Ghats: from South Kanara to Travancore. A medium-sized tree, up to 400 m. Endemic to Western Ghats. Rare.

Pollen: 3-colporate, sexine smooth to scabrate.
P = 25 µm (23 to 26), E = 20 µm (19 to 22).

VEZEY *et al.*, 1988.

Carallia brachiata (Lour.) Merr. **Pl. 55**

Medicinal garden, Tropical Botanical Garden, Palode (Thiruvananthapuram Dt.), MATHEW DAN 4097, (TBGT).
Slide HIFP 21898.

Distribution: Continental Asia to N. Australia.

Western Ghats: in all districts. A large tree common in wet deciduous and semi-evergreen forests, up to 1300 m.

Pollen: 3-colporate, sexine smooth.
P = 12 µm (11 to 15), E = 10 µm (9 to 12).

VEZEY *et al.*, 1988.

ROSACEAE

Prunus ceylanica (Wt.) Miq. **Pl. 55**

Raxidi estate (Hassan Dt.), JARRETT, SALDANHA & RAMAMOORTHY 870, (JCB).
Slide HIFP 14216.

Distribution: Indo-Malaysia.

Western Ghats: from S. Kanara to the Nilgiri, Palni and Travancore hills. A large tree, from 1000 to 2000 m. Common.

Pollen: 3-colporate, sexine scabrate.
P = 24 µm (21 to 27), E = 22 µm (19 to 25).

HEBDA *et al.*, 1991.

RUBIACEAE

Ixora elongata Heyne ex G. Don **Pl. 56**

Goa, KNB 2398, (DD).
Slide HIFP 11585.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara to Wayanad and Atapadi hills of Malabar. A shrub at about 500 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine reticulate
P = 23 µm (20 to 27), E = 21 µm (18 to 22).

HUSAIN & PAUL, 1986.

Ixora nigricans Wt. & Arn. **Pl. 56**

Kollur (S. Kanara Dt.), PETERSCHMITT & RAMALINGAM, s.n., (HIFP).
Slide HIFP 21692.

Distribution: Indo-Malaysia.

Western Ghats: in all districts. A large shrub or small tree common on the hill slopes, up to about 1600 m.

Pollen: 3-colporate, sometimes 2-colporate, sexine reticulate.
P = 24 µm (23 to 26), E = 23 µm (21 to 25).

HUSAIN & PAUL, 1986.

Lasianthus acuminatus Wt. **Pl. 57**

Devarunde (Hassan Dt.), SALDANHA 14026, (JCB).
Slide HIFP 19414.
Babubudan Hills (Chickmangalor Dt.), ARAVAJY Y13A, (HIFP).
Slide HIFP 21700.

Distribution: Western peninsular India.

Western Ghats: Nilgiris, Palnis and hills of Tirunelveli and Travancore. A slender shrub in sholas, from 1000 to 2000 m. Endemic to Western Ghats. Common.

Pollen: 2-3 colpate, sexine reticulate.
P = 36 µm (33 to 38), E = 45 µm (41 to 51).

VASANTHY, 1976.

Neonauclea purpurea (Roxb.) Merr. **Pl. 57**

Uppangala (Coorg Dt.), RAMESH 1763, (HIFP).
Slide HIFP 21862.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara to Malabar. A small tree in moist valleys, up to 1000 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine microreticulate.
P = 16 µm (15 to 17), E = 19 µm (18 to 20).

Octotropis travancorica Bedd. **Pl. 57**

Locality unknown, collector unknown, (TBGT).
Slide HIFP 21899.

Distribution: Western peninsular India.

Western Ghats: from Wayanad to the hills of Travancore and Tirunelveli. A pretty shrub or small tree in moist evergreen forests, at 1000-1700 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine reticulate.
P = 28 µm (27 to 30), E = 32 µm (29 to 34).

Psychotria anamallayana Bedd. **Pl. 58**

Locality unknown, NARAYANA IYER, s.n., (TBGT).
Slide HIFP 21840.

Distribution: Western peninsular India.

Western Ghats: Anaimalai and Travancore hills. A small tree generally on river banks, at 1000-1500 m. Endemic to Western Ghats. Common.

Pollen: 3-colporate, sexine reticulate.
P = 53 µm (50 to 60), E = 59 µm (55 to 70).

GUINET, 1962; VASANTHY, 1976.

Psychotria flavida Talbot **Pl. 58**

Kaninahalla (Dt.), NICOLSON, SALDANHA & RAMAMOORTHY HFP 131, (JCB).
Slide HIFP 21892.

Distribution: Western peninsular India.

Western Ghats: from S. Kanara to Travancore. A small shrub, up to 800 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colpate, sexine reticulate.
P = 50 µm (46 to 51), E = 46 µm (44 to 49).

Remark: see *P. nigra*.

GUINET, 1962; VASANTHY, 1976.

Psychotria nigra (Gaertn.) Alston
(not illustrated)

Biligirirangan Hills (Mysore Dt.), RAMESH 1585, (HIFP).
Slide HIFP 21658.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: Anaimalai, Travancore and Tirunelveli hills. A common shrub, from 400 to 1600 m.

Remark: pollen of *P. nigra* and *P. flavida* are very similar.

GUINET, 1962; VASANTHY, 1976.

Tricalysia apiocarpa (Dalz.) Gamble **Pl. 59**

Cholaipalam (Tirunelveli Dt.), RAMESH & DE FRANCESCHI 1878, (HIFP). Slide HIFP 21834.
Travancore, Bourdillon 620, (K),.
Slide HIFP 21801.

Distribution: Western peninsular India.

Western Ghats: Coimbatore hills, Nilgiris, Anaimalai and hills of Travancore. A small tree growing on slopes, from 1000 to 1500 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine reticulate.
P = 30 µm (27 to 31), E = 28 µm (25 to 29).

RUTACEAE

Atalantia wightii Tanaka **Pl. 60**

Yettinahalla (Hassan Dt.), SALDANHA 16534, (HIFP).
Slide HIFP 14300.

Western Ghats, Gibson, s.n., (MH).
Slide TBGT 1291.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: from Wayanad southwards. A thorny shrub or small tree, up to 1500 m. Occasional

Pollen: 4-5-colporate, sexine reticulate.
P = 36 µm (30 to 40), E = 29 µm (25 to 35)

Clausena dentata (Willd.) R. & S. **Pl. 60**

Agastyarmala (Thiruvananthapuram Dt.), MOHANAN 7868, (TBGT).
Slide TBGT 1236.

Distribution: Eastern Himalaya, Sikkim, Peninsular India, Sri Lanka and Moluccas.

Western Ghats: from Konkan southwards. A small tree, up to 900 m. Common. Frequency increases with altitude.

Pollen: 3-colporate, sexine microreticulate to reticulate.
P = 23 µm (21 to 25), E = 17 µm (15 to 20).

RASOLODIMBY, 1983; MILLOGO-RASOLODIMBY, 1988.

Clausena heptaphylla Wt. & Arn. **Pl. 61**

Shabarimala (Pathanamthitta Dt.), ANIL KUMAR 1659, (SN College Herbarium, Quilon). Slide TBGT 1221.
Tropical Botanical Garden forest site (Thiruvananth puram Dt.), SURESH 15206, (TBGT).
Slide TBGT 1224.

Distribution: Eastern and Southern India

Western Ghats: Wayanad, Anaimalai, Palni, Malabar and Travancore. A strong smelling bushy shrub or small tree, from 900 to 1500 m. Occasional.

Pollen: 3-colporate, rarely 4-colporate, sexine reticulate and striato-reticulate along the colpi.
P = 30 µm (23 to 38), E = 23 µm (18 to 30).

RASOLODIMBY, 1983; MILLOGO-RASOLODIMBY, 1988.

Clausena indica (Dazl.) Oliver **Pl. 61**

Kavaledurga (Shimoga Dt.), RAGHAVAN, s.n., (BSI).
Slide HIFP 16551.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: Konkan (Maharashtra and Goa), North Kanara, Anaimalai and Travancore. A shrub or small tree in evergreen and semi-evergreen forests in the lower ghats, from 900 to 1500 m. Occasional.

Pollen: 3-colporate, sexine reticulate.
P = 24 µm (21 to 27), E = 20 µm (18 to 24).

RASOLODIMBY, 1983; MILLOGO-RASOLODIMBY, 1988.

Glycosmis macrocarpa Wt. **Pl. 61**

Pamba Dam (Pathanamthitta Dt.), MOHANAN 54371, (MH).
Slide TBGT 1290.

Distribution: Indo-Malaysia and Australia.

Western Ghats: Konkan, Belgaum, North Kanara and Malabar southwards. A shrub, occasionally a small tree, common especially as undergrowth or at the margins of the forests. Planted as hedge rows near villages.

Pollen: 3-colporate, sexine reticulate.
P = 27 µm (25 to 30), E = 26 µm (23 to 30).

Luvunga eleutherandra Dalz. **Pl. 62**

Gowoppodu falls (North Kanara Dt.), TALBOT 2679, (MH).
Slide TBGT 1270.

Distribution: Western peninsular India.

Western Ghats: Konkan, Kanara, Anaimalai and Travancore hills. A scandent shrub, up to 900 m. Endemic to the Western Ghats. Occasional.

Pollen: 4-5-colporate, sexine smooth, tectum perforate.
P = 35 µm (32 to 38), E = 30 µm (25 to 35).

Murraya paniculata (L.) Jack. **Pl. 62**

Athihalli (Hassan Dt.), NICOLSON, SALDANHA & RAMAMOORTHY HFP 93, (JCB).
Slide HIFP 21908.
Bodai hills (Salem Dt.), MOHANAN 22113, (MH).
Slide TBGT 1292.

Distribution: Western peninsular India, Sri Lanka, Burma, China, Australia and Pacific Islands.

Western Ghats: Konkan, Kanara and all hilly districts southwards. A large shrub or small tree, common in lower storey specially in ravines. Often introduced in gardens.

Pollen: 3-colporate, sexine striate.
P = 43 µm (39 to 47), E = 37 µm (34 to 43).

RASOLODIMBY, 1983.

Toddalia asiatica (L.) Lam. **Pl. 63**
var. ***floribunda*** Gamble

Kumbarvada (North Kanara Dt.), PASCAL 1143, (HIFP).
Slide HIFP 21909.

Distribution: Indo-Malaysia and Tropical Africa.

Western Ghats: in all districts. A scandent shrub especially in the upper ghats. Common.

Pollen: 3-colporate (occasionally 4-colporate), sexine striate to striato-reticulate.
P = 22 µm (20 to 24), E = 18 µm (16 to 20).

RASOLODIMBY, 1983; MILLOGO-RASOLODIMBY, 1988.

Vepris bilocularis (Wt. & Arn.) Engl. **Pl. 63**

Rockwood estate (Travancore). BOURDILLON 1534, (TBGT).
Slide TBGT 1256.

Distribution: Western peninsular India.

Western Ghats: from Konkan southwards. A handsome tree, up to 1200 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sometimes 2-colporate, sexine striate to striato-reticulate.
P = 27 µm (24 to 29), E = 24 µm (21 to 27).

RASOLODIMBY, 1983; MILLOGO-RASOLODIMBY, 1988.

Zanthoxylum ovalifolium Wt. **Pl. 63**

Muthukuzhivayal (Kanniyakumari Dt.).
HENRY 48331, (MH).
Slide TBGT 1233.

Distribution: Eastern and Western peninsular India, Burma, Singapore, Java and Queensland.

Western Ghats: from Kanara southwards. A shrub, up to 1200 m. Occasional.

Pollen: 3-colporate, sexine reticulate.
P = 24 µm (22 to 28), E = 25 µm (24 to 28).

BARTH, 1980; RASOLODIMBY, 1983; MILLOGO-RASOLODIMBY, 1988.

SAPINDACEAE

Dimocarpus longan Lour. **Pl. 64**

Shiradi Ghat (Hassan Dt.), SALDANHA 16536, (JCB).
Slide HIFP 14726.

Distribution: Eastern Bengal, Burma, Western peninsular India and Sri Lanka.

Western Ghats: from S. Kanara to Tirunelveli hills. A large handsome tree, up to 1700 m. Common. Cultivated in the tropics. The longan tree.

Pollen: 3-colporate, sexine grano-rugulate.
P = 22 µm (19 to 25), E = 26 µm (24 to 28).

MULLER, 1971; VAN DER HAM, 1990.

Filicium decipiens (Wt. & Arn.) Thw. **Pl. 65**

Sankanteri (Travancore Dt.), BLASCO Sank-22, (HIFP).
Slide HIFP 21893.

Distribution: South India and Sri Lanka.

Western Ghats: from Malabar and Nilgiris to Travancore and Tirunelveli hills. A handsome tree in somewhat dry localities, up to about 1700 m. Often planted. Occasional.

Pollen: 3-colporate, sexine echinate.
P = 20 µm (18 to 21), E = 21 µm (20 to 24).

MULLER *et al.*, 1989.

Harpullia arborea (Blanco) Radlk. **Pl. 66**

Aryankavu (Quilon Dt.), BOURDILLON 393, (TBGT).
Slide HIFP 21900.
Uppangala (Coorg Dt.), RAMESH 1019, (HIFP).
Slide HIFP 21827.

Distribution: Indo-Malaysia.

Western Ghats: from S. Kanara to Anaimalai and Travancore. A large tree, up to 1300 m. Occasional.

Pollen: 3-colporate, sexine striate.
P = 24 µm (22 to 25), E = 22 µm (20 to 23).

MULLER, 1985; VAN DER HAM, 1990.

Otonephelium stipulaceum (Bedd.) Radlk. **Pl. 66**

Chalakudy (Thrissur Dt.), PASCAL 1375, (HIFP).
Slide HIFP 21687.

Distribution: Western peninsular India.

Western Ghats: Malabar, Anaimalai and Travancore hills. A medium-sized tree, up to 1300 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, sexine finely striate.
P = 21 µm (21 to 23), E = 25 µm (23 to 27).

VAN DEN BERG, 1978; VAN DER HAM, 1990.

Thraulococcus erectus Radlk. **Pl. 66**

Anaimalai (Coimbatore Dt.), BARBER 3944, (HIFP).
Slide HIFP 21843.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: Wayanad and Anaimalai hills. A small tree or shrub, from 1000 to 1400 m. Occasional.

Pollen: 3-colporate, colpus extremely short, not always visible in polar view. Sexine smooth.
P = 25 µm (23 to 27), E = 28 µm (26 to 29).

SAPOTACEAE

Chrysophyllum lanceolatum (Bl.) DC. **Pl. 67**

Udumanparai (Coimbatore Dt.), BARBER 4081, (MH).
Slide HIFP 21895.

Distribution: Indo-Malaysia.

Western Ghats: Anaimalai and hills of Travancore. A lofty tree, up to 1300 m. Occasional. The star apple.

Pollen: 3-colporate, sexine smooth, tectum perforate. P = 29 µm (28 to 31), E = 21 µm (19 to 24).

HARLEY, 1991; DE FRANCESCHI, 1992.

Isonandra lanceolata Wt. **Pl. 67**

Mancholai (Tirunelveli Dt.), SEBASTINE, s.n., (MH).
Slide HIFP 21897.

Distribution: Western peninsular India and Sri Lanka.

Western Ghats: in all districts from Wayanad southwards. A small tree, up to 1300 m. Common.

Pollen: 4-colporate, sexine scabrate. P = 41 µm (37 to 42), E = 28 µm (26 to 30).

HARLEY, 1991; DE FRANCESCHI, 1992.

Madhuca neriifolia (Moon) Lam. **Pl. 68**

Uppangala (Coorg Dt.), DE FRANCESCHI 186, (HIFP).
Slide HIFP 21729.

Distribution: India and Sri Lanka.

Western Ghats: from South Kanara to Travancore, Anaimalai and Tirunelveli hills. A large tree common along streams and river banks, up to 1000 m.

Pollen: 3-4 colporate, sexine smooth, tectum perforate. P = 50 µm (42 to 58), E = 44 µm (39 to 50).

HARLEY, 1991; DE FRANCESCHI, 1992.

Mimusops elengi L. **Pl. 68**

Devalkere (Hassan Dt.), NICHOLSON, SALDANHA & RAMAMOORTHY HFP 38, (JCB).
Slide HIFP 14560.

Distribution: India (Deccan and Carnatic) and Malay Peninsulas.

Western Ghats: West coast and lower Ghats. A large spreading tree, very common in moist evergreen forests, cultivated in the tropics.

Pollen: 3 colporate, sexine smooth, tectum perforate. P = 44 µm (41 to 47), E = 35 µm (31 to 37).

HARLEY, 1991; DE FRANCESCHI, 1992.

Palaquium ellipticum (Dalz.) Baillon **Pl. 69**

Uppangala (Coorg Dt.), RAMESH 1975, (HIFP).
Slide HIFP 21738.

Distribution: Western peninsular India.

Western Ghats: in all districts. A lofty tree, from 300 to 1700 m. Endemic to Western Ghats. Abundant at elevation higher than 500 m.

Pollen: 3-colporate, sexine smooth, tectum perforate. P = 51 µm (50 to 55), E = 41 µm (38 to 44).

HARLEY, 1991; DE FRANCESCHI, 1992.

Xantolis tomentosa (Roxb.) Raf. **Pl. 69**

Junnar (Poona Dt.), HEMADRI, s.n., (BSI).
Slide HIFP 14481.

Distribution: India, Burma and Sri Lanka.

Western Ghats: hills of Kanara to High Wavy and Biligirirangan. A small thorny tree, from 800 m, common in evergreen and deciduous forests.

Pollen: 4-colporate, sexine smooth, tectum perforate. P = 41 µm (36 to 52), E = 29 µm (26 to 34).

HARLEY, 1991; DE FRANCESCHI, 1992.

STAPHYLEACEAE

Turpinia malabarica Gamble **Pl. 70**

Kuttikanam (Idukki Dt.), VIVEKANANTAN 23006, (MH).
Slide HIFP 14364.

Distribution: Western peninsular India.

Western Ghats: Anaimalai and Travancore hills. A large tree found on slopes, from 400 to 2000 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate with periapertural thinnings, sexine microreticulate. P = 30 µm (25 to 34), E = 25 µm (21 to 30).

DICKISON, 1987.

STERCULIACEAE

Heritiera papilio Bedd. **Pl. 70**

Anaimalai (Coimbatore Dt.), collector unknown, (MH).
Slide HIFP 21844.

Distribution: Western peninsular India.

Western Ghats: Tirunelveli hills and Travancore extending northwards to Coorg. A lofty tree, up to 1400 m. Endemic to Western Ghats. Occasional in evergreen and semi-evergreen forests.

Pollen: 3-colporate, sexine reticulate.
P = 24 µm (21 to 25), E = 26 µm (23 to 28).

TISSOT, 1980.

Leptonychia moacurroides Bedd. **Pl. 71**

Uppangala (Coorg Dt.), RAMESH 1184, (HIFP)
Slide HIFP 21901.

Distribution: Western peninsular India.

Western Ghats: from the Carcoor Ghats in Wayanad, and hills of Coimbatore, Tirunelveli and Travancore . A small tree, up to 1600 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colpate, sometimes 2-colpate, rarely 4-colpate, colpus very short, sexine reticulate with wide meshes, rarely in meridional view.
P = 18 µm (17 to 19), E = 24 µm (23 to 26).

Pterospermum diversifolium Bl. **Pl. 71**

Bisle Ghat (Hassan Dt.), SALDANHA 16034, (JCB).
Slide HIFP 21868.

Distribution: Indo-Malaysia.

Western Ghats: in all districts. A medium-sized tree at low elevations. Common.

Pollen: 3-porate, sexine echinate (spine more than 4 µm), tectum microechinate.
P = 51 µm (49 to 53), E = 75 µm (71 to 79).

Pterygota alata (Roxb.) R.Br. **Pl. 72**

Locality unknown, BOURNE 2259, (PC).
Slide HIFP 21848.

Distribution: India (Chittagong, Andaman Islands and Western peninsular India) and Burma (Pegu).

Western Ghats: from Malabar to Tirunelveli hills. A tall tree in openings of forests, up to 1000 m. Occasional.

Pollen: 3-colporate, sexine reticulate.
P = 43 µm (38 to 46), E = 37 µm (35 to 41).

THEACEAE

Eurya japonica Thunb. **Pl. 73**

Kodaikanal (Madurai Dt.), GUINET, s.n., (HIFP).
Slide HIFP 21903.

Distribution: India (Eastern Himalaya, Sikkim, Khasia, Eastern and western Peninsula) to Japan, Fiji.

Western Ghats: from S. Kanara to Travancore. A shrub or a small tree common in open evergreen forests.

Pollen: 3-colporate, sexine smooth, scabrate in the polar area.
P = 18 µm (17 to 20), E = 14 µm (13 to 16).

Gordonia obtusa Wall. ex Wt. & Arn. **Pl. 73**

Silent Valley (Palghat Dt.), PASCAL 565, (HIFP).
Slide HIFP 21831.

Distribution: Western peninsular India.

Western Ghats: in all districts. A tall tree along the margins of the forests, from 1000 to 2300 m. Endemic to Western Ghats. Occasional.

Pollen: 3-colporate, most often longiaxe, sexine grano-rugulate.
P = 40 µm (37 to 42), E = 34 µm (30 to 37).

URTICACEAE

Villebrunea integrifolia Gaud. **Pl. 73**

Locality unknown, collector unknown, (PDA).
Slide HIFP 21860.

Distribution: India and Sri Lanka.

Western Ghats: in all districts. A small tree, from 300 to 1500 m. Occasional.

Pollen: 3-porate, sexine scabrate.
P = 13 µm (12 to 14), E = 15 µm (14 to 17).

SORSA & HUTTUNEN, 1975.

VERBENACEAE

Clerodendrum viscosum Vent. **Pl. 74**

Eldersley Estate (Quilon Dt.), KANODIA 63289, (BSI).
Slide HIFP 14321.

Distribution: Indo-Malaysia.

Western Ghats: in all districts. A large shrub or small tree in hilly forests, specially the moister ones, up to 2000 m. Frequent in forest undergrowth and near villages.

Pollen: 3-colpate, sexine scabrate with echinate processes.
P = 67 µm (59 to 71), E = 58 µm (45 to 67).

GUINET, 1962; LIENAU *et al.*, 1986.

VIOLACEAE

Rinorea bengalensis (Wall.) O. Kuntze **Pl. 74**

Uppangala (Coorg Dt.), RAMESH 1730, (HIFP).
Slide HIFP 21826.
Shiradi Ghats (Hassan Dt.), Saldanha 16946, (JCB).
Slide HIFP 14737.

Distribution: Western peninsular India, Andaman Islands, Sri Lanka and Burma.

Western Ghats: Malabar and Travancore. A large shrub or small tree, up to 800 m. Occasional.

Pollen: 3-colporate, sexine scabrate.
P = 38 µm (35 to 40), E = 31 µm (28 to 35).

Angiospermae Monocotyledoneae

ARECACEAE

Bentinckia condapanna Berry ex Roxb. **Pl. 75**

Perumalmalai (Madurai Dt.), THANIKAIMONI 1039, (HIFP).
Slide HIFP 21846.

Distribution: Western peninsular India.

Western Ghats: Tirunelveli and Travancore hills. A slender palm, from 800 to 2000 m, abundant in its restricted locality. Endemic to Western Ghats.

Pollen: monosulcate, sexine smooth to scabrate.
L = 38 µm (36 to 40), w = 24 µm (23 to 26).

THANIKAIMONI, 1970.

Caryota urens L. **Pl. 75**

India, RITCHIE 753, (K).
Slide HIFP 20495.

Distribution: Tropical Asia.

Western Ghats: in all districts. A slender palm from sea level to 1300 m. Common. Sometimes cultivated.

Pollen: monosulcate, sexine baculate
L = 30 µm (28 to 34), w = 25 µm (22 to 30).

THANIKAIMONI, 1970; FERGUSON, 1986.

Pinanga dicksonii Bl. **Pl. 75**

Kannikatti (Tirunelveli Dt.), collector unknown, (MH).
Slide HIFP 1419.

Distribution: Western peninsular India.

Western Ghats: Nilgiris and Travancore hills. A slender tree, from 300 to 2000 m. Endemic to Western Ghats. Occasional.

Pollen: monosulcate, sexine reticulate with wide meshes.
L = 48 µm (44 to 50), w = 37 µm (34 to 42).

THANIKAIMONI, 1970; FERGUSON *et al.*, 1983; FERGUSON, 1986.

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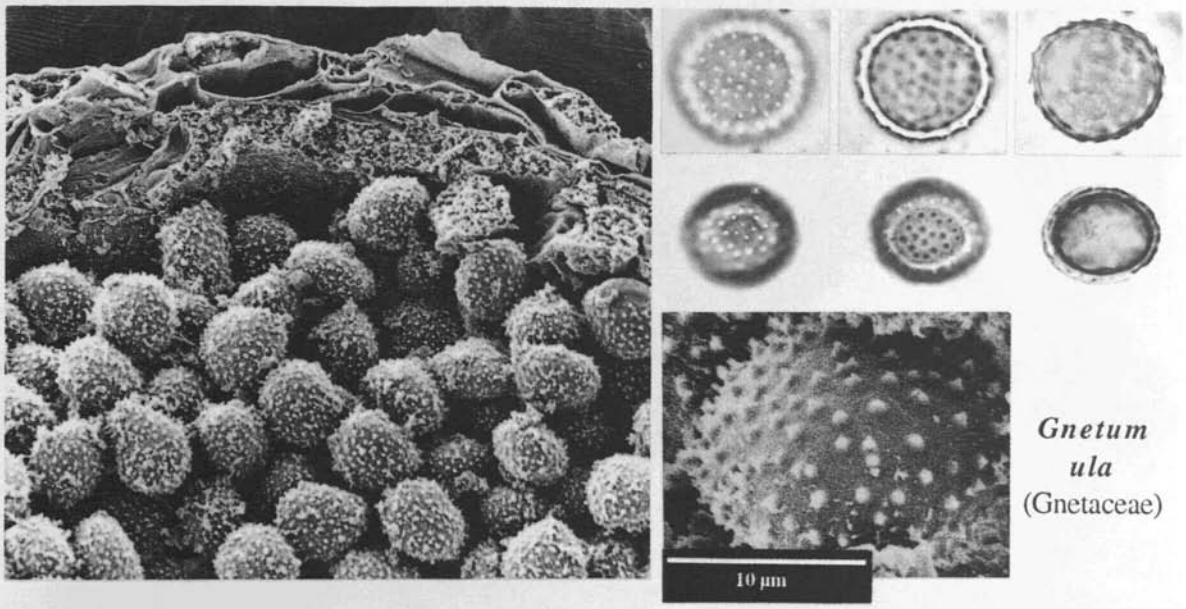
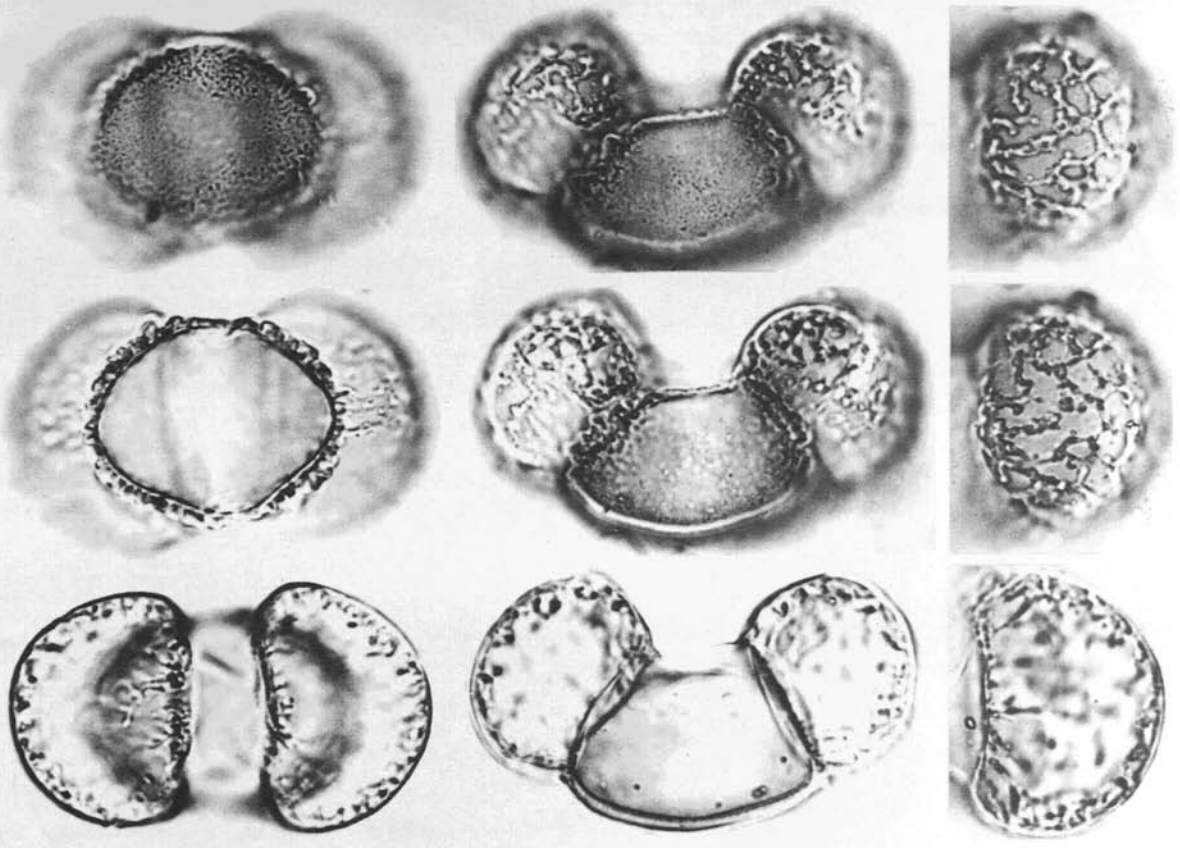
Plates

(All light micrographs x 1000, unless otherwise stated)

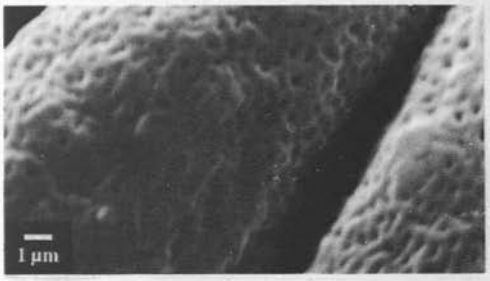


Gnetum ula (Gnetaceae)

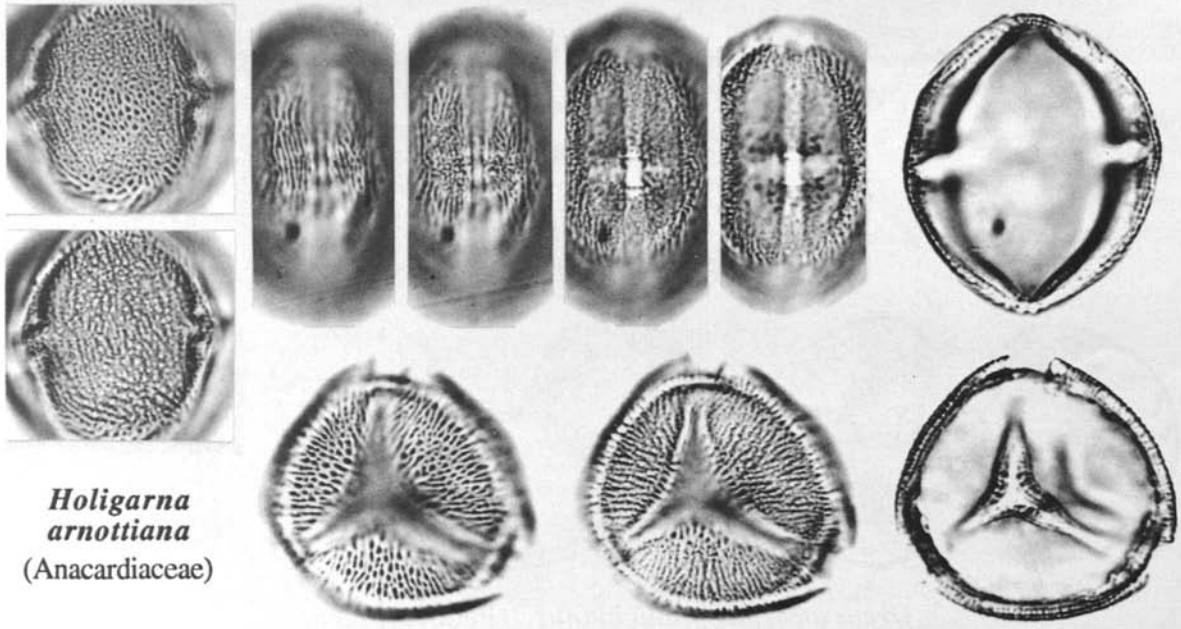


Decussocarpus wallichianus (Podocarpaceae)

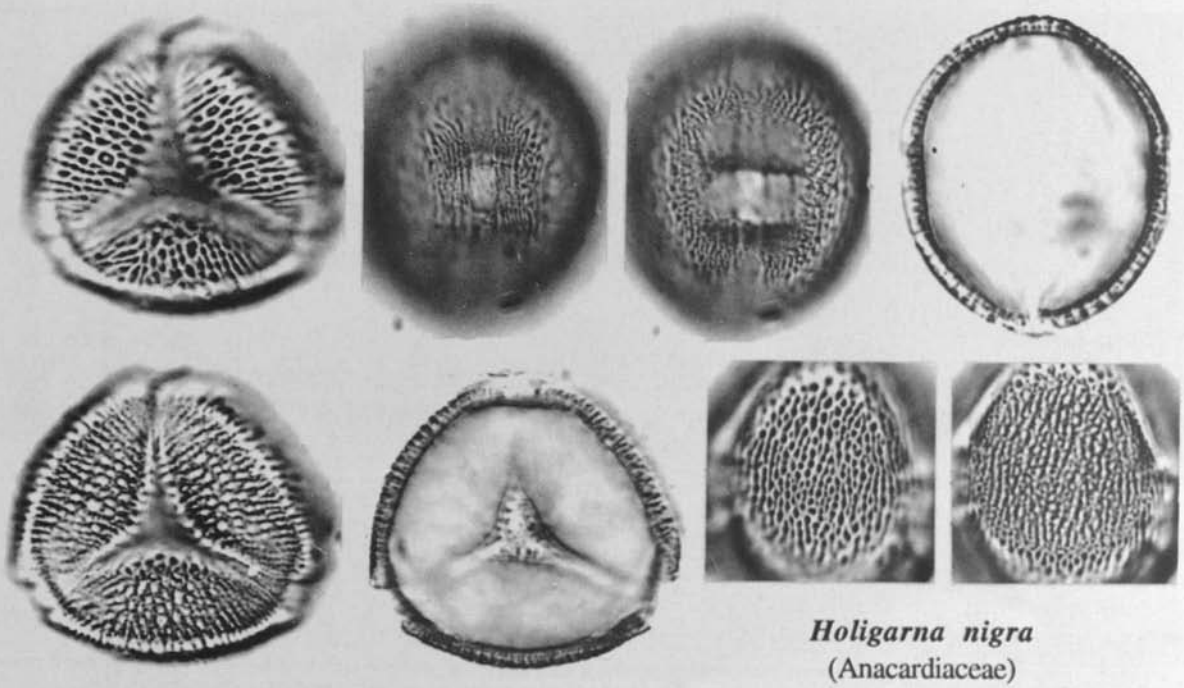
PLATE 2



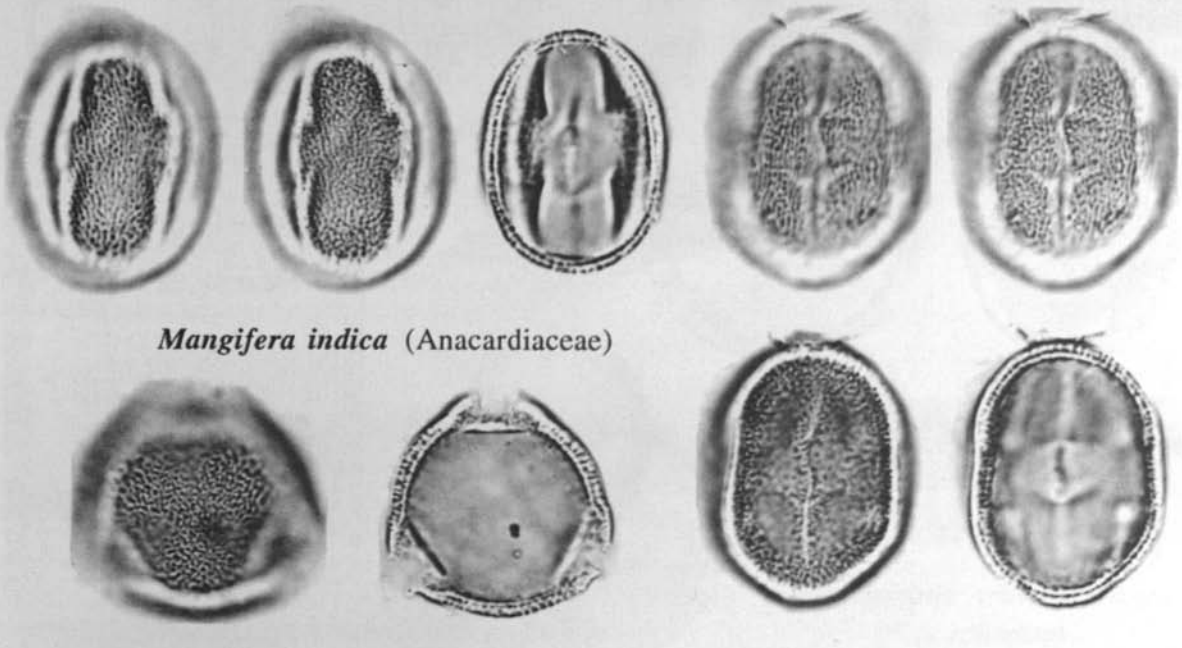
Gluta travancorica
(Anacardiaceae)



Holigarna arnottiana
(Anacardiaceae)

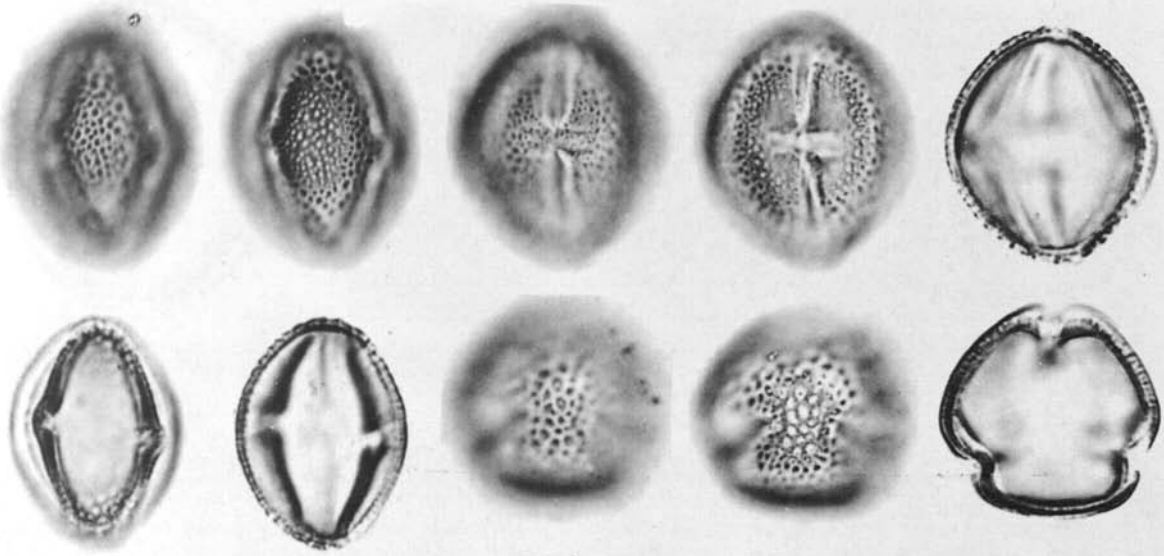


Holigarna nigra
(Anacardiaceae)

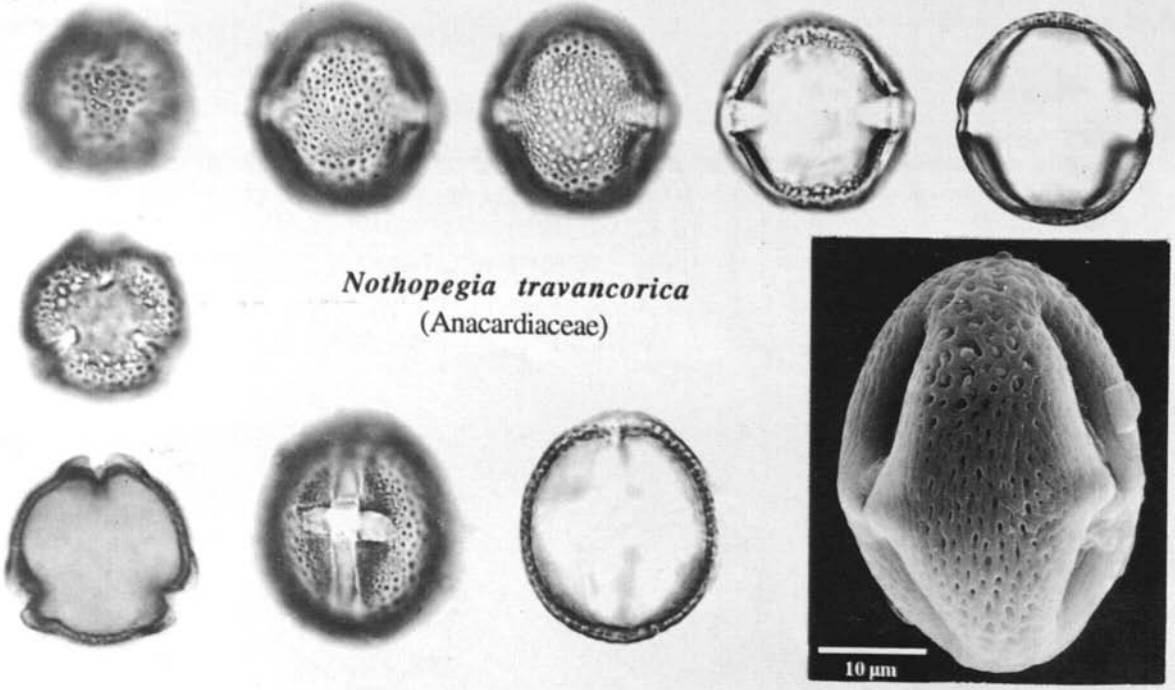


Mangifera indica (Anacardiaceae)

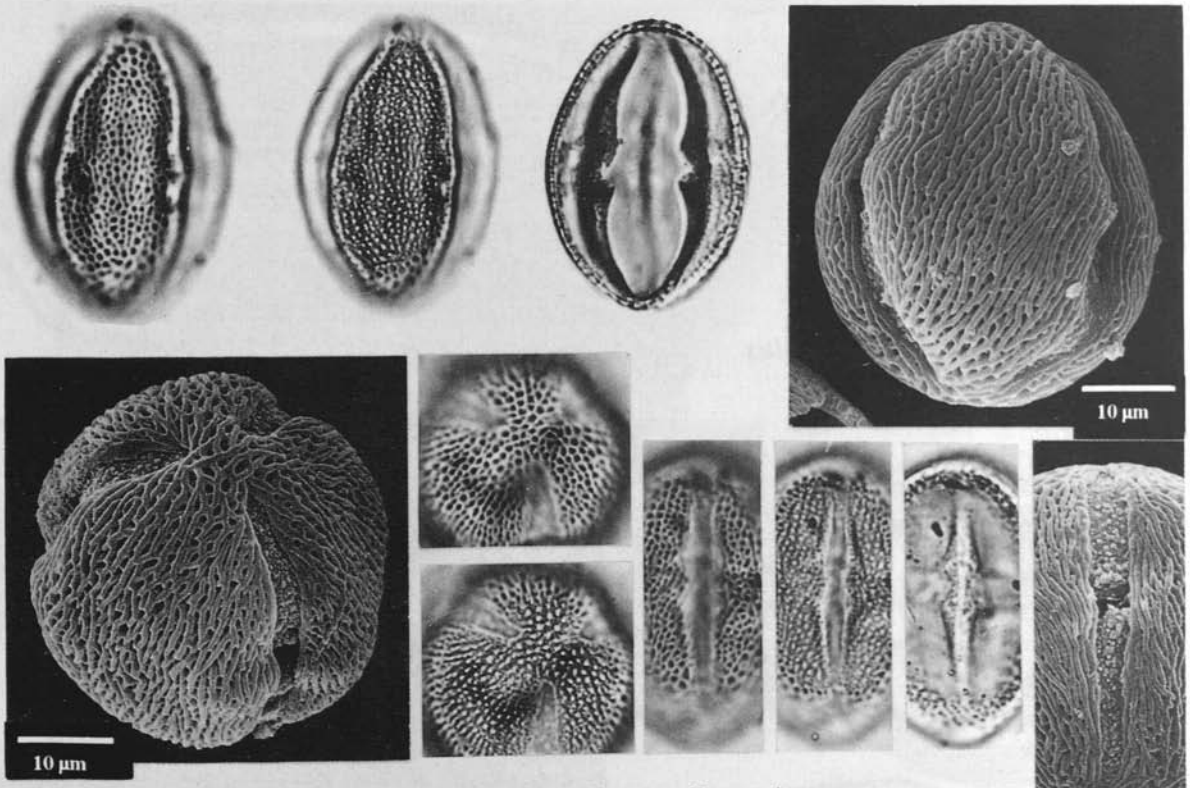
PLATE 4



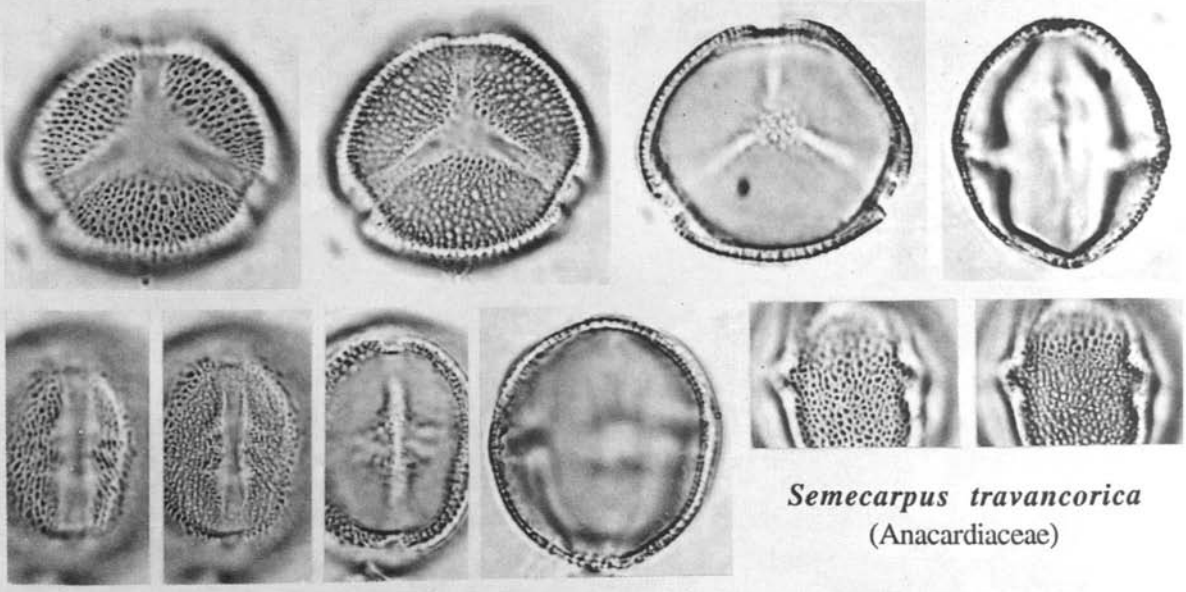
Nothopegia beddomei (Anacardiaceae)



