
Report

Pollen morphology of 17 species from a peat swamp forest in Sabah, Malaysia

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Abstract

Pollen specimens were collected from 17 species of 15 families that were growing in the peat swamp forest of Klias and Binsulok Forest Reserves, Sabah, Malaysia. These specimens were then observed with a light microscope and morphologically described.

Key words: pollen morphology, peat swamp forest, light microscope, Sabah

Introduction

A scientific expedition was held from March 22 to April 8, 1999 in the Klias and Binsulok Forest Reserves in Sabah, Malaysia. We participated in this expedition to accumulate palynological data of recent pollen grains. The typical ecology of these areas is a peat swamp forest, with dominant tree species such as *Dryobalanops rappa* Becc., *Stemonurus scorpioides* Becc., *Palaquium rostratum* (Miq.) Burck, *Gonystylus bancanus* (Miq.) Kurz, and *Combretocarpus rotundatus* (Miq.) Danser (Ahmad and Sugau, 2000). During the expedition, we had a chance to investigate the vegetation of the peat swamp forest and collect pollen specimens from one dominant species (*Stemonurus scorpioides*) as well as some other shrubs and herbs of the understory and forest floor. In this report we describe the pollen morphology of 17 species.

samples were collected from fresh flowers of each specimen and stored in acetic acid in the field. For the observation with a light microscope, pollen samples were acetolyzed, stained with safranin and mounted in glycerin jelly. For the pollen size, either the polar axis (P) and equatorial axis (E), or longest axis (L) of 50 grains were measured in each specimen and the average, maximum, and minimum values described in for each axis size. Apertures and polar area index (PAI) were measured with three grains. The terminology follows that of Punt et al. (1994). Pollen sample numbers (KHP No.) and sources of voucher specimens are shown in the description of each species. The voucher specimens are deposited in the herbaria of the Universiti Malaysia Sabah, the Museum of Nature and Human Activities, Hyogo, Japan (HYO), and others.

Materials and Methods

Pollen specimens of 17 species from 15 families were examined and described morphologically. Pollen

Results

Annonaceae

Mezzetia eptopoda (Hook.f. et Thoms.) Oliv. (Plate 1: 1-3)

KHP-415, Takahashi et al., 99225, 1.IV.1999,

Malaysia, Sabah, Papar Distr., Kg. Binsulok, Binsulok Forest Reserve.

Pollen grains monad, heteropolar, bilaterally symmetric, L 38.1 (42.5-33.0) μm ; polar view elliptic; equatorial view elliptic; monosulcate; sulcus wide, irregular; exine intectate, verrucate; verrucae polygonal at base.

Asclepiadaceae

Dischidia sp. (Plate 1: 4-9)

KHP-400, Takahashi et al., 99404, 25.III.1999, Malaysia, Sabah, Papar Distr., Kg. Pulai Manang Klias Forest Reserve.

KHP-407, Takahashi et al., 99406, 27.III.1999, Malaysia, Sabah, Papar Distr., Kg. Pulai Manang Klias Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 19.6 (22.0-17.5) μm , E 19.6 (23.0-17.0) μm , P/E 1.00 (1.24-0.87), subprolate to oblate spheroidal; polar view semiangular to circular; equatorial view circular to elliptic; trizonocolporate; colpi long, PAI (polar area index) 0.24, or sometimes syncolporate, colpi fusing in each apocolpium to cut off an island of exine shaped like a triangle, with equatorial bridge, covered by coarsely granular membrane; endoapertures indistinct pores, often lalongate, rarely forming continuous equatorial attenuation; exine semitectate, finely reticulate.

Cecropiaceae

Poikilospermum oblongifolium (Borg-Petri) Merr. (Plate 1: 10, 11)

KHP-403, Takahashi et al., 99007, 26.III.1999, Malaysia, Sabah, Papar Distr., Kg. Pulai Manang Klias Forest Reserve.

Pollen grains monad, isopolar, bilaterally symmetric, L 10.9 (13.0-9.0) μm , spherical; diporate; pores circular to elliptic; exine intectate, granulate; granula arranged irregular.

