

POLLEN GRAINS OF FORMOSAN PLANTS I⁽²⁾

TSENG-CHIENG HUANG⁽¹⁾

Abstract: The pollen grains of three families, i. e., the Chloranthaceae, Piperaceae, and Saururaceae including six genera and eleven species have been studied. Pollen morphology among species of the same genus is frequently similar, but pollen grains of these different genera are sufficiently different so that they usually can be distinguished readily, excepting members of *Houttuynia*, *Saururus*, and *Piper*. On the basis of pollen morphology, plants of Piperaceae are closely related to those of Saururaceae.

I. INTRODUCTION

The Chloranthaceae, Piperaceae, and Saururaceae are mostly herbaceous plants; only plants of the genus, *Sarcandra*, are woody herbs. Members of the Chloranthaceae and Piperaceae are usually found in secondary forests at low elevations; and those of Saururaceae grow in either wet places or streamsides at low elevations. Members of the Chloranthaceae are most distinctly different from the other two families by having opposite or whorled leaves. Plants of Piperaceae differ from those of Saururaceae by their unicarpellate gynoecea and by their scattered vascular strands; otherwise, they are very similar morphologically.

II. MATERIAL AND METHODS

The pollen grains were extracted from the dry herbarium specimens which are deposited in the National Taiwan University Herbarium.

The pollen grains of all available taxa were studied from permanent slides prepared by the method outlined by Erdtman (1952). The palynological terminology follows those of Erdtman (1952), and Faegri, Iversen, and Waterbolk (1964). When possible, three different collections in the same taxon were studied. All quantitative data for the pollen descriptions are based on 10 random measurements for each collection. The photomicrographs represent the same magnification (1500× in the original) which were taken with the aid of an Olympus microscope. The morphological description of these pollen grains is the main purpose for this study, but these characteristics have been applied in systematic treatments.

III. OBSERVATIONS

(1) Chloranthaceae 金粟蘭科

The pollen grains of Chloranthaceae are prolate spheroidal to spheroidal; inaper-

(1) Associate Professor, National Taiwan University

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turate or 4-6-colpate; exine scabate, clavate or baculate, 1.5μ thick; sexine conspicuously reticulate, as thick as or a little thicker than nexine, with its stratification of OL-pattern; nexine consisting of rods.

Key to genera

1. Grains 4-6-colpate; exine tectate, with closely fused bacula; sexine with small reticulate, the lumina 4-5(-6)-hedron.....*Chloranthus*
1. Grains inaperturate or monosulcate; exine semitectate, with partially free or loosely fused bacula; sexine with large reticulate, the lumina (4-)6-hedron.....*Sarcandra*

Chloranthus LINN. 金粟蘭屬

Grains prolate spheroidal to spheroidal, with polar axes (P) of (20-)22.5(-25) μ and with equatorial axes (E) of (15-)20(-21.3) μ or the size index as 21 μ ; amb foss-aperturate; aperture 4-6 colpate, the polar area index 0.4-0.5, the ratio between polar axes and colpi 1.5; exine tectate, scabrate 1.5μ thick; sexine reticulate, the lumina tetra- to hexa- hedron, the muri simplibaculate with laterally fused bacula, as thick as or little thicker than nexine, with distinct OLOL-pattern.

Chloranthus oldhami Solms.—Plate 1: A-B 接骨木

The vouchers are Suzuki, T. 6094; Suzuki, S. s. n., February, 1928; and Shimizu & Kao 11622.

Sarcandra Gardr. 木質金粟蘭屬

Grains prolate spheroidal to spheroidal, (20-)25-27.5(-34) μ in diameter; inaperturate, infrequently monosulcate; exine semitectate, scabrate in fused bacula and baculate to clavate in free bacula, 1.5μ thick; sexine per-reticulate to reticulate, the lumina tetra- to hexa- hedron, the muri simplibaculate with free or loosely fused bacula, as thick as or a little thicker than nexine, with OL-pattern.

Sarcandra glabra (Thunb.) Nak.—Plate 1: C-D 四葉蓮

The vouchers are Suzuki 4387, 7059; and Kawahara & Hayama s. n.

This species has been treated as a member of *Chloranthus* by Liu (1961) and Ohwi (1956). However, it is best separated from the genus, *Chloranthus*, at least, on the basis of pollen features.