Nothopegia travancorica
(Anacardiaceae)

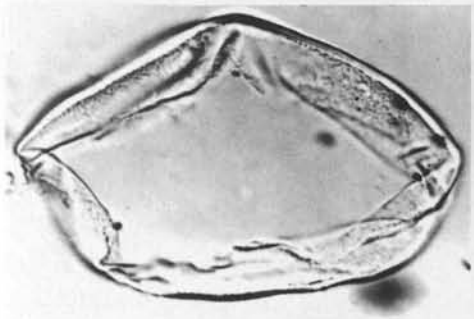


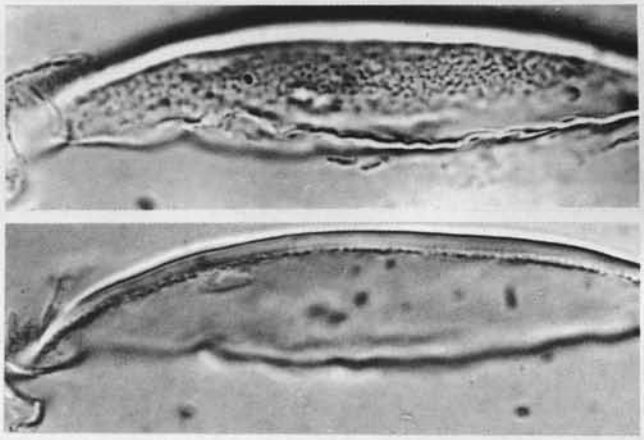
Semecarpus auriculata (Anacardiaceae)



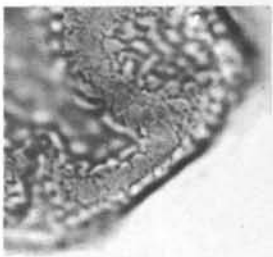
Semecarpus travancorica (Anacardiaceae)

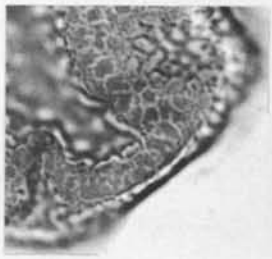
PLATE 6

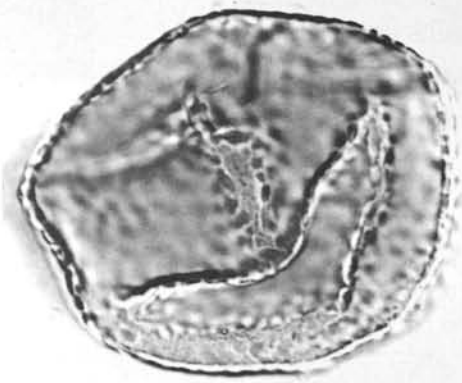


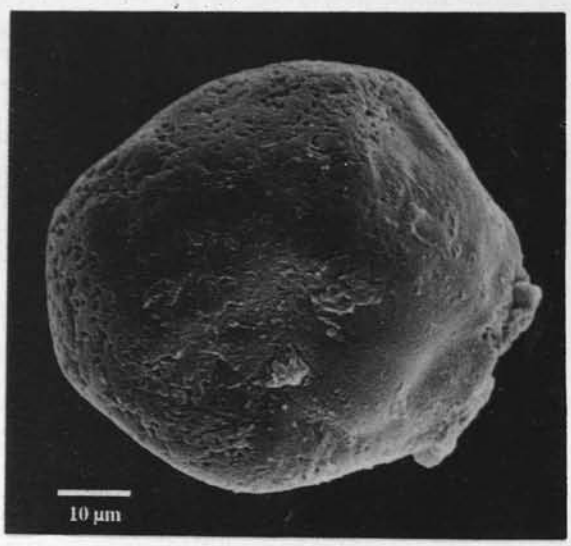


Goniothalamus cardiopetalus
(Annonaceae)



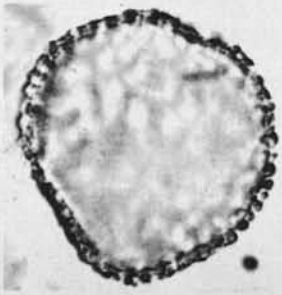


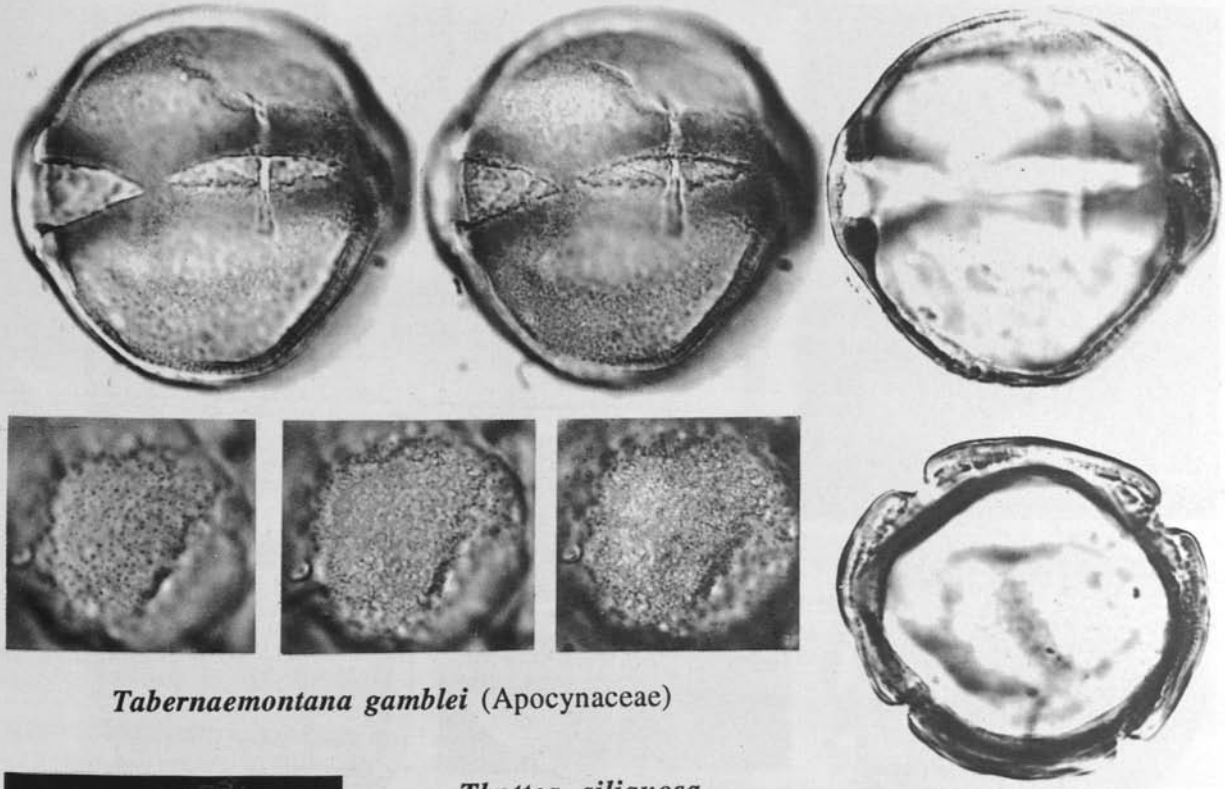




Meiogyne pannosa (Annonaceae)

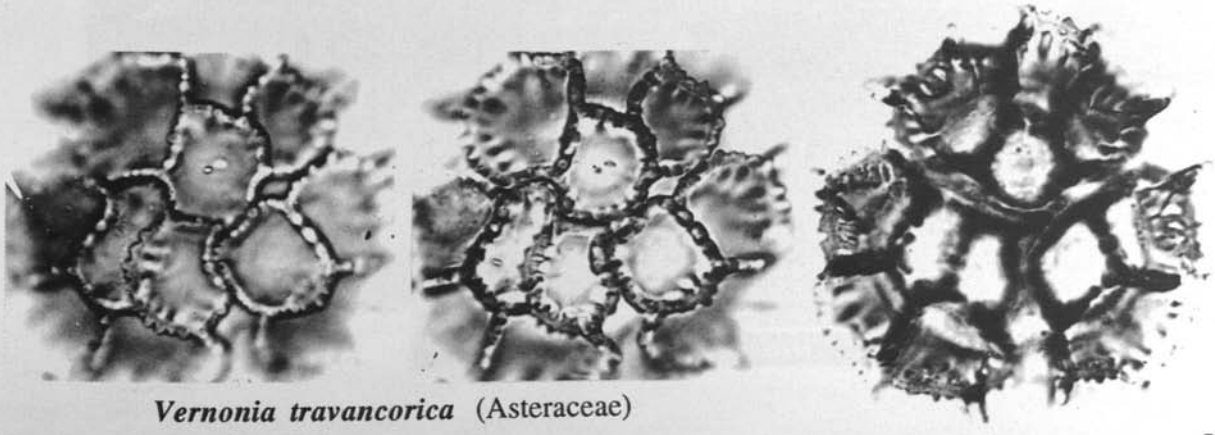
Polyalthia fragrans
(Annonaceae)





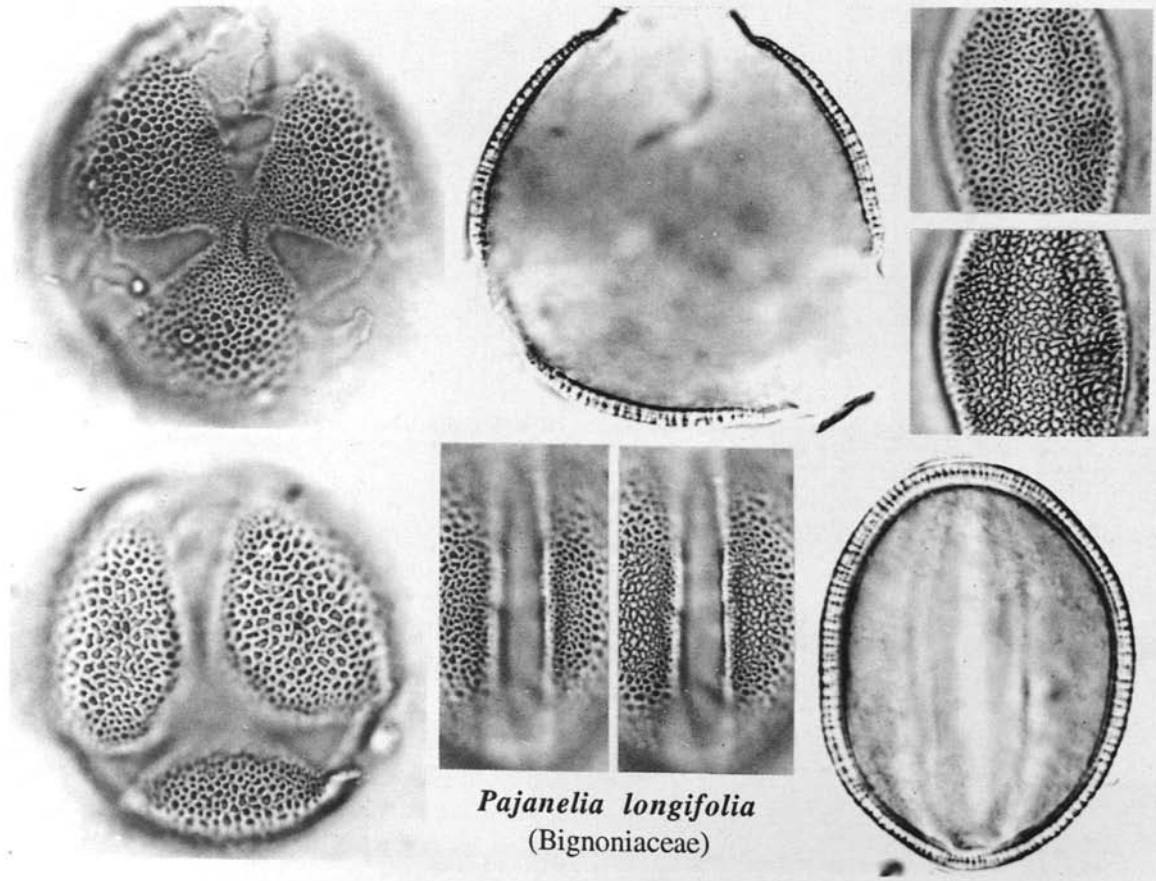
Tabernaemontana gamblei (Apocynaceae)

Thottea siliquosa
(Aristolochiaceae)

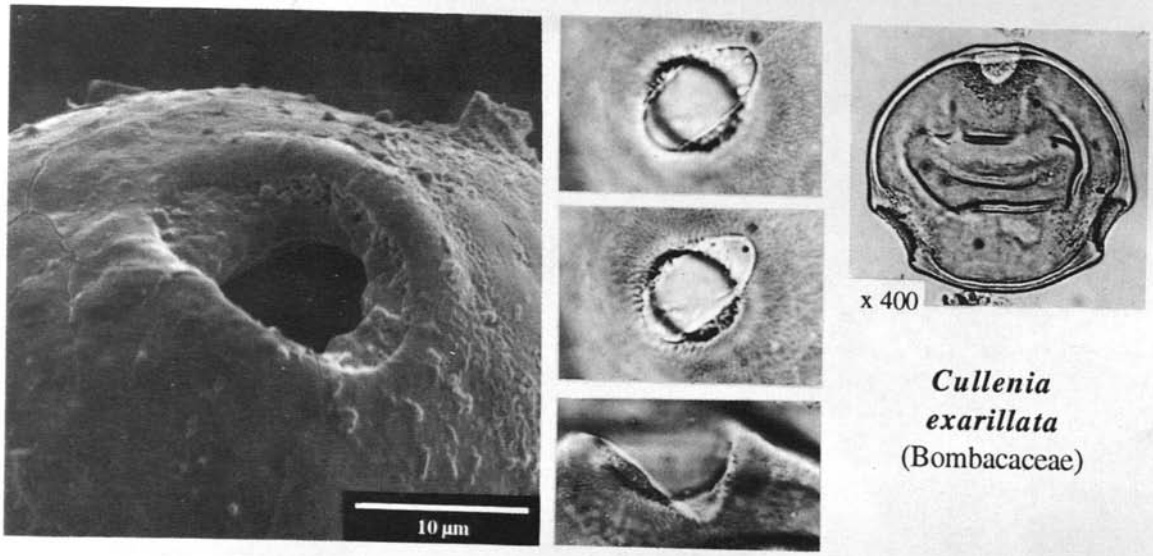


Vernonia travancorica (Asteraceae)

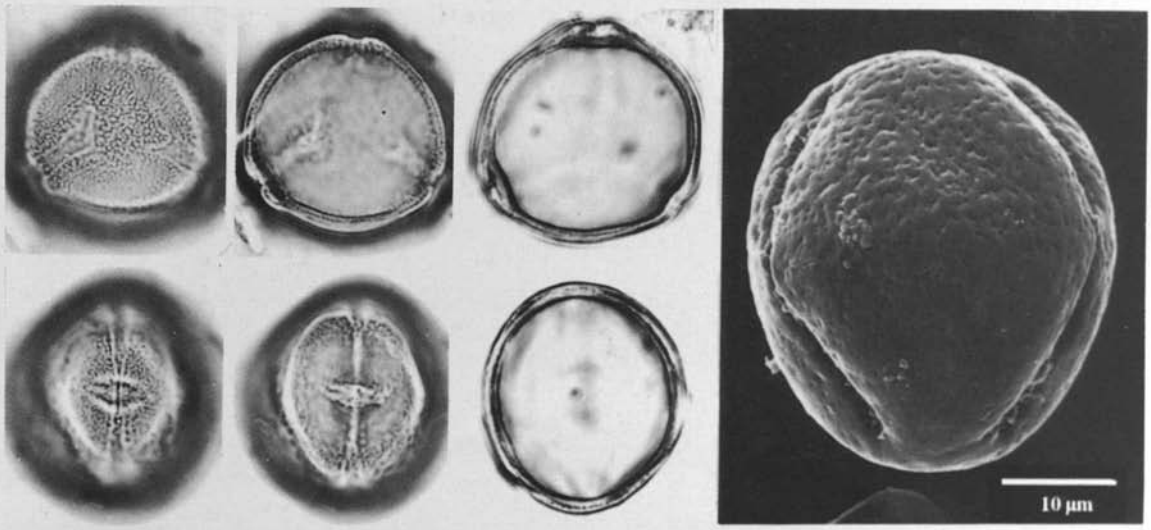
PLATE 8

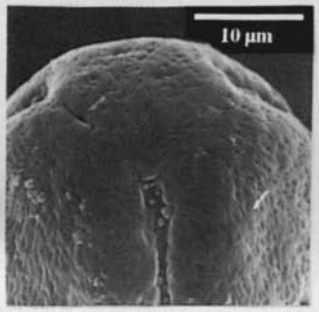


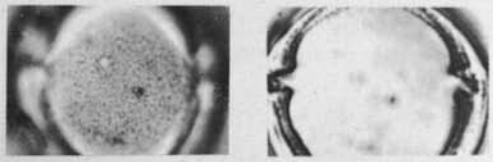
Pajanelia longifolia
(Bignoniaceae)



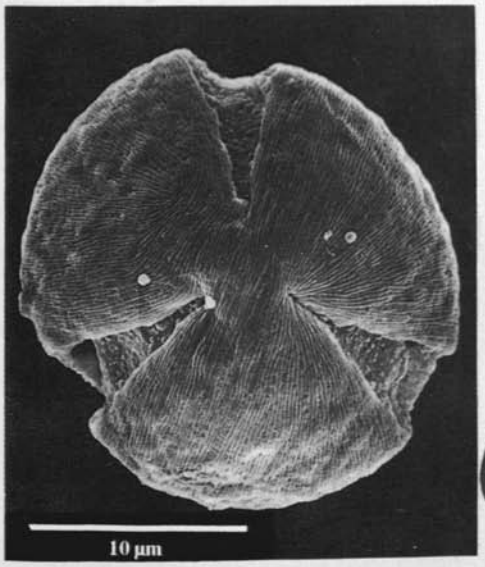
Cullenia exarillata
(Bombacaceae)

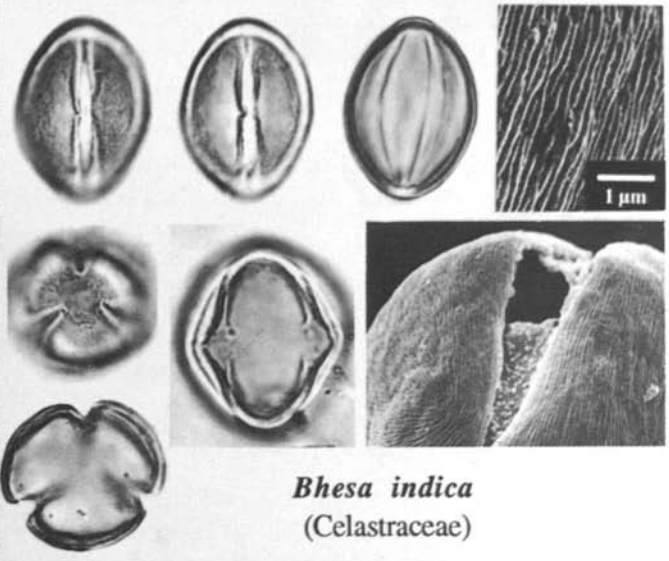






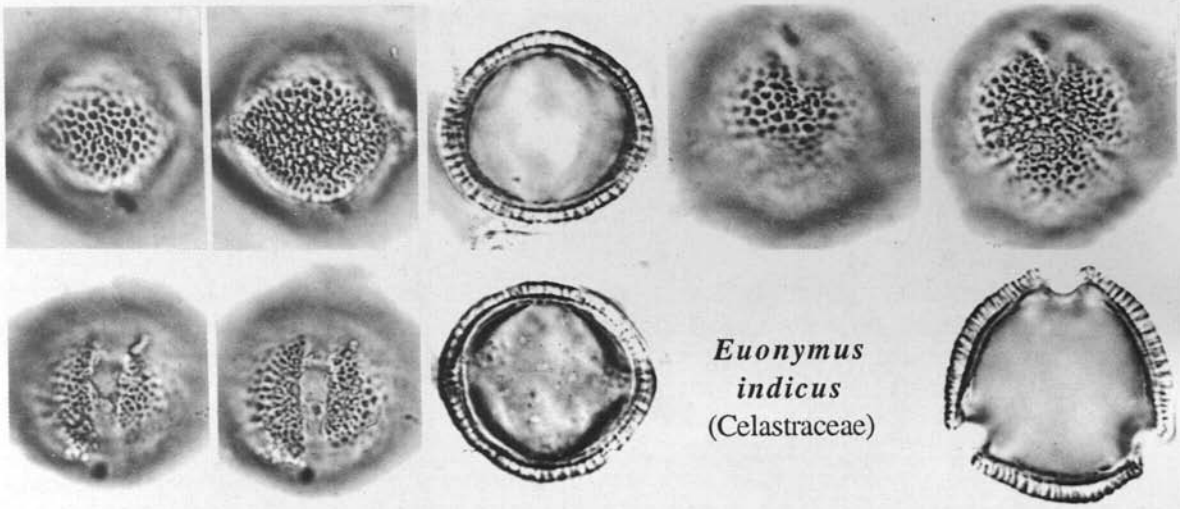
Canarium strictum
(Burseraceae)



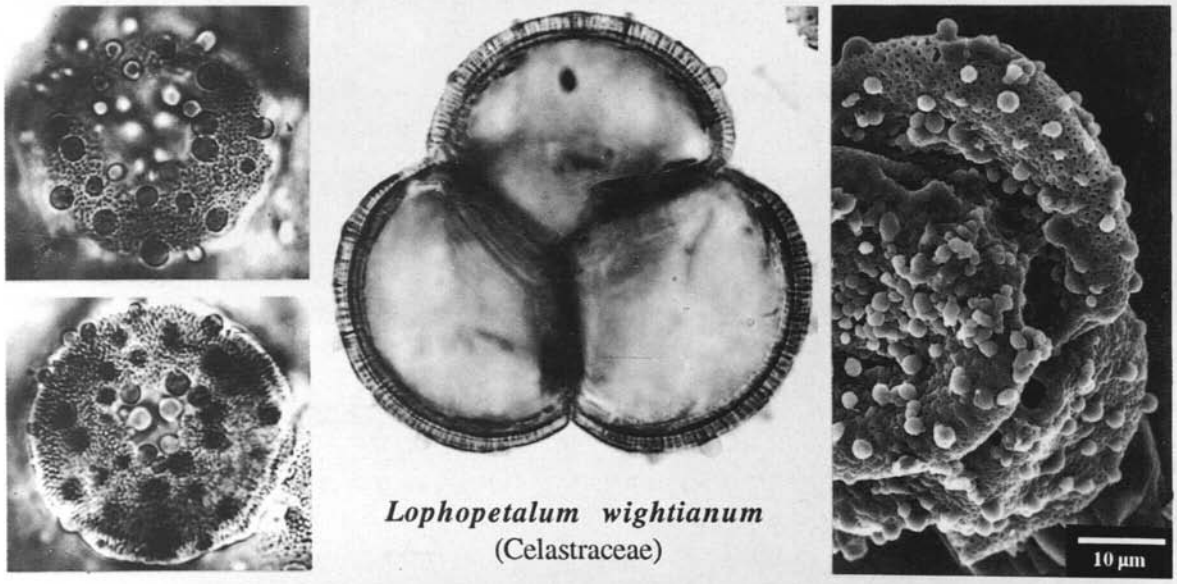


Bhesa indica
(Celastraceae)

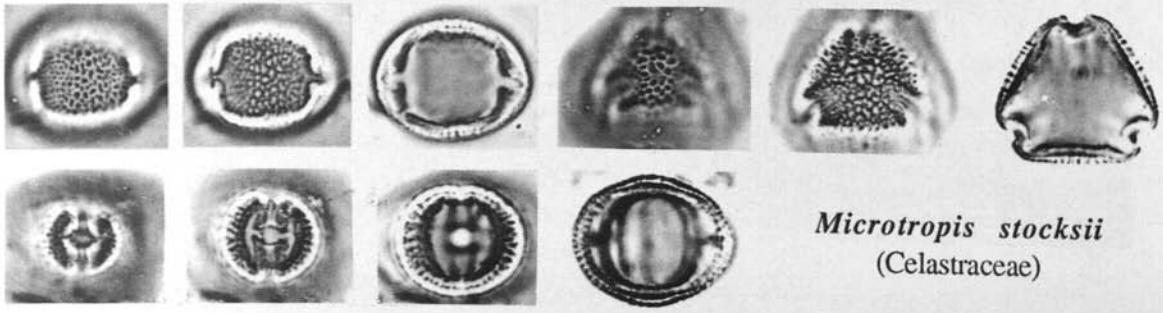
PLATE 10



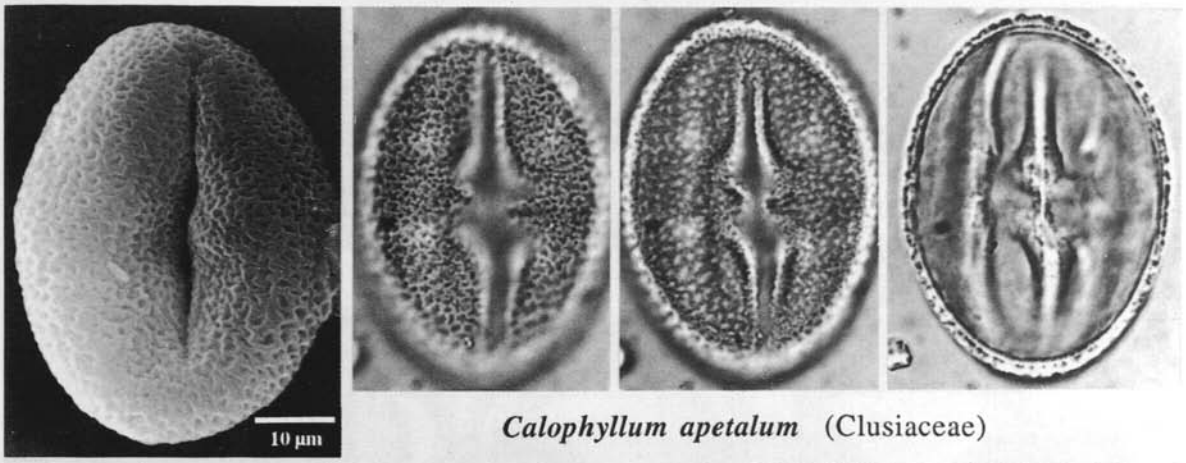
Euonymus indicus
(Celastraceae)



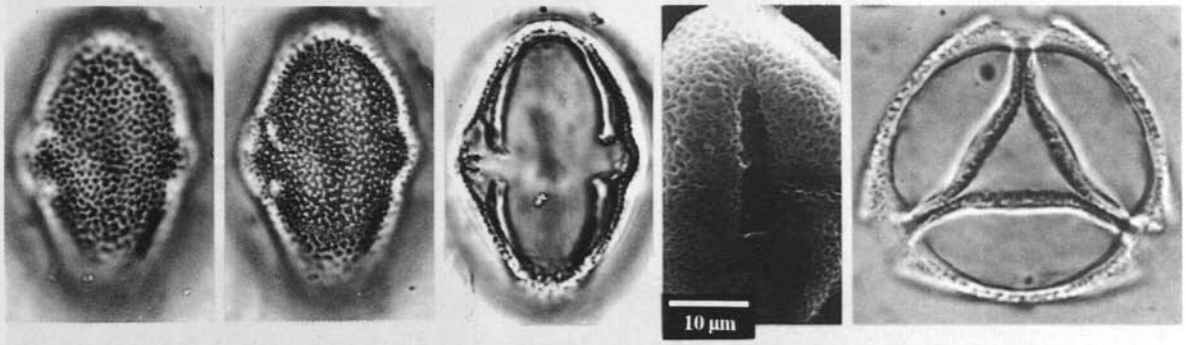
Lophopetalum wightianum
(Celastraceae)

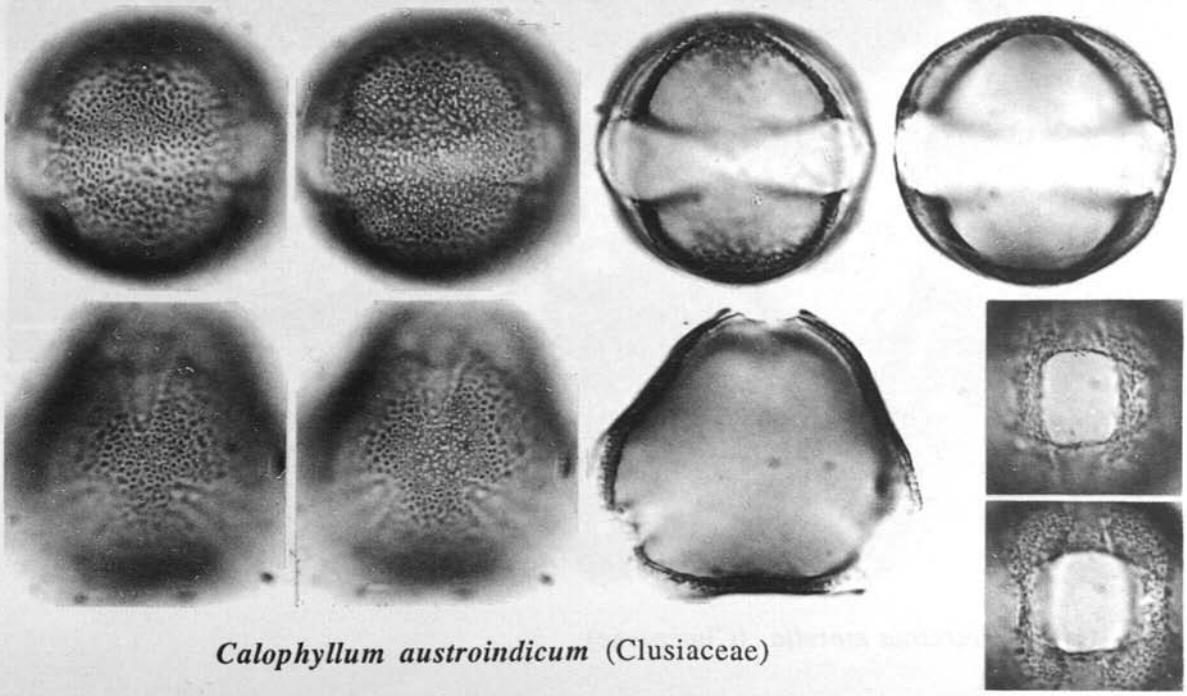


Microtropis stocksii
(Celastraceae)



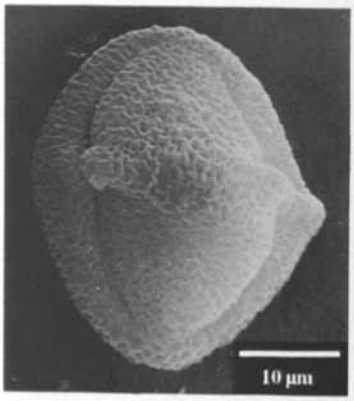
Calophyllum apetalum (Clusiaceae)

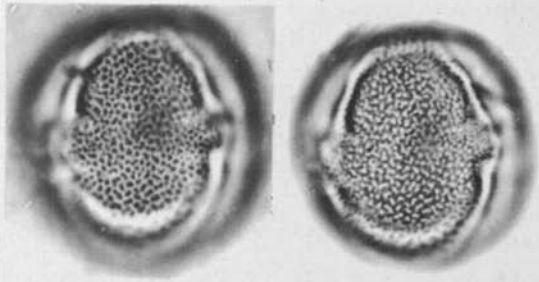




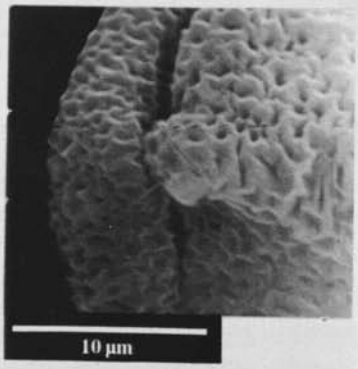
Calophyllum austroindicum (Clusiaceae)

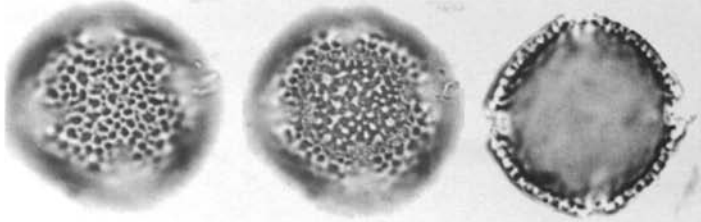
PLATE 12

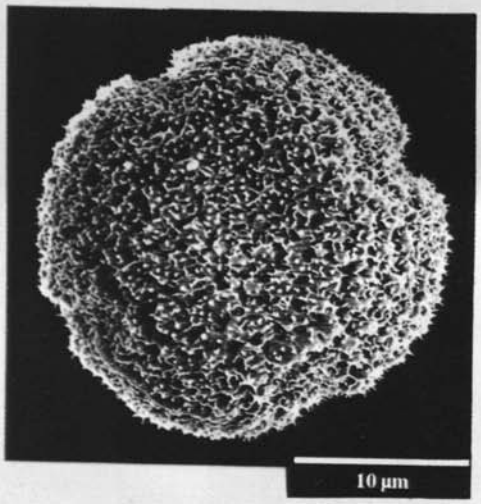




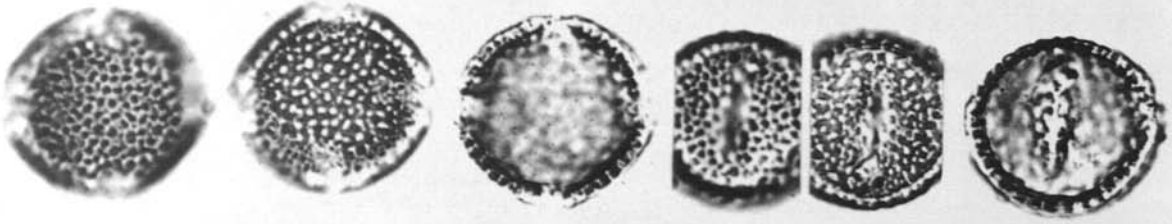
Calophyllum polyanthum
(Clusiaceae)



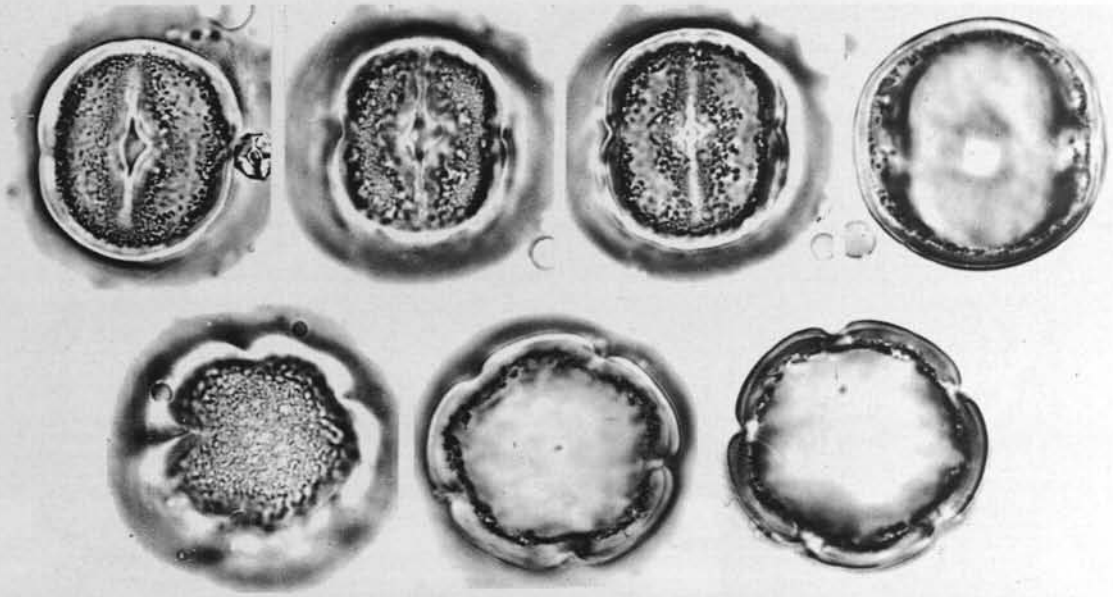




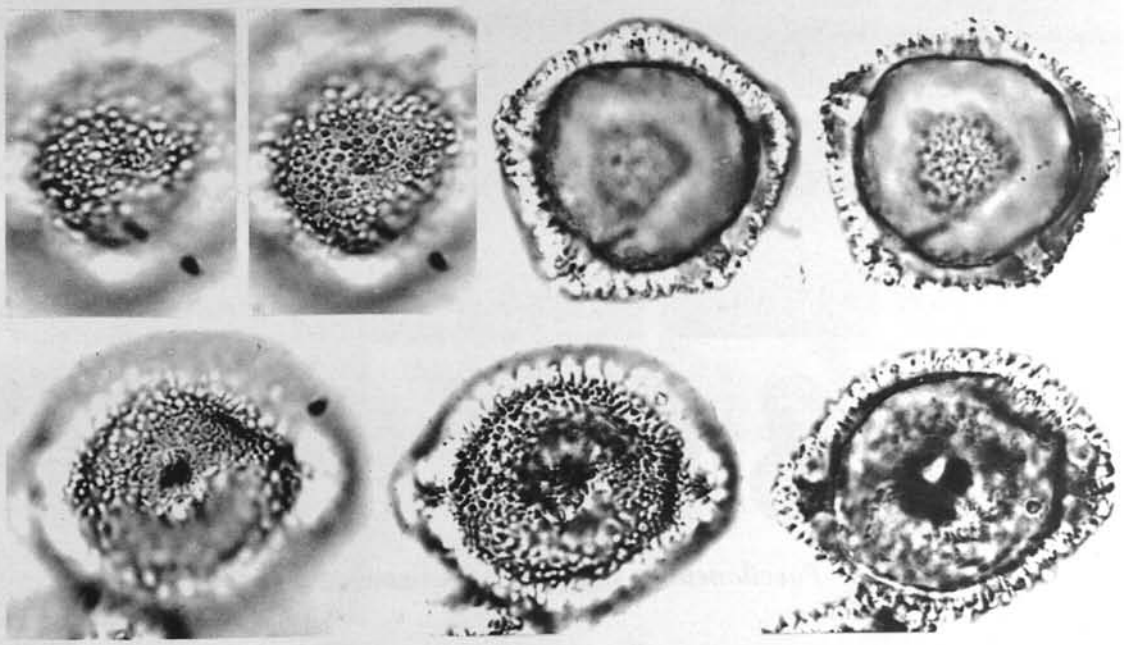
Garcinia gummi-gutta
(Clusiaceae)



Garcinia morella (Clusiaceae)

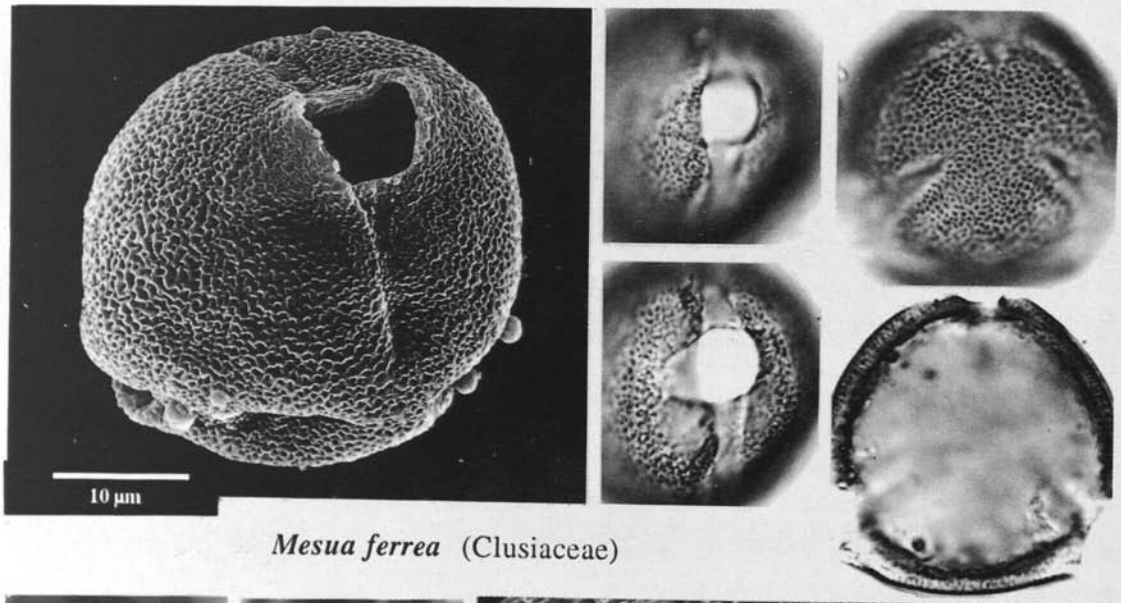


Garcinia talbotii (Clusiaceae)

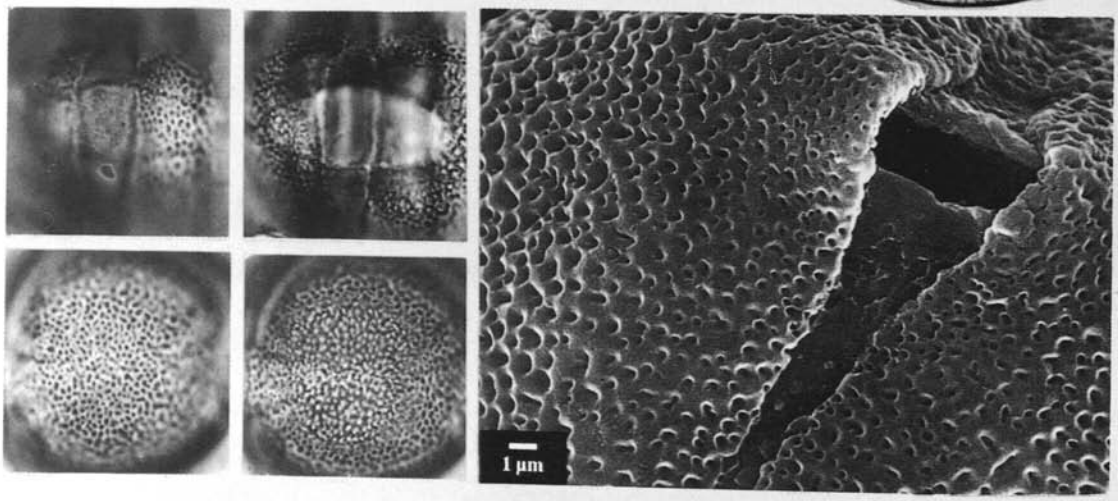


Garcinia travancorica (Clusiaceae)