Dilleniaceae

Dillenia suffruticosa (Griff.) Martelli (Plate 1: 12-14)

KHP-406, Takahashi et al., 99504, 26.III.1999, Malaysia, Sabah, Papar Distr., Kg. Pulai Manang Klias Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 22.3 (25.5-17.5) μm , E 28.3 (31.0-24.0) μm , P/E 0.79 (0.90-0.66), oblate spheroidal to oblate; polar view circular; equatorial view elliptic; trizonocolporate, rarely 4-zonocolporate; colpi short, PAI 0.58, narrow, often not

parallel to the polar axis, covered by coarsely granular membrane; endoapertures indistinct or same shape as the colpus; exine semitectate, finely reticulate; muri simplicolumellate; columellae thick.

Euphorbiaceae

Antidesma sp. (Plate 1: 15-18)

KHP-399, Takahashi et al., 99403, 25.III.1999, Malaysia, Sabah, Papar Distr., Kg. Pulai Manang Klias Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 31.4 (37.0-23.0) μm , E 36.1 (43.0-29.0) μm , P/E 0.87 (0.93-0.77), oblate spheroidal to suboblate; polar view circular; equatorial view elliptic; trizonoporate, rarely diporate, pores always indistinct or circular, 5 μm diameter, slightly protruding; endoapertures narrow lalongate ruptures, 17 μm width, surrounded by nexine thickenings, rarely forming continuous equatorial attenuation; exine tectate, perforate with densely spaced perforations; columellae fine, denth.

Cephalomappa sp. (Plate 1: 19-22)

KHP-395, Takahashi et al., 99205, 24.III.1999, Malaysia, Sabah, Papar Distr., Kg. Pulai Manang Klias Forest Reserve.

KHP-412, Takahashi et al., 99223, 1.IV.1999, Malaysia, Sabah, Papar Distr., Kg. Binsulok, Binsulok Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 18.6 (21.0-17.0) μm , E 16.0 (18.0-13.5) μm , P/E 1.17 (1.37-1.03), subprolate to prolate spheroidal; polar view inter-hexagonal; equatorial view elliptic; trizonocolporate; colpi narrow, long, pointed ends; endoapertures narrow, lalongate, 8 μm wide; exine tectate to semitectate, finely reticulate, with densely spaced perforations, thick at both poles.

Comment: These two specimens of *Cephalomappa* sp. displayed some differences such as size of leaves, number of secondary veins of leaves and color of flowers. These specimens could be different species, but we could not identify them precisely. In this report, we treat these specimens as belonging to the same species. Regarding pollen morphological characters, we did not recognize any differences between these two specimens.

Icacinaeae

Stemonurus scorpioides Becc. (Plate 1: 23-25)

KHP-419, Takahashi et al., 99228, 2.IV.1999, Malaysia, Sabah, Papar Distr., Kg. Binsulok, Binsulok Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 6.86 (8.0-6.0) μm , E 16.1 (18.0-14.5) μm , P/E 0.43 (0.52-0.33), peroblate; polar view subangular; equatorial view dumbbell-shaped with depressed poles; trizonoporate, rarely 4-zonoporate; pores narrow, pointed ends, 5 μm length, 2 μm wide, surrounded by nexine thickenings; exine intectate, granulate, granula irregular in shape arranged irregular.

Leguminosae

Sp. 1 (Plate 2: 1-4)

KHP-396, Takahashi et al., 99402, 24.III.1999, Malaysia, Sabah, Papar Distr., Kg. Pulau Manang Klias Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 29.3 (32.5-26.0) μm , E 31.8 (35.0-28.0) μm , P/E 0.92 (1.00-0.79), oblate spheroidal to suboblate; polar view triangular, plane to convex mesocolpia, protruding apertures; equatorial view elliptic to subrhomboidal; trizonocolporate; colpi long, PAI 0.22, 3 μm wide at equator, pointed ends, covered by smooth membrane; endoapertures lalongate, 5 μm length, 13 μm wide, dumbbell-shaped or elliptic; exine semitectate, reticulate, decrease in size near colpi and poles; muri pluricolumellate; columellae fine; lumina irregular elongate.