Plate 1. Palynogram of Chloranthaceae (c. $\times 1820$)

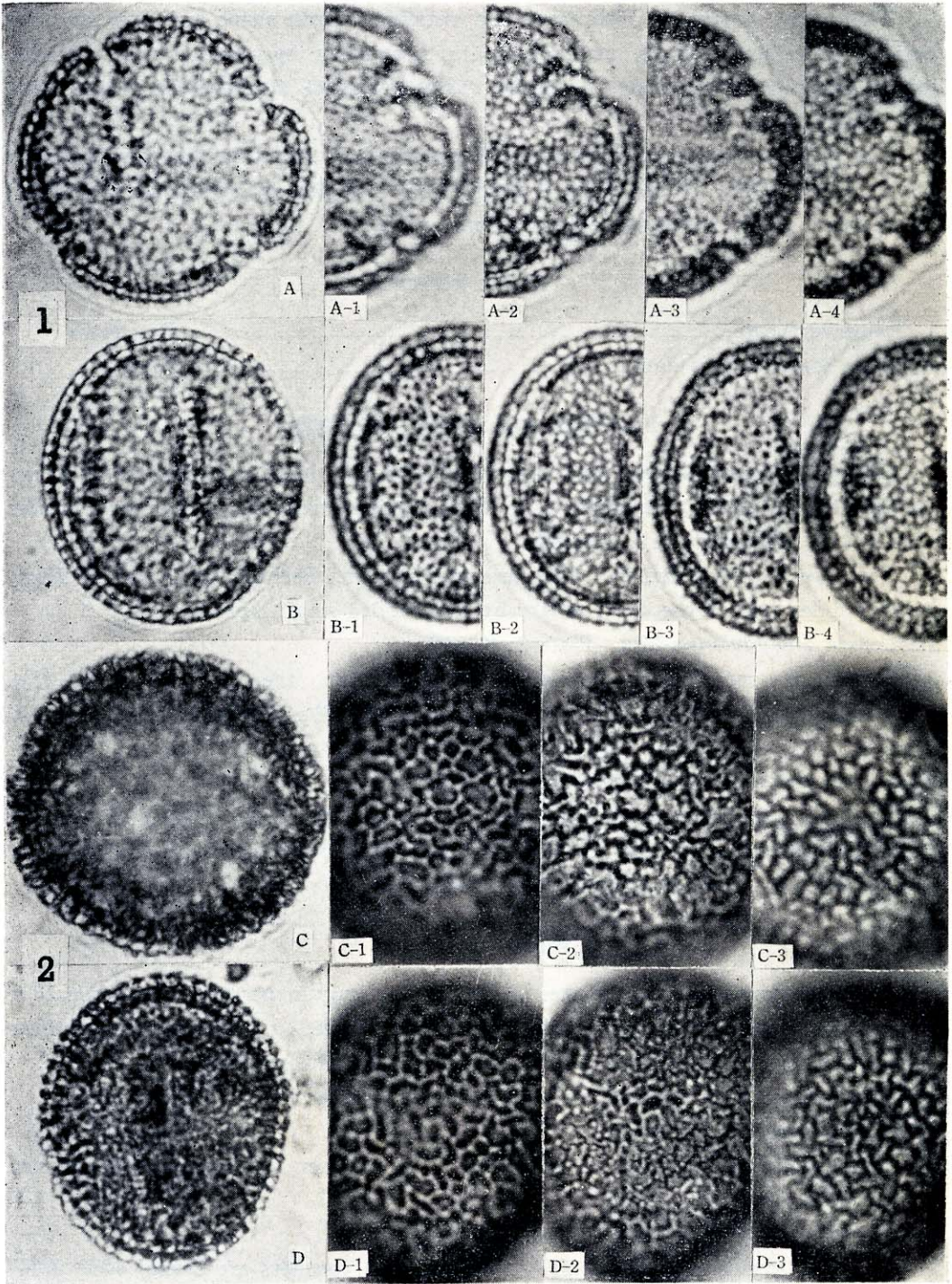
1. (A and B): *Chloranthus oldhami* Solms.
(Suzuki 6094).