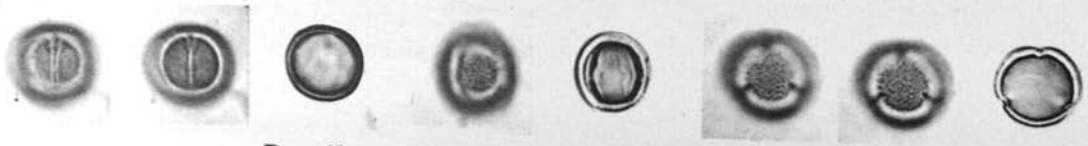
PLATE 14



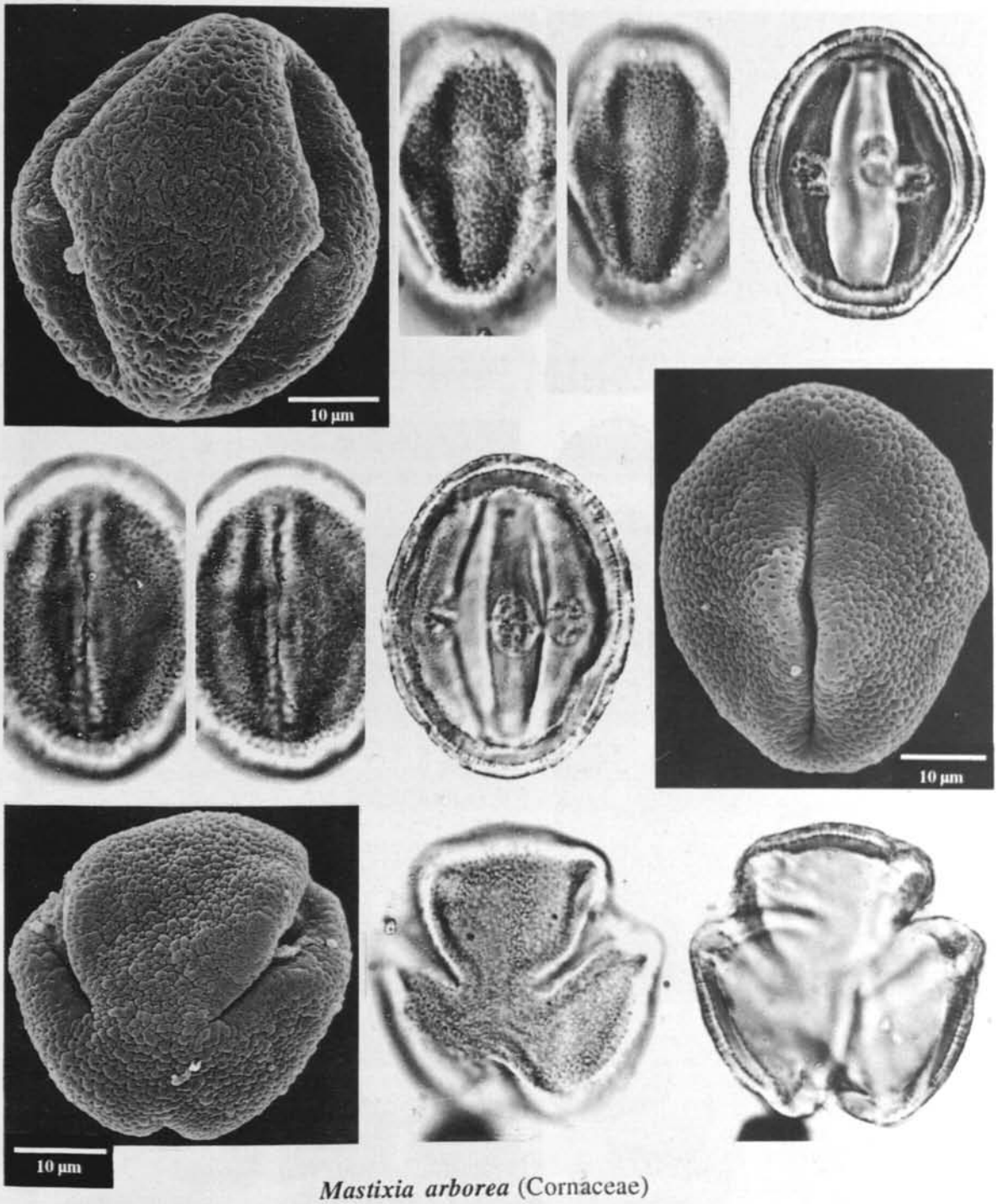
Mesua ferrea (Clusiaceae)



Poeciloneuron indicum (Clusiaceae)

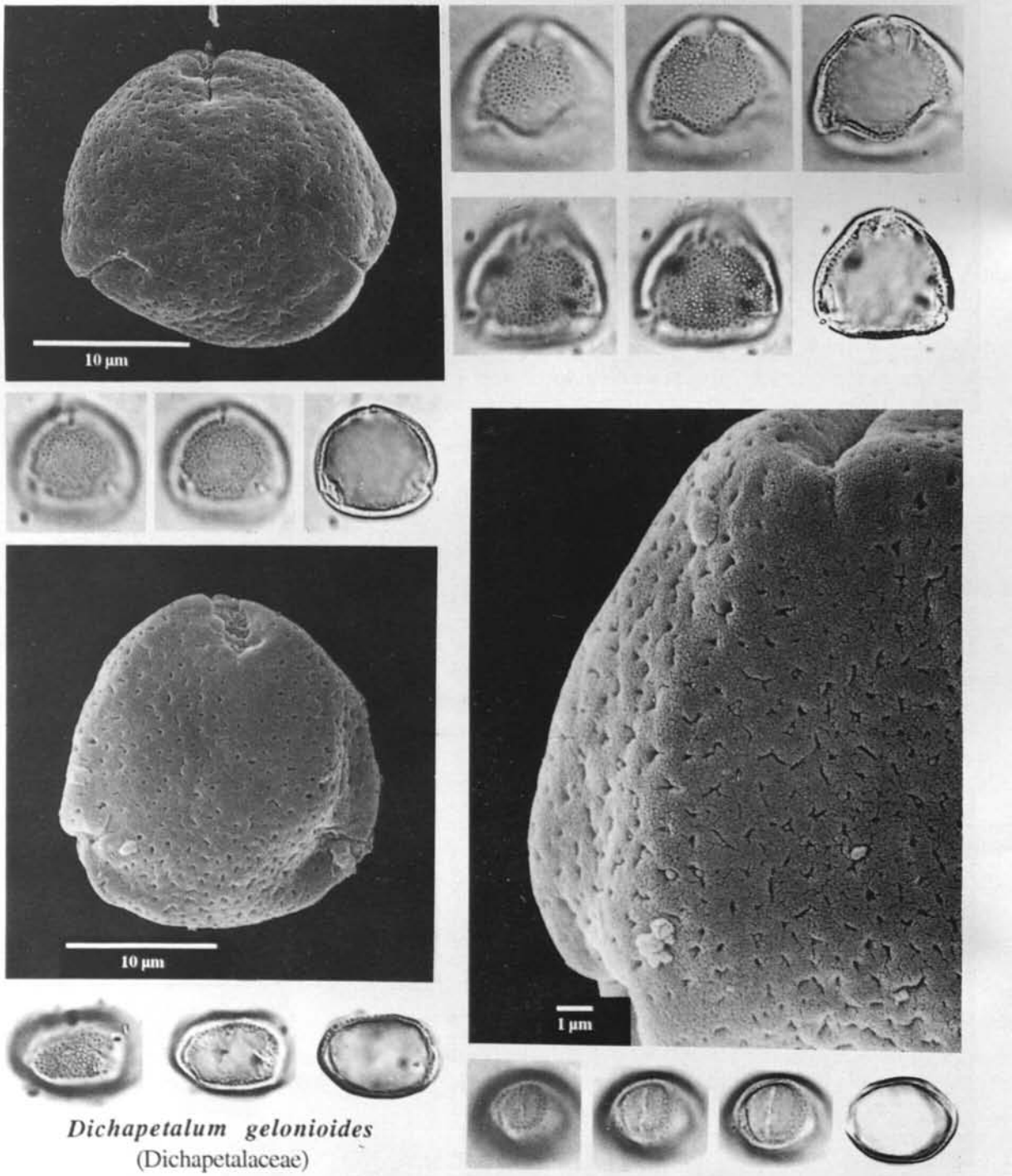


Poeciloneuron pauciflorum (Clusiaceae)

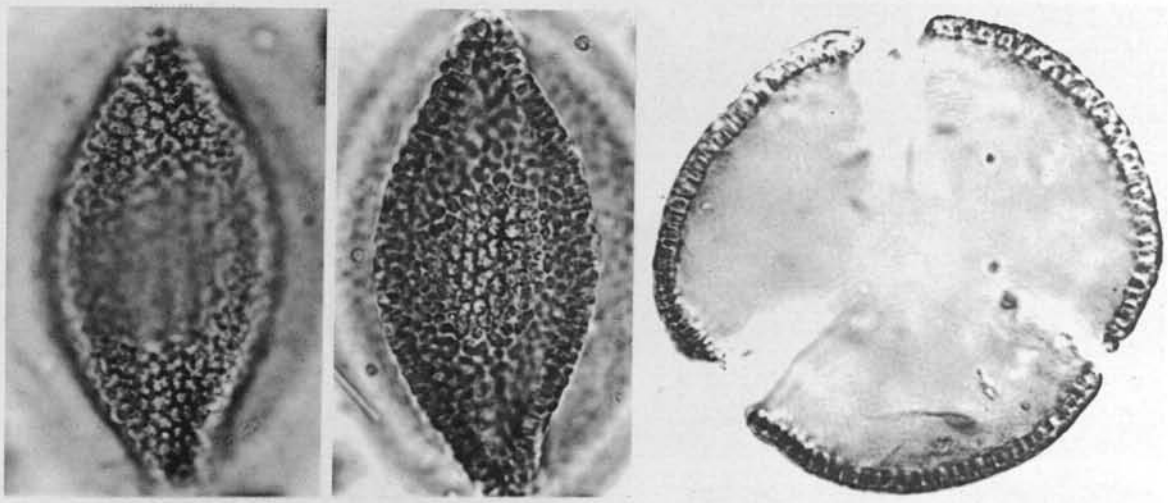


Mastixia arborea (Cornaceae)

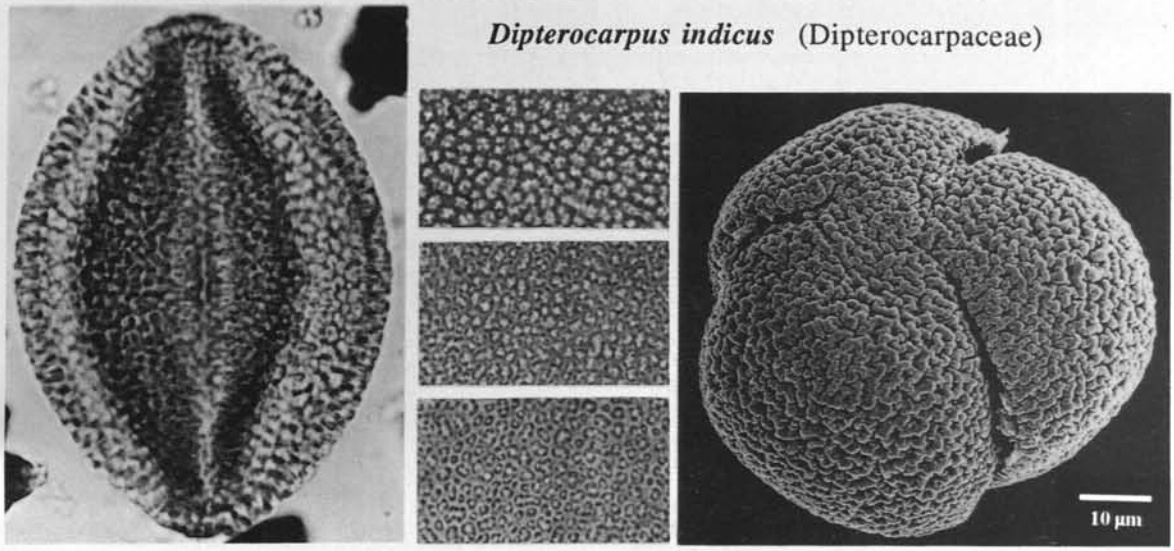
PLATE 16



Dichapetalum gelonioides
(Dichapetalaceae)



Dipterocarpus indicus (Dipterocarpaceae)



Dipterocarpus bourdilloni (Dipterocarpaceae)

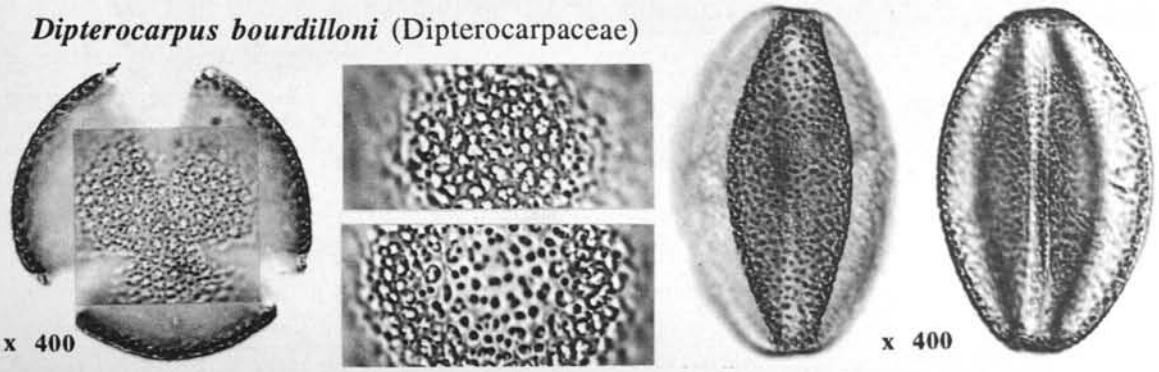
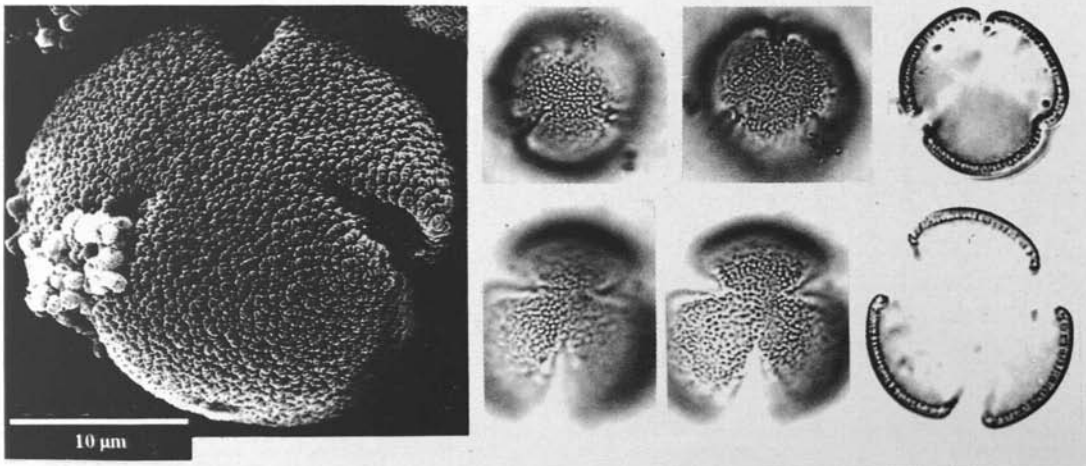
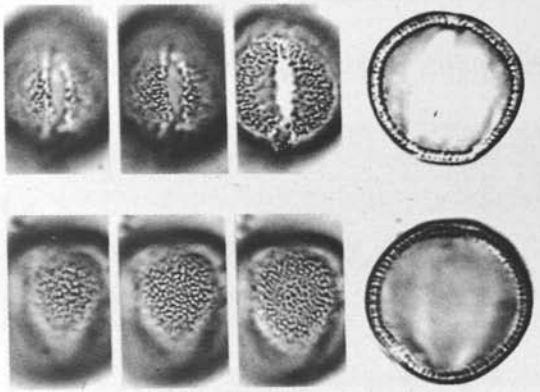
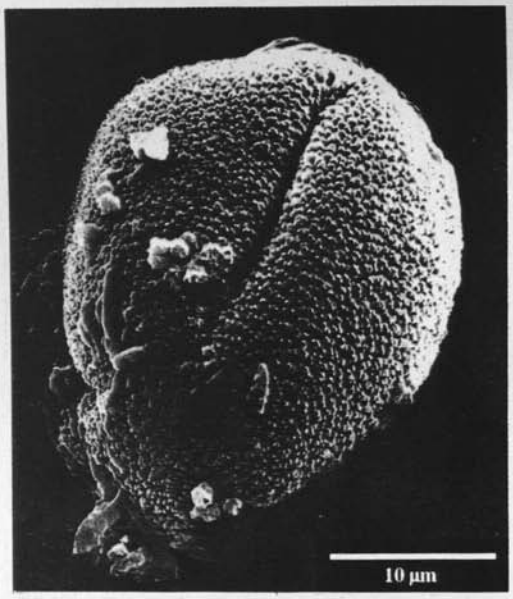


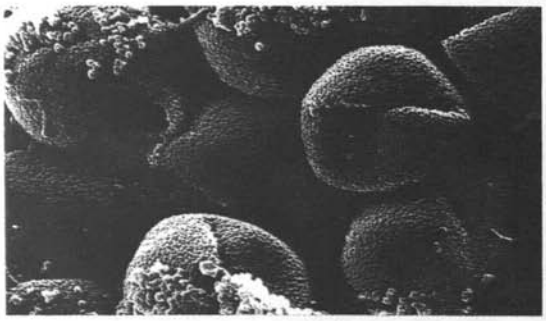
PLATE 18

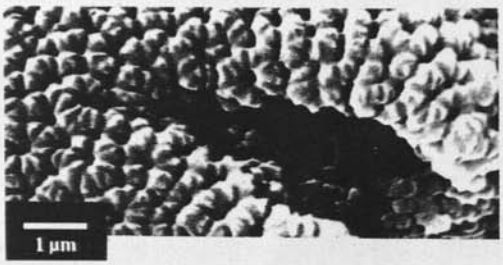


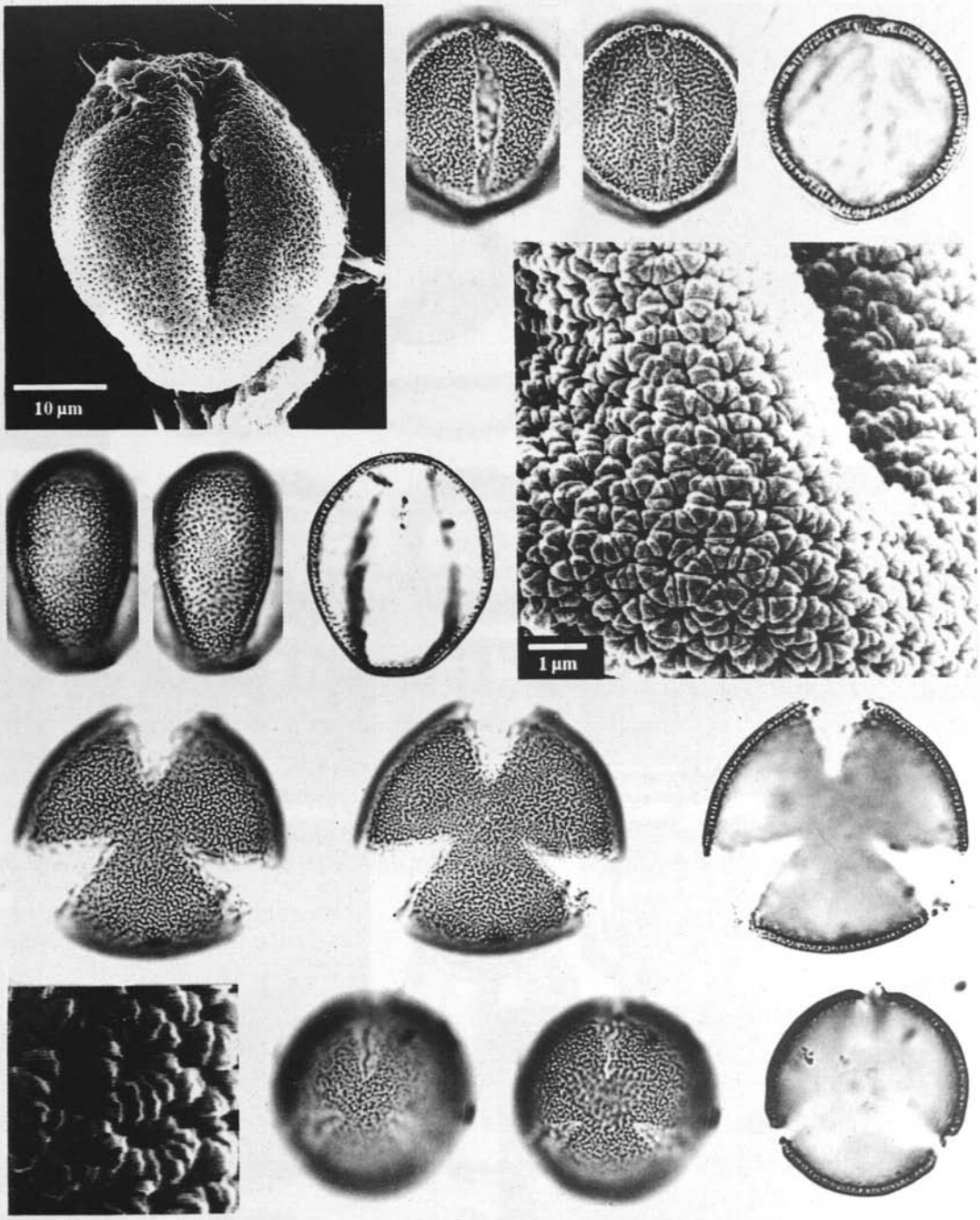




Hopea parviflora
(Dipterocarpaceae)

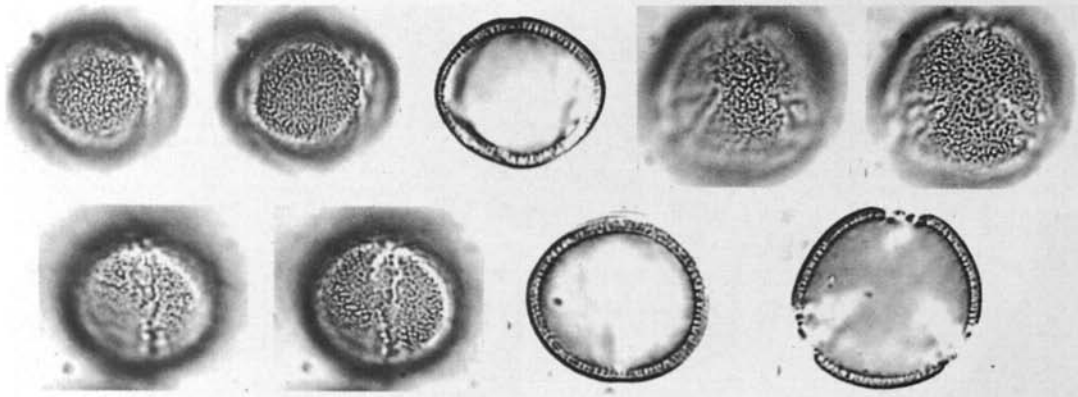




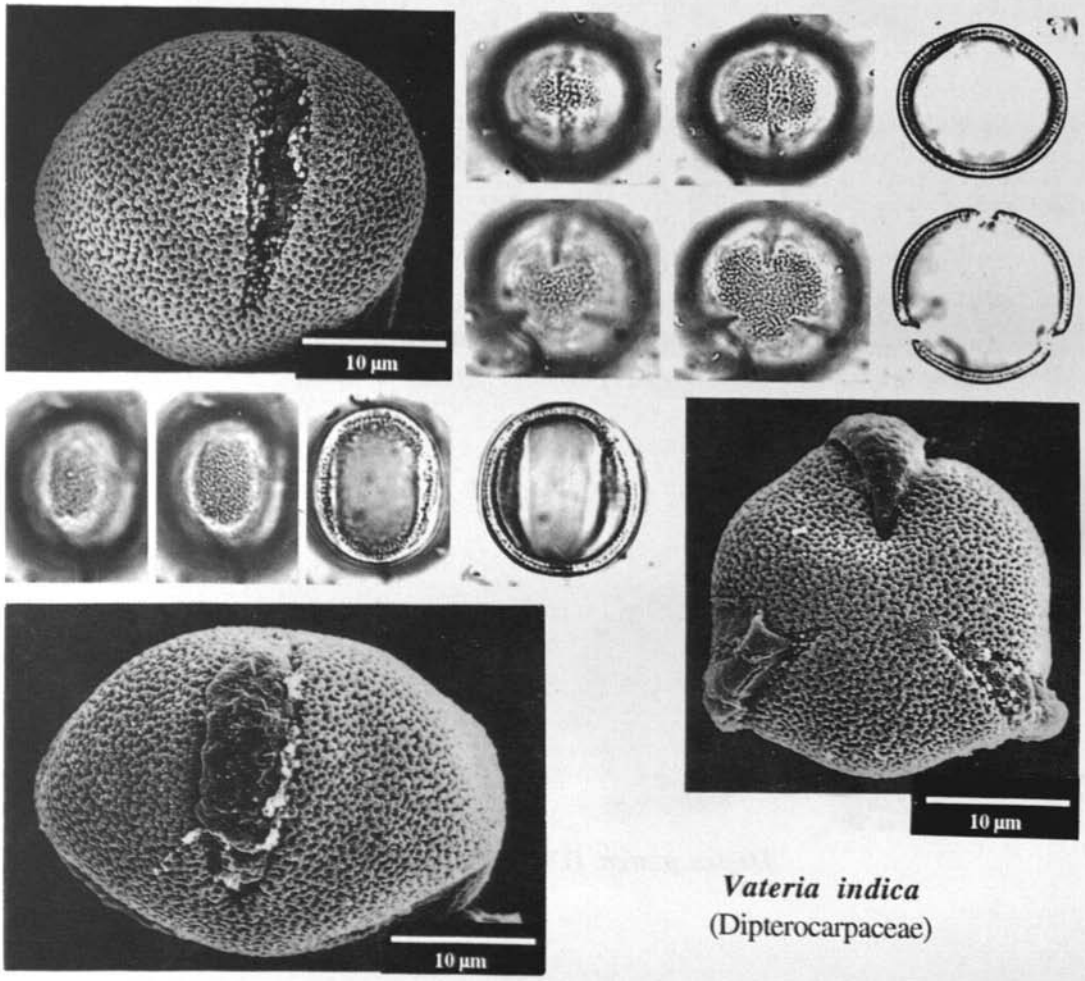


Hopea ponga (Dipterocarpaceae)

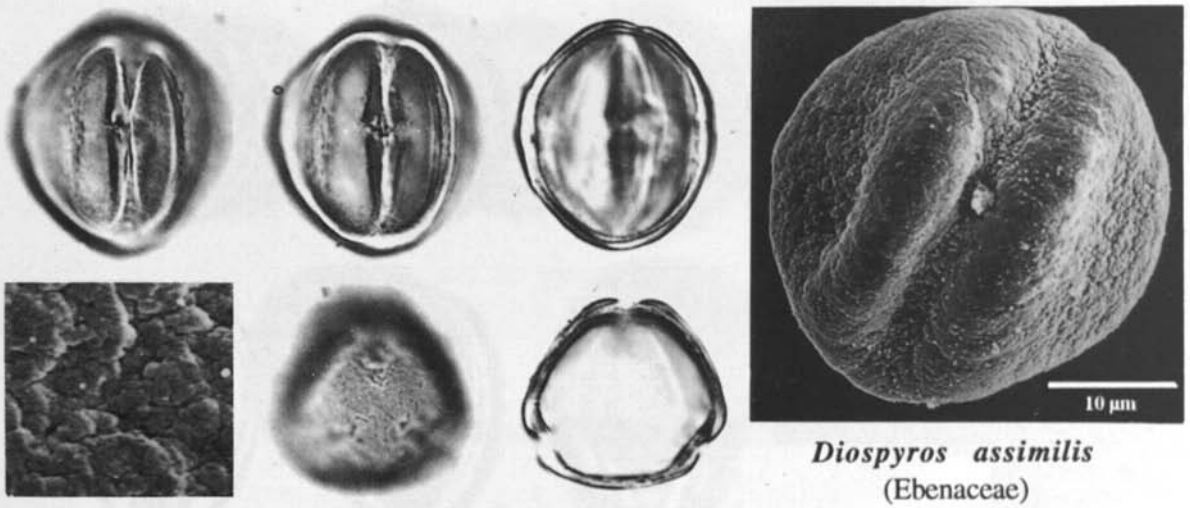
PLATE 20



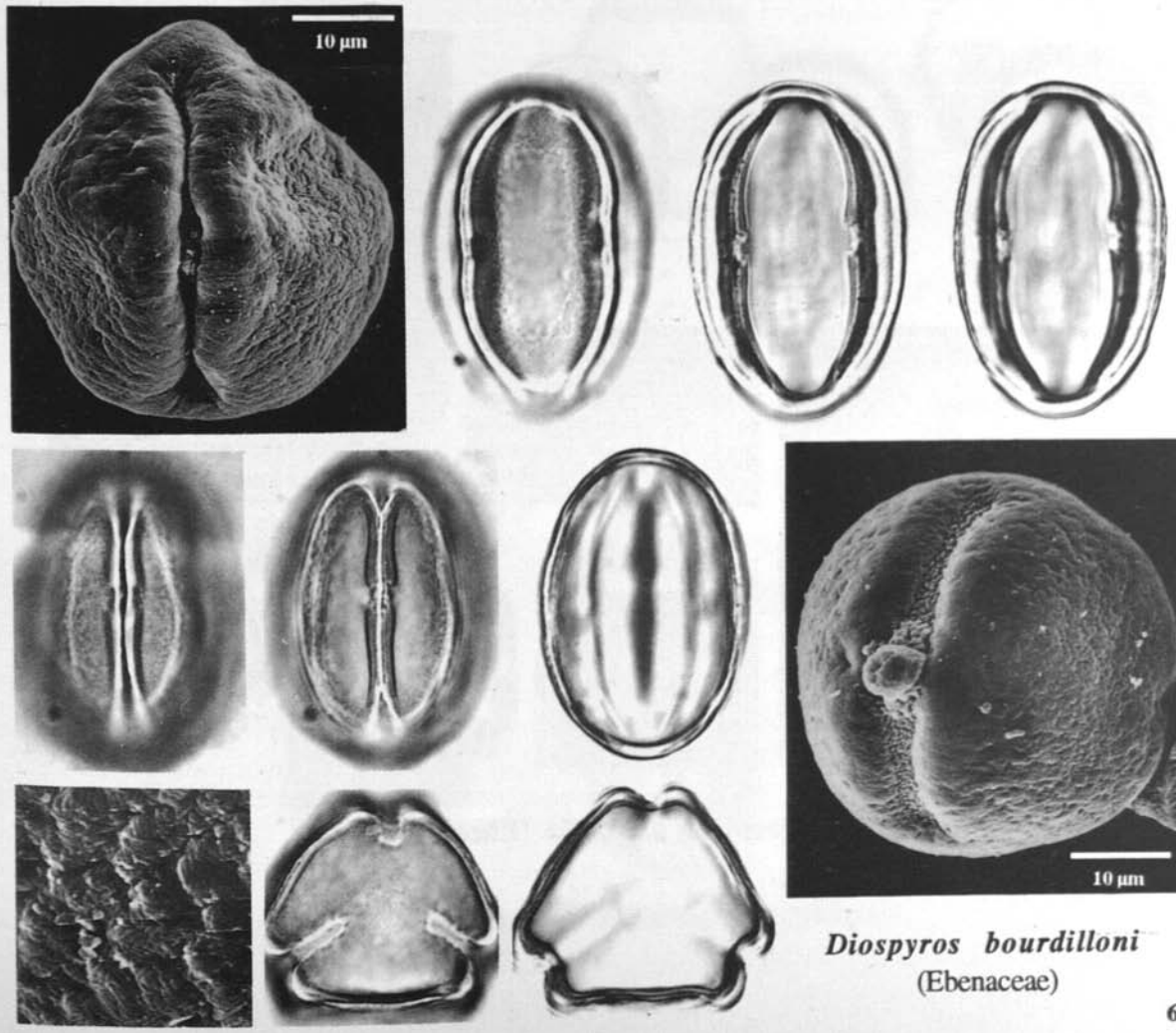
Hopea utilis (Dipterocarpaceae)



Vateria indica
(Dipterocarpaceae)

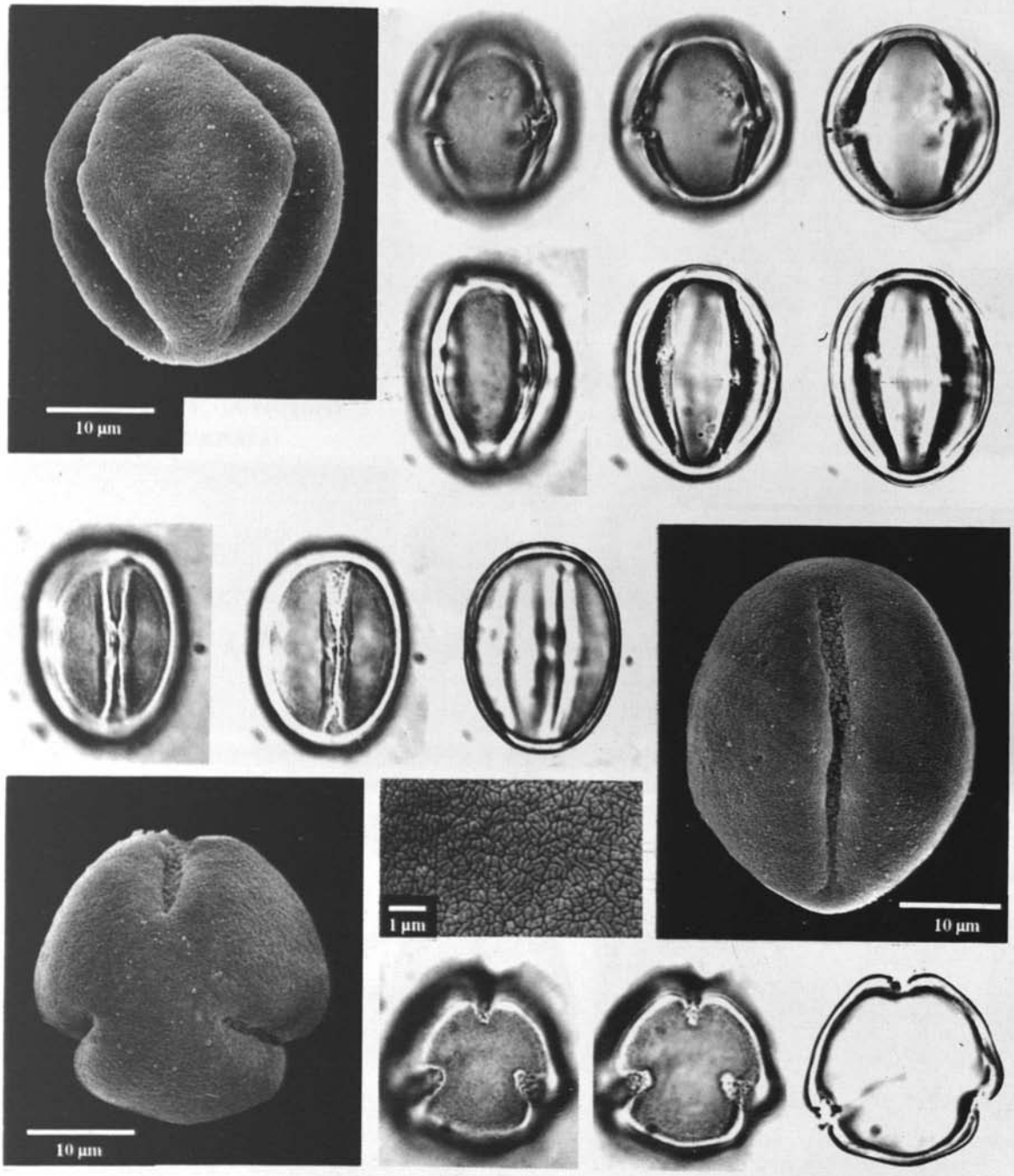


Diospyros assimilis
(Ebenaceae)

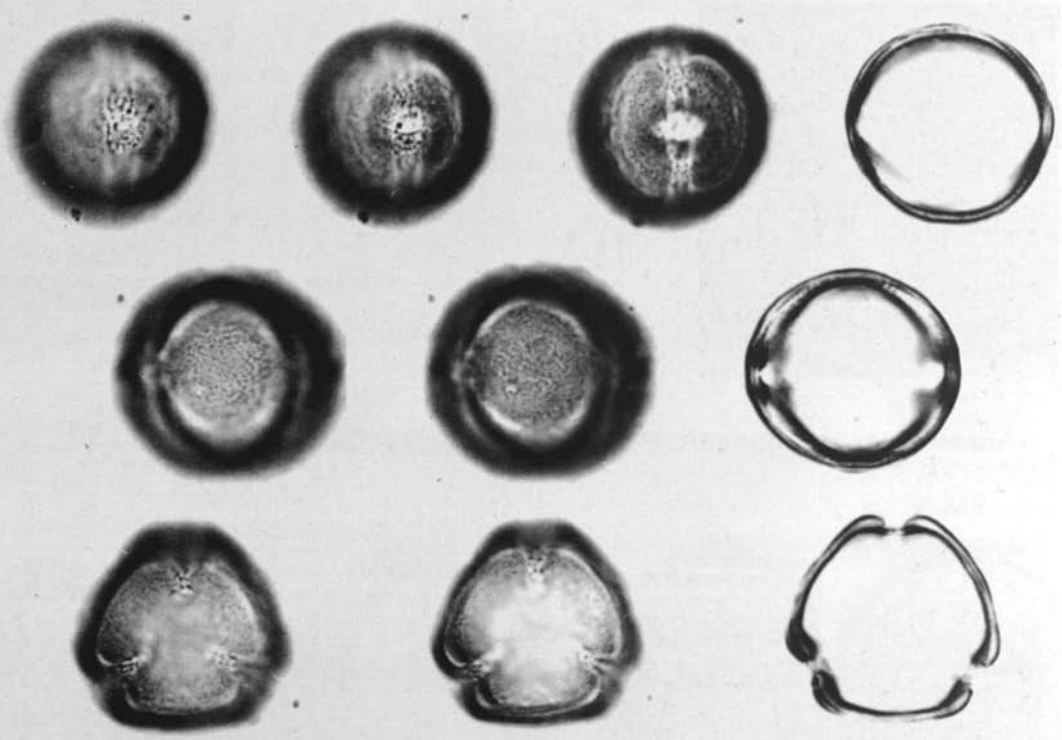


Diospyros bourdilloni
(Ebenaceae)

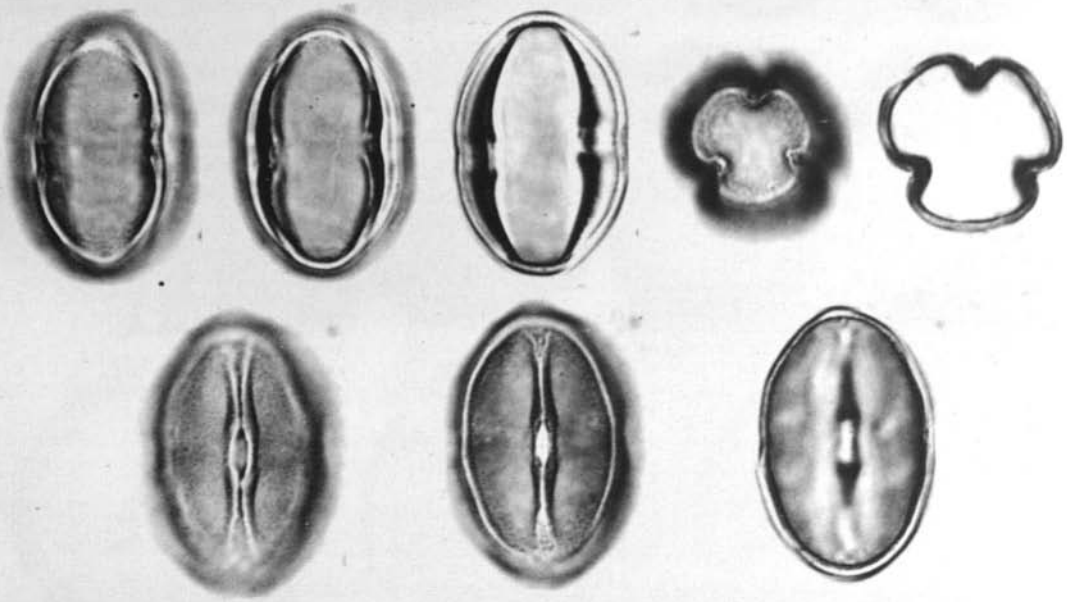
PLATE 22



Diospyros buxifolia (Ebenaceae)

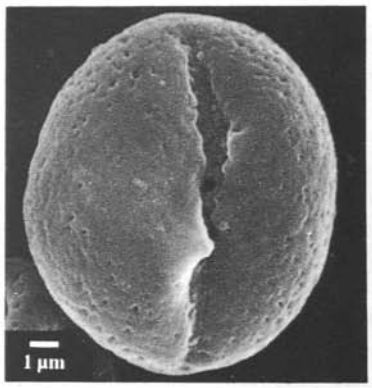


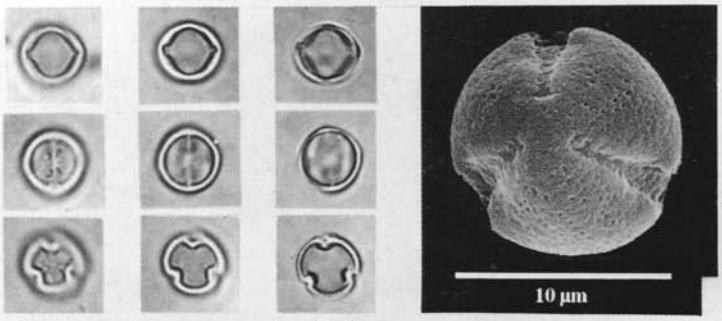
Diospyros paniculata (Ebenaceae)



Diospyros sylvatica (Ebenaceae)

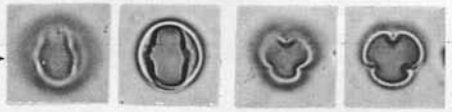
PLATE 24

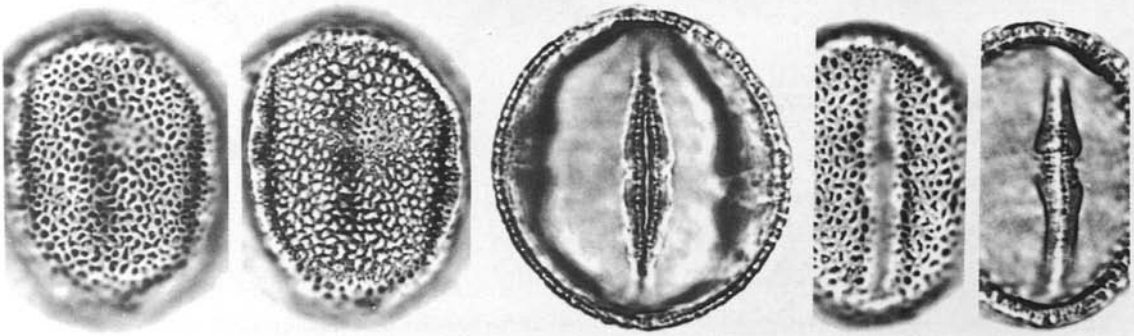




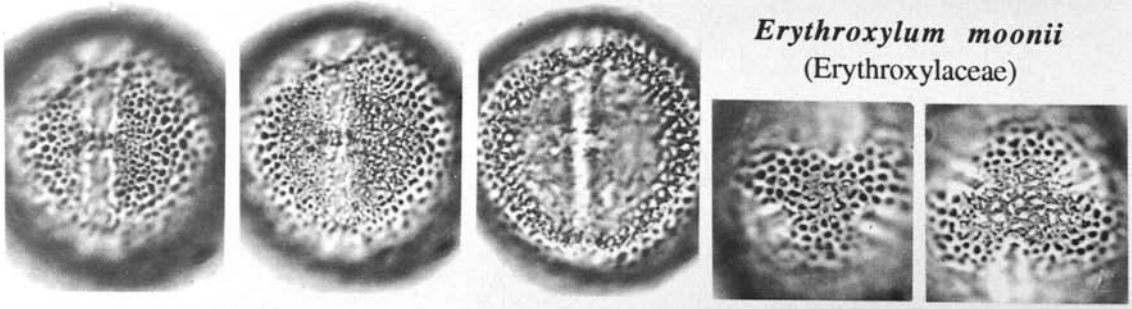
Elaeocarpus serratus (Elaeocarpaceae)

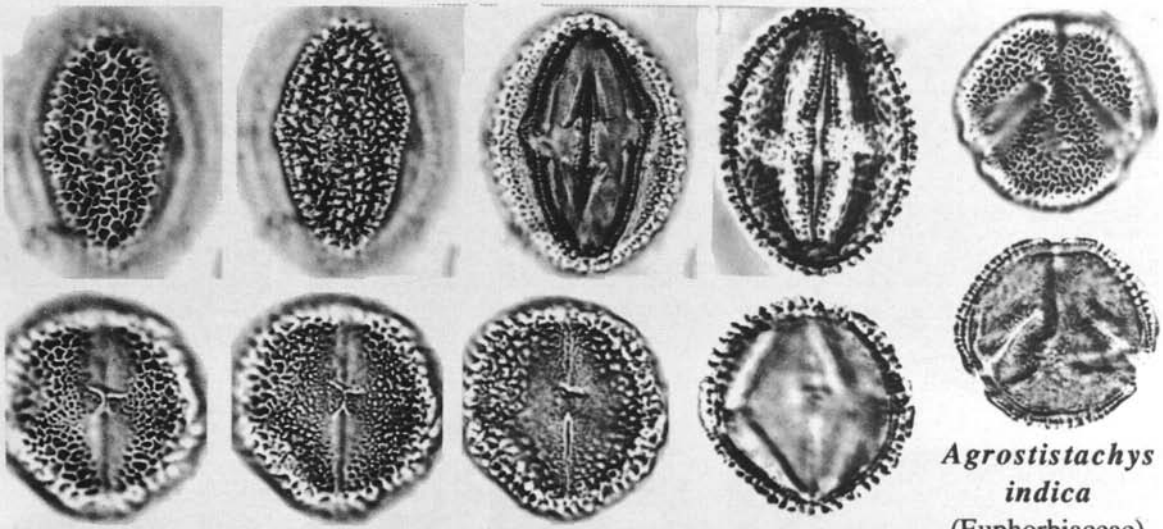
Elaeocarpus tuberculatus (Elaeocarpaceae) →



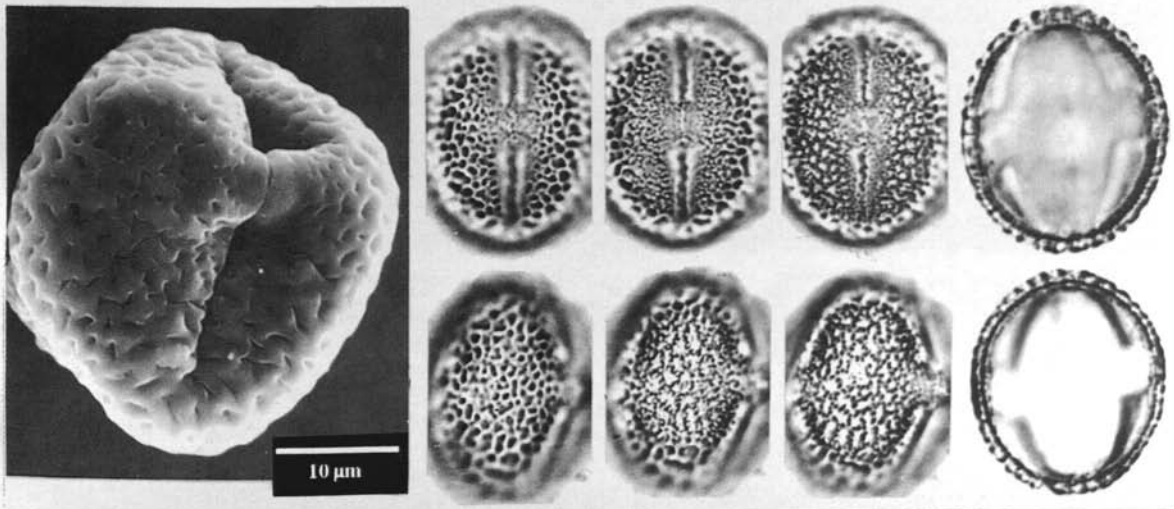


Erythroxylum moonii
(Erythroxylaceae)