Loganiaceae

Fagraea cuspidata Blume (Plate 2: 5-9)

KHP-410, Takahashi et al., 99410, 30.III.1999, Malaysia, Sabah, Papar Distr., Weston, Siunggau Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 36.1 (39.5-32.5) μm , E 42.3 (45.0-38.0) μm , P/E 0.86 (0.93-0.81), oblate spheroidal to suboblate; polar view circular; equatorial view elliptic; trizonocolporate; colpi long, PAI 0.31, 3 μm wide, pointed ends, covered by smooth membrane; endoapertures circular to lalongate elliptic, 5 μm diameter; exine semitectate, reticulate; lumina decrease in size near poles; muri simplicolumellate.

Melastomataceae

Sp. 2 (Plate 2: 10-13)

KHP-398, Takahashi et al., 99507, 24.III.1999, Malaysia, Sabah, Papar Distr., Kg. Pulau Manang Klias Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 23.0 (25.5-20.0) μm , E 23.7 (28.0-20.0) μm , P/E 0.97 (1.14-0.81), prolate spheroidal to suboblate; polar view

trilobate; equatorial view elliptic; trizonocolporate with 3-pseudocolpi; colpi long, rarely fusing in each apocolpium; pseudocolpi short, situated at convex part of mesocolpia, pointed ends, covered by smooth membrane, rarely coarsely granular; pseudocolpi shorter than colpi; endoapertures lalongate to elliptic, 3 μm length, 10 μm wide, dumbbell-shaped to elliptic; exine intectate, psilate.

Myrsinaceae

Labisia sp. (Plate 2: 14-16)

KHP-401, Takahashi et al., 99405, 25.III.1999, Malaysia, Sabah, Papar Distr., Kg. Pulau Manang Klias Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 17.4 (20.0-15.0) μm , E 17.1 (20.0-15.0) μm , P/E 1.02 (1.13-0.88), prolate to oblate spheroidal; polar view trilobate; equatorial view rectangular; trizonocolporate, rarely 4-zonocolporate; colpi narrow, 12 μm length, situated at concave part of trilobate; endoapertures elliptic or narrow lalongate ruptures, 7 μm wide; exine tectate, perforate, with densely spaced perforations, thick in mesocolpium.

Nepenthaceae

Nepenthes gracilis Korth. (Plate 2: 17)

KHP-411, Takahashi et al., 99411, 30.III.1999, Malaysia, Sabah, Papar Distr., Weston, Siunggau Forest Reserve.

Pollen grains tetrahedral tetrad, L 29.6 (32.5-25.0) μm , inaperturate; exine where grains touch thrown into folds which converge towards the innermost point of the tetrad; exine intectate, echinate; spinule sparse, less than 1 μm length.

Oxalidaceae

Sarcotheca glauca (Hook.f.) Hallier f. (Plate 2: 18-21)

KHP-418, Takahashi et al., 99229, 2.IV.1999, Malaysia, Sabah, Papar Distr., Kg. Binsulok, Binsulok Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 19.3 (21.0-17.5) μm , E 21.1 (24.0-19.0) μm , P/E 0.92 (1.03-0.83), oblate spheroidal to suboblate; polar view circular to semiangular; equatorial view circular to elliptic; trizonocolporate; colpi long, PAI 0.25, 6 μm wide, rounded to pointed ends, covered by smooth membrane; endoapertures circular or irregular, 5 μm diameter; exine tectate, perforate, with densely spaced perforations.

Rubiaceae***Ixora* sp.** (Plate 3: 1-7)

KHP-408, Takahashi et al., 99407, 29.III.1999, Malaysia, Sabah, Papar Distr., Kg. Pulau Manang Klias Forest Reserve.

KHP-414, Takahashi et al., 99413, 1.IV.1999, Malaysia, Sabah, Papar Distr., Kg. Binsulok, Binsulok Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 27.9 (35.0-22.5) μm , E 26.5 (32.0-21.0) μm , P/E 1.06 (1.27-0.91), subprolate to oblate spheroidal; polar view circular; equatorial view elliptic or often subrhomboidal; trizonocolporate; colpi long, PAI 0.28, pointed ends; endoapertures narrow, lalongate, 3 μm length, and 15 μm wide, often lalongate forming continuous equatorial attenuation; exine thick, perforate, with densely spaced perforations; columellae thick.