2. (C and D): *Sarcandra glabra* (Thunb.) Nak.
(Suzuki 7059)

A and C: polar view

B and D: equatorial view

1-4: from uppermost to lowest focus of sexine, OLOL-pattern in A₁-A₄ and B₁-B₄, and OL-pattern in C₁-C₃ and D₁-D₃.



(2) Piperaceae 胡椒科

The pollen grains of Piperaceae are variable in both shape and size; aperture various, from inaperturate, monosulcate to irregularly aperturate; exine tectate, psilate, scabrate, or verrucate, 1μ thick; sexine granulate, thicker than nexine, with LO-pattern.

The grains of different genera, i. e., *Peperomia* and *Piper*, in this family can be distinguished readily on the basis of their exine. But the distinction among species of the same genus is difficult, otherwise impossible.

Key to genera

1. Exine verrucate.....*Peperomia*
 1. Exine scabrate to psilate.....*Piper*

Peperomia Ruiz & Par. 肉質胡椒屬

Grains variously shaped, the axes (7-)10-13(-15) μ long; inaperturate to monosulcate; exine tectate, verrucate, c. 1μ thick; sexine granulate, about twice thicker than nexine, with distinct LO-pattern.

Two species were studied. They are very similar. Perhaps, grains of *P. dindygulensis* differ from those of *P. reflexa* by its rounded small lumina.

Peperomia dindygulensis Miq.—Plate 2: 3 山椒

Grains are monosulcate, infrequently inaperturate, the axes (7-)11-13(-15) μ long; sexine granulate, the lumina small ellipsoidal. The voucher is *Yamamoto s. n.*, June 1927.

Peperomia reflexa A. Diet.—Plate 2: 4 肉質胡椒

Grains are inaperturate, infrequently monosulcate, the axes 10-12.5(-15) μ long; sexine prominently granulate, the lumina large, tetra- or penta-hedron. The vouchers are *Hayata s. n.*, April 1916; and *Liu & others 0352*.

Piper LINN. 胡椒屬

Grains variously shaped, the axes (4-)9-11(-18) μ long; inaperturate, monosulcate to irregularly aperturate; exine tectate, scabrate to psilate, 1μ thick; sexine granulate or fine granulate, about twice as thick as nexine, with LO-pattern.

Five species were studied, yet the distinction among them is obscure.

Piper hispidum Hay. 密毛胡椒

Axes of grains are (7-)9-11(-13) μ long. The voucher is *Kanehira & Sasaki s. n.*, May 1919.

Piper kadsura (Choisy) Ohwi—Plate 2: 5 荖藤

Axes of grains are (8-)11-15(-18) μ long. The vouchers are *Suzuki 4089, 4097*; and *Chuang 2158*.