Agrostistachys indica
(Euphorbiaceae)



Agrostistachys meeboldii
(Euphorbiaceae)

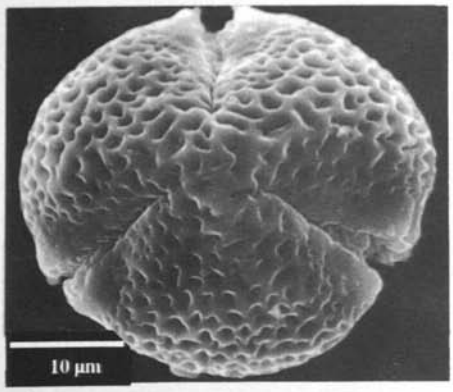
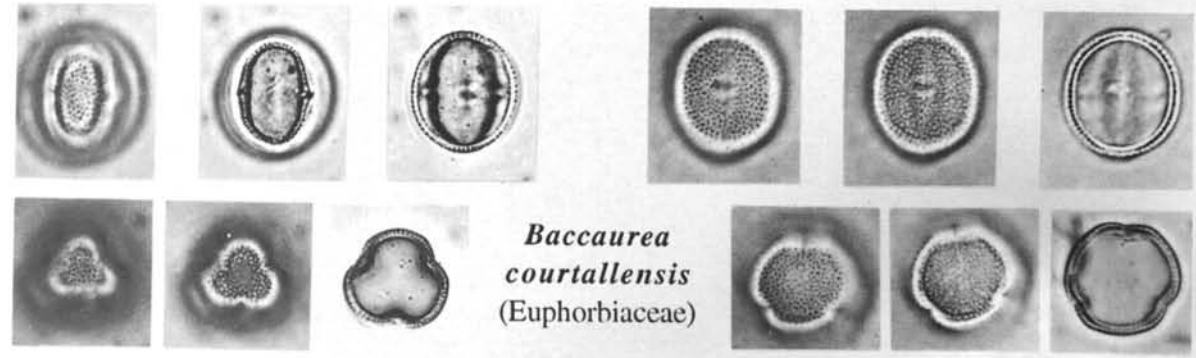
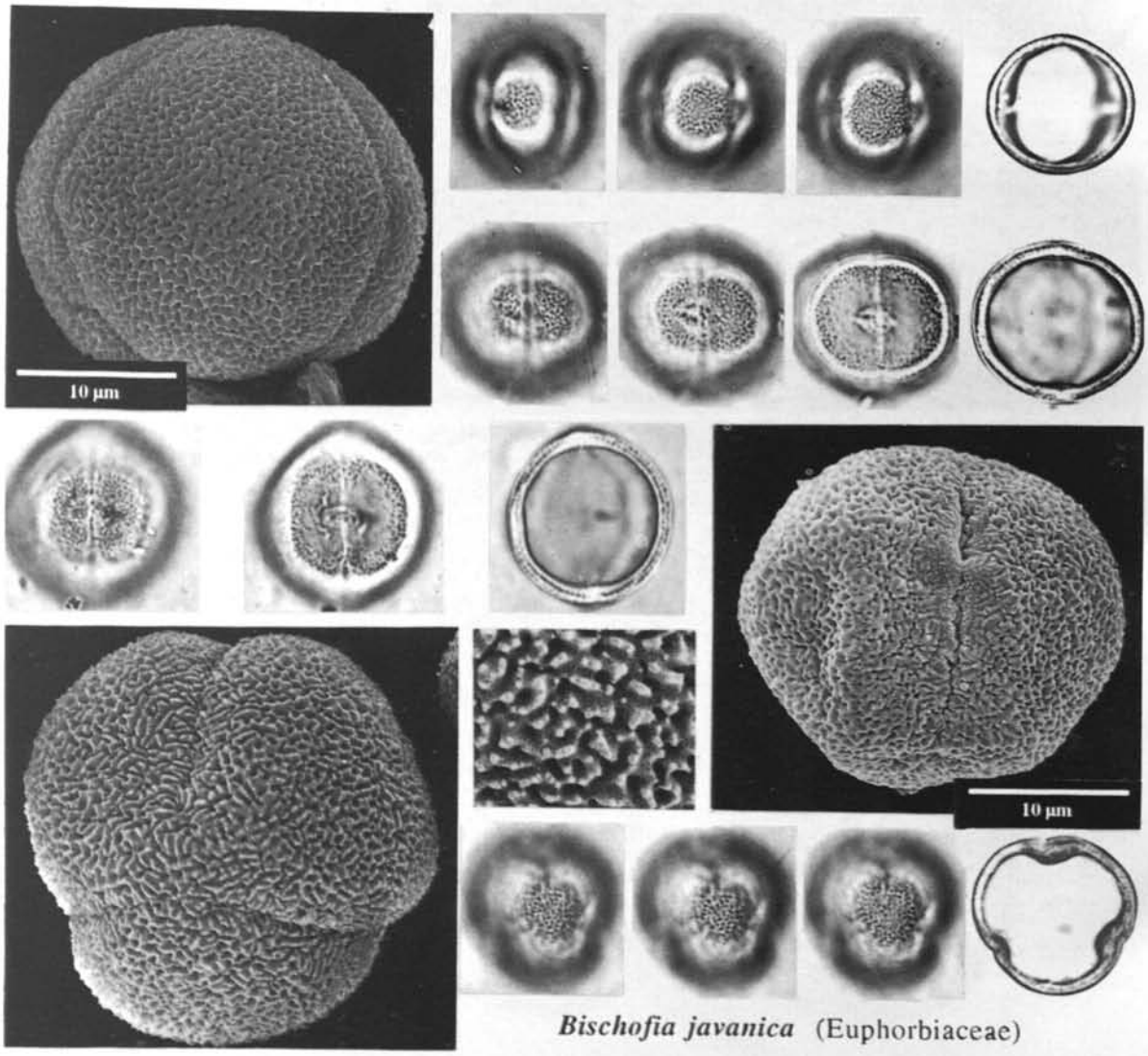


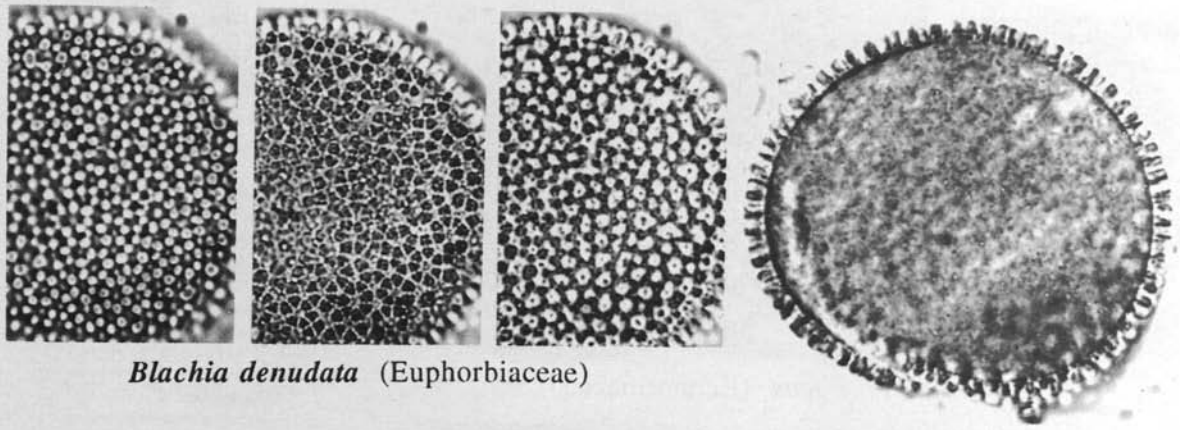
PLATE 26



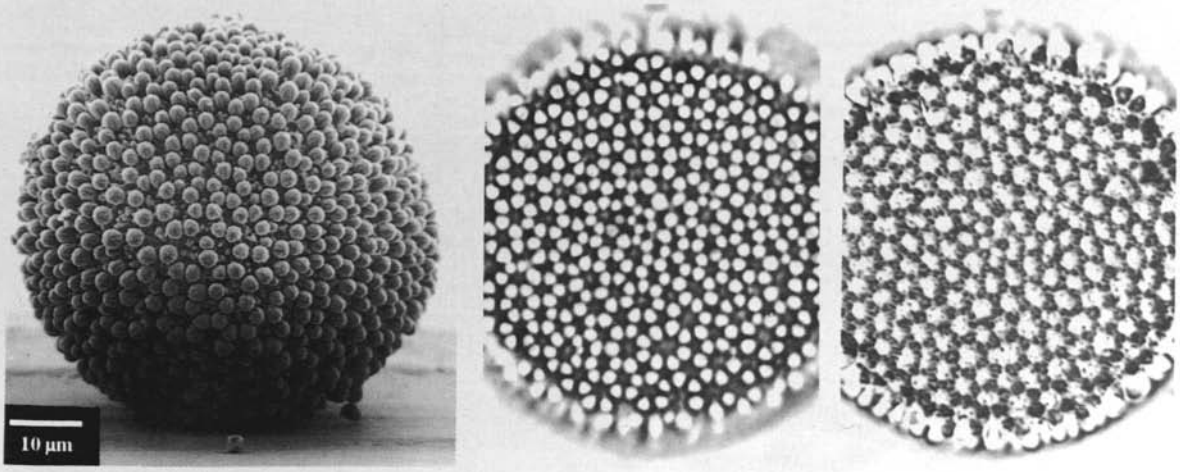
Baccaurea courtallensis (Euphorbiaceae)

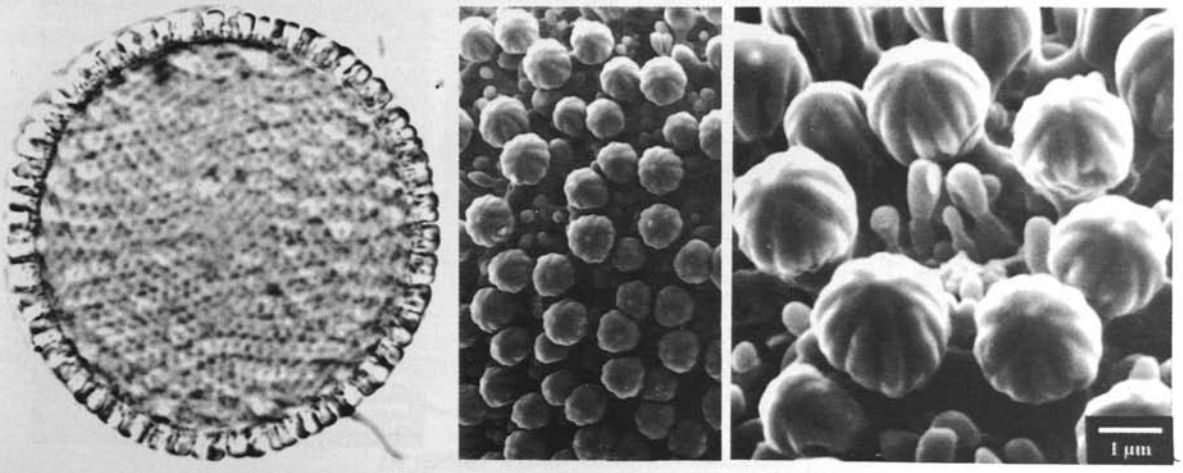


Bischofia javanica (Euphorbiaceae)



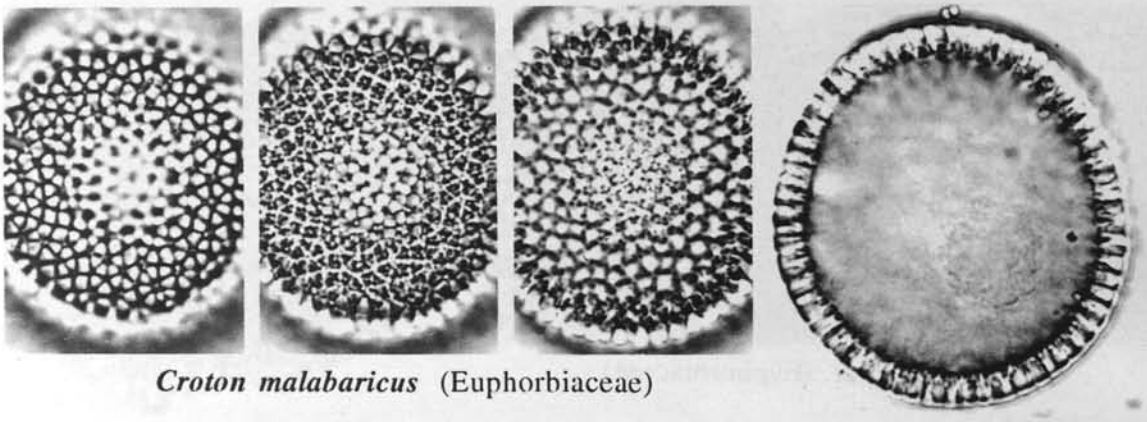
Blachia denudata (Euphorbiaceae)



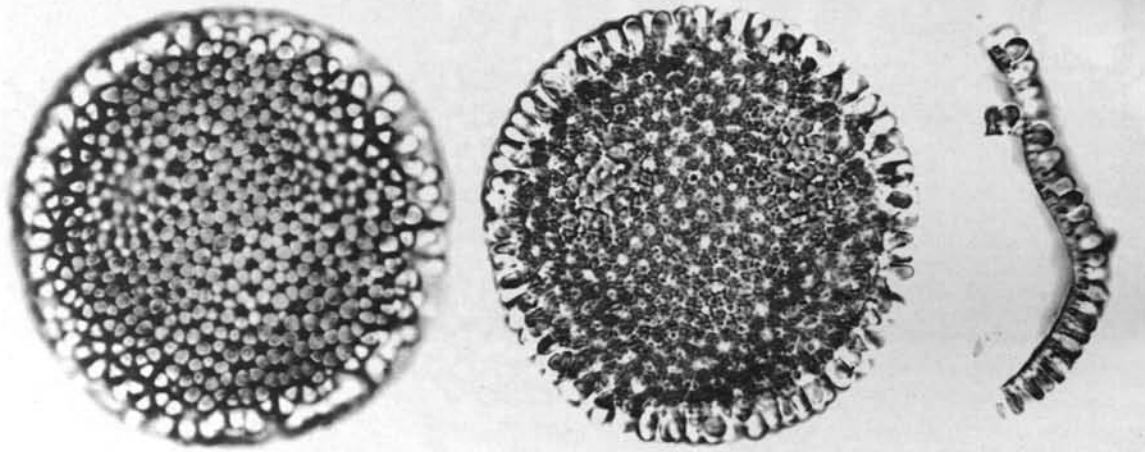


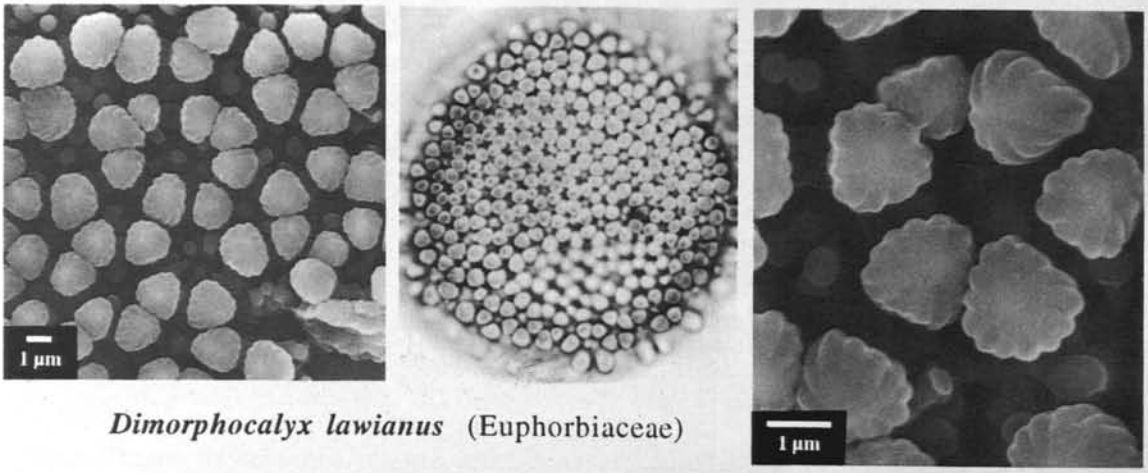
Croton gibsonianus (Euphorbiaceae)

PLATE 28

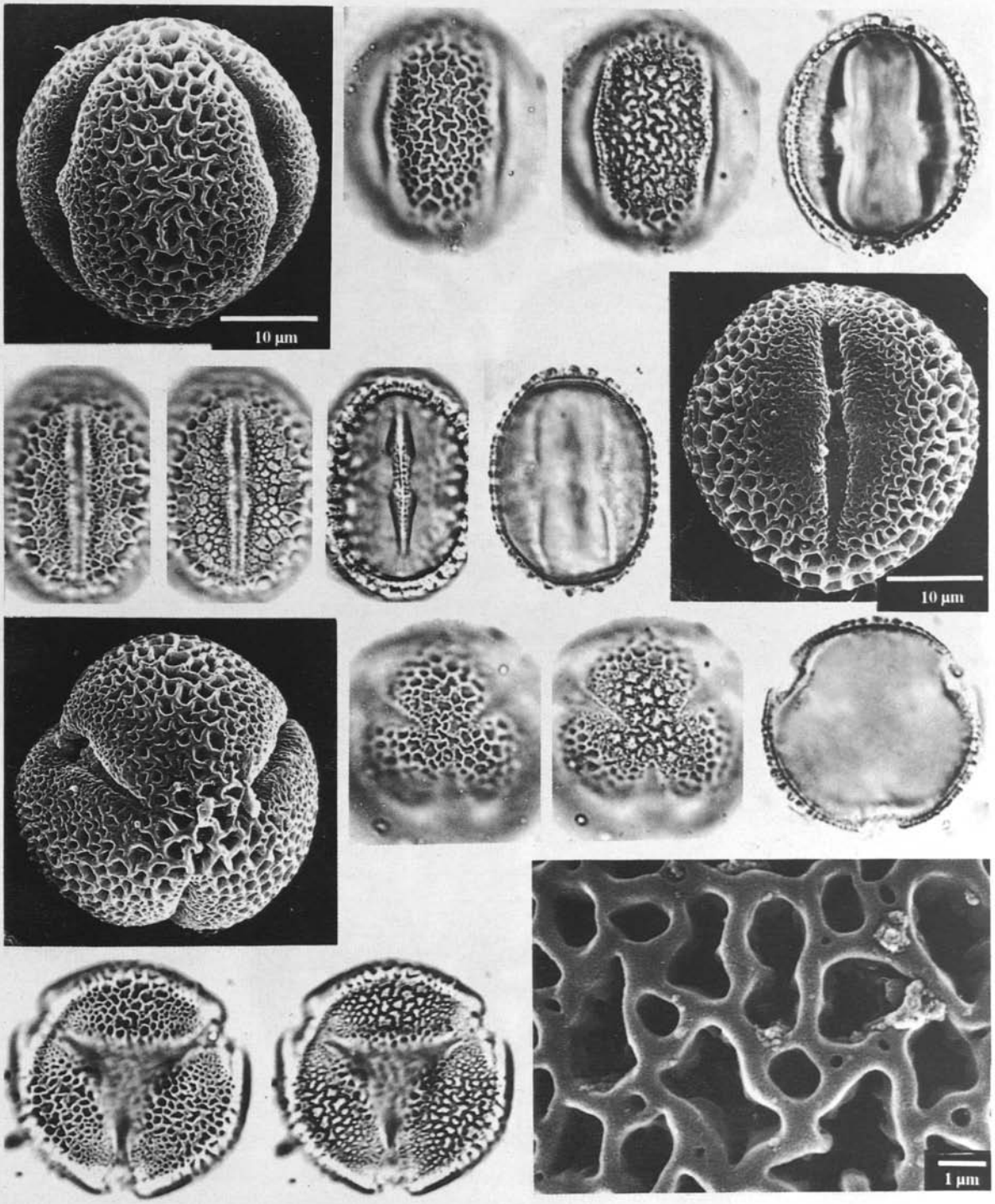


Croton malabaricus (Euphorbiaceae)



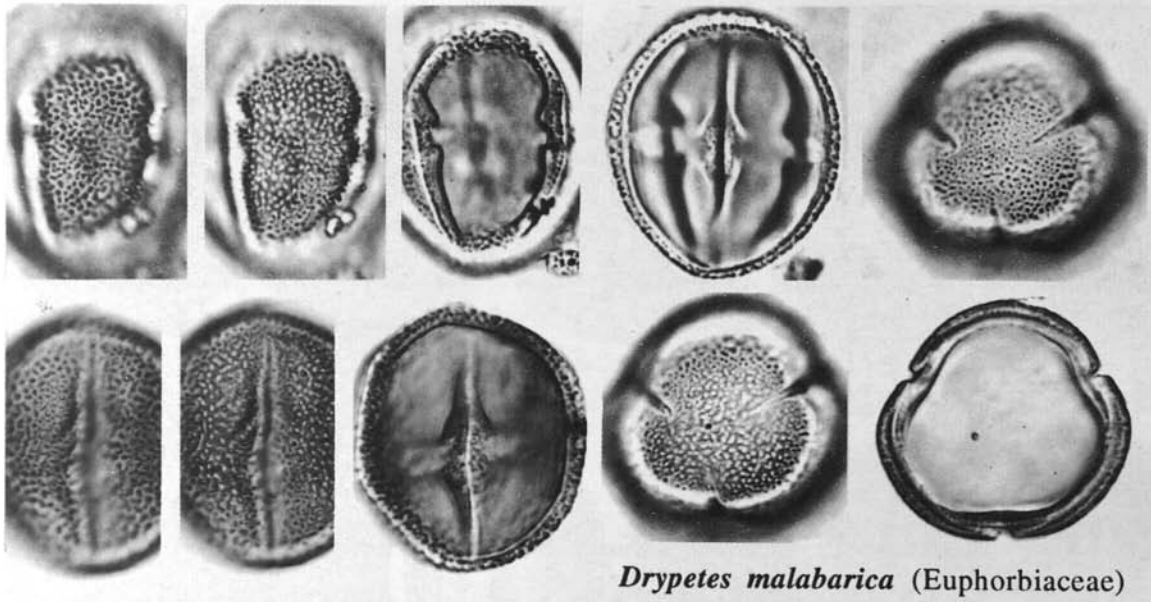


Dimorphocalyx lawianus (Euphorbiaceae)

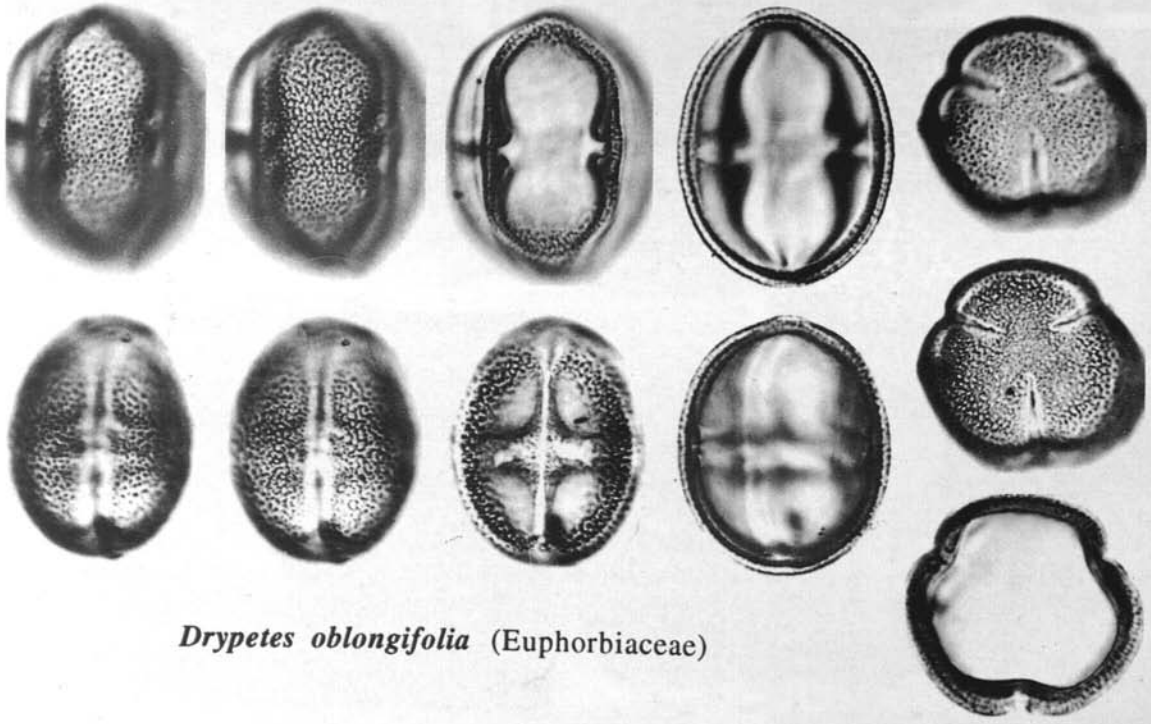


Drypetes elata (Euphorbiaceae)

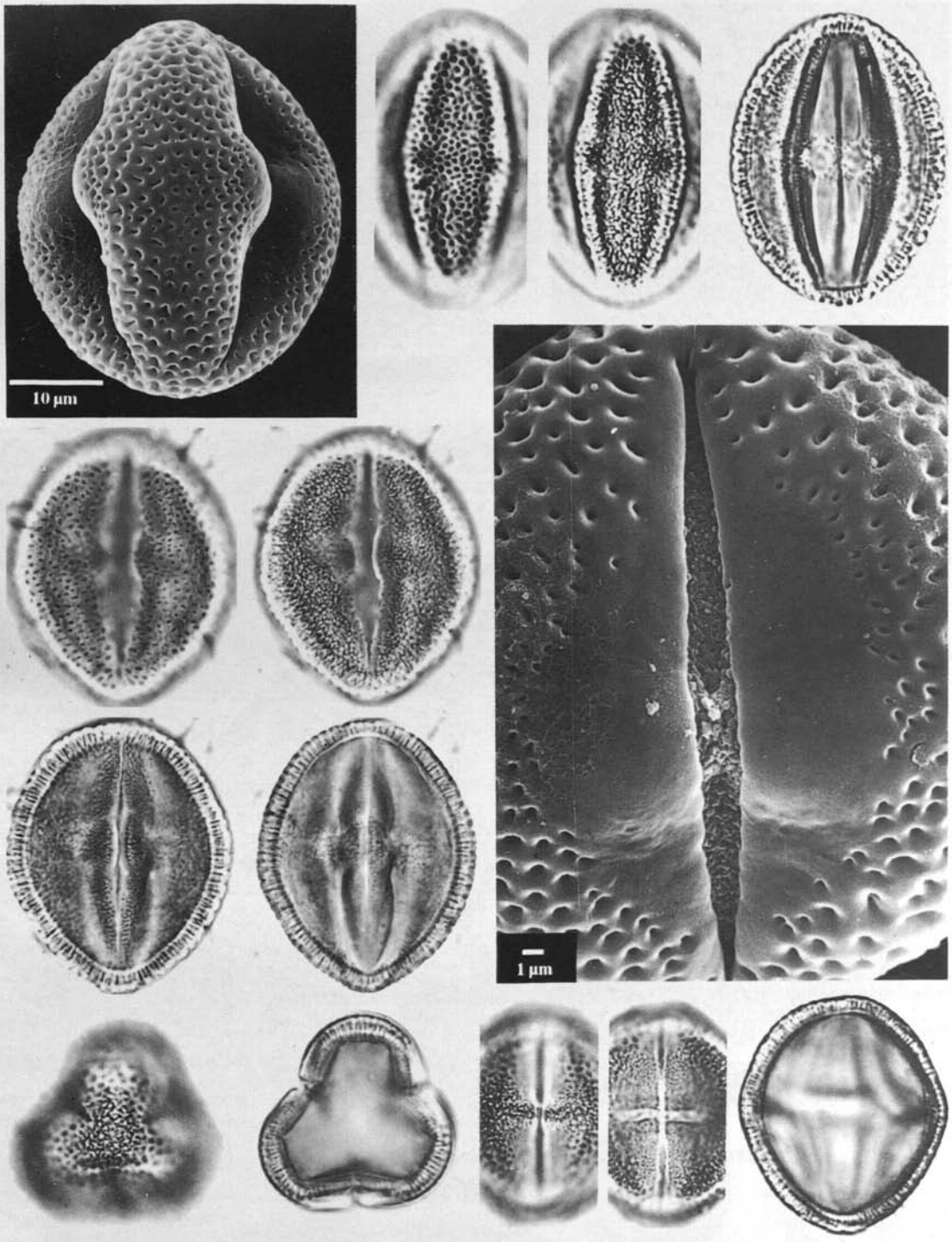
PLATE 30



Drypetes malabarica (Euphorbiaceae)

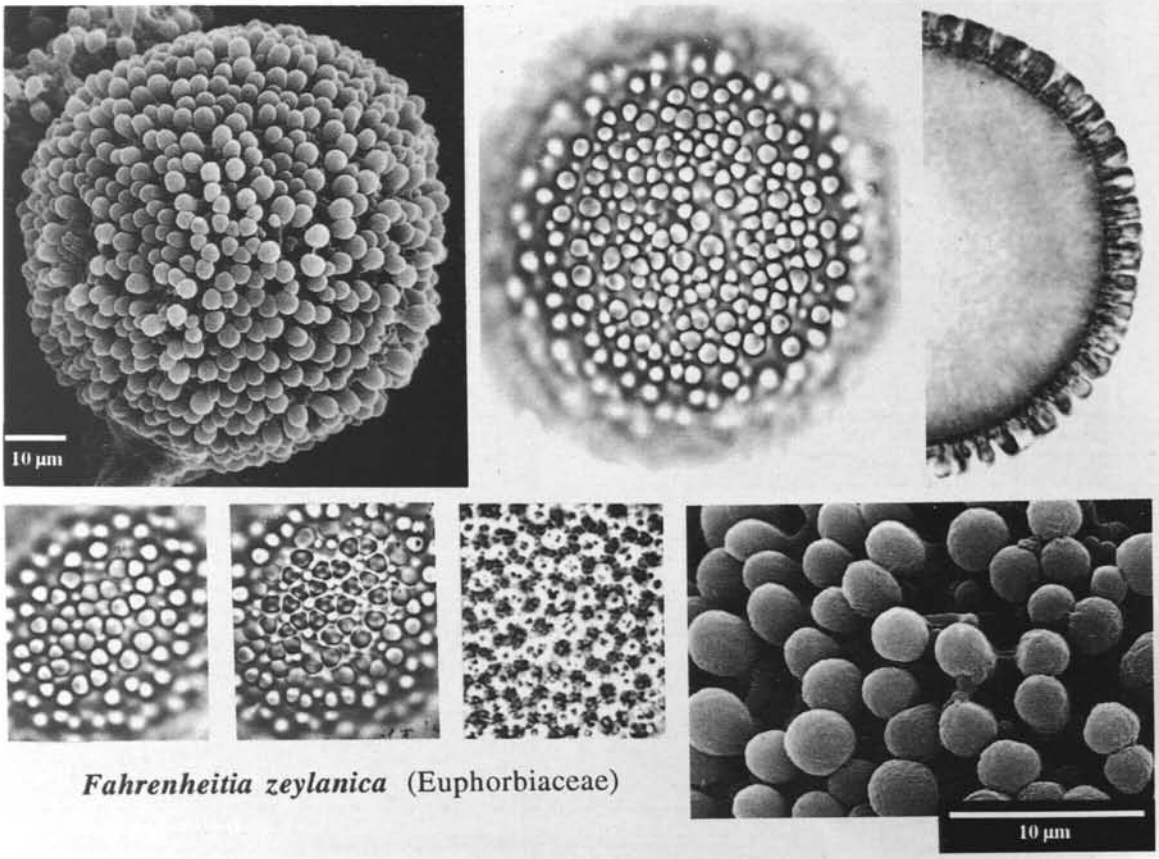


Drypetes oblongifolia (Euphorbiaceae)

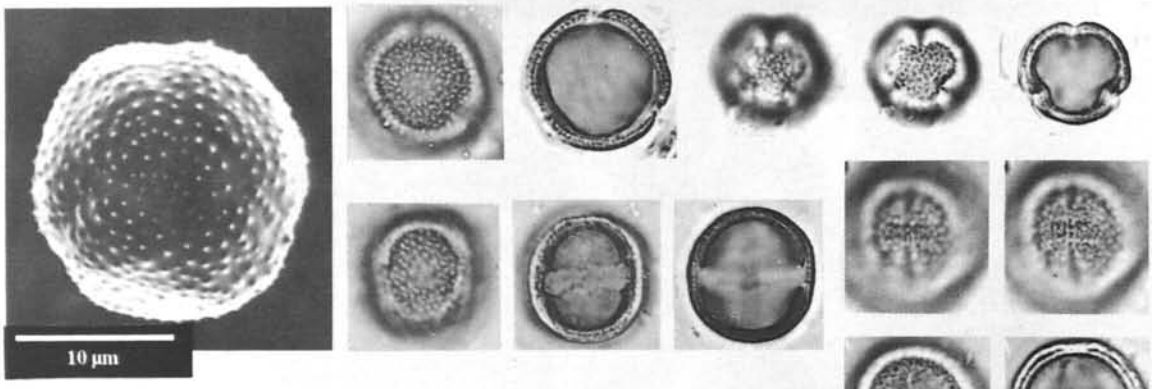


Excoecaria crenulata (Euphorbiaceae)

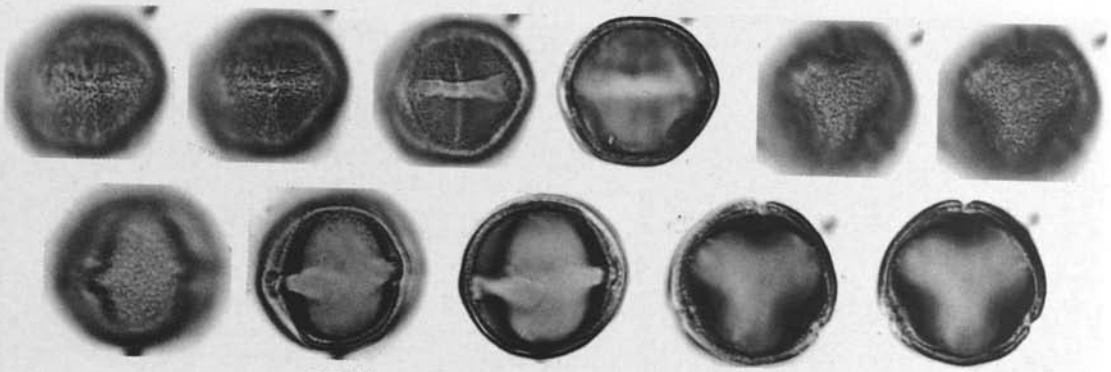
PLATE 32



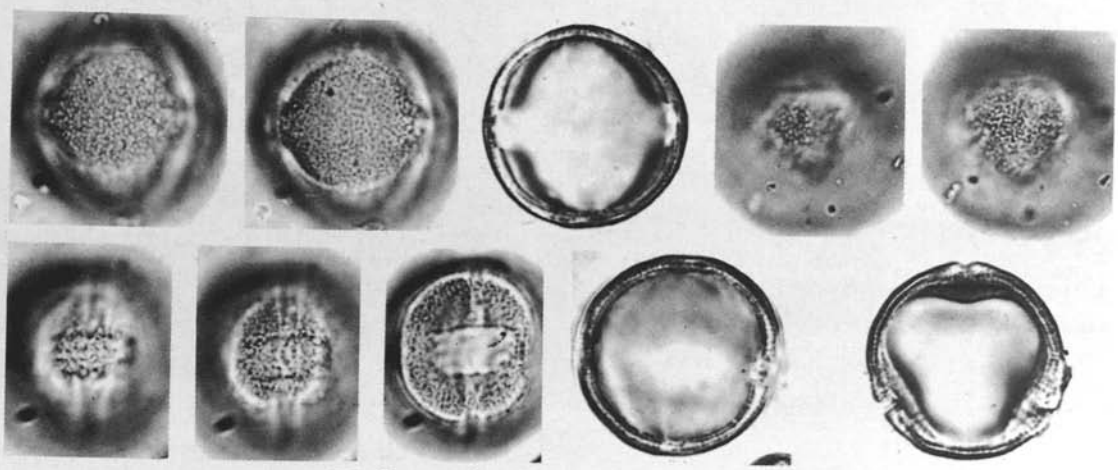
Fahrenheitia zeylanica (Euphorbiaceae)



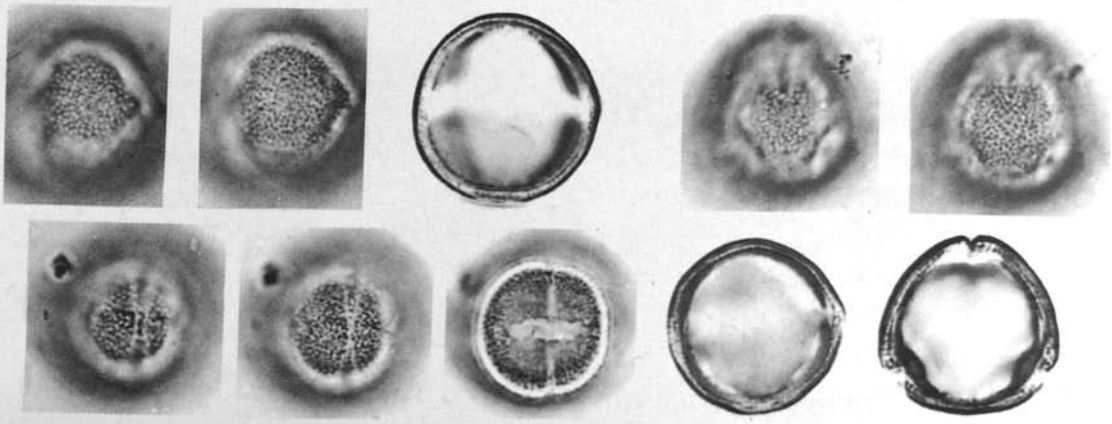
Macaranga peltata (Euphorbiaceae)



Mallotus beddomei (Euphorbiaceae)

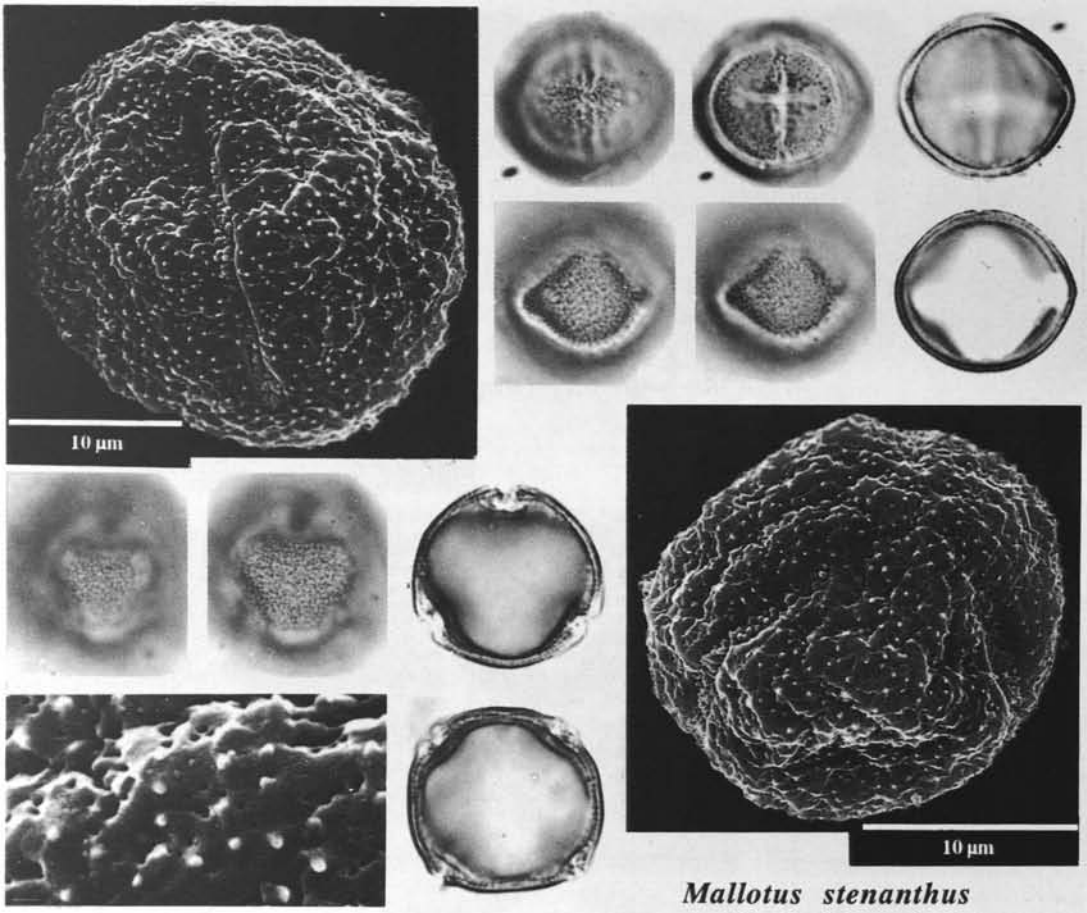


Mallotus distans (Euphorbiaceae)

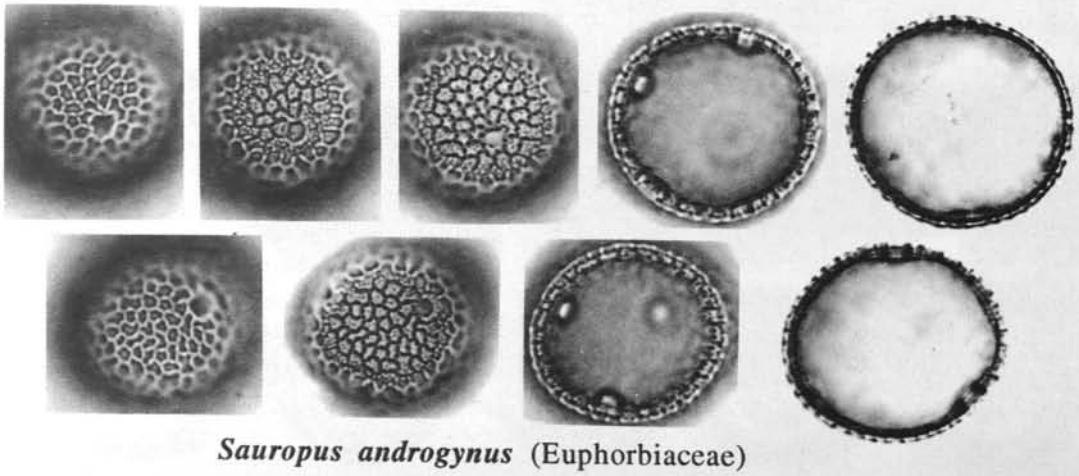


Mallotus philippensis (Euphorbiaceae)

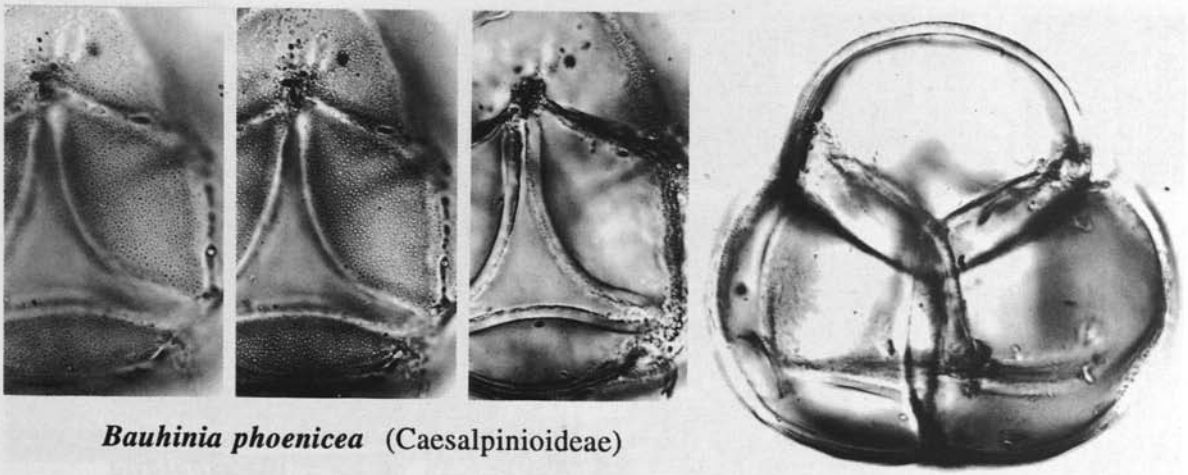
PLATE 34



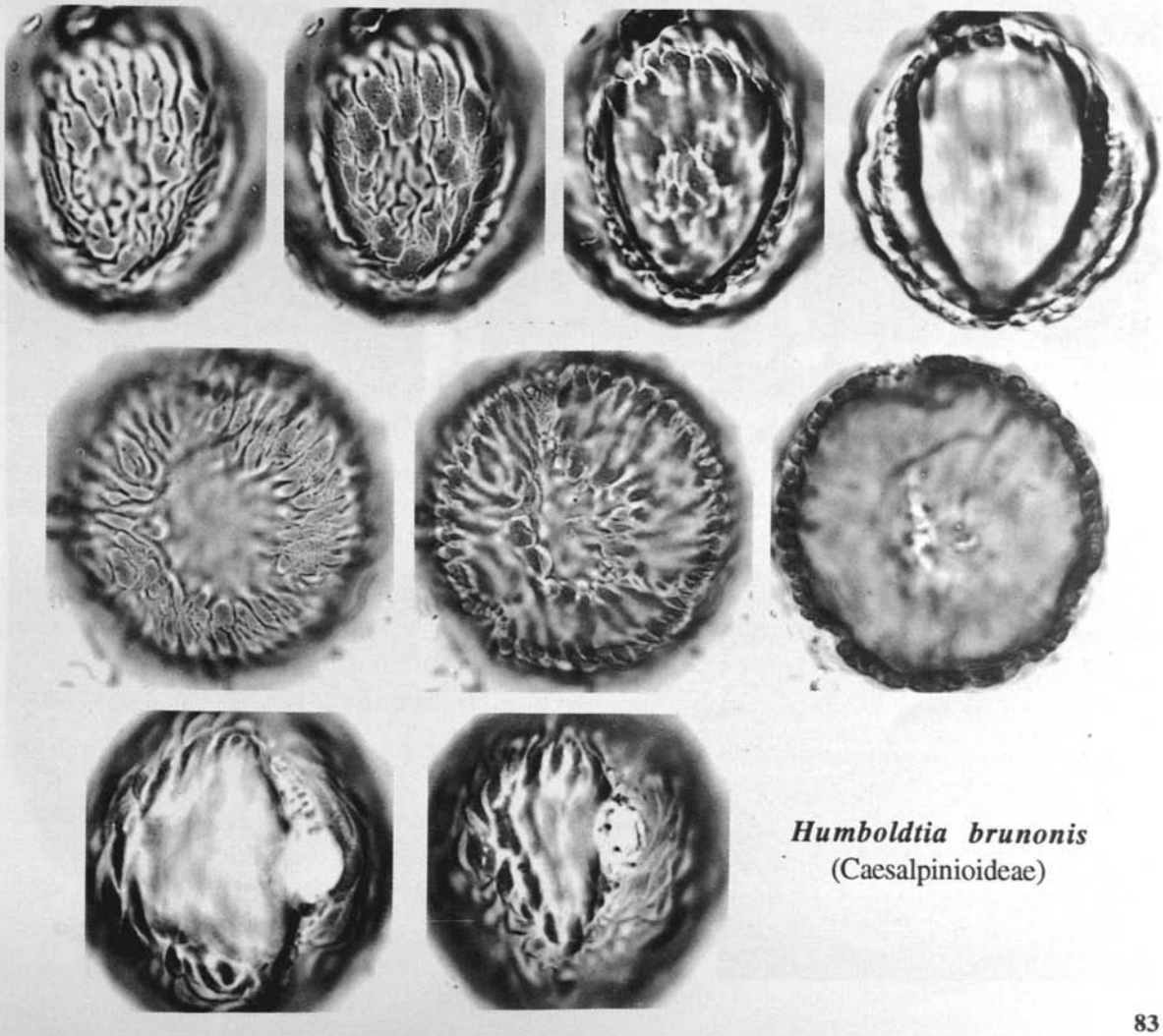
Mallotus stenanthus
(Euphorbiaceae)