***Timonius* sp.** (Plate 3: 8-11)

KHP-397, Takahashi et al., 99401, 24.III.1999, Malaysia, Sabah, Papar Distr., Kg. Pulau Manang Klias Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 27.2 (32.0-23.0) μm , E 32.1 (34.0-27.5) μm , P/E 0.85 (0.94-0.74), oblate spheroidal to oblate; polar view circular; equatorial view elliptic; trizonocolpate, rarely dicolpate; colpi 8 μm length, narrow, indistinct; exine semitectate, reticulate, muri simplicolumellate; columellae dense, fine, 0.5 μm diameter.

Vitaceae***Tetrastigma* sp.** (Plate 3: 12-16)

KHP-404, Takahashi et al., 99540, 26.III.1999, Malaysia, Sabah, Papar Distr., Kg. Pulau Manang Klias Forest Reserve.

Pollen grains monad, isopolar, radially symmetric, P 49.9 (55.0-42.5) μm , E 45.2 (51.5-34.0) μm , P/E 1.11 (1.40-1.02), subprolate to prolate spheroidal; polar view subangular to inter-hexagonal; equatorial view elliptic to circular; trizonocolporate; colpi long, PAI 0.26, 2 μm wide, pointed ends, covered by coarsely granular membrane; endoapertures elliptic to lalongate elliptic, 5 μm length, 7 μm wide; exine semitectate, reticulate, reticulum decrease in size near colpus and both poles; muri duplicolumellate.

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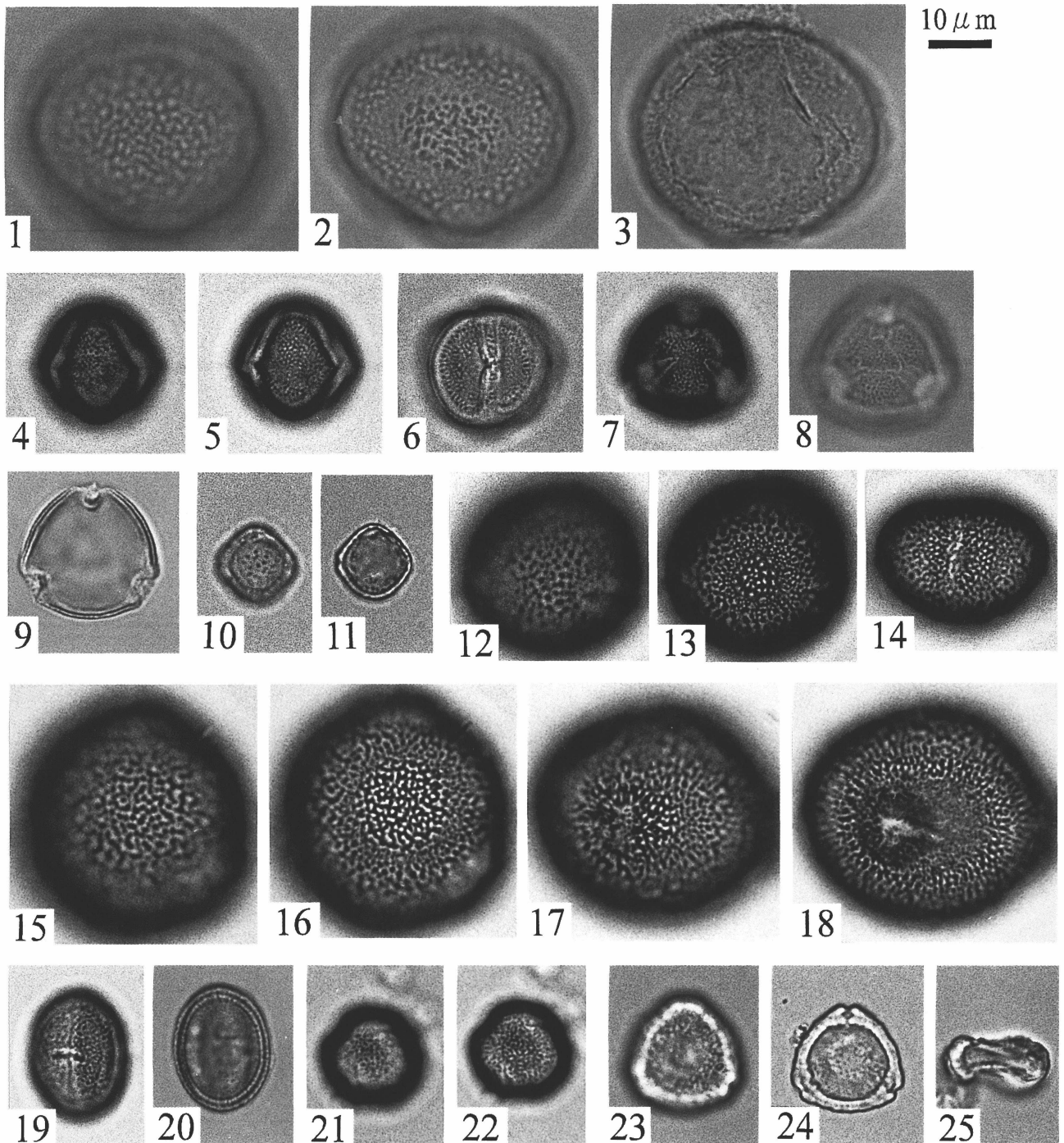