Piper kawakamii Hay. 川上氏胡椒

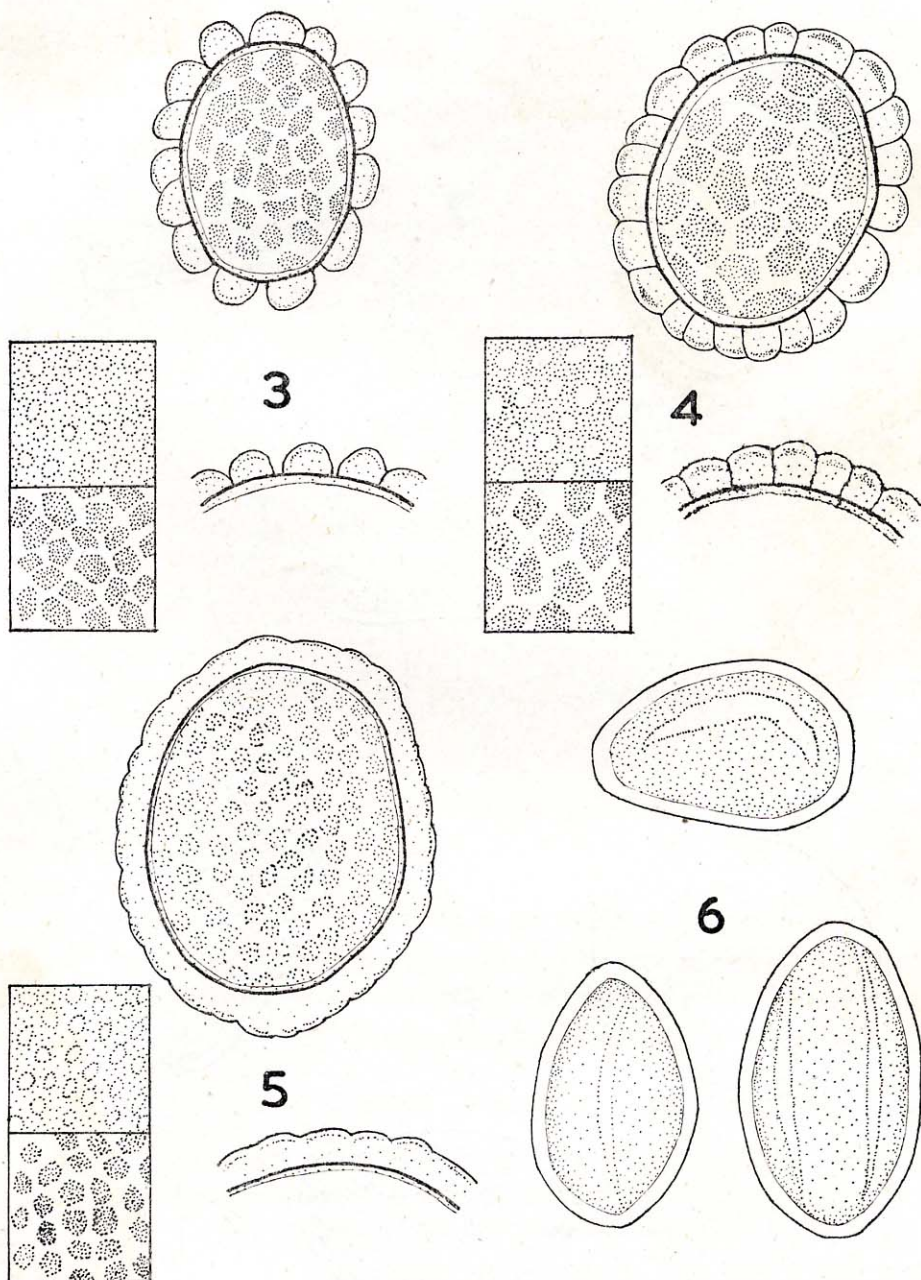


Plate 2. Palynogram of Piperaceae c. $\times 3,000$

3. *Peperomia dindygulensis* Miq. (Yamamoto s. n., June 1927), showing a inaperturate grain, the verrucate exine, the reticulate sexine, and the LO-pattern.
4. *Peperomia reflexa* A. Diet. (Liu & others 0352).
5. *Piper kadsura* (Choisy) Ohwi (Chuang 2158), showing a inaperturate grain, the scabrate exine, the fine reticulate sexine, and the obscure LO-pattern.
6. *Piper subpeltatum* Willd. (Huang 1880), showing three grains of 1(-2) aperturate, the psilate exine, the granular sexine, and the obscure LO-pattern,