Sauropus androgynus (Euphorbiaceae)

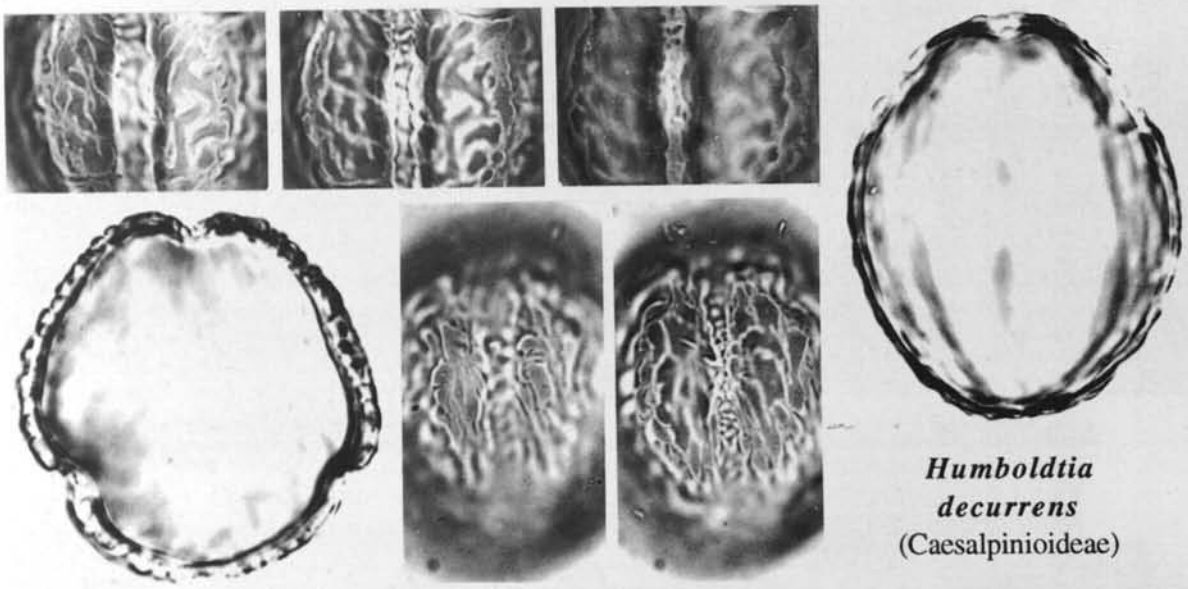


Bauhinia phoenicea (Caesalpinioideae)

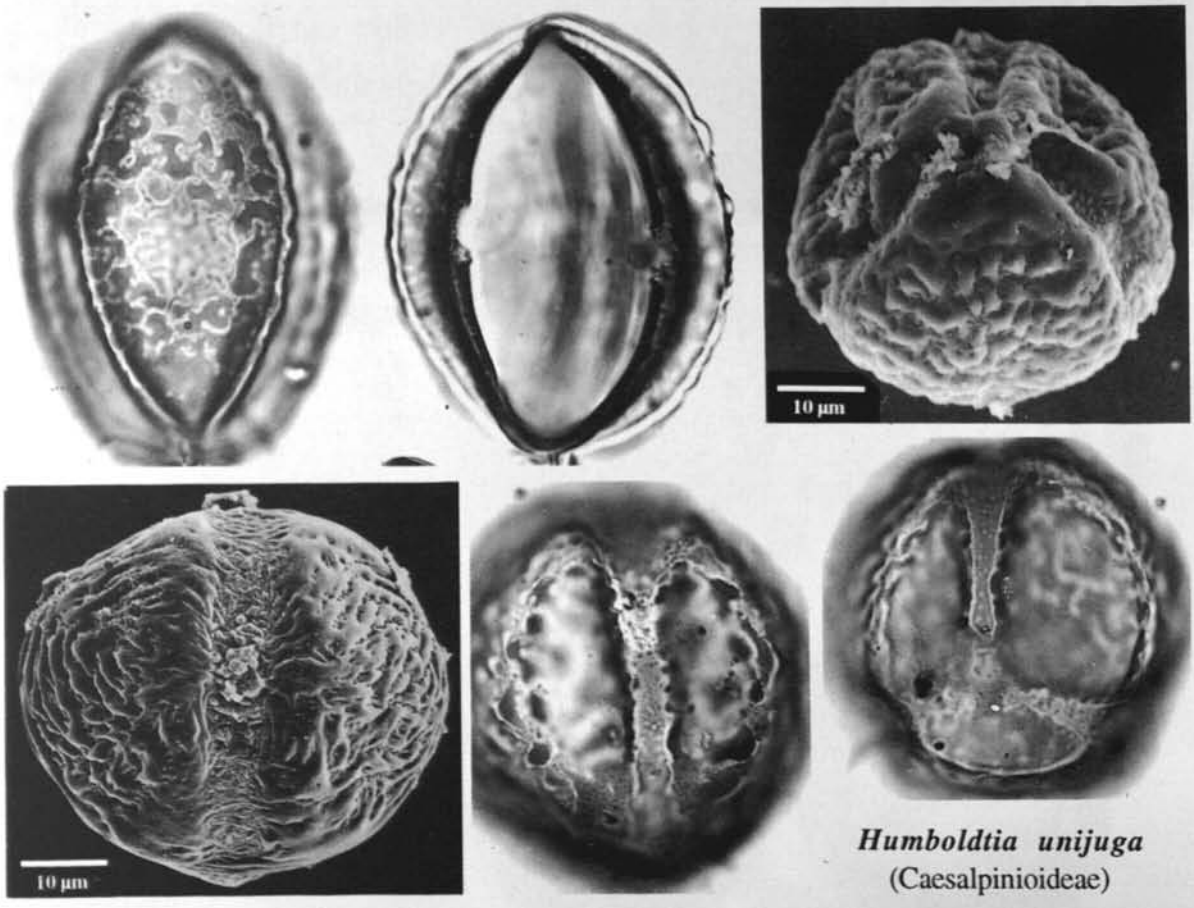


Humboldtia brunonis
(Caesalpinioideae)

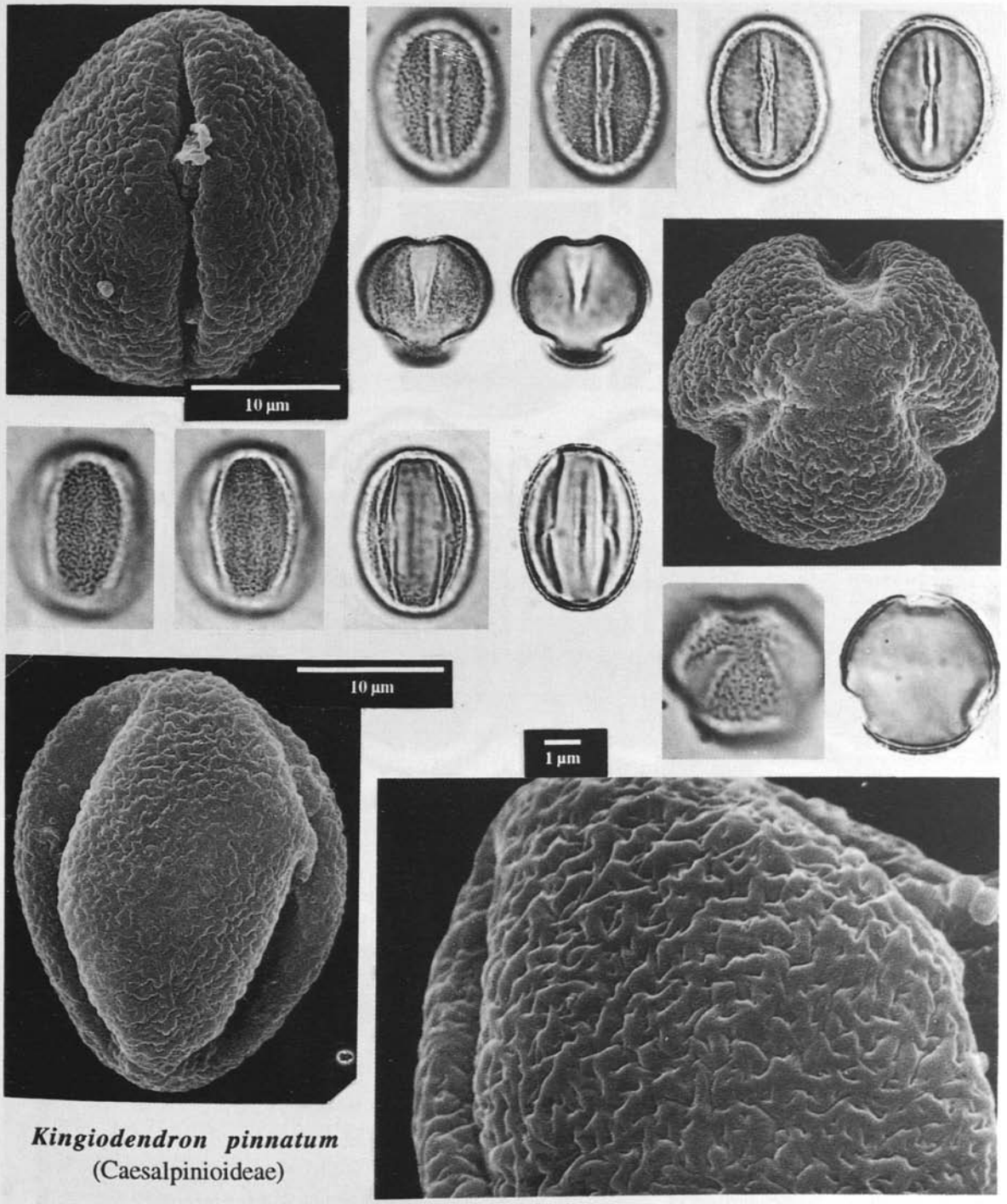
PLATE 36



Humboldtia decurrens
(Caesalpinioideae)

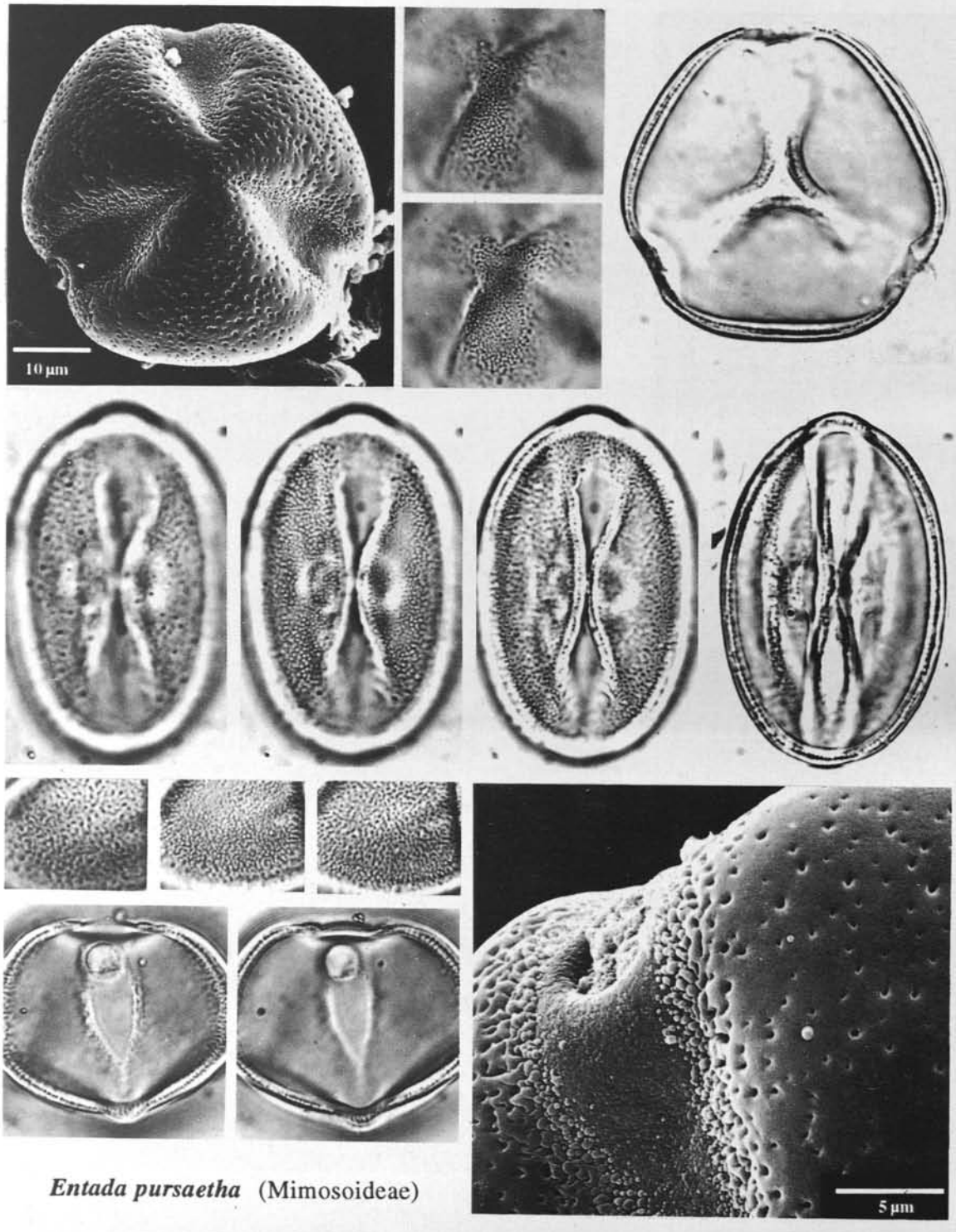


Humboldtia unijuga
(Caesalpinioideae)

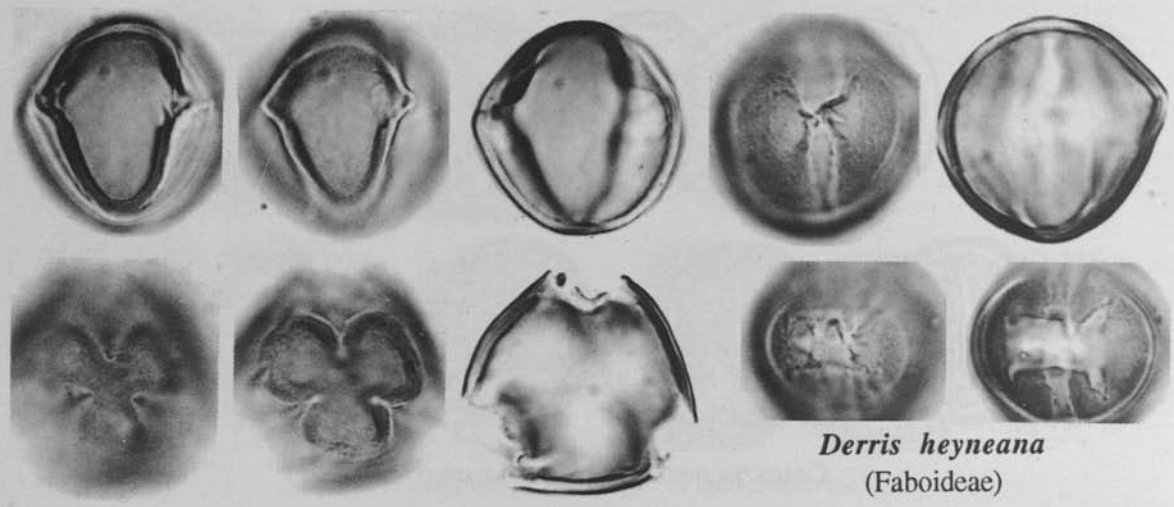


Kingiodendron pinnatum
(Caesalpinioideae)

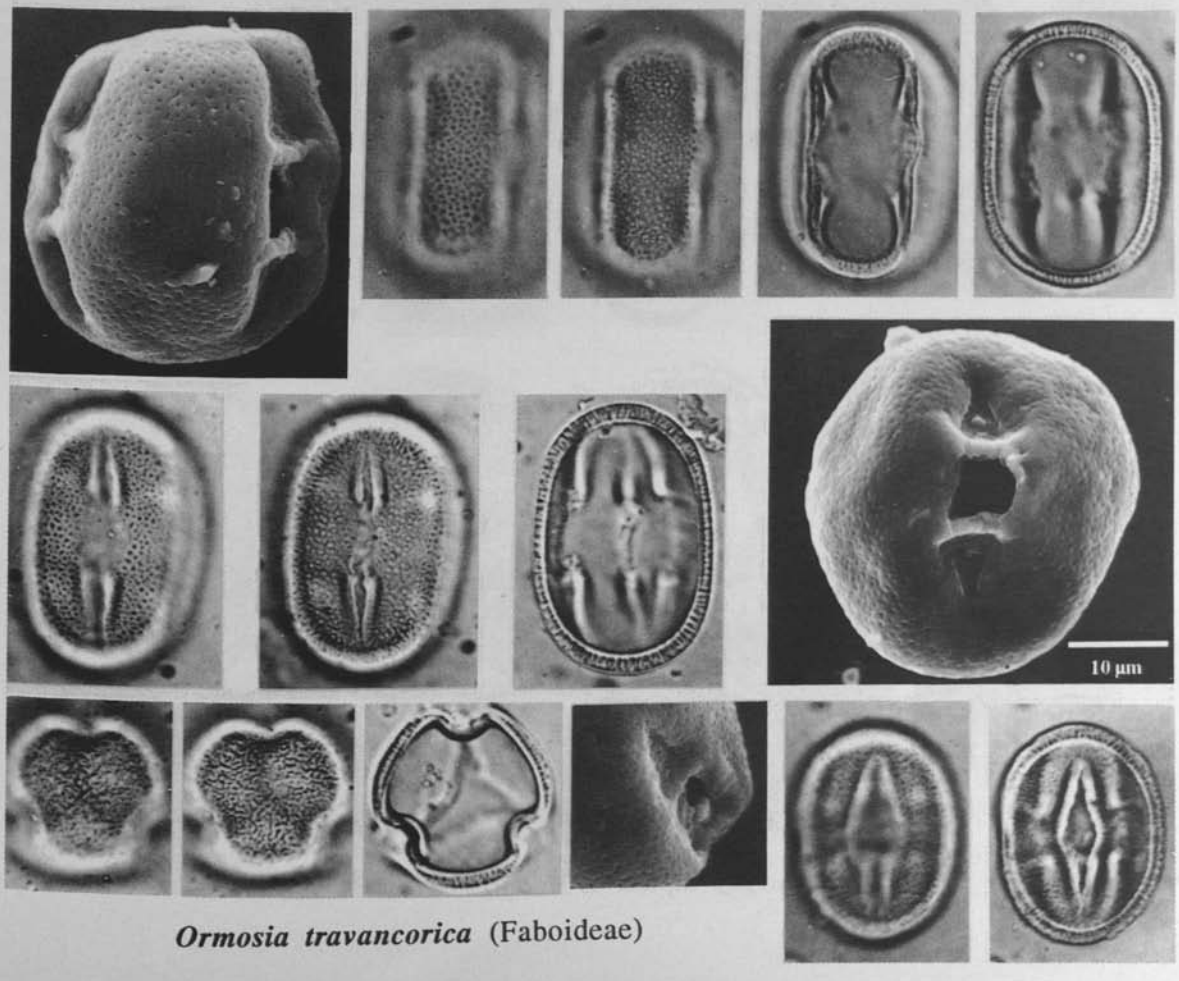
PLATE 38



Entada pursaetha (Mimosoideae)

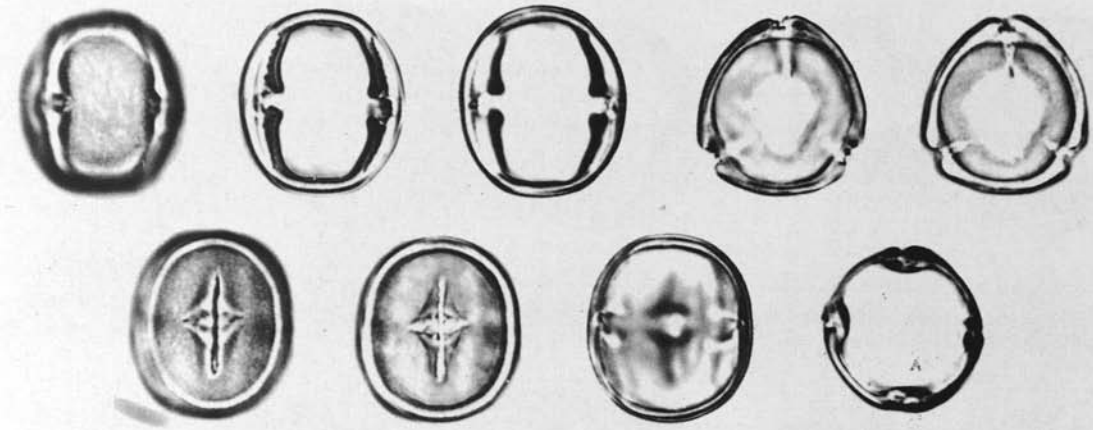


Derris heyneana
(Faboideae)

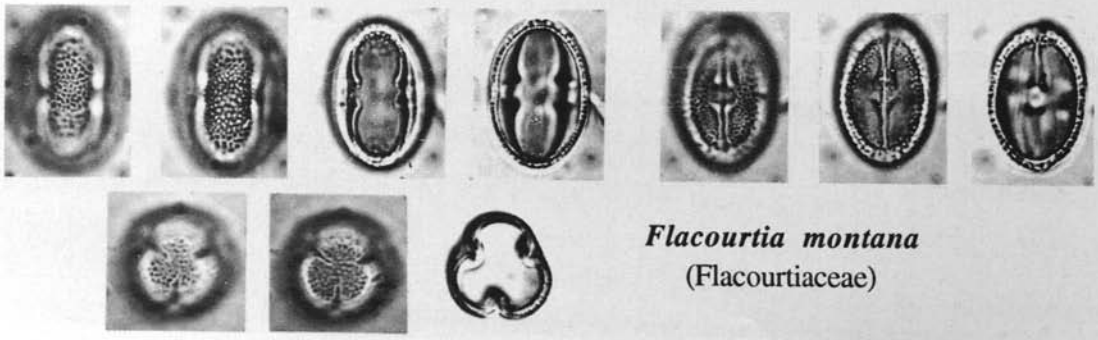


Ormosia travancorica (Faboideae)

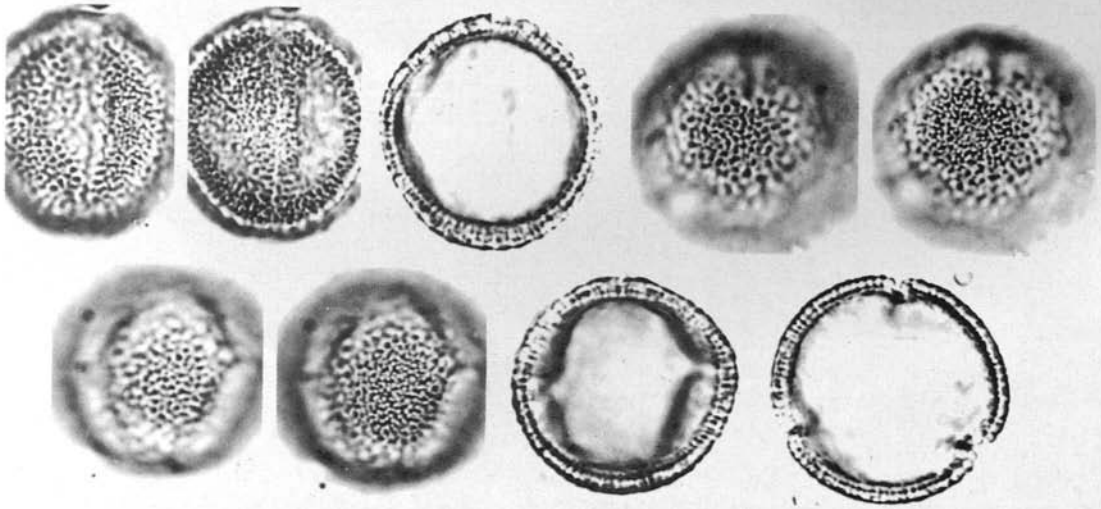
PLATE 40



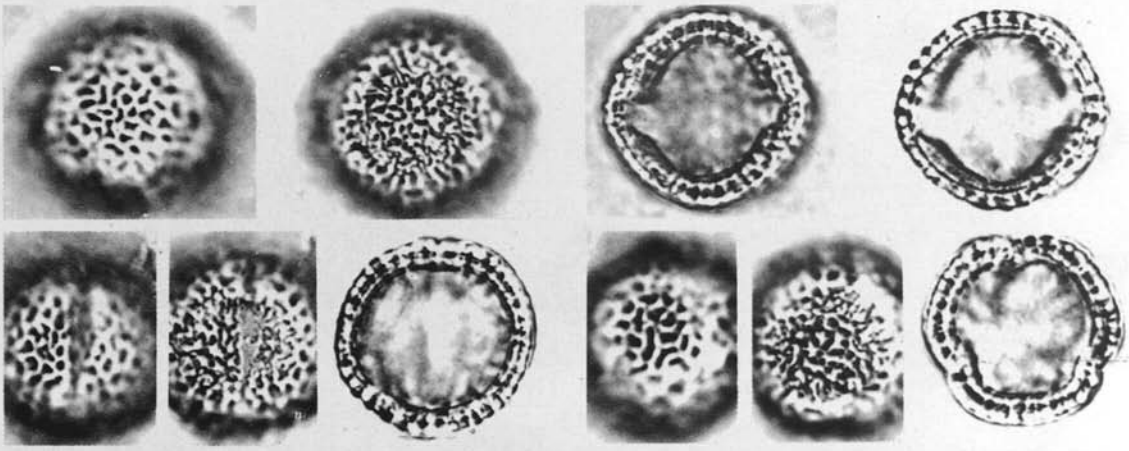
Casearia ovata (Flacourtiaceae)



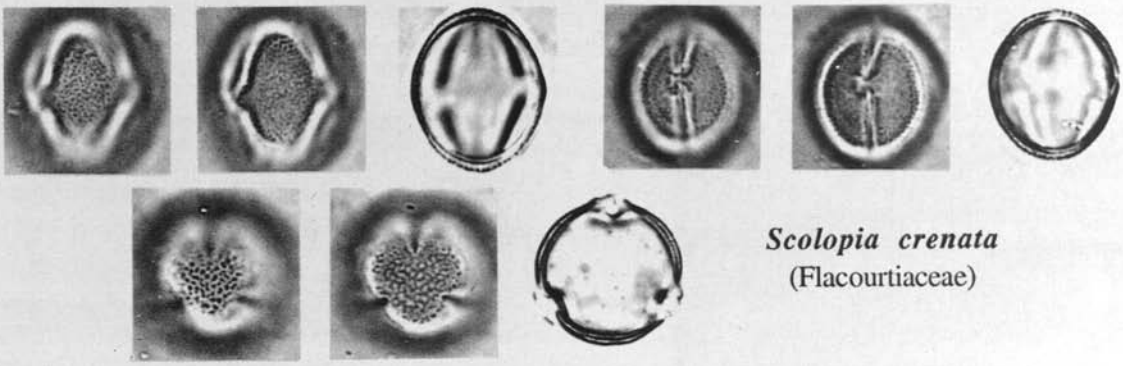
Flacourtia montana
(Flacourtiaceae)



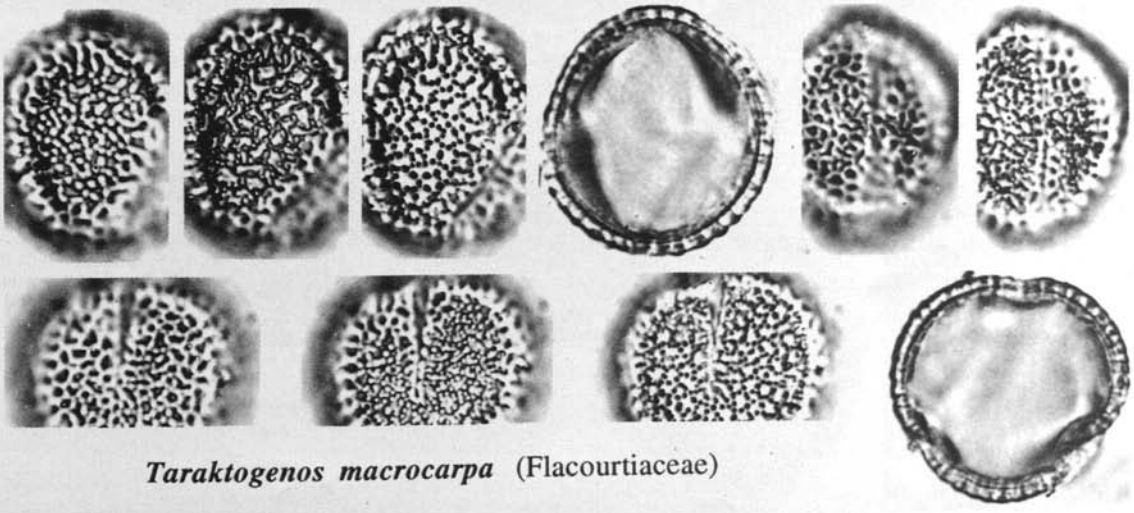
Hydnocarpus alpina (Flacourtiaceae)



Hydnocarpus pentandra (Flacourtiaceae)

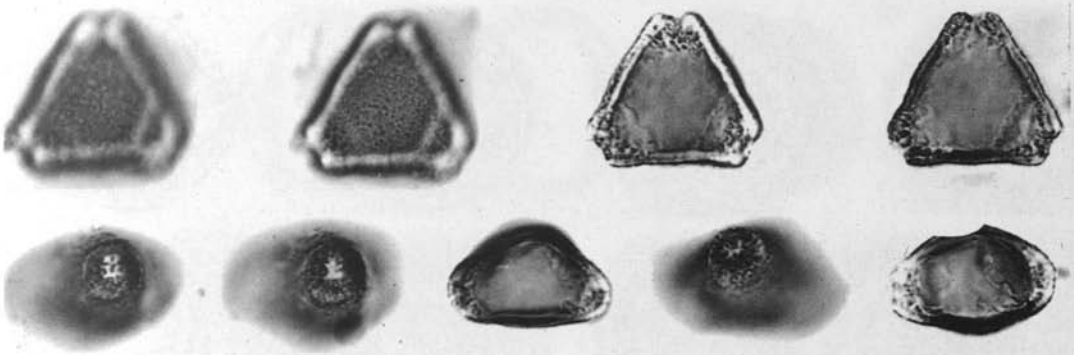


Scolopia crenata
(Flacourtiaceae)

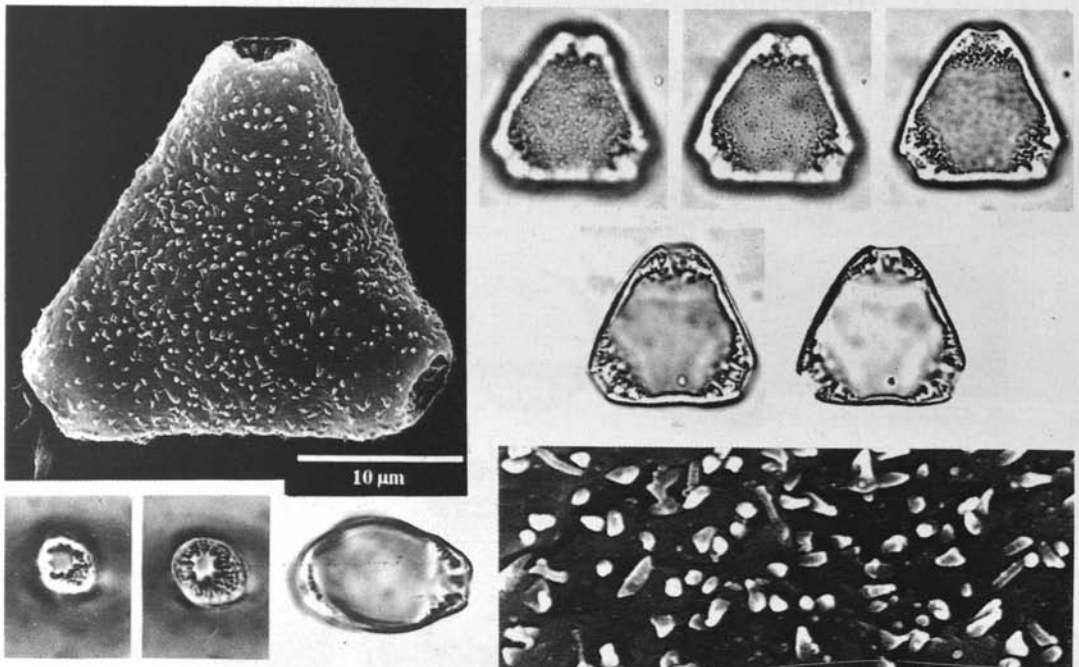


Taraktogenos macrocarpa (Flacourtiaceae)

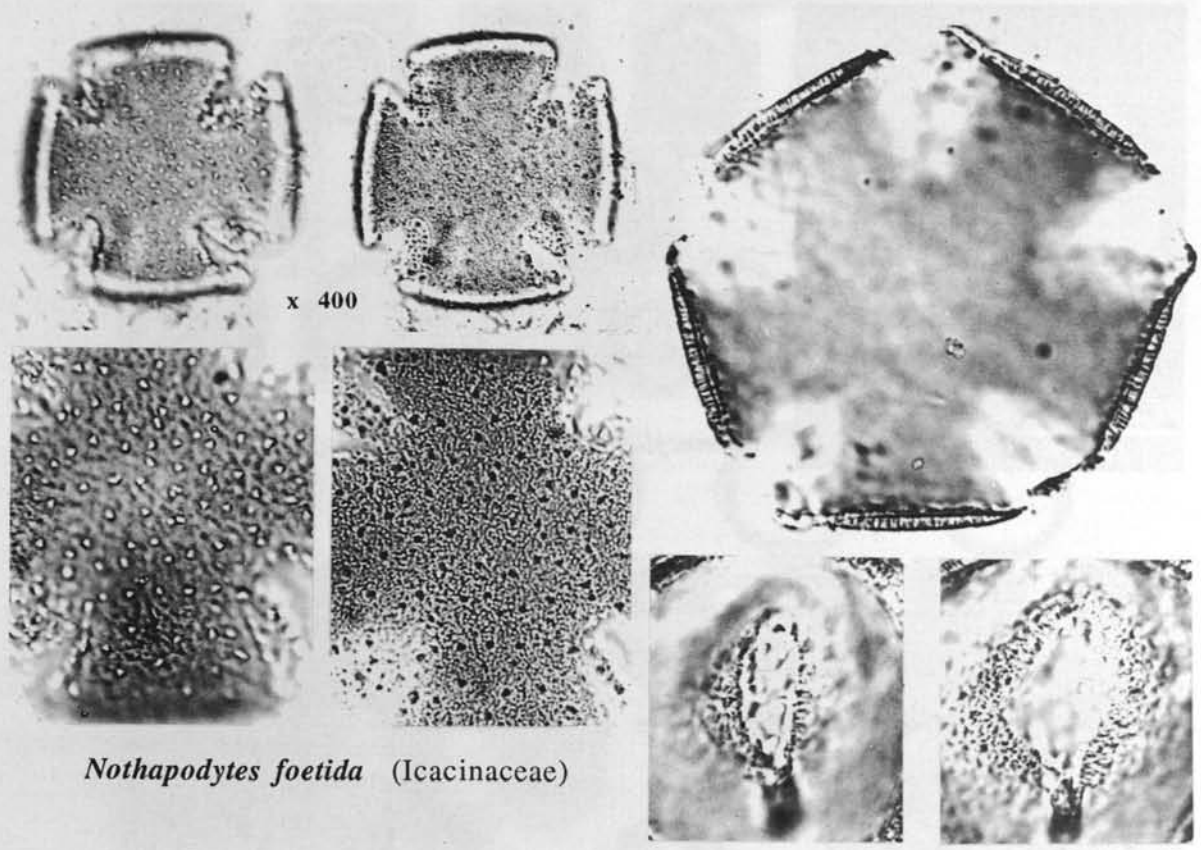
PLATE 42



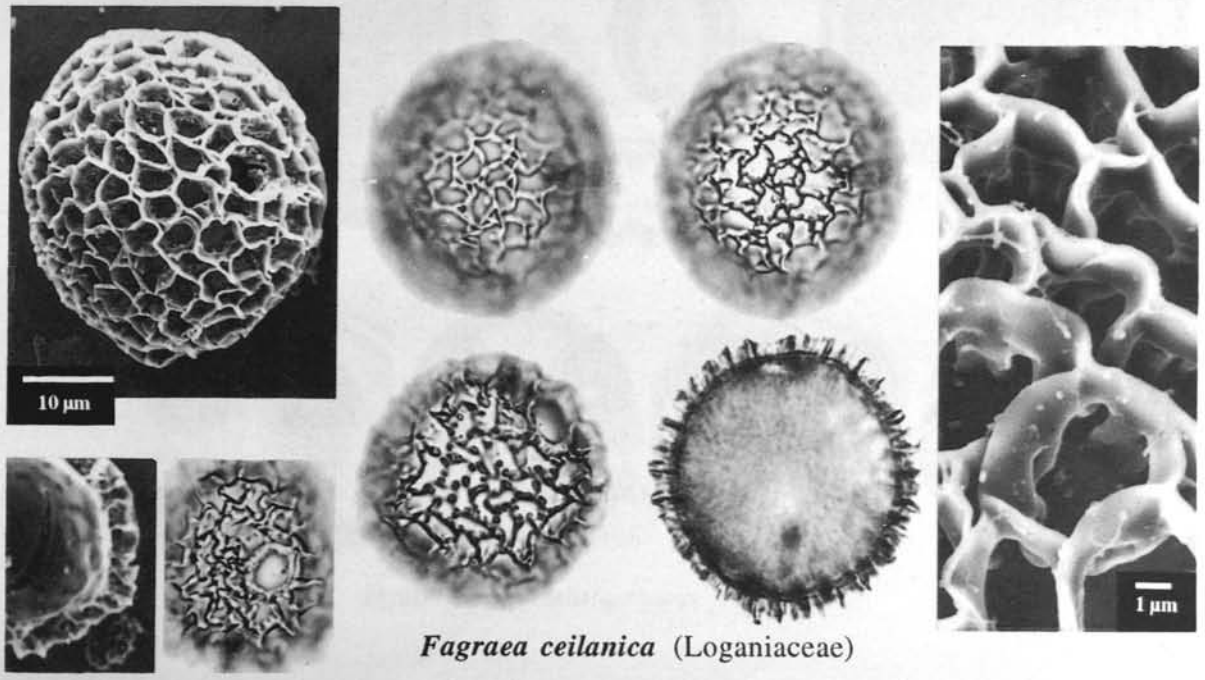
Gomphandra coriacea (Icacinaceae)



Gomphandra tetrandra
(Icacinaceae)

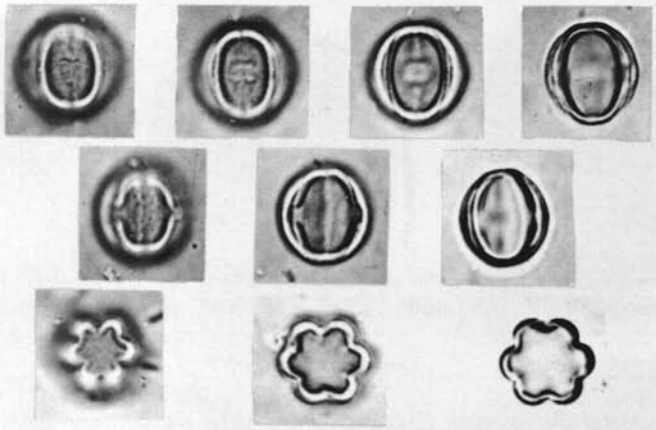


Nothapodytes foetida (Icacinaceae)



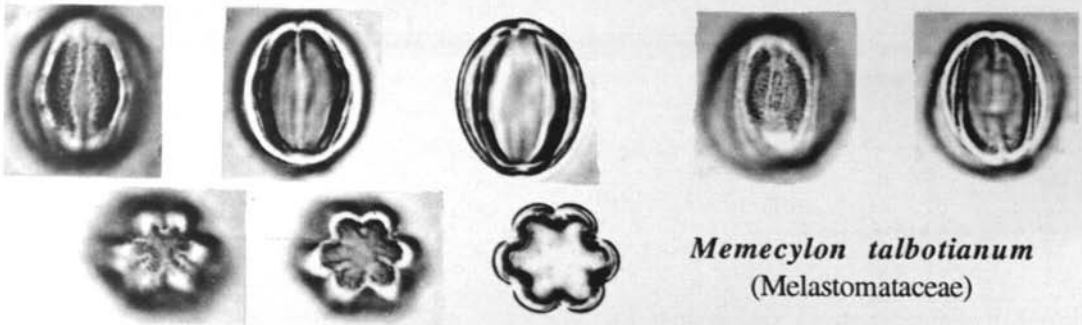
Fagraea ceilanica (Loganiaceae)

PLATE 44

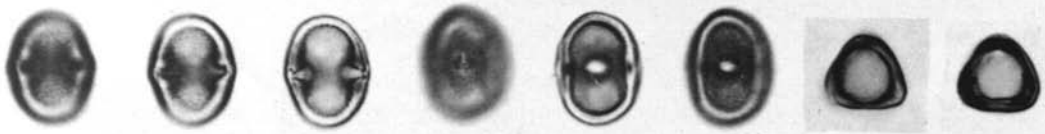


Memecylon angustifolium (Melastomataceae)

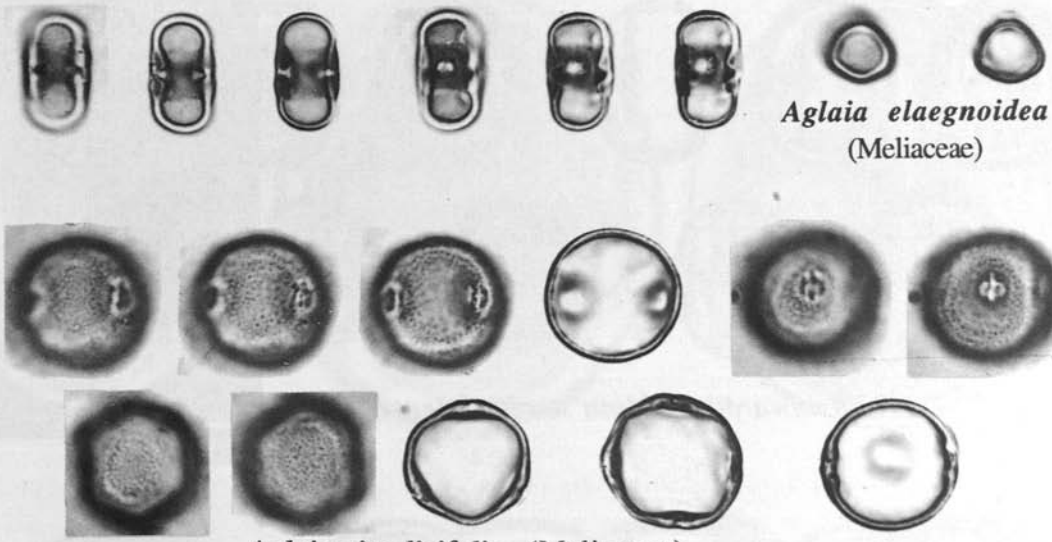
Memecylon malabaricum (Melastomataceae)



Memecylon talbotianum
(Melastomataceae)