Plate 1. Photomicrographs of pollen grains taken from peat swamp forests in Sabah, Malaysia.

1-3. *Mezzetia leptopoda*, Annonaceae. **1, 2:** LO-pattern at proximal face. **3:** Sulcus at distal face.

4-9. *Dischidia* sp., Asclepiadaceae. **4, 5:** LO-pattern in equatorial view. **6:** Colpus with equatorial bridge. **7:** Ends of colpi in Polar view. **8:** Syncolporate in apocolpium. **9:** Polar view, optical cross-section.

10, 11. *Poikilospermum oblongifolium*, Cecropiaceae. **10:** Sculptural pattern. **11:** Optical cross-section.

12-14. *Dillenia suffruticosa*, Dilleniaceae. **12, 13:** LO-pattern in polar view. **14:** Sulcus in equatorial view.

15-18. *Antidesma* sp., Euphorbiaceae. **15, 16:** LO-pattern in polar view. **17:** Pore in equatorial view. **18:** Endoaperture in equatorial view.

19-22. *Cephalomappa* sp., Euphorbiaceae. **19:** Aperture and sculptural pattern in equatorial view. **20:** Equatorial view, optical cross-section. **21, 22:** LO-pattern in polar view.

23-25. *Stemonurus scorpioides*, Icacinaceae. **23:** Sculptural pattern in polar view. **24:** Polar view, optical cross-section. **25:** Equatorial view, optical cross-section.