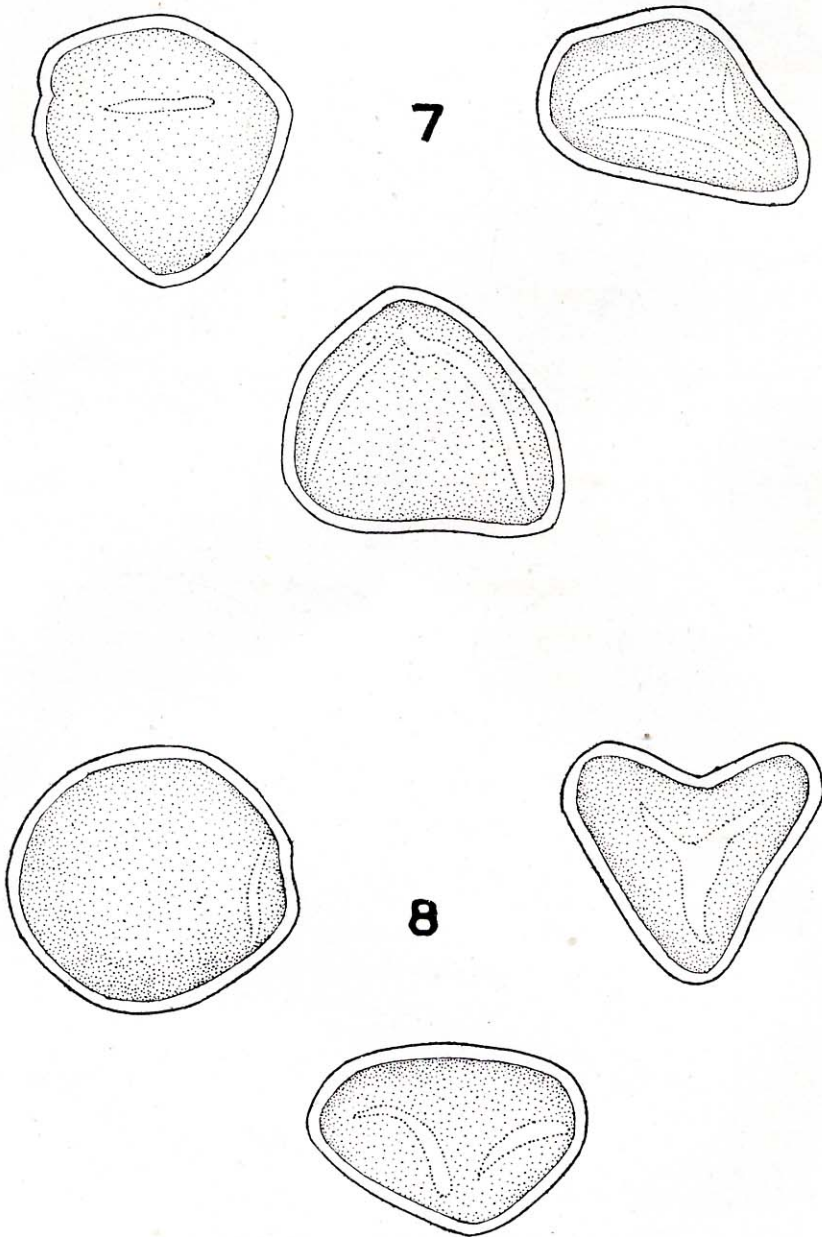


Plate 3. Palynogram of Saururaceae c. $\times 3,000$

7. *Houttuynia cordata* Thunb. (*Shimizu H. 2257*), showing three grains of different views.
 8. *Saururus chinensis* (Lour.) Ball. (*Faurie 8395*), showing three grains of different views including trichotomosulcate aperture.

Axes of grains are (5-)9(-10) μ long. The voucher is *Soma s.n.*, 1910.

Piper sintenense Hatusima 新店胡椒

Axes of grains are from 4 to 17 μ long. The voucher is *Faurie 8391*.

Piper subpeltatum Willd.—Plate 2: 6 盾葉胡椒

Axes of grains are (4-)7-12(-13) μ long. The vouchers are *Kudo & Suzuki 15922*; and *Huang 1880*.

(3) Saururaceae 白草科

The pollen grains of Saururaceae are variable in shape and size; aperture various, from inaperturate, monosulcate, trichotomosulcate to irregularly aperturate; exine psilate, about 1 μ thick; sexine indistinct to fine granulate, twice as thick as nexine, with obscure LO-pattern.

The pollen grains of two genera, i. e., *Houttuynia* and *Saururus*, in this family are very similar, and they can not be separated from each other.

The pollen grains of this family is similar to those of *Piper* in the Piperaceae. The former may be distinguished from the latter by its obscure sexine pattern. Thus these two families can be considered as closely related in this respect.

Houttuynia Thunb. 蕺菜屬

Houttuynia cordata Thunb.—Plate 3: 7 蕺菜

Axes of grains are (7.5-)10-15(-25) μ long. The vouchers are *Shimizu 2257*; *Suzuki 61*; and *Huang 2427*.

Saururus LINN. 三白草屬

Saururus chinensis (Lour.) Ball.—Plate 3: 8 三白草

Axes of grains are (6-)7.5-12.5(-28) μ long. The vouchers are *Faurie 8395*; *Ito s.n.*, May 1942; and *Huang 2327*.

IV. LITERATURE CITED

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