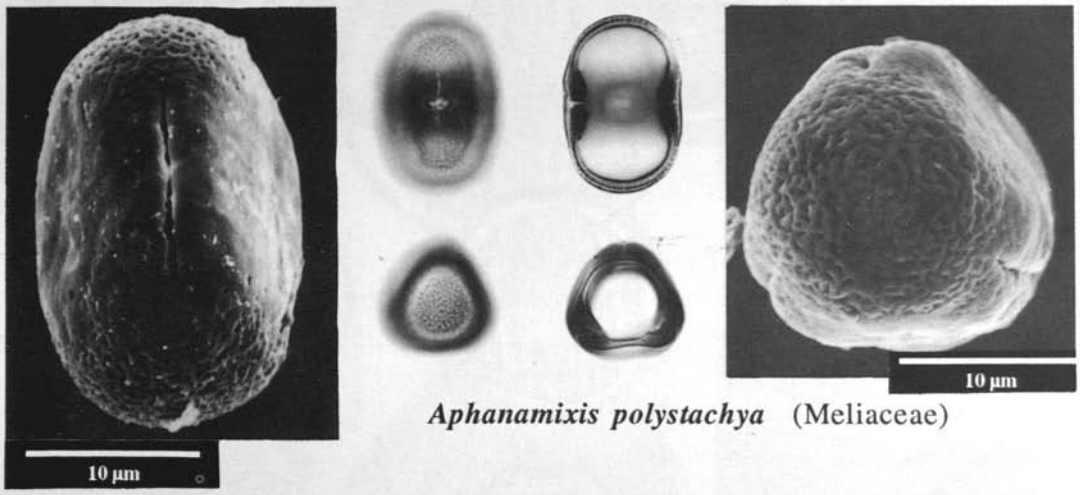


Aglaia barberi (Meliaceae)

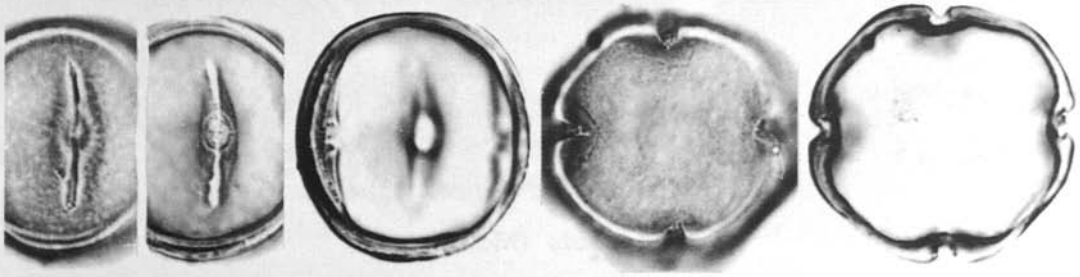


Aglaia elaegnoidea (Meliaceae)

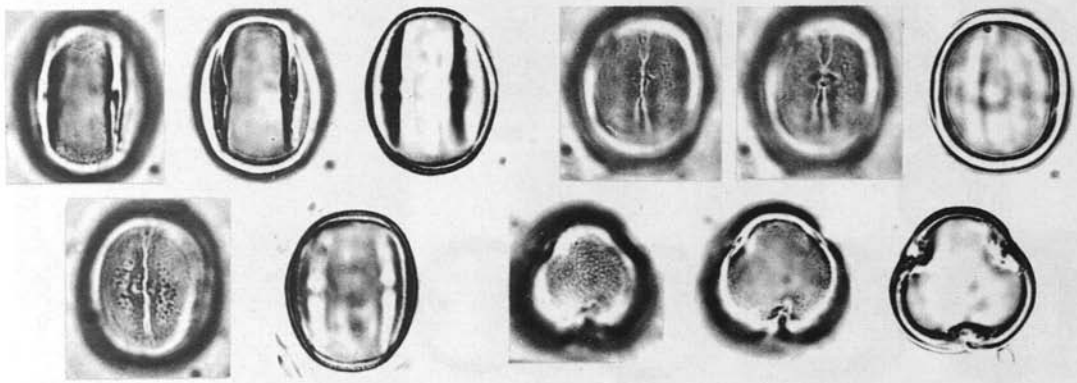
Aglaia simplicifolia (Meliaceae)



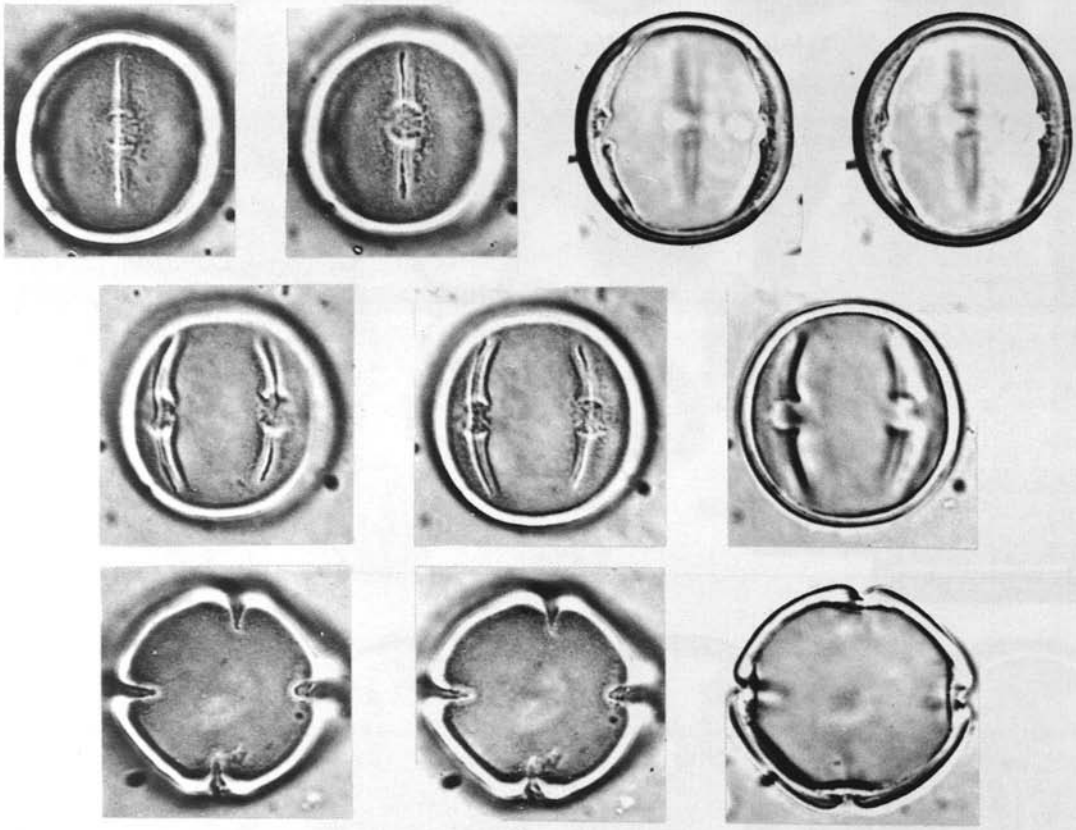
Aphanamixis polystachya (Meliaceae)



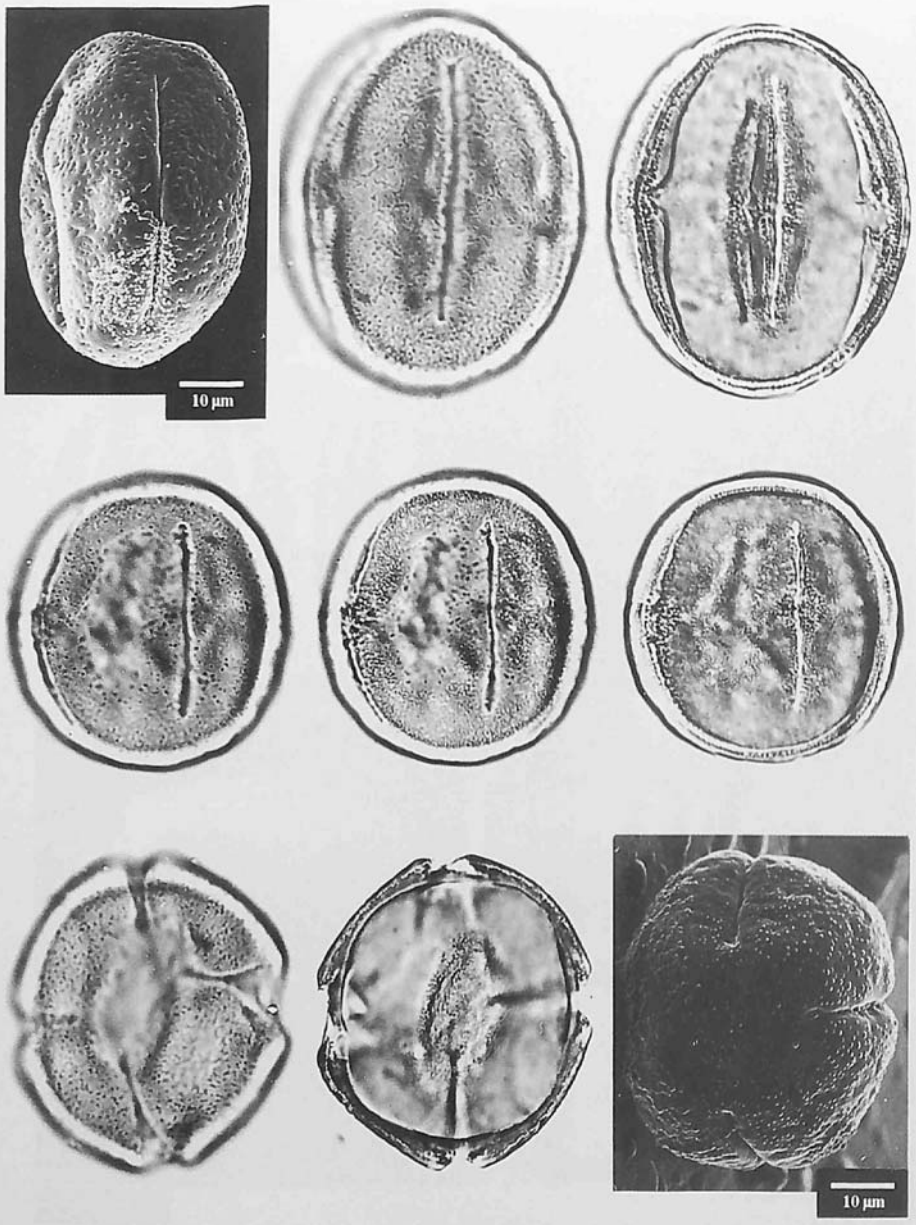
Dysoxylum malabaricum (Meliaceae)



Reinwardtiodendron anaimalaiense (Meliaceae)

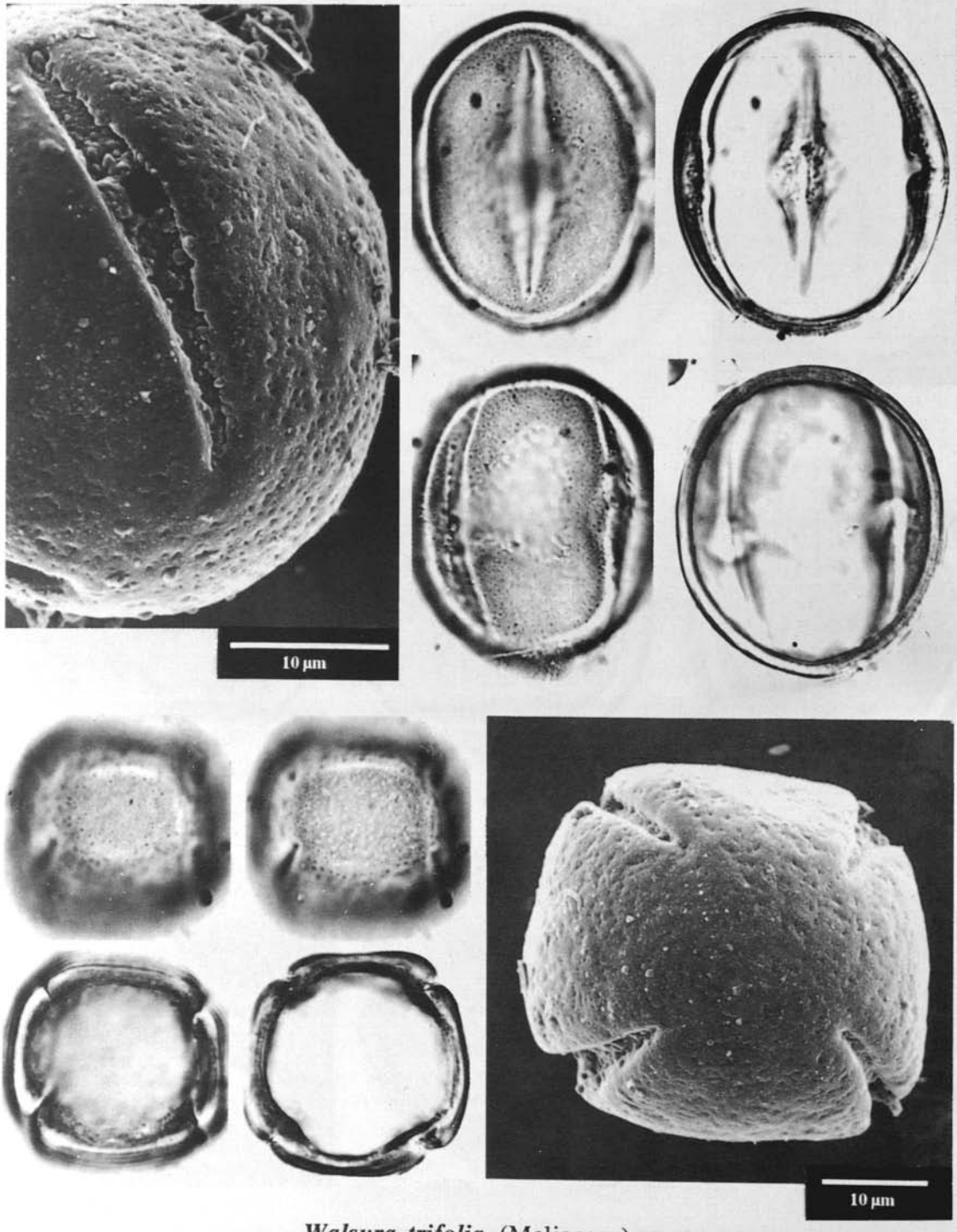


Toona ciliata (Meliaceae)

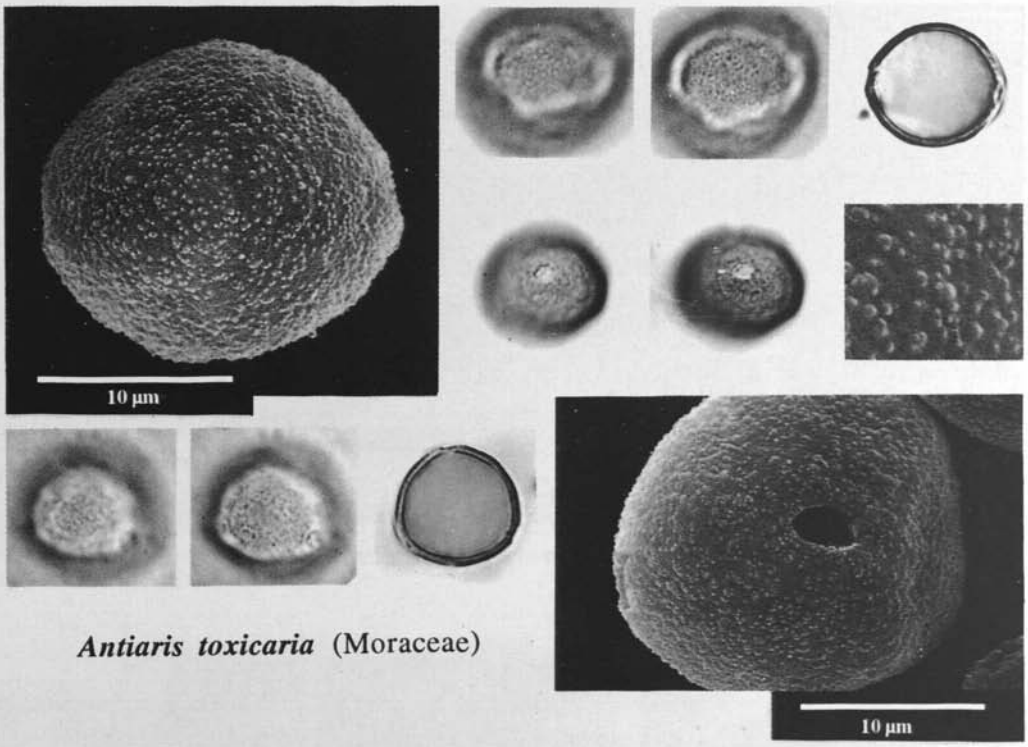


Trichilia connaroides (Meliaceae)

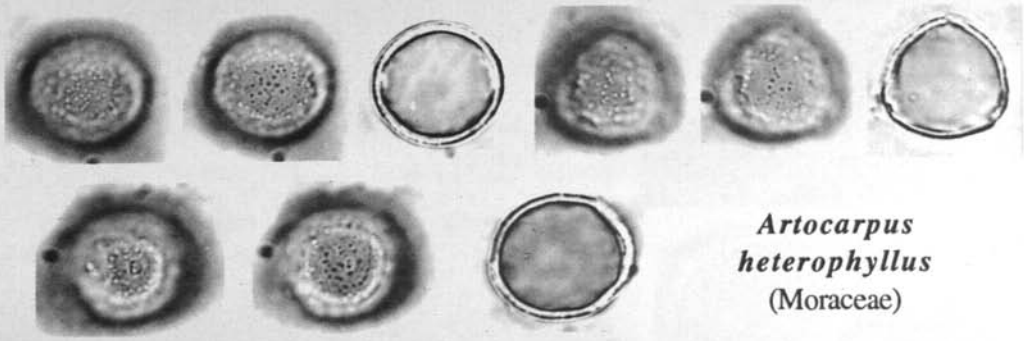
PLATE 48



Walsura trifolia (Meliaceae)



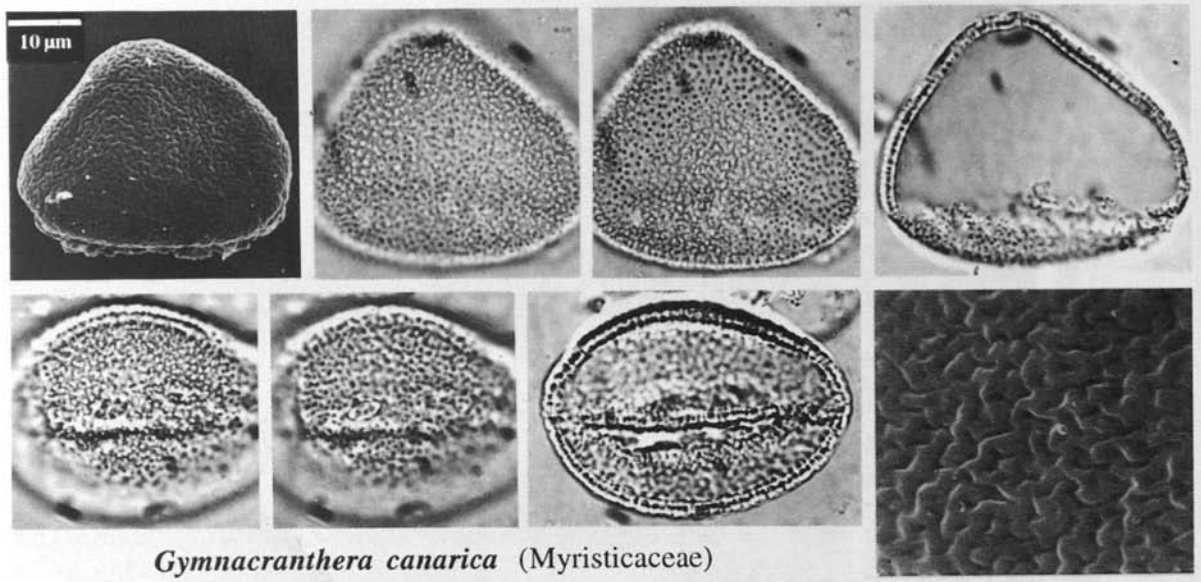
Antiaris toxicaria (Moraceae)



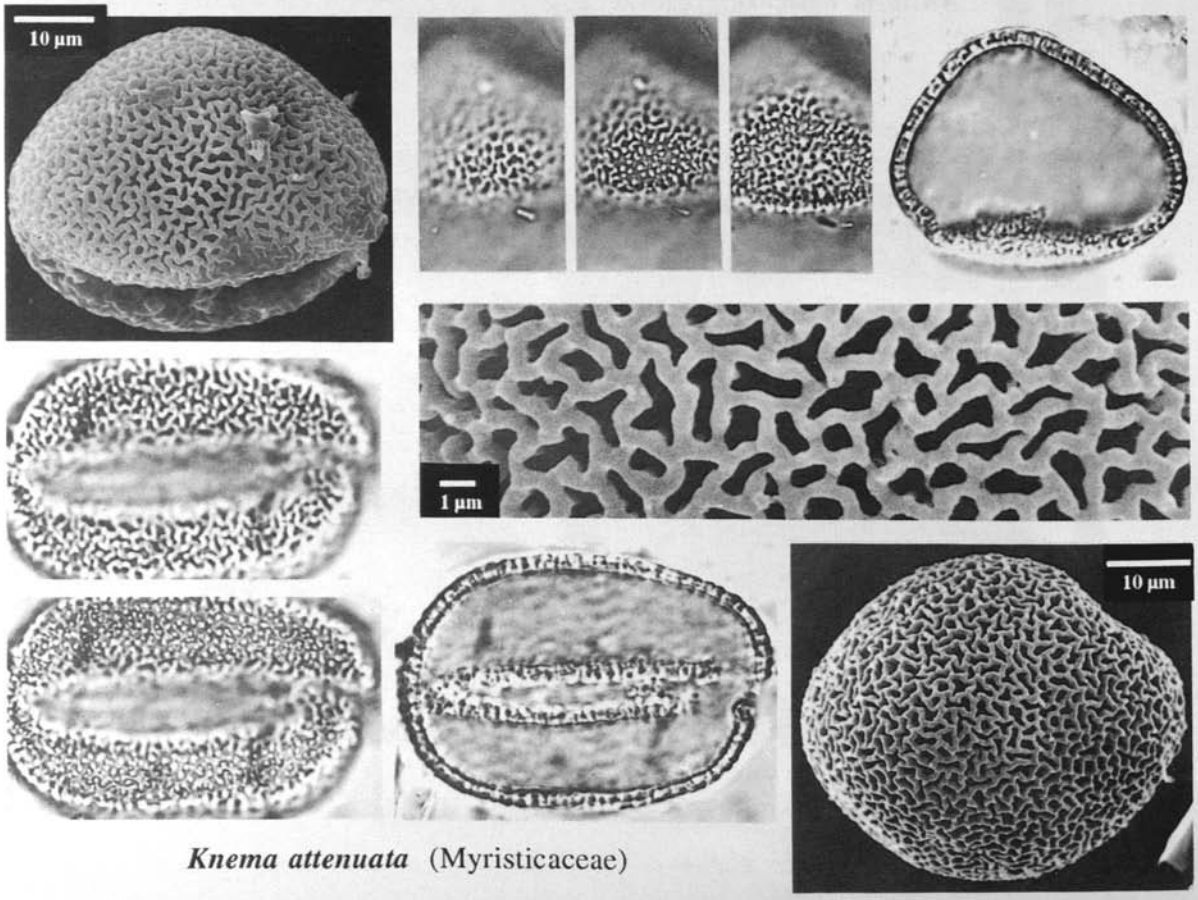
Artocarpus heterophyllus (Moraceae)

Ficus nervosa (Moraceae)

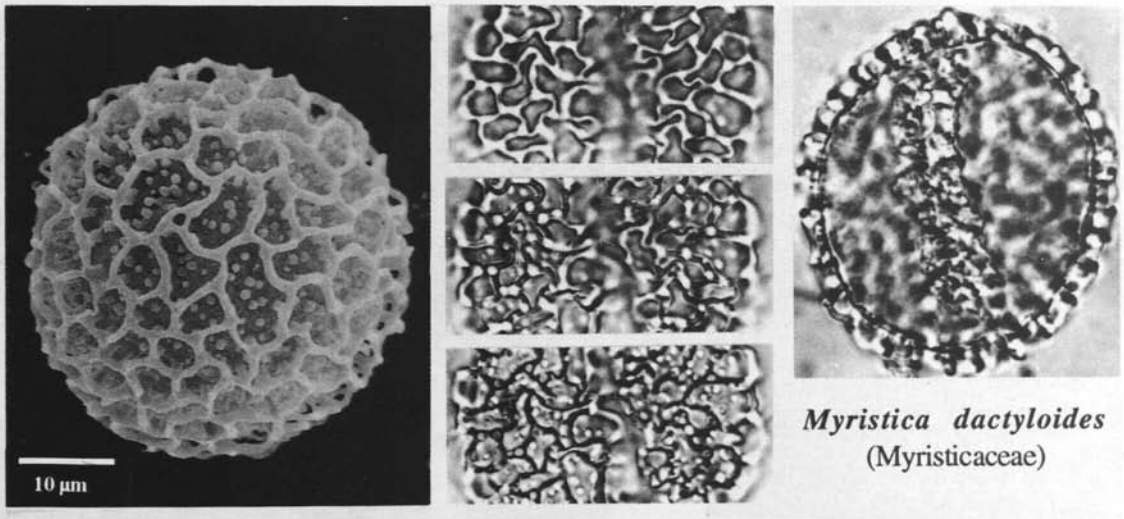
PLATE 50



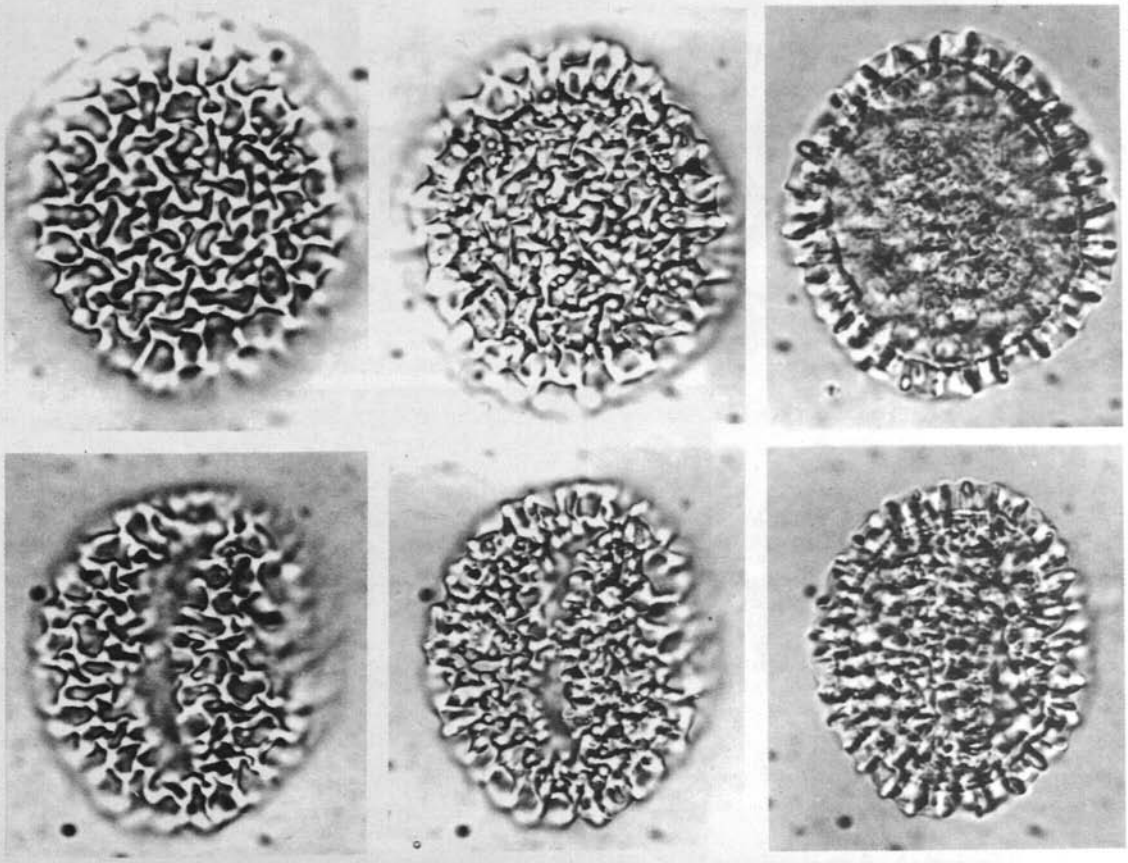
Gymnacranthera canarica (Myristicaceae)



Knema attenuata (Myristicaceae)

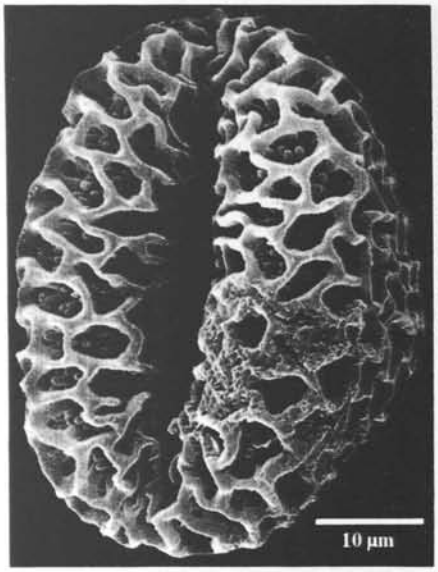


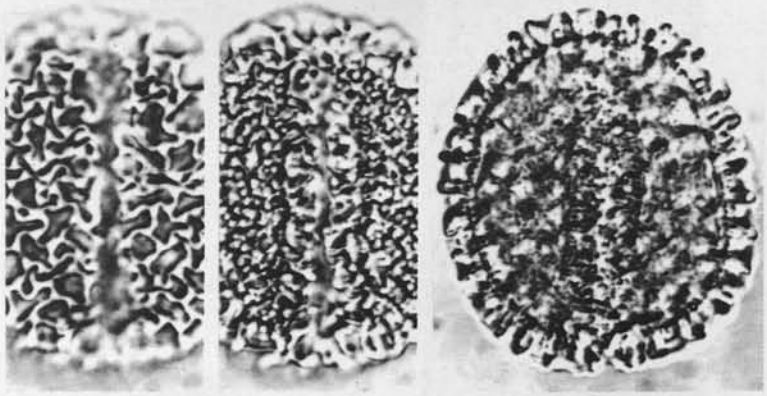
Myristica dactyloides (Myristicaceae)

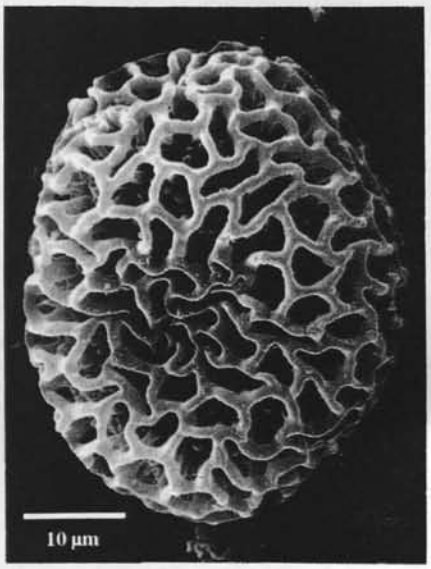


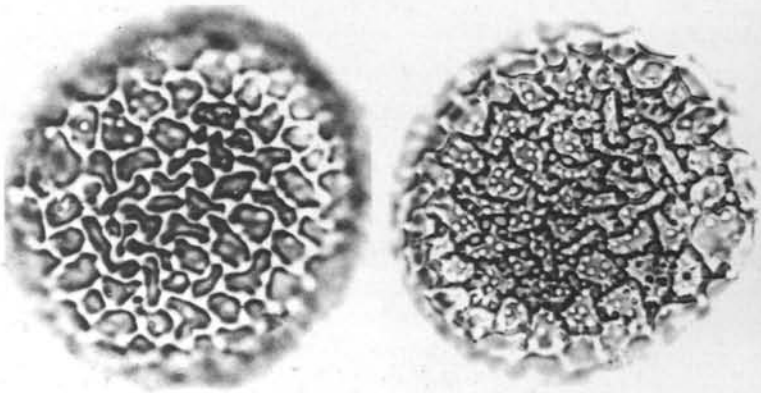
Myristica malabarica (Myristicaceae)

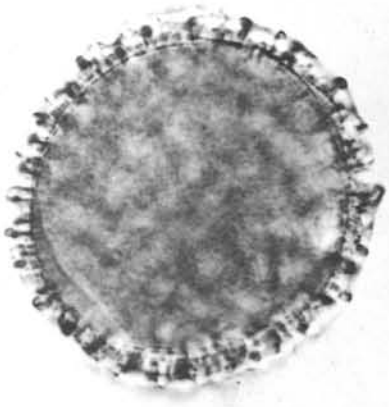
PLATE 52

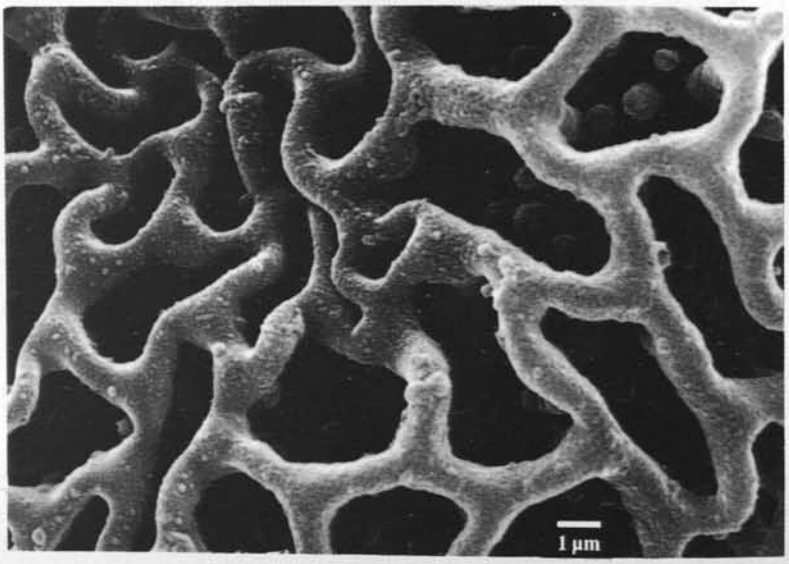




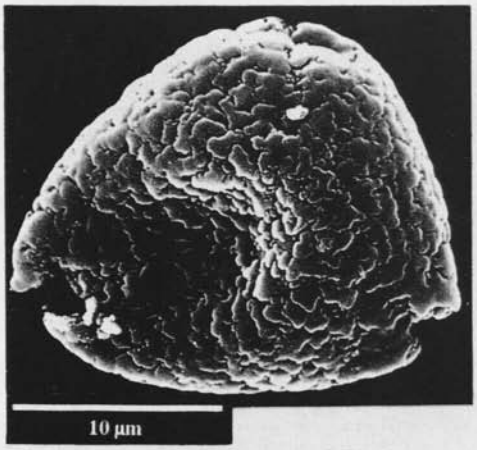


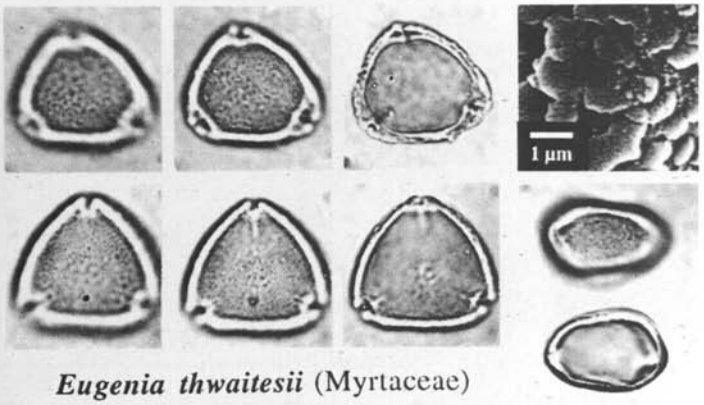






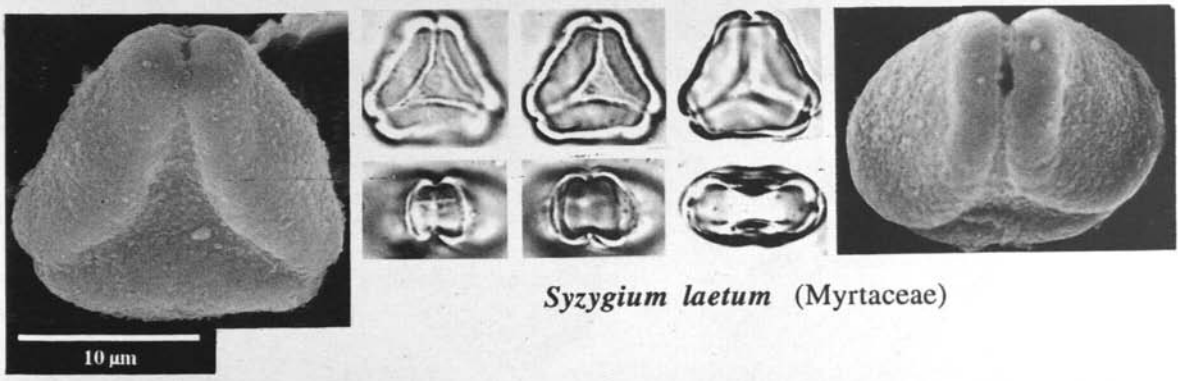
Myristica fatua
(Myristicaceae)



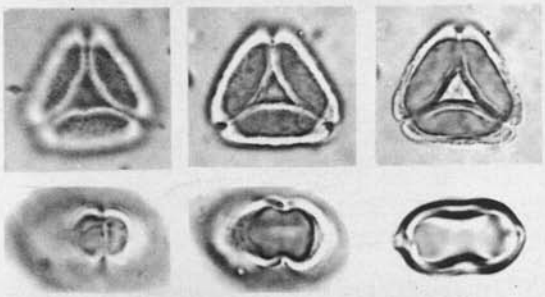


Eugenia thwaitesii (Myrtaceae)

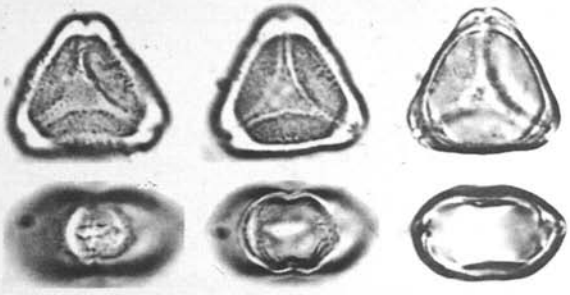
Syzygium gardneri (Myrtaceae)



Syzygium laetum (Myrtaceae)

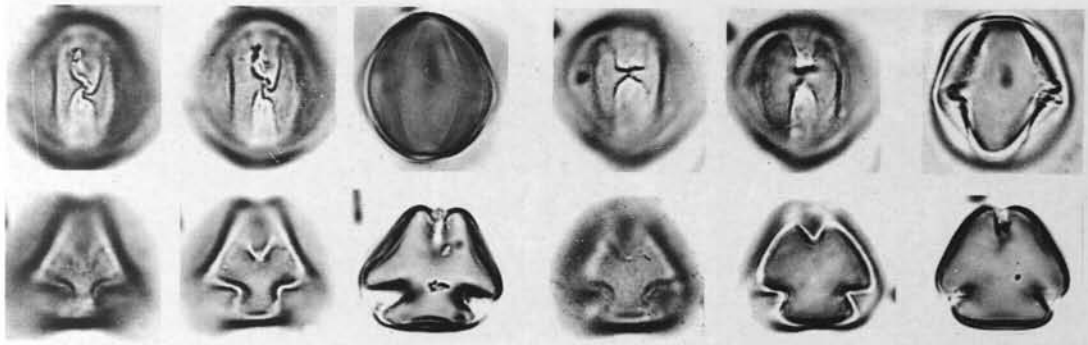


Syzygium mundagam
(Myrtaceae)

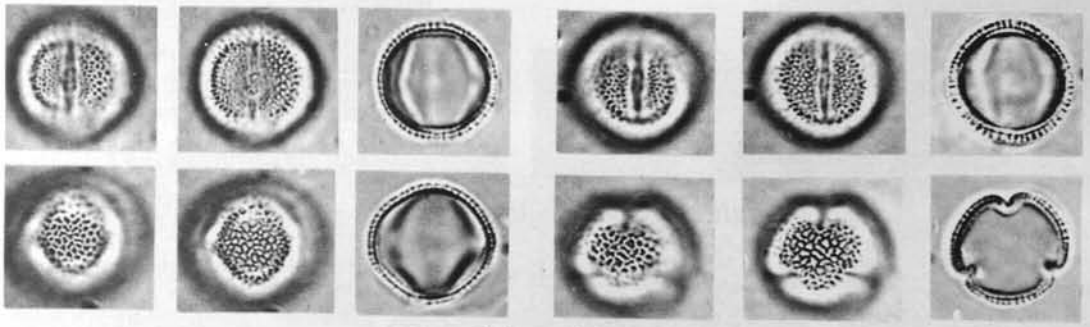


Syzygium occidentale
(Myrtaceae)

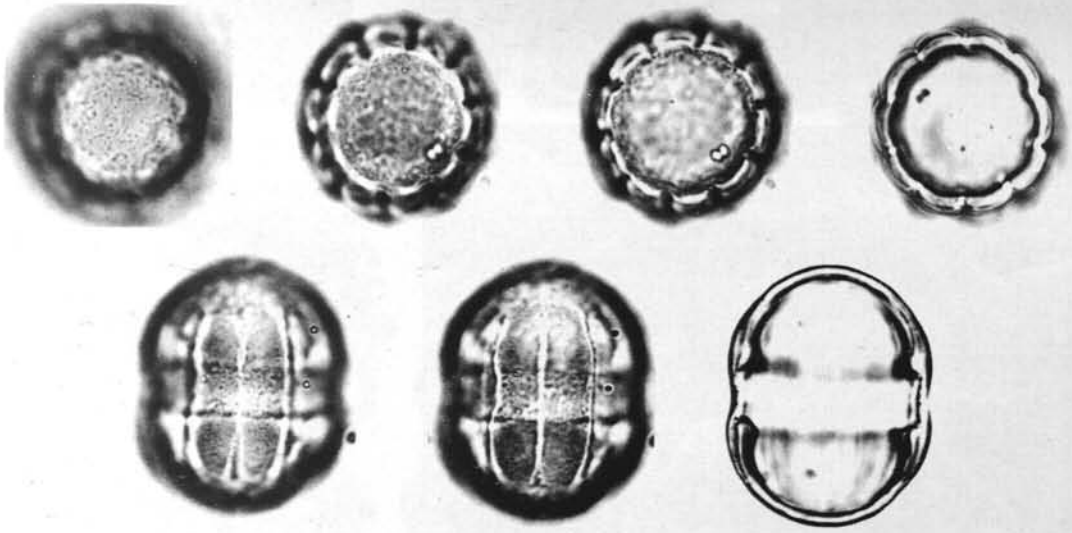
PLATE 54



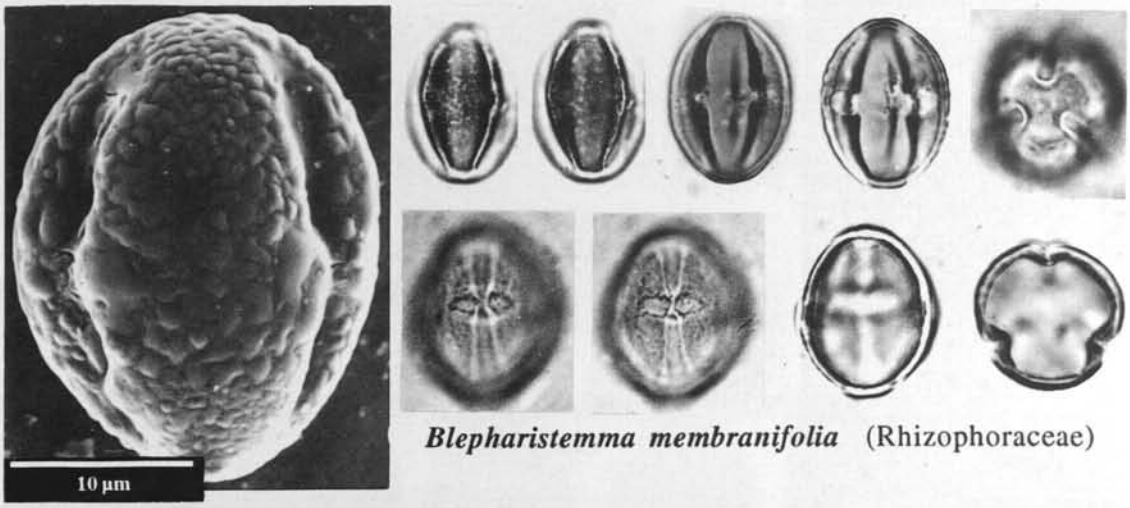
Strombosia ceylanica (Olacaceae)



Olea dioica (Oleaceae)

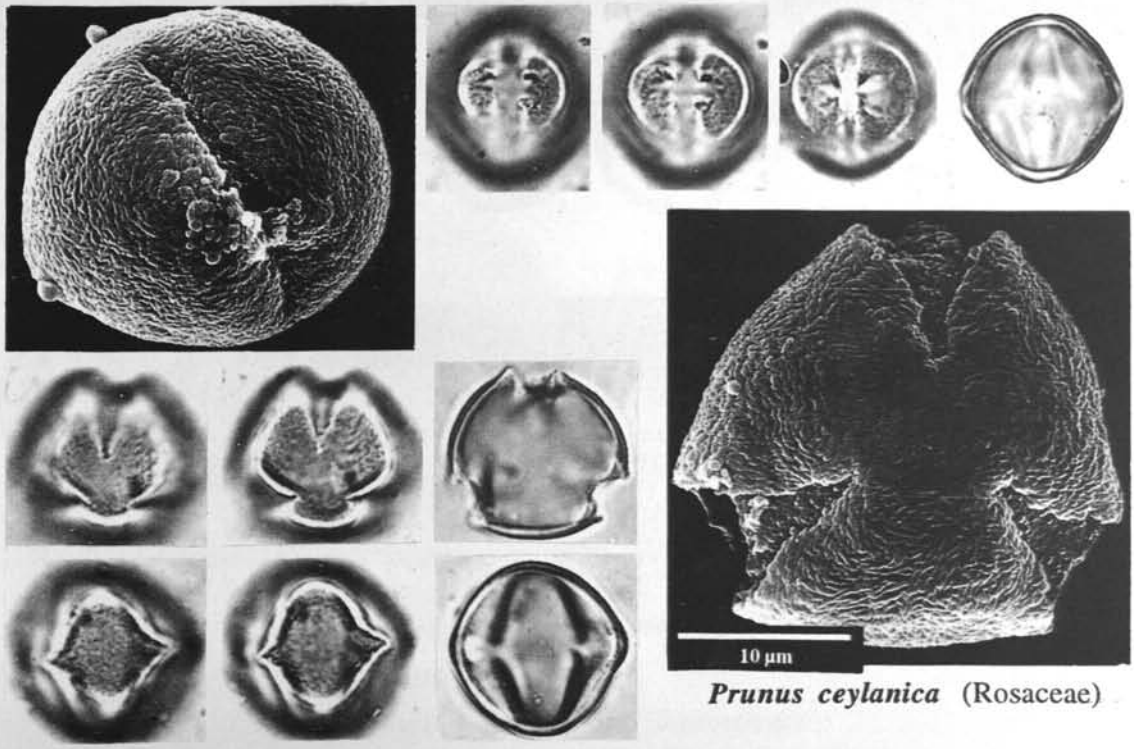


Xanthophyllum flavescens (Polygalaceae)