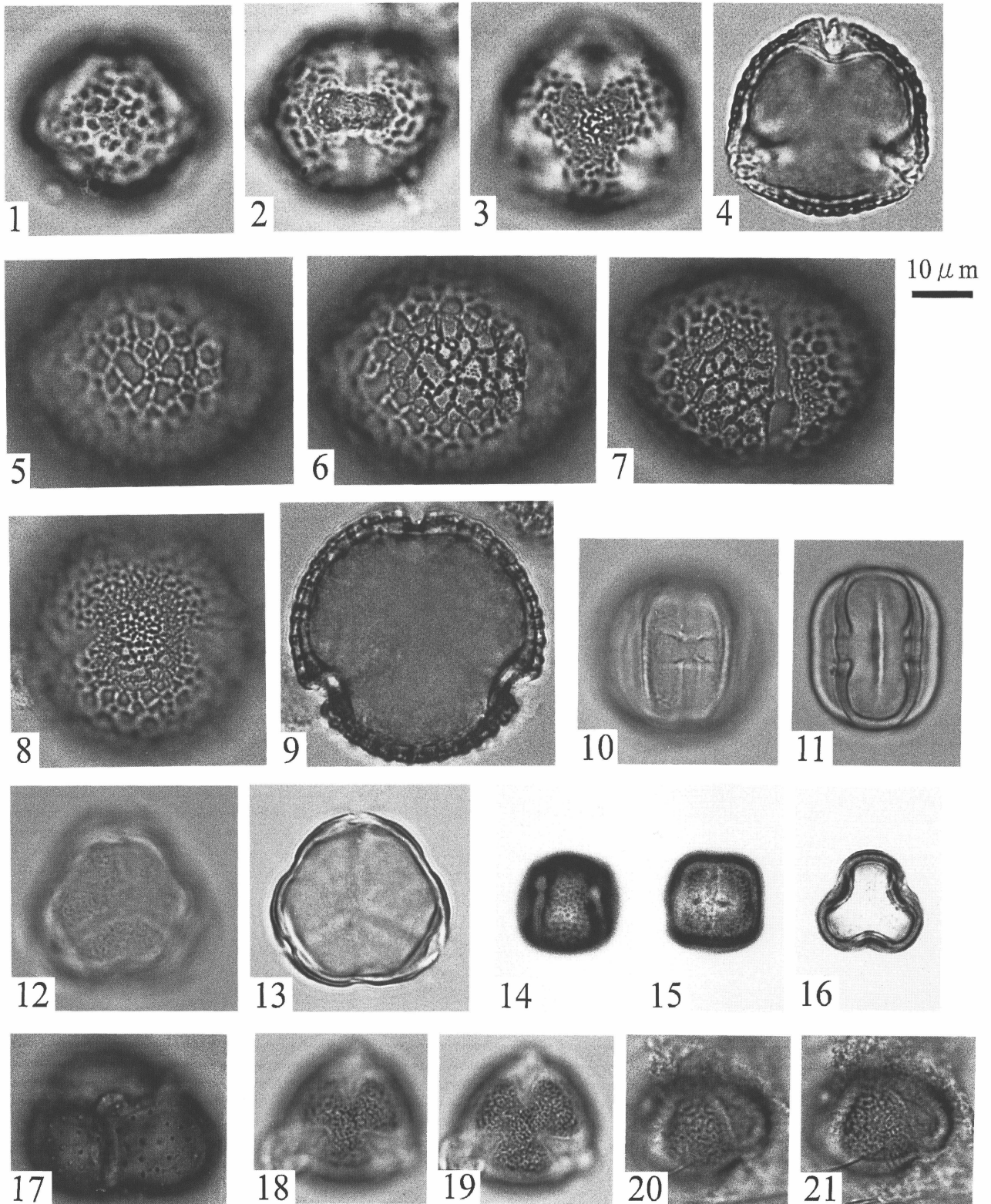


Plate 2. Photomicrographs of pollen grains taken from peat swamp forests in Sabah, Malaysia.

1-4. Sp. 1, Leguminosae. **1:** Sculptural pattern in equatorial view. **2:** Aperture in equatorial view. **3:** Sculptural pattern in polar view. **4:** Polar view, optical cross-section.

5-9. *Fagraea cuspidata*, Loganiaceae. **5, 6:** LO-pattern in equatorial view. **7:** Aperture in equatorial view. **8:** Sculptural pattern in polar view. **9:** Polar view, optical cross-section.

10-13. Sp. 2, Melastomataceae. **10:** Aperture in equatorial view. **11:** Pseudocolpus in equatorial view. **12:** Sculptural pattern in polar view with elongate colpi and short pseudocolpi. **13:** Polar view, optical cross-section.

14-16. *Labisia* sp., Myrsinaceae. **14:** Sculptural pattern in equatorial view **15:** Aperture in equatorial view **16:** Polar view, optical cross-section.

17. *Nepenthes gracilis*, Nepenthaceae Tetrad with echinate sculpture.

18-21. *Sarcotheca glanca*, Oxalidaceae. **18, 19:** LO-pattern in polar view. **20, 21:** LO-pattern in equatorial view.