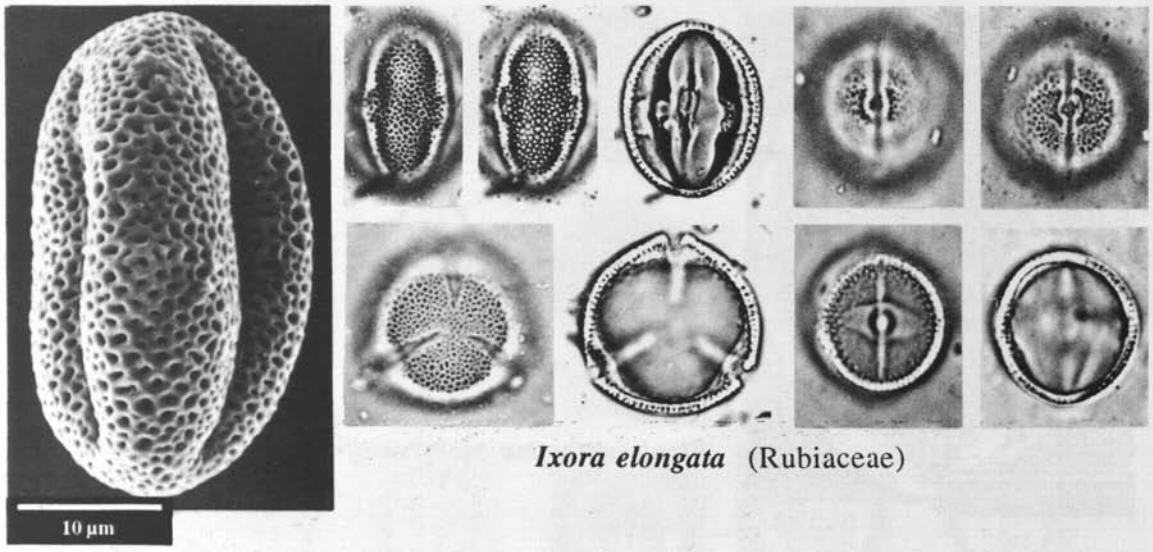


Blepharistemma membranifolia (Rhizophoraceae)

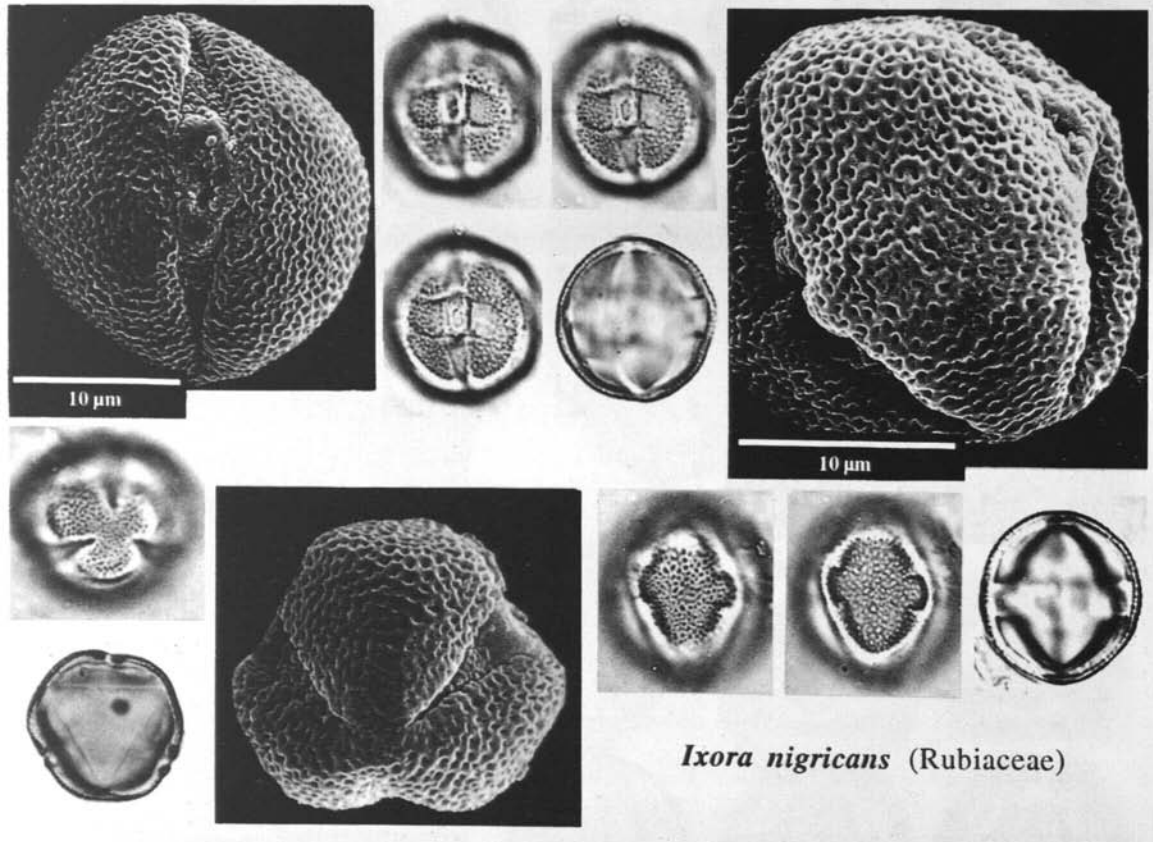
Carallia brachiata (Rhizophoraceae)



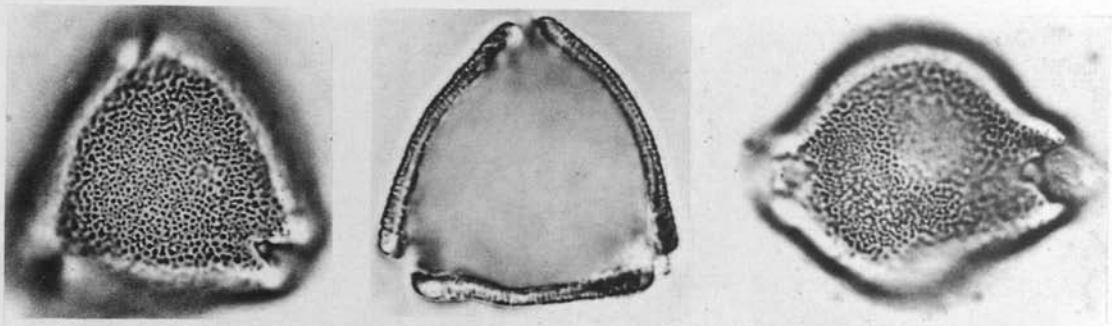
Prunus ceylanica (Rosaceae)



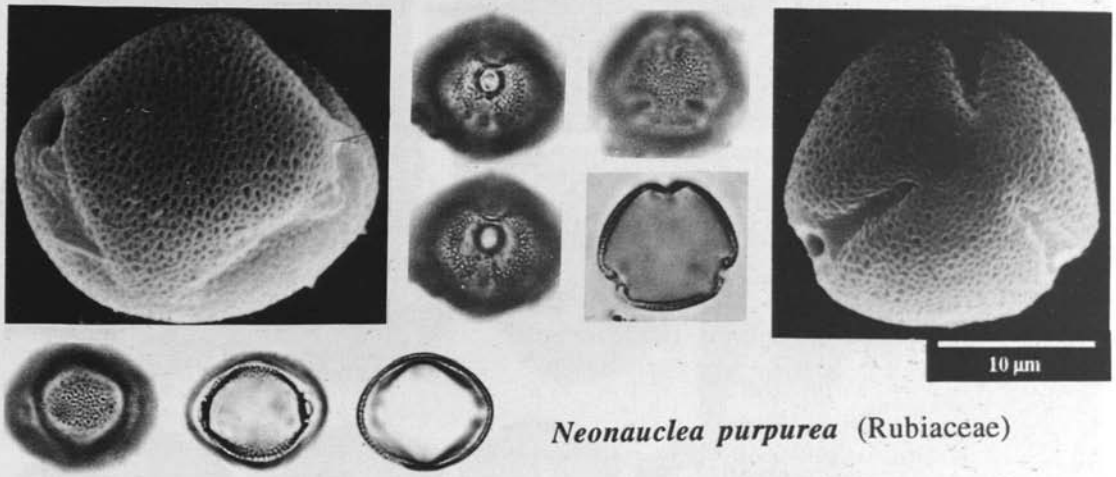
Ixora elongata (Rubiaceae)



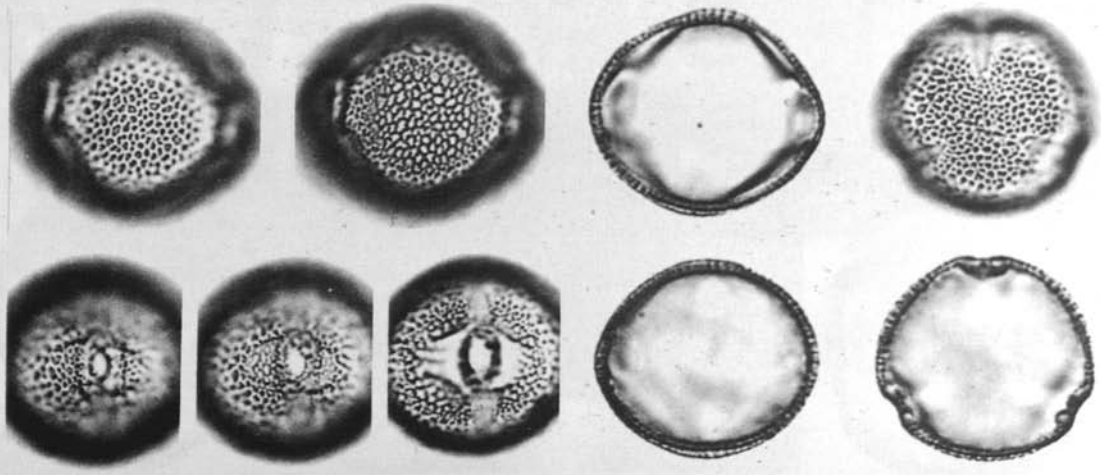
Ixora nigricans (Rubiaceae)



Lasianthus acuminatus (Rubiaceae)

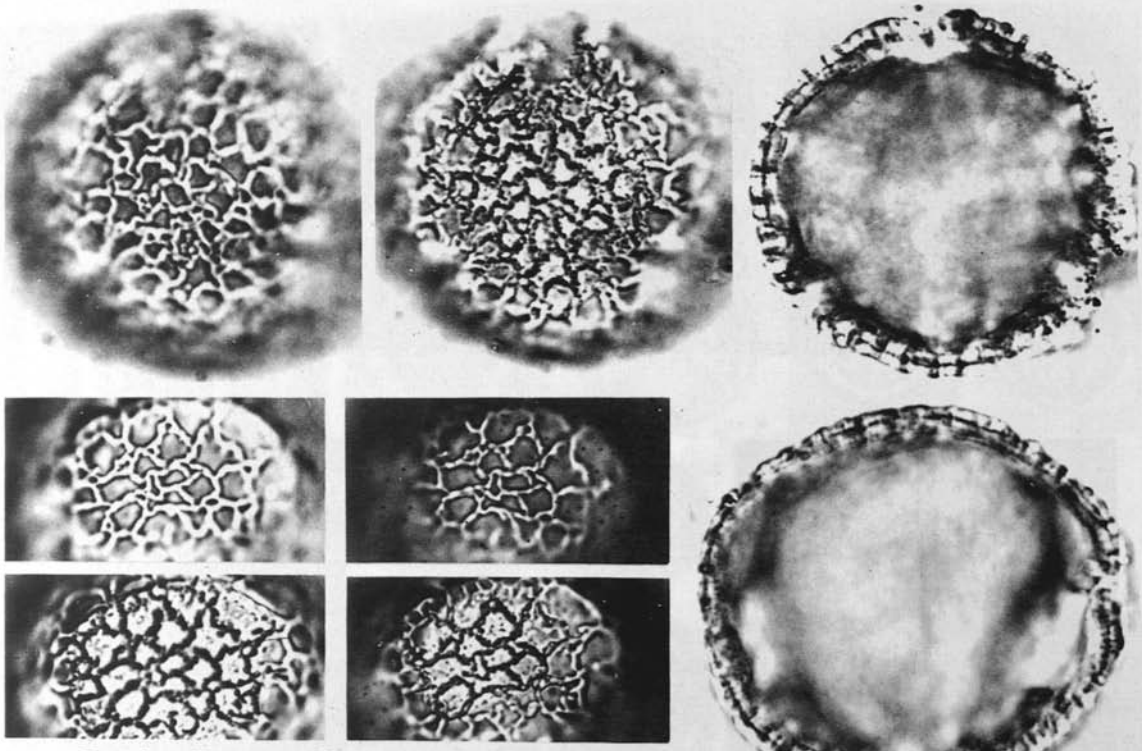


Neonauclea purpurea (Rubiaceae)

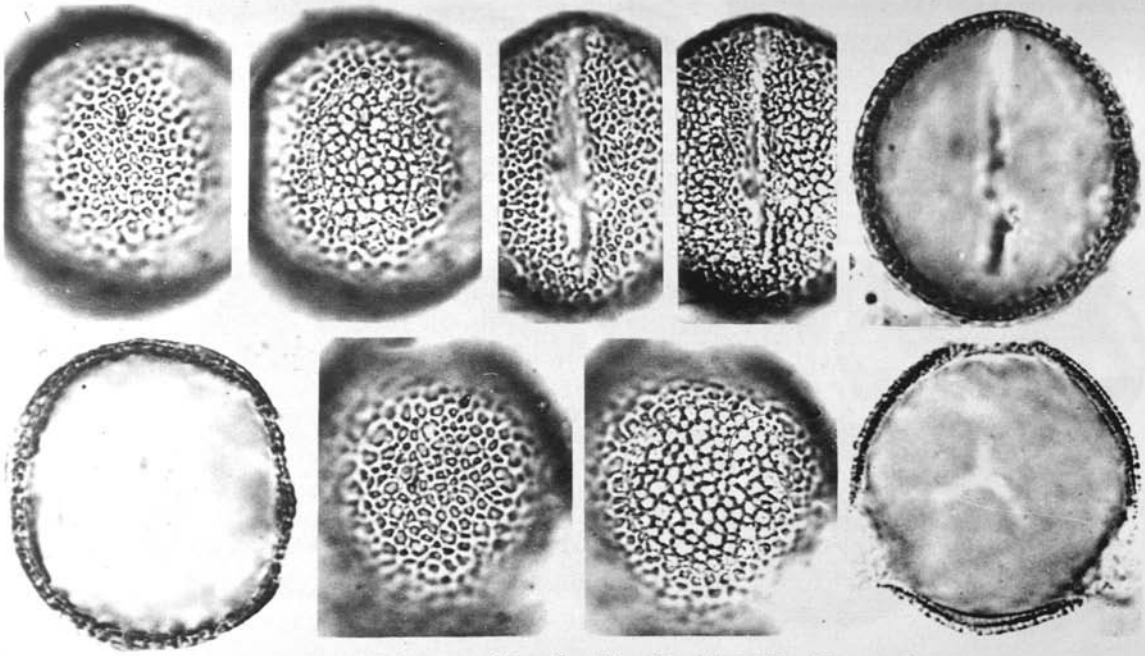


Octotropis travancorica (Rubiaceae)

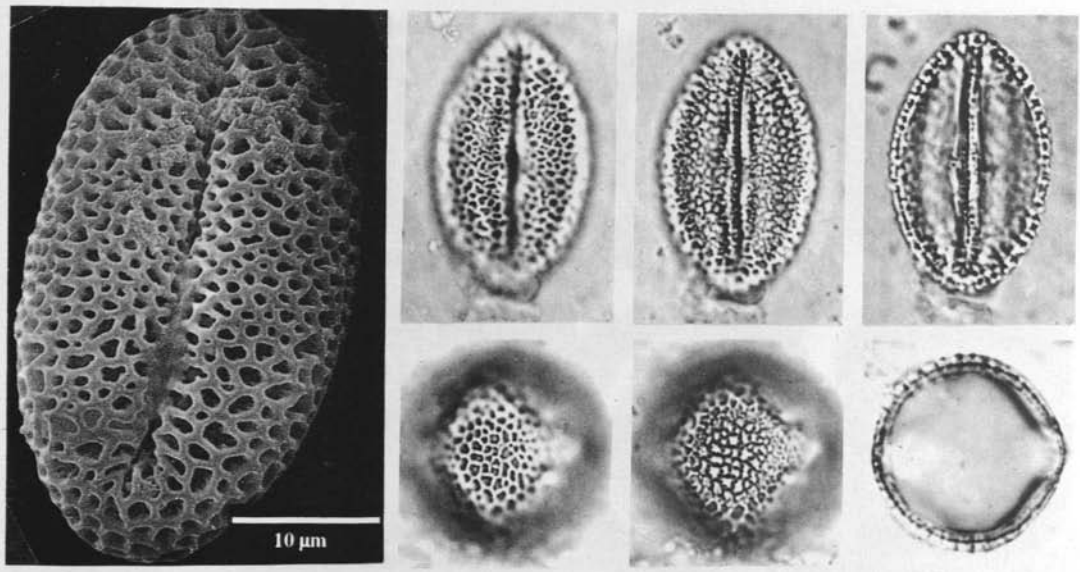
PLATE 58

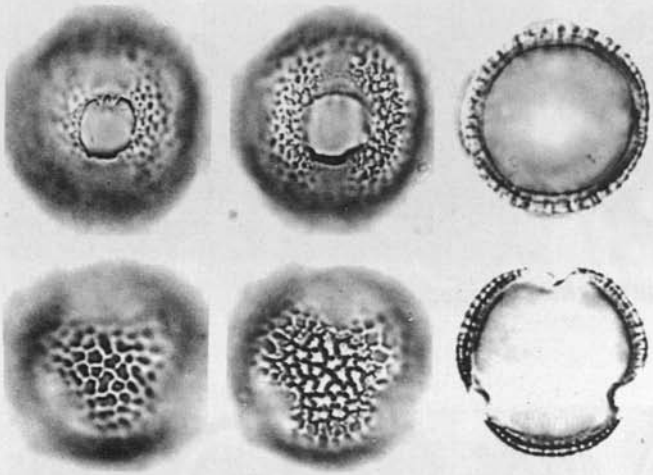


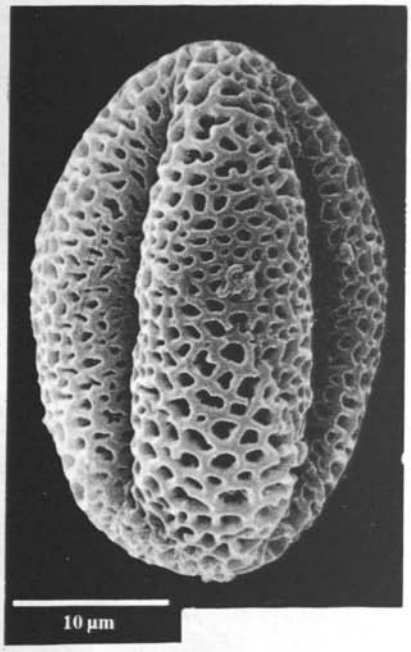
Psychotria anamallayana (Rubiaceae)

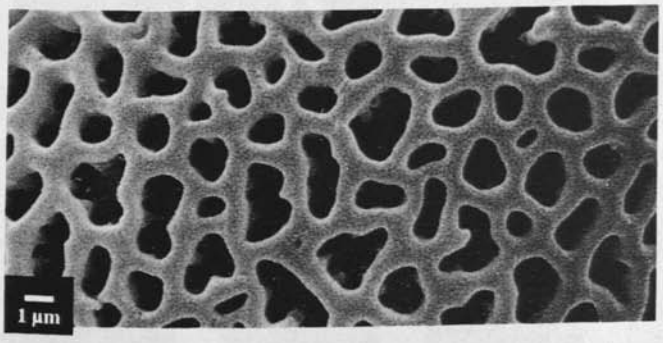


Psychotria flavida (Rubiaceae)









Tricalysia apiocarpa
(Rubiaceae)

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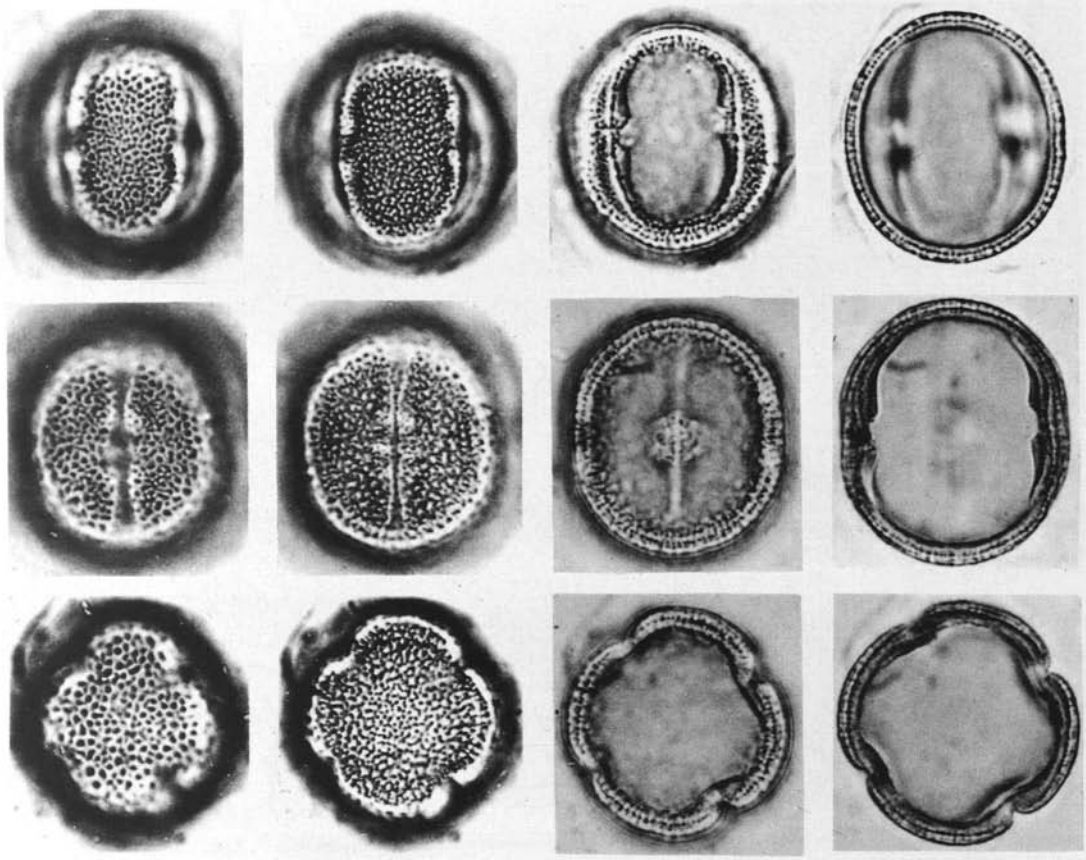
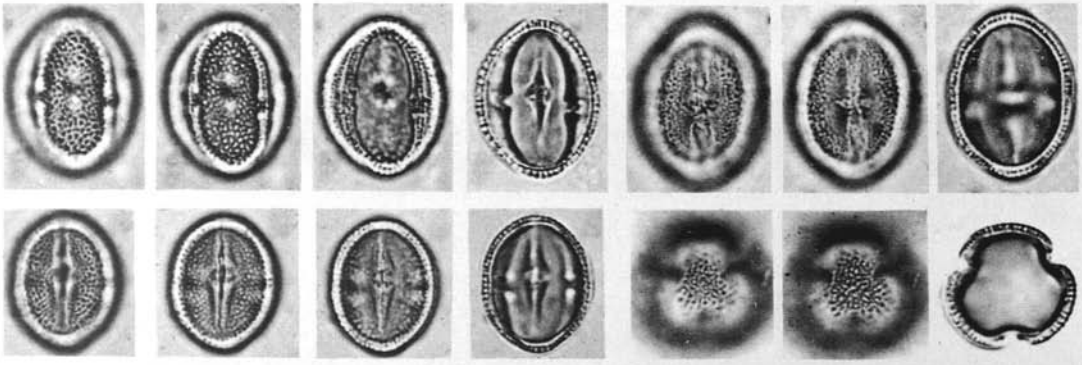
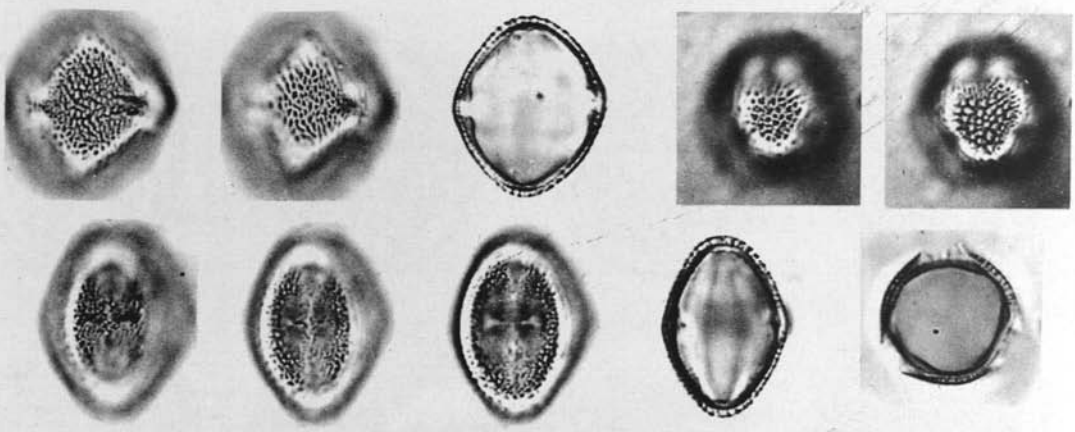


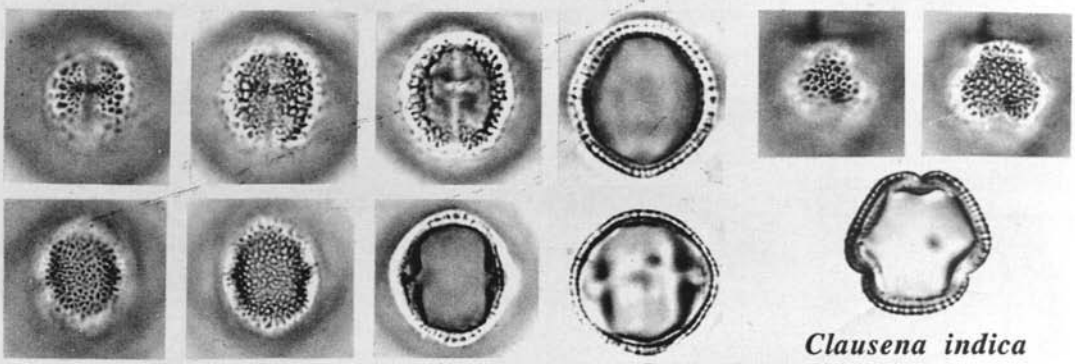
Atalantia wightii (Rutaceae)



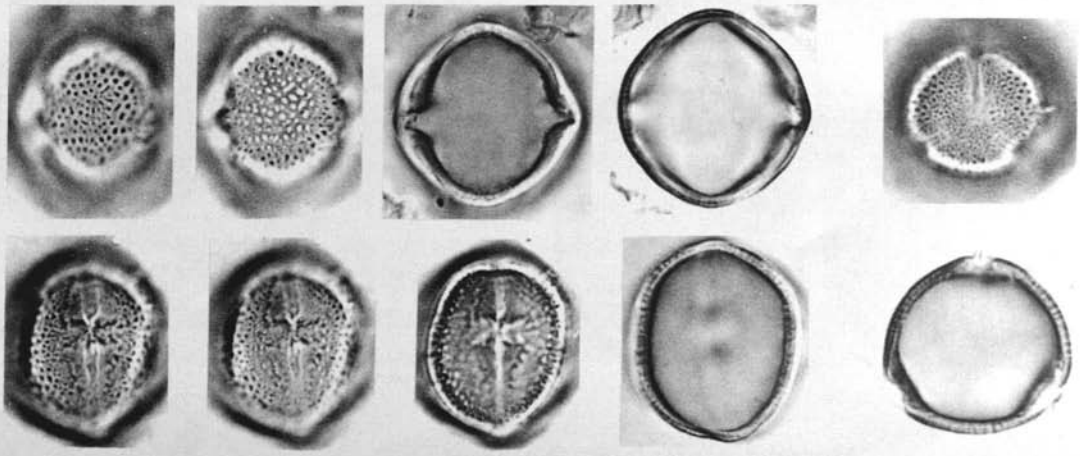
Clausena dentata (Rutaceae)



Clausena heptaphylla (Rutaceae)



Clausena indica
(Rutaceae)



Glycosmis macrocarpa (Rutaceae)

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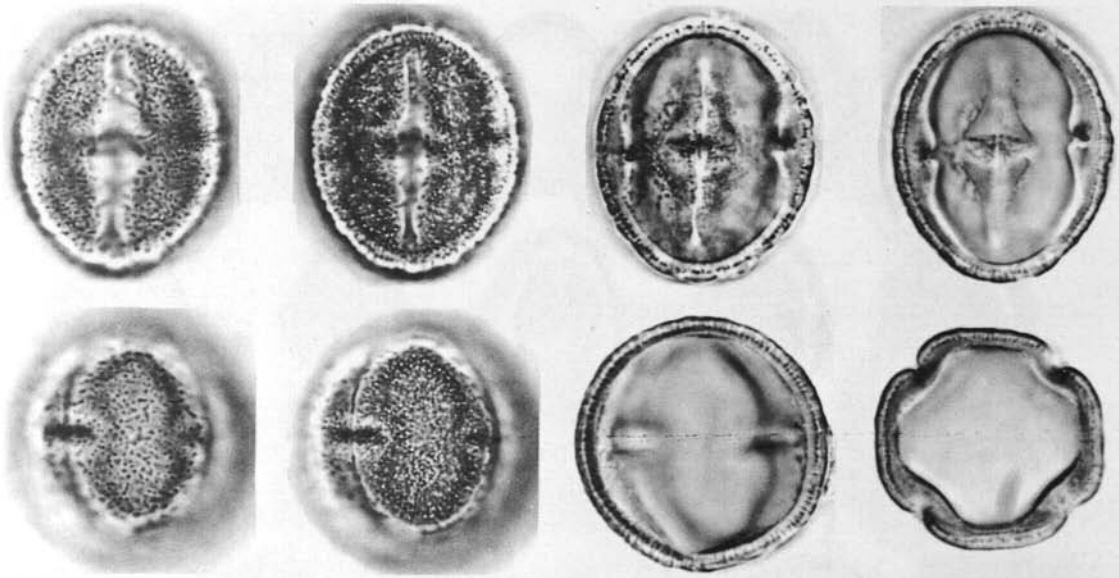
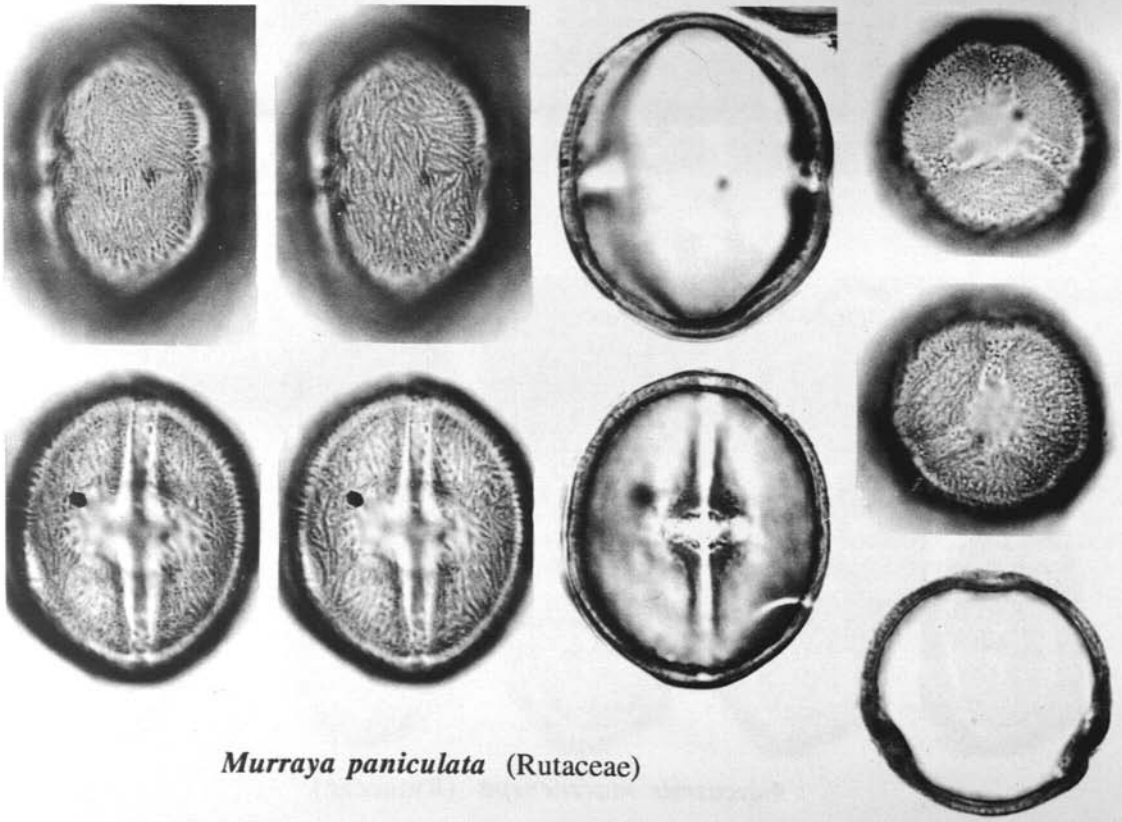
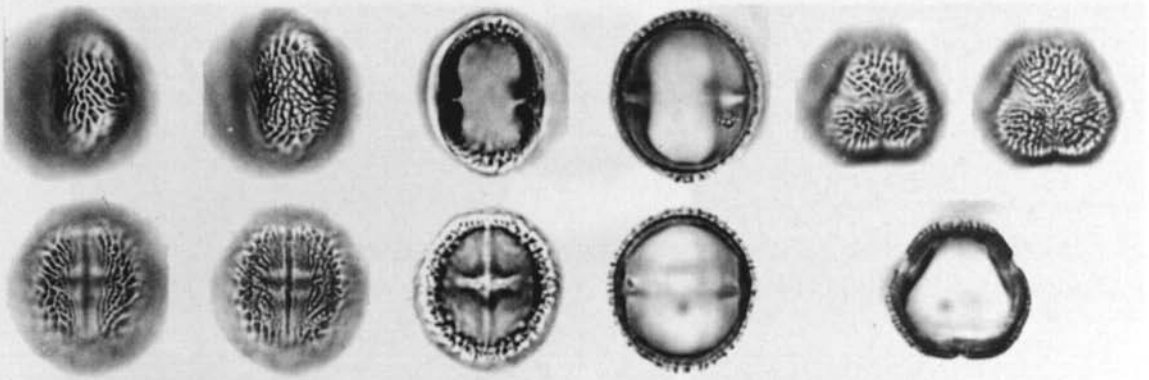


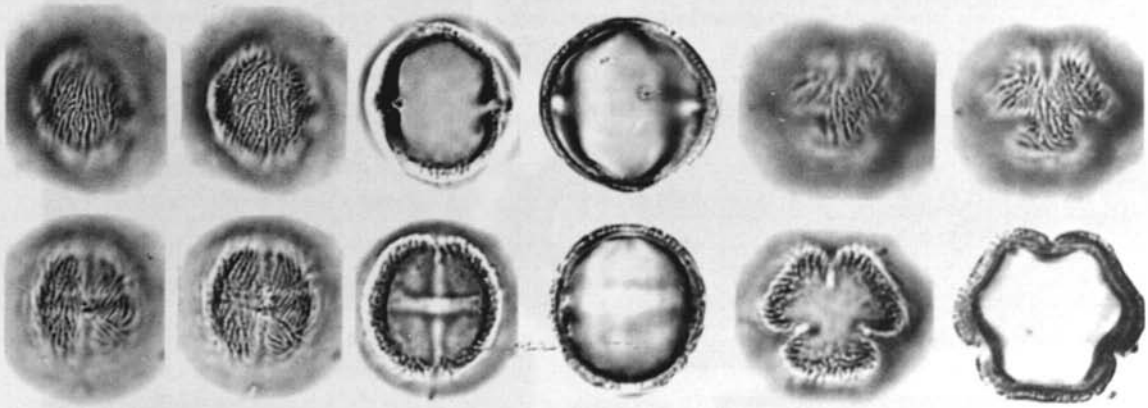
Luvunga eleutherandra (Rutaceae)



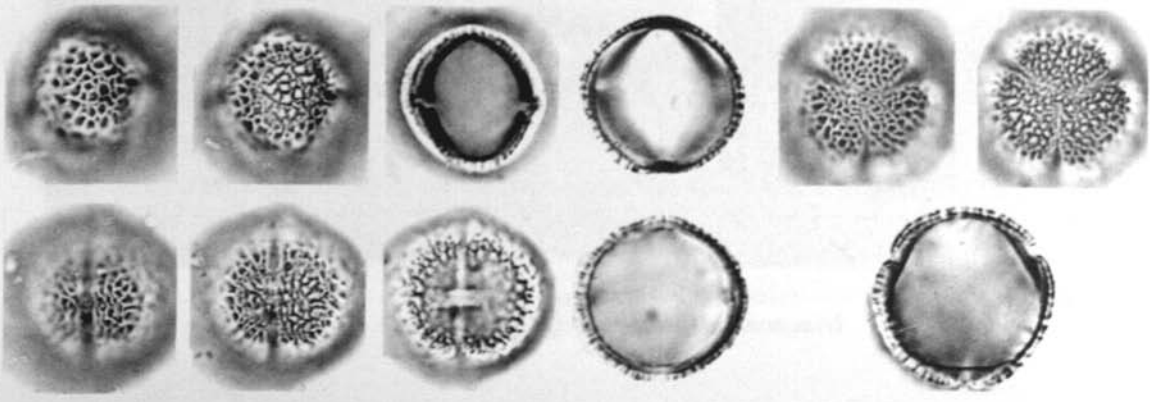
Murraya paniculata (Rutaceae)



Toddalia asiatica (Rutaceae)



Vepris bilocularis (Rutaceae)



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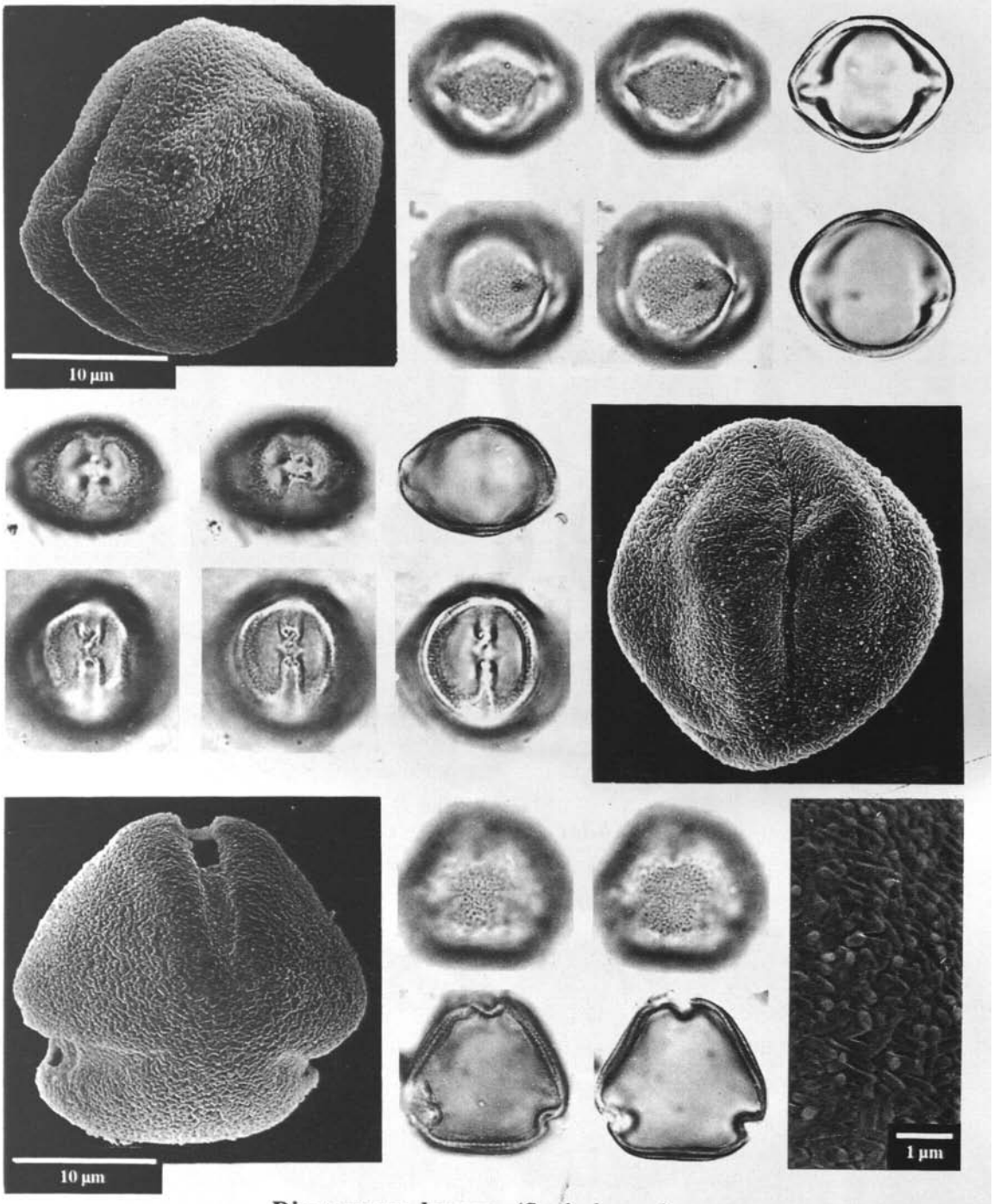
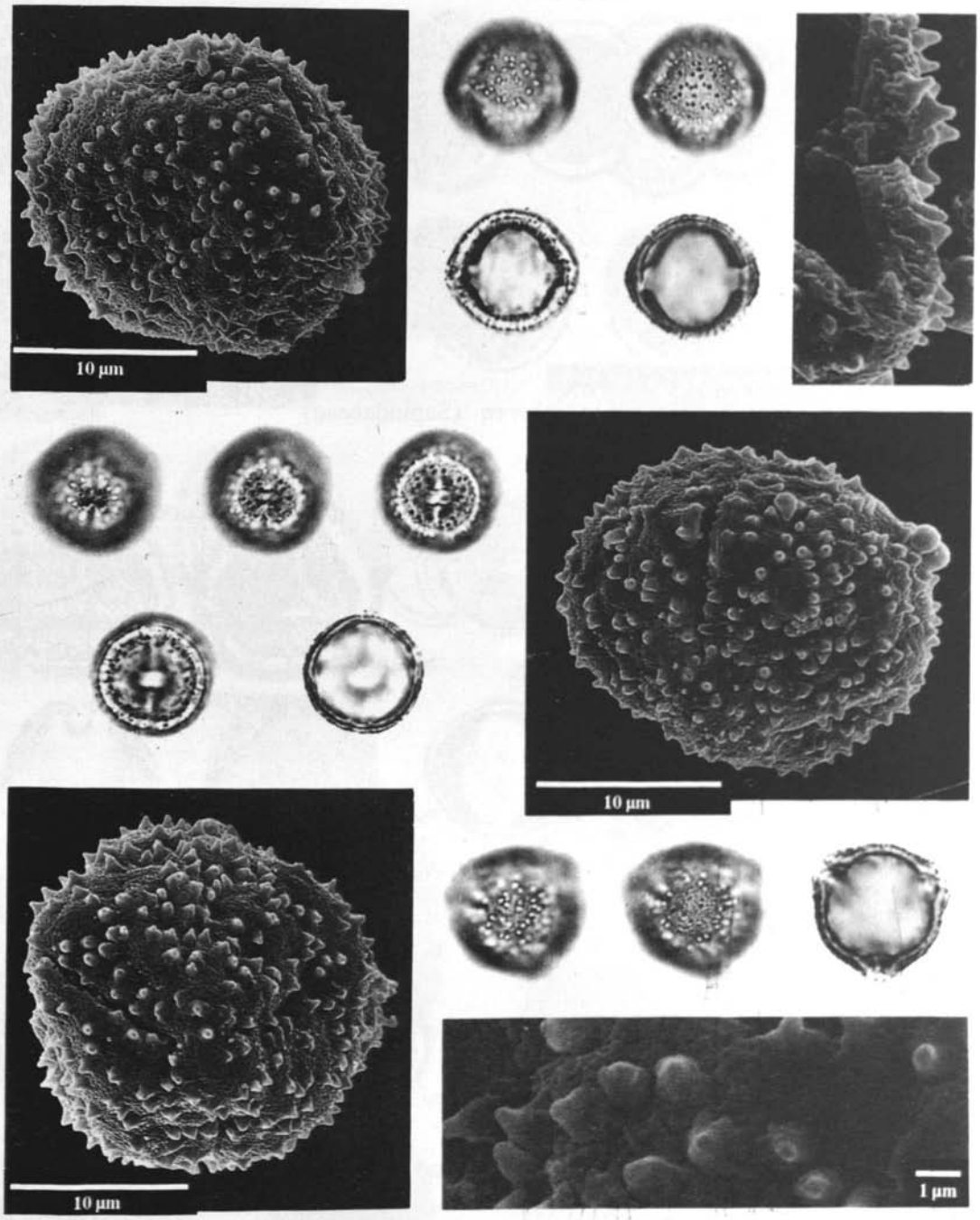


Dimocarpus longan (Sapindaceae)



Filicium decipiens (Sapindaceae)

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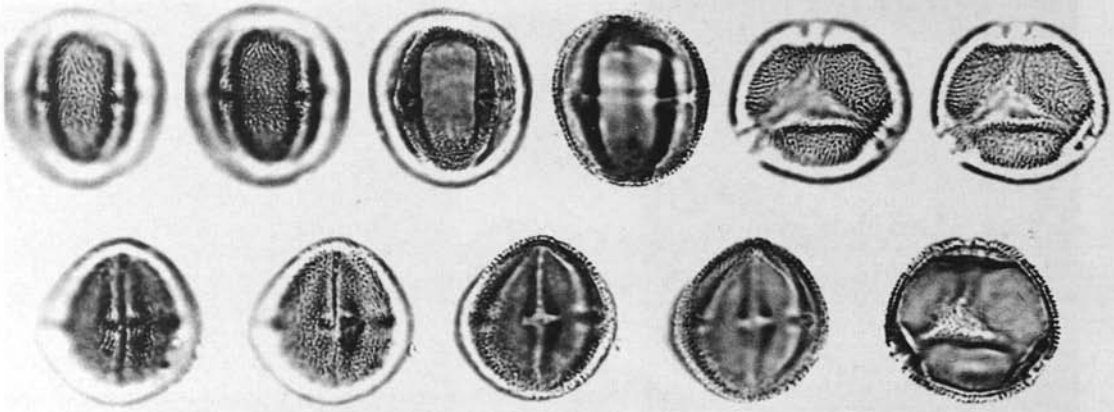
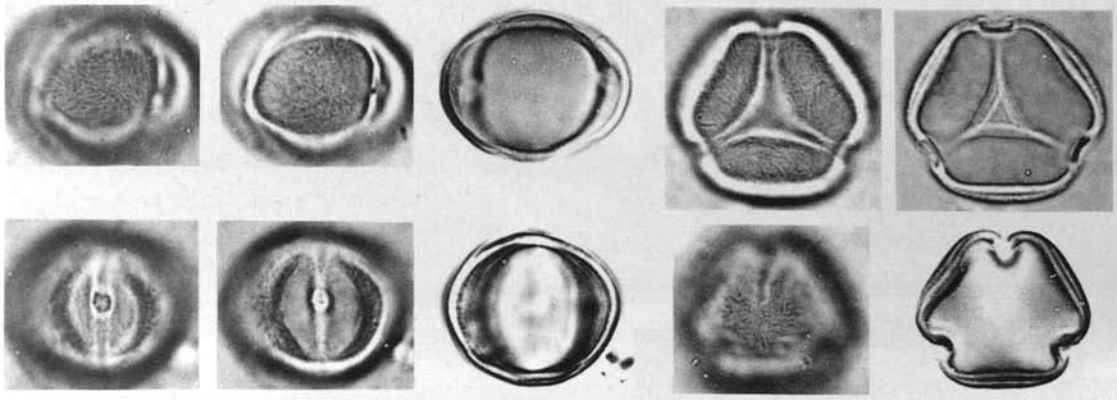
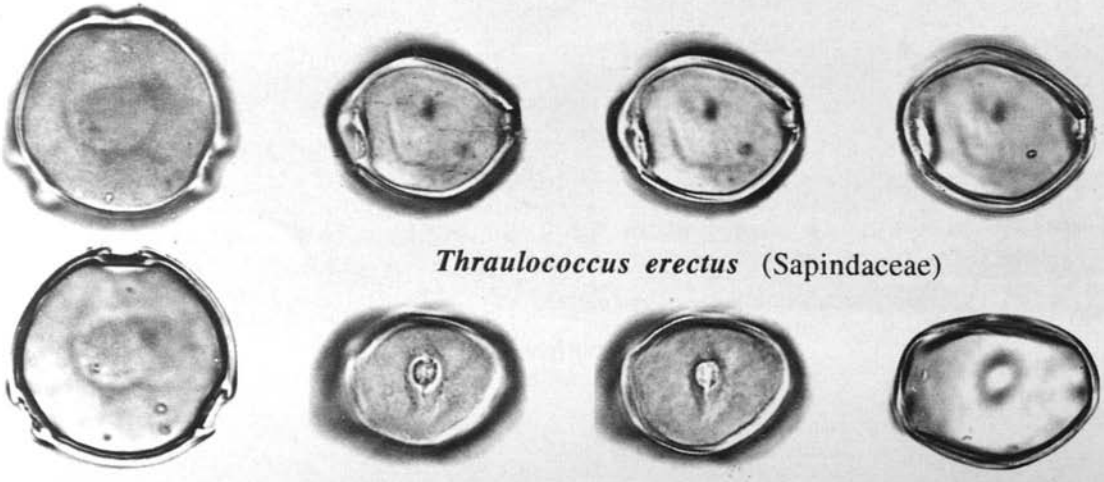


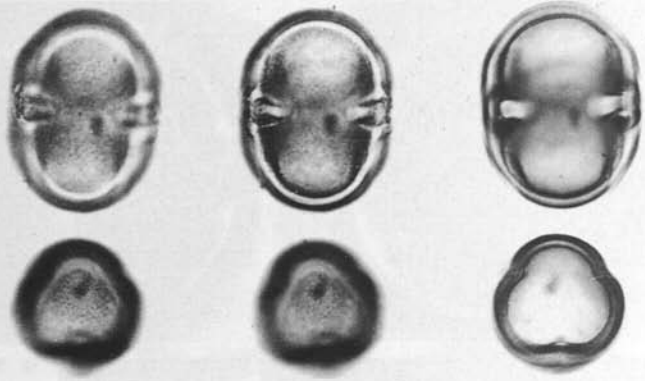
Harpullia arborea (Sapindaceae)

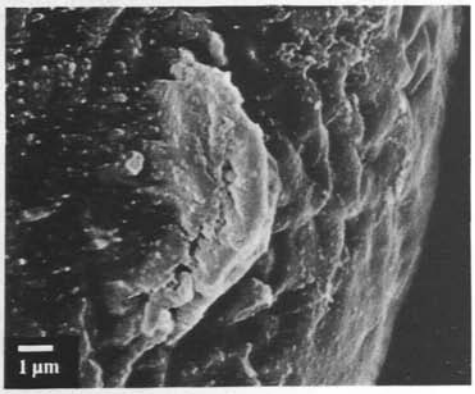


Otonephelium stipulaceum (Sapindaceae)

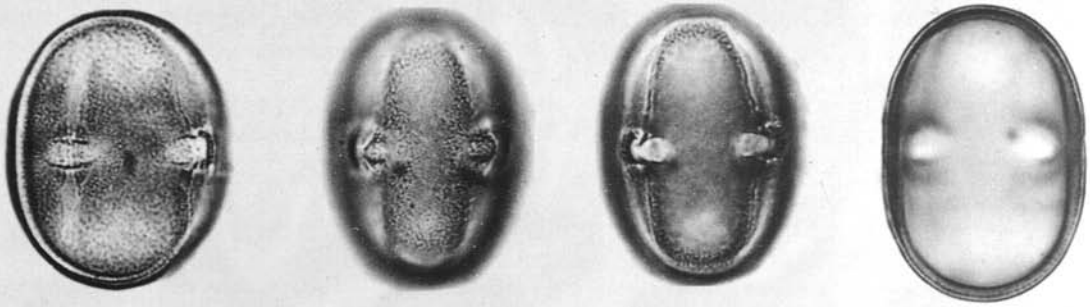


Thraulococcus erectus (Sapindaceae)

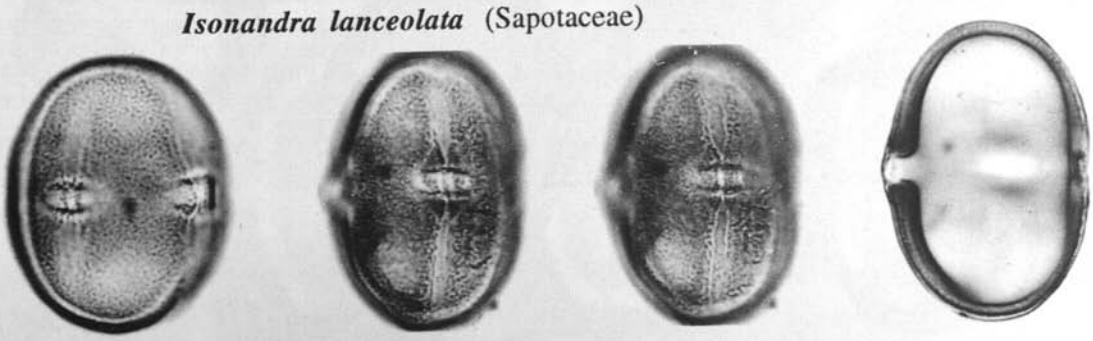




Chrysophyllum lanceolatum
(Sapotaceae)



Isonandra lanceolata (Sapotaceae)



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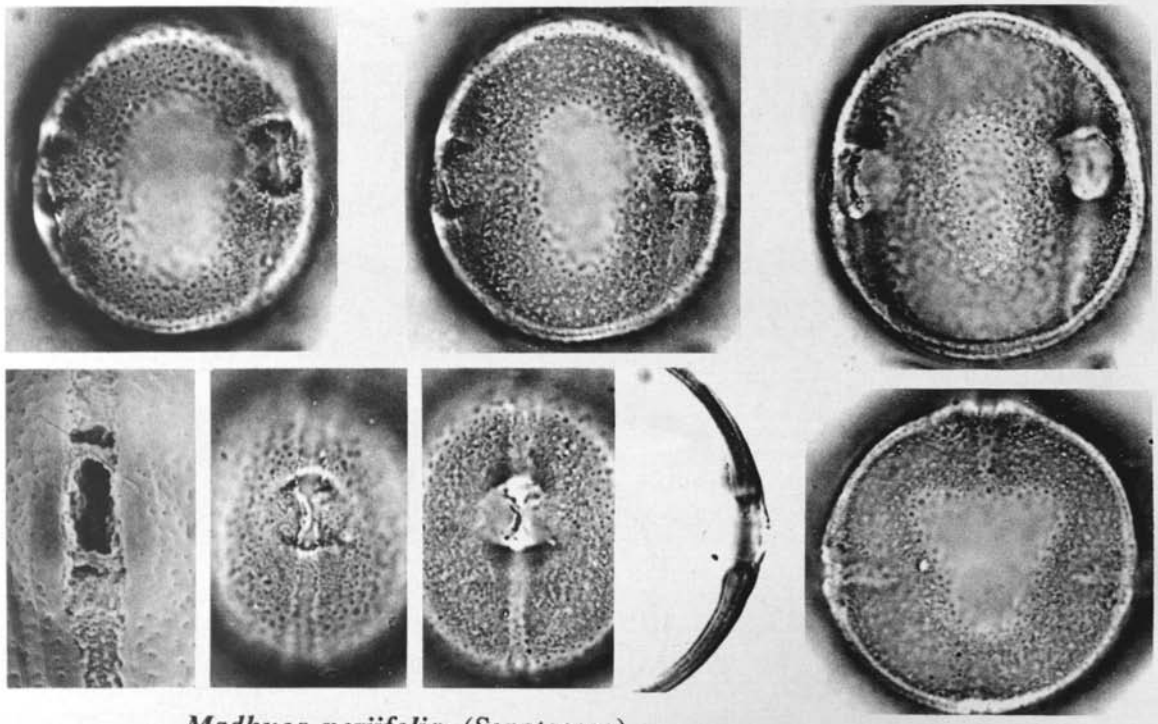
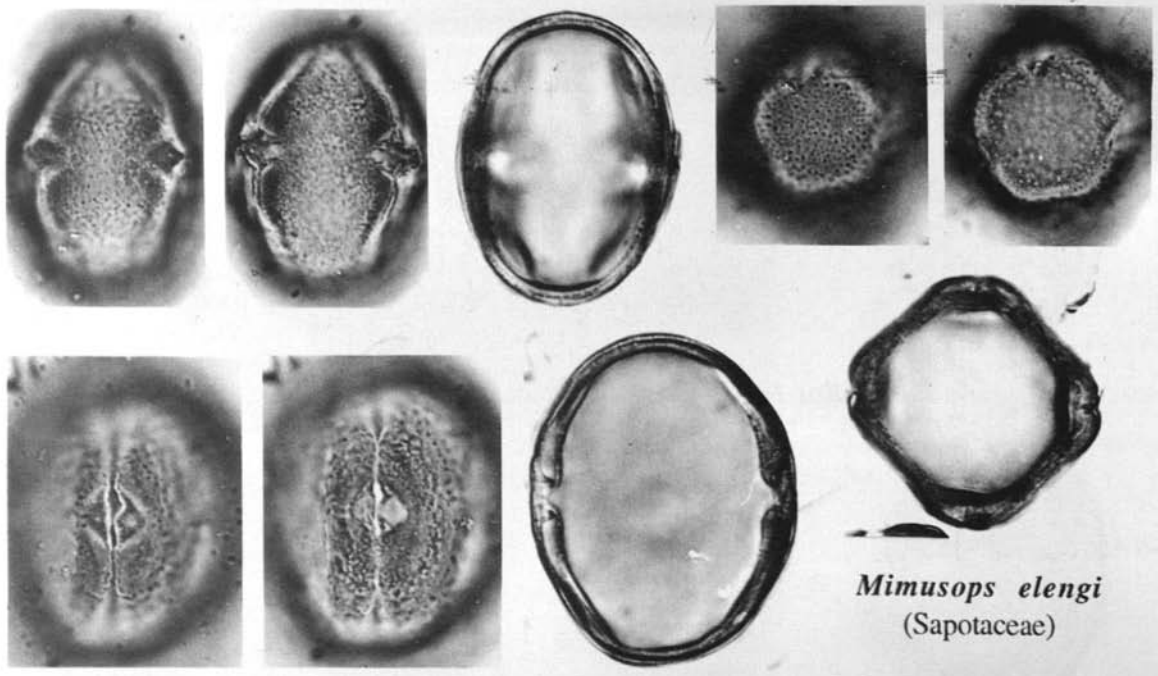


Madhuca neriifolia (Sapotaceae)



Mimusops elengi
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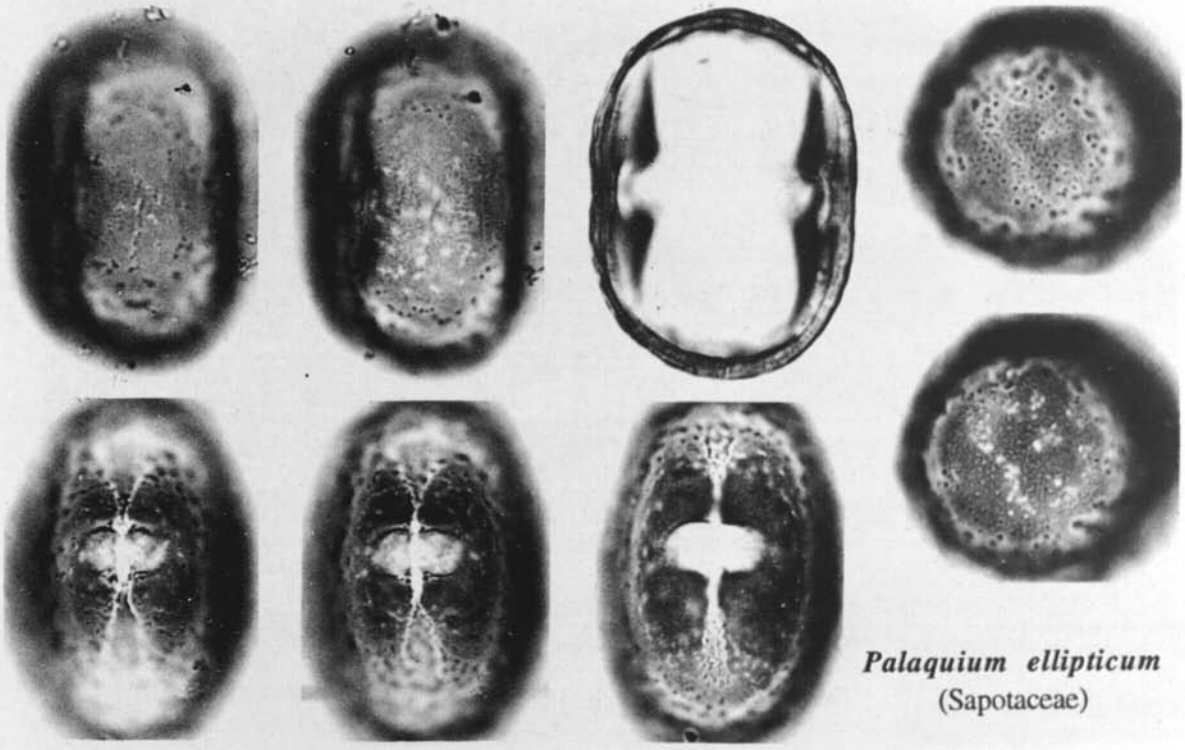

Palaquium ellipticum
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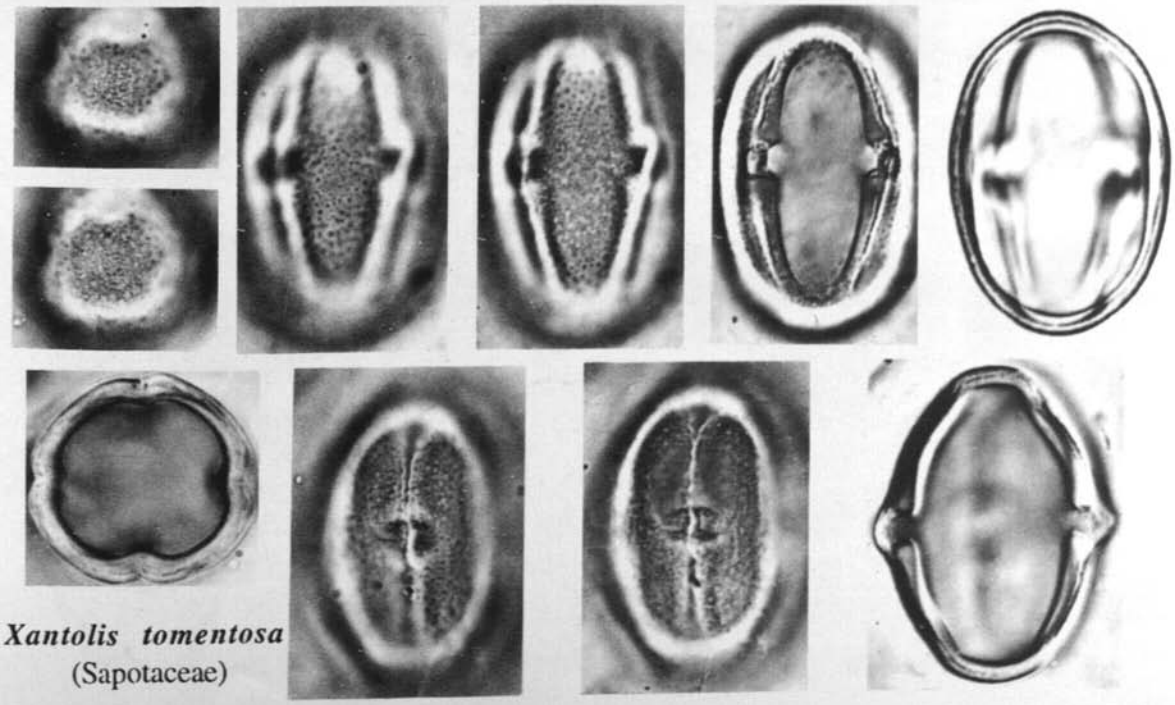
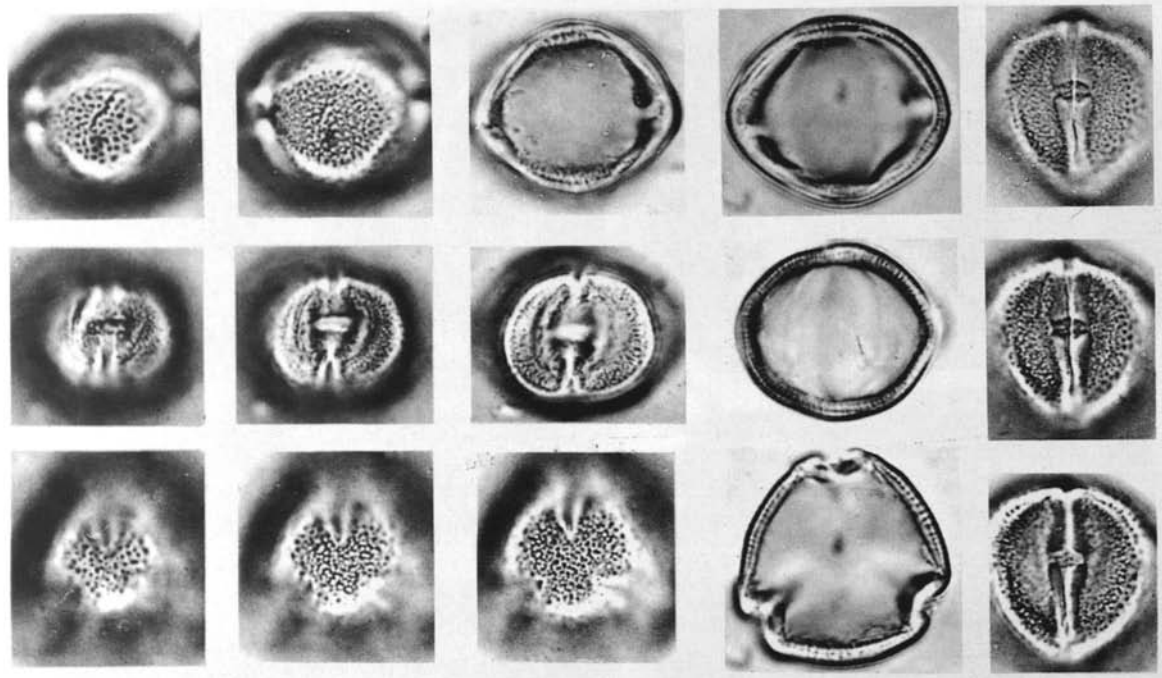
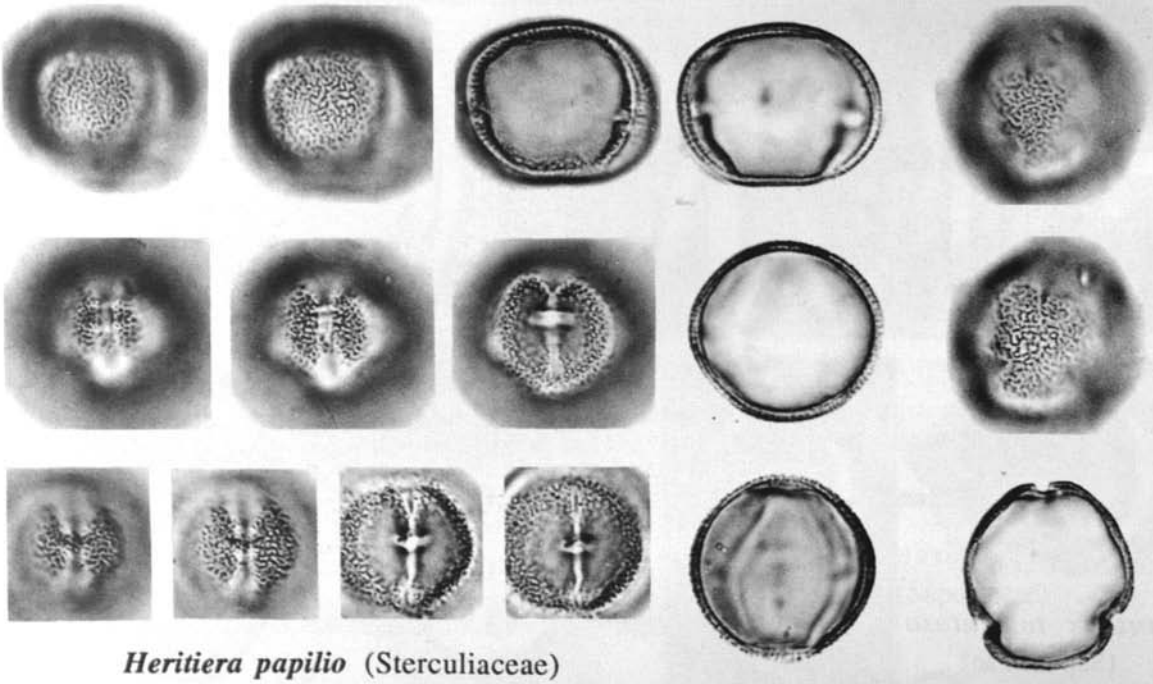


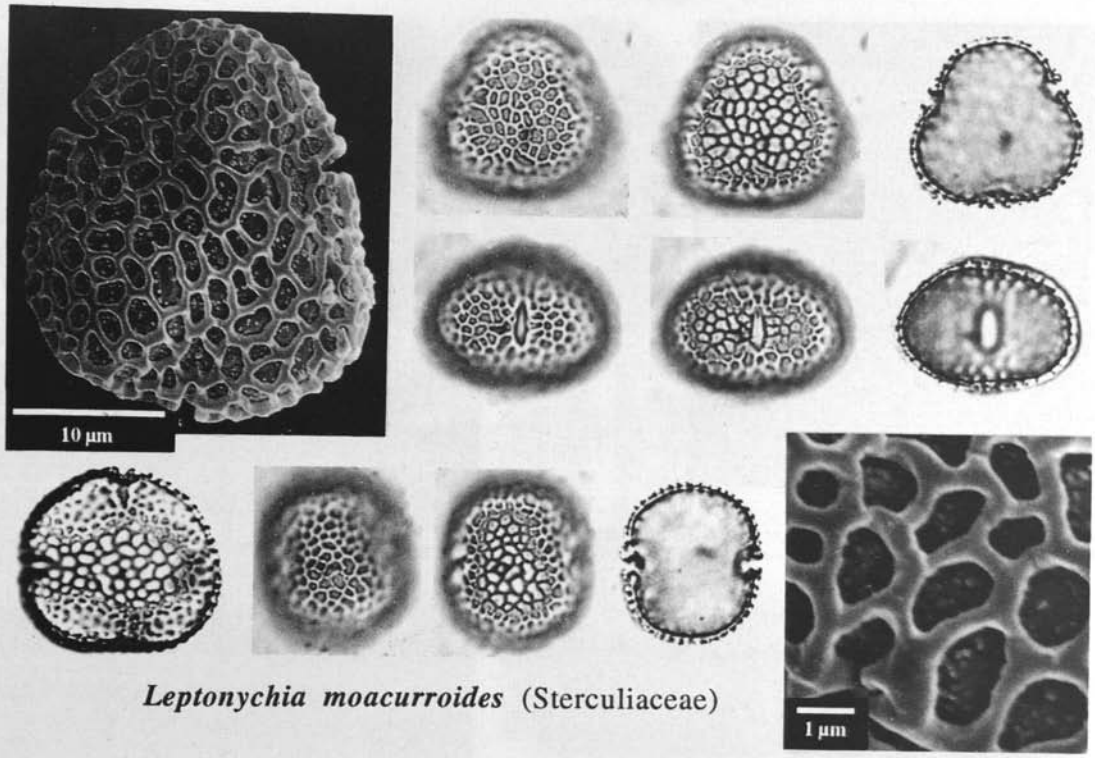
Xantolis tomentosa
(Sapotaceae)



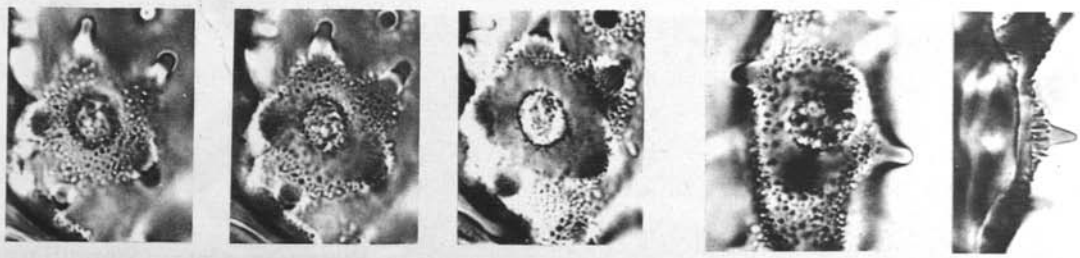
Turpinia malabarica (Staphyleaceae)



Heritiera papilio (Sterculiaceae)



Leptonychia moacurroides (Sterculiaceae)



Pterospermum diversifolium (Sterculiaceae)

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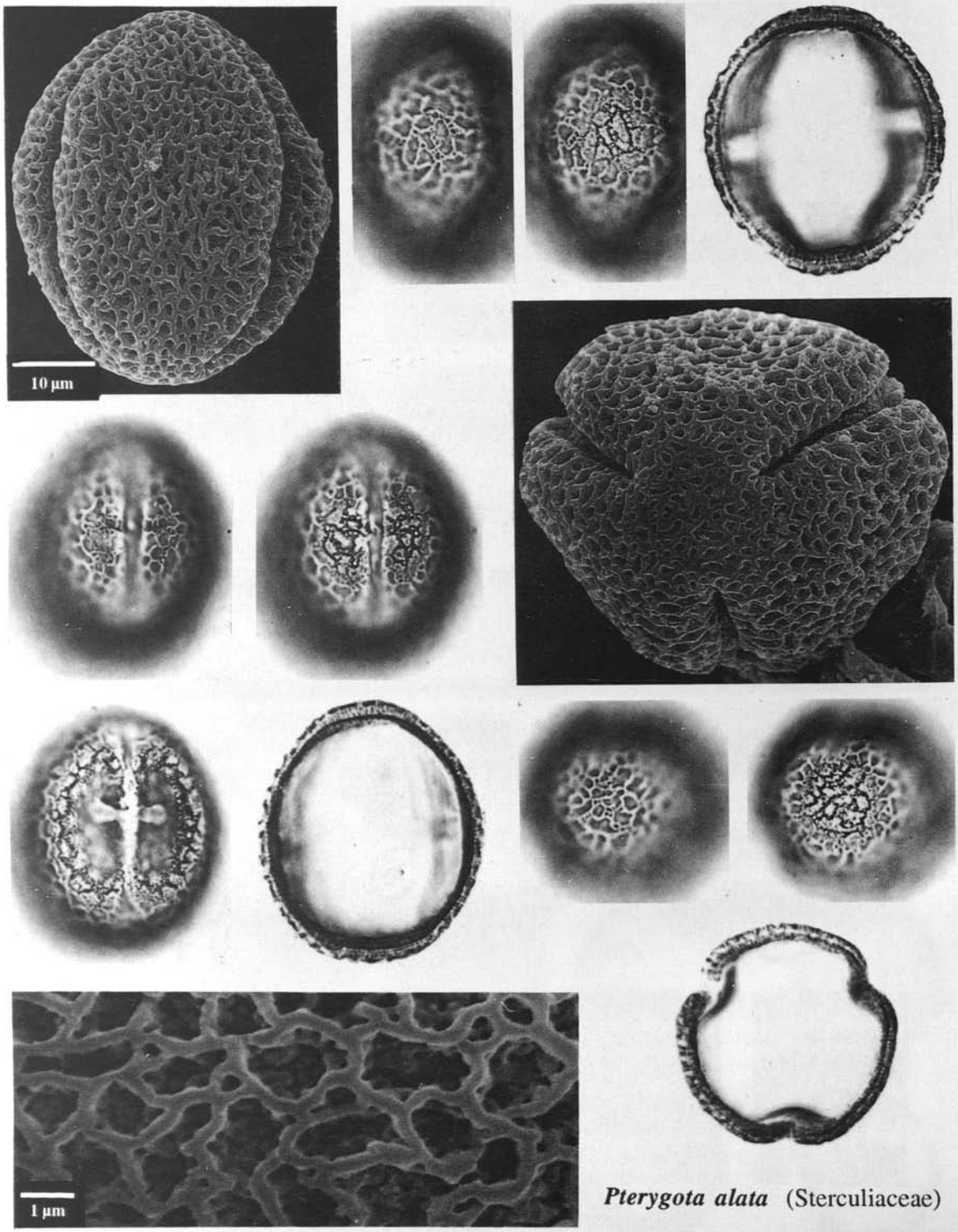
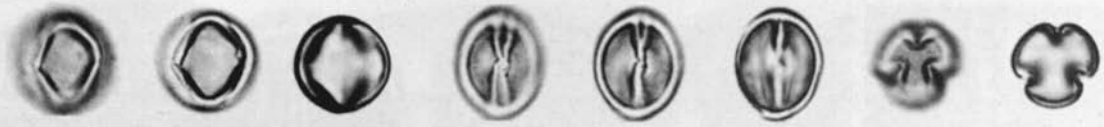
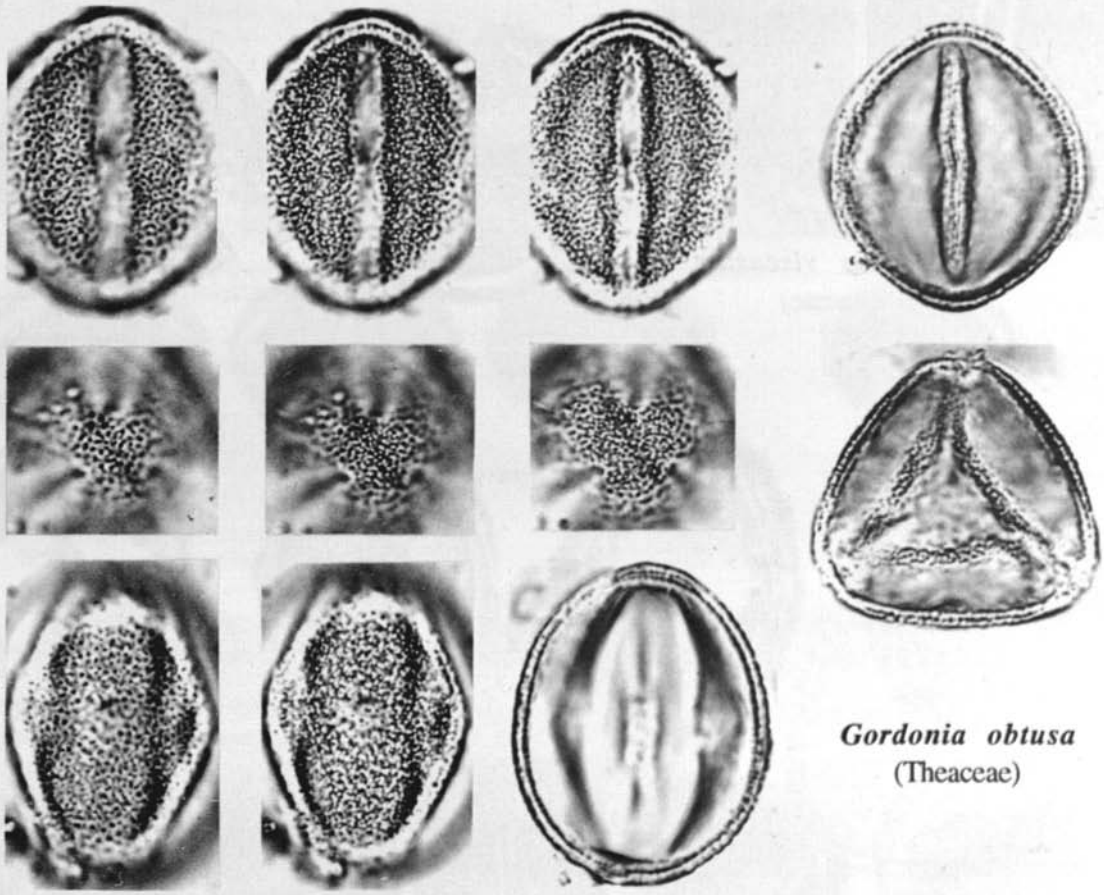


Pterygota alata (Sterculiaceae)



Eurya japonica (Theaceae)



Gordonia obtusa
(Theaceae)

Villebrunea integrifolia (Urticaceae)

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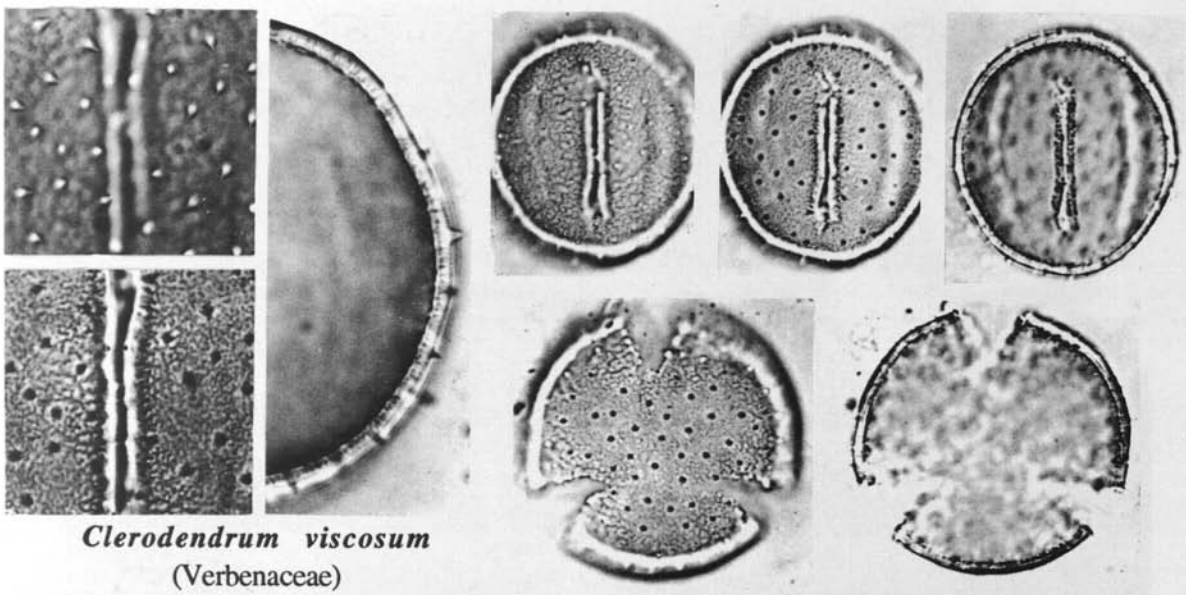
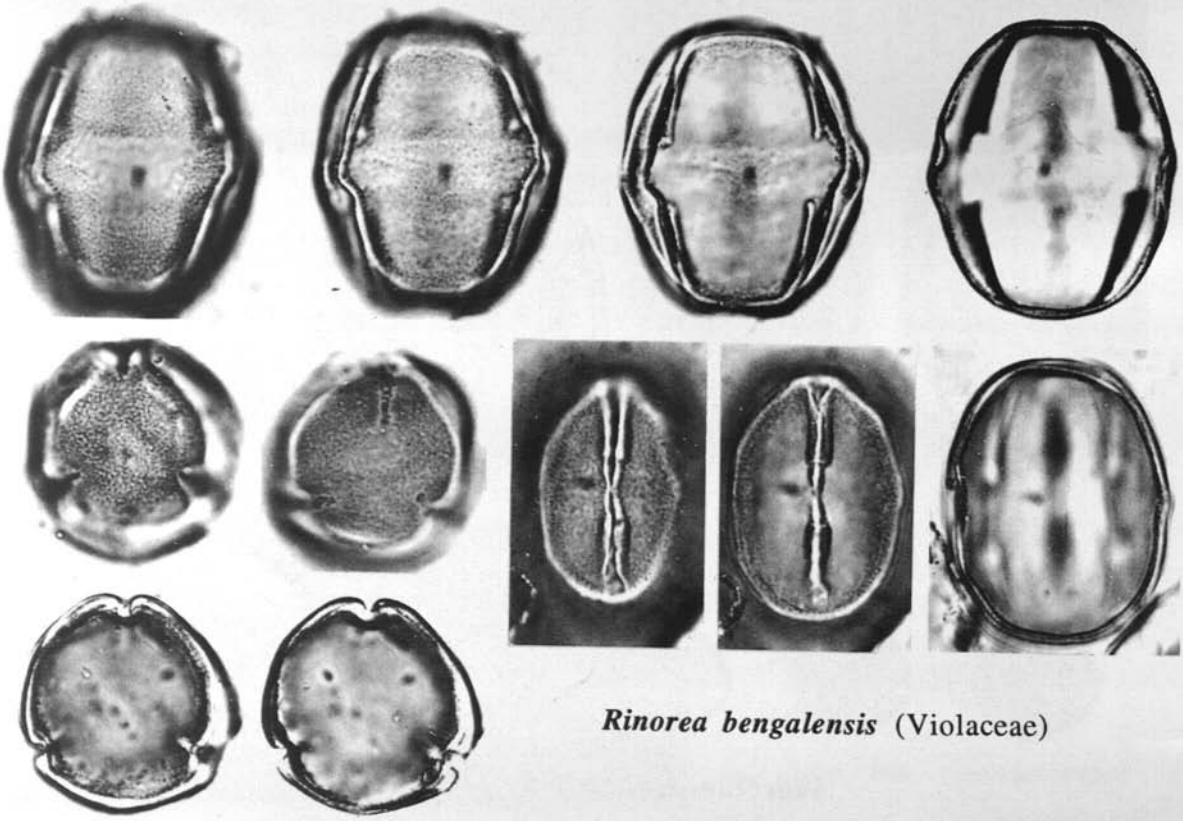
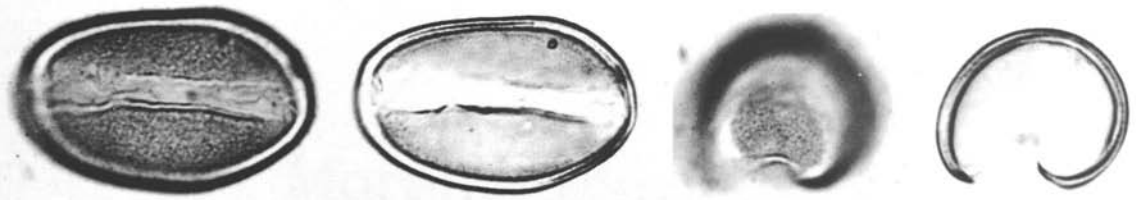


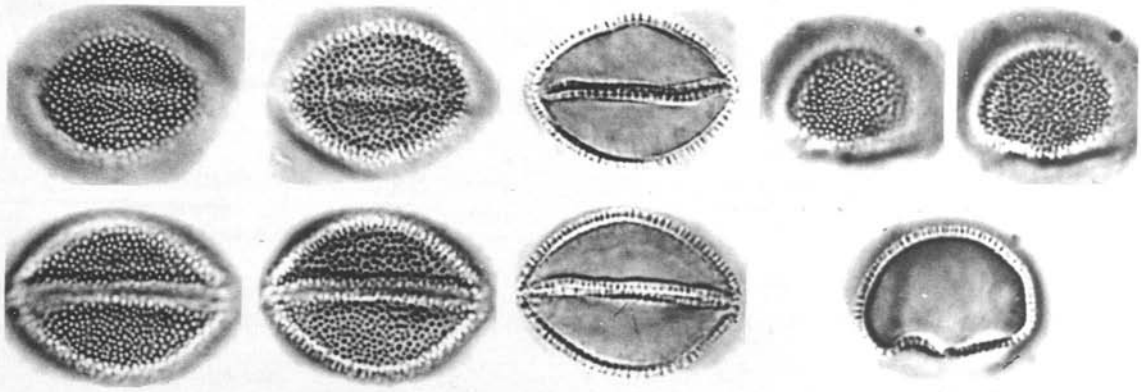
Clerodendrum viscosum
(Verbenaceae)



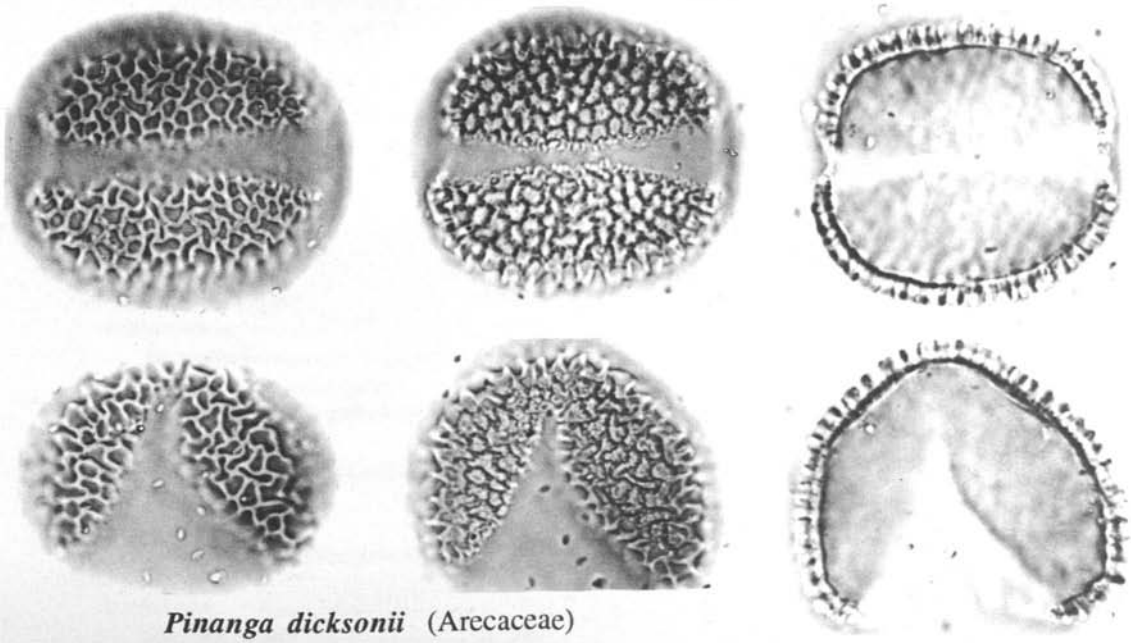
Rinorea bengalensis (Violaceae)



Bentinckia condapanna (Arecaceae)



Caryota urens (Arecaceae)



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