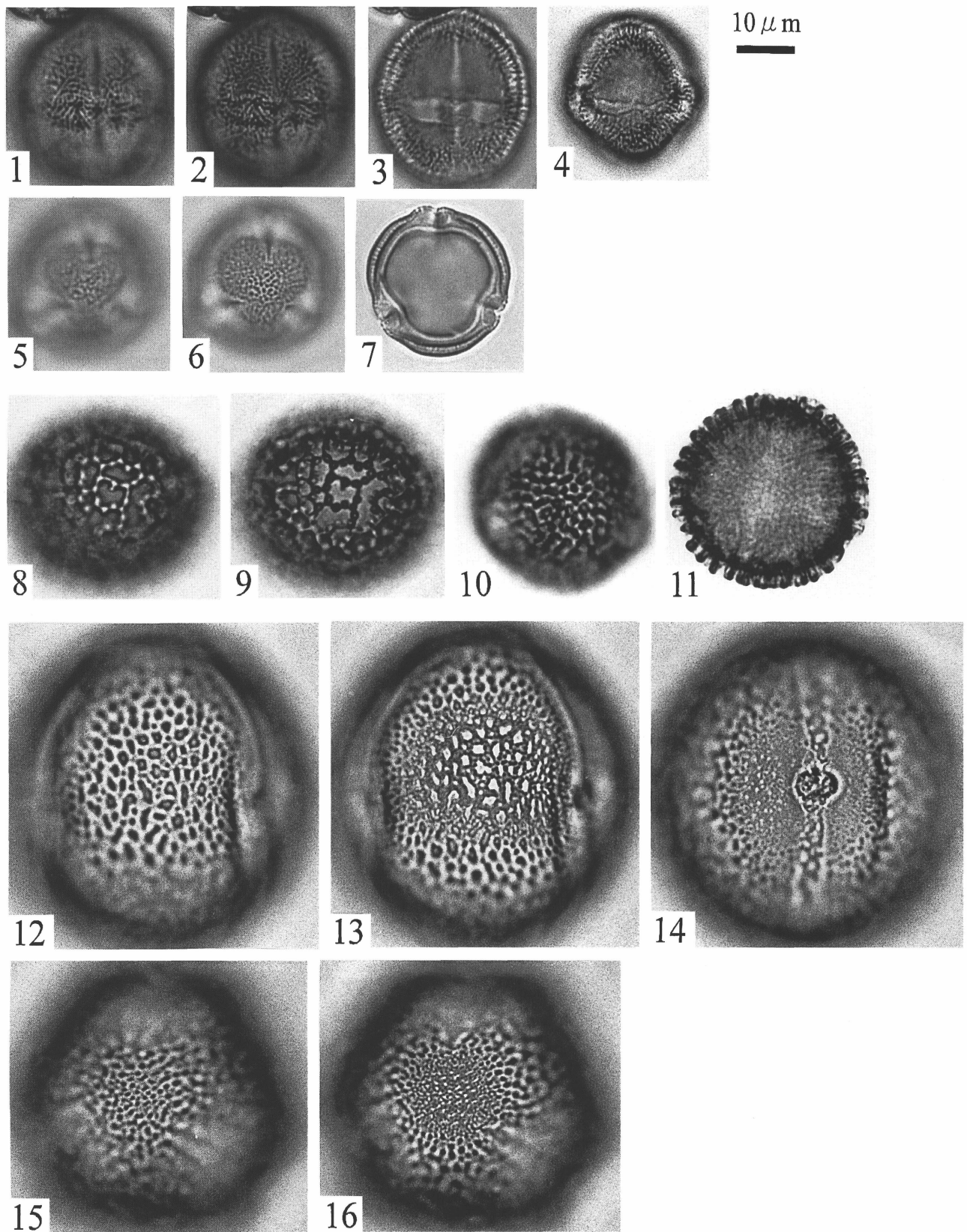


Plate 3. Photomicrographs of pollen grains taken from peat swamp forests in Sabah, Malaysia.

- 1-7.** *Ixora* sp., Rubiaceae. **1, 2:** LO-pattern in equatorial view. **3:** Aperture in equatorial view. **4:** Lalongate endoaperture forming continuous equatorial attenuation. **5, 6:** LO-pattern in polar view. **7:** Polar view, optical cross-section.
- 8-11.** *Timonius* sp., Rubiaceae. **8, 9:** LO-pattern in equatorial view. **10:** Sculptural pattern in polar view. **11:** Polar view, optical cross-section.
- 12-16.** *Tetrastigma* sp., Vitaceae. **12, 13:** LO-pattern in equatorial view. **14:** Aperture in equatorial view. **15, 16:** LO-pattern in polar view.