POLLEN MORPHOLOGY OF OCHNACEAE*

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ABSTRACT

Four pollen types are based on 7 genera and 13 species. Pollen grains, small to medium in size, are distinguished by shape, size, aperture and exine characters. Pollen morphology supports the family concept of Ochnaceae based on floral morphology.

INTRODUCTION

According to WILLIS (1973), the family Ochnaceae comprises of 40 genera and 600 species, confined to the tropics, especially abundant in North Eastern part of South America.

The family is distinguished by the stamen distinct and usually 1-3 times the number of petals, the single usually deep-lobed ovary, the gynophore, the generally poricidal anthers and the carpels usually separating into baccate. Cocci in fruit (LAWRENCE, 1951).

MOHL (1934) described the pollen grains of *Ochna atropurpurea* and *Gomphia fimbriata* as "Eiforming, drei Falten, in Wasser Eiforming drei streifen mit Warzen". ERDTMAN (1952) described 10 species from 6 genera. NAIR (1965) reported *Ochna pumila* and *O. squarrosa* during his studies on the pollen grains of Western Himalayan plants. Recently MULLER (1969) studied 24 species distributed over 12 genera mainly from South Eastern Asia and SOWUNMI (1973) described pollen morphology of two Ochnaceous species from Nigeria viz., *Lophira lanceolata* and *Ouratea flava*. In the present note, 15 specimens distributed over 7 genera and 13 species from pan and palaeotropics were studied.

MATERIAL AND METHOD

Polliniferous materials, collected from Central National Herbarium (CAL), were acetolysed (ERDTMAN, *l.c.*) to prepare pollen slides. An average of 10 measurements were made and photomicrographs were enlarged to × 1000. ERDTMAN (*l.c.*) and FAEGRI AND IVERSEN (1964) were followed for pollen morphological terminology. Recent nomenclatural changes have been incorporated after KANIS (1968) on the revision of the Ochnaceae of the Indo-Pacific area. The pollen slides are preserved in the sporotheca of the Botanical Survey of India.

OBSERVATION

Pollen eumonad, isopolar, spheroidal to prolate spheroidal (oblate spheroidal in *Gomphia sumatrana*), 3 colporate (rarely 4 colporate). Apertures equatorial and equidistant. Colpa extends from pole to pole, uniform slit-like or gradually tapering, generally free or parasyncolpate in one case. Os lalongate, ends rounded, distinct or indistinct (very fine slit-like in *Blastemanthus*) or circular. Exine tectate or semitectate; ornamentation obscure,

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Table 1—Pollen morphological characters of species of Ochnaceae

Species and locality	P×E (mean & μm range)	Colpi μm	Ora μm	Exine μm	Sexine	Remarks
1	2	3	4	5	6	7
1. *Ochna atropurpurea* DC. India/Howrah Cult. IBG.	31(35)37×25(29.6)35	23×1	4×8	1	Verrucose	Subprolate, colpi do not extend up to poles, tapering ruporate (at an angle to P axis).
2. *O. integerrima* (Lour.) Merr. India/Assam CNH 77475.	37(38)40×27(29.2)38	32×2	5×10	1.5	Faintly rugulose	Subprolate, colpi extend up to poles, tapering.
3. " India/Bengal CNH 77481.	40(42)44×30(34)37	34×2	4×14	1.5	Obscure	Subprolate-prolate, colpi extend up to poles, tapering, parasyncolpate.
4. " Burma. CNH 77531.	33(36.3)40×28(30.5)33	28.6×1.3	6.5×11.3	1.5	Obscure	Prolate, spheroidal, colpi extend up to poles, tapering.
5. *O. obtusata* DC. var. *obtusata* India/Bombay Fernandes, J. 2124	33(36.4)40×29(30)32	30×1	5.4×10.5	1.5	Obscure	Subprolate.
6. —var. *pumila* (Buch. Ham. ex DC.) Kanis, Sikkim Himlaya CNH 77565.	37(39)44×29(31)34	28×1	5.3×11.6	1.6	Obscure	Subprolate.
7. *Brackenridgea zanguebarica* Oliv. Australia CNH 77750.	24(24)25×19(20.6)21	22×1	3×8	1	Fine reticulate	Prolate, spheroidal, colpi extend up to poles, slit-like.
8. *Gomphia angustifolia* Vahl. India CNH 77640	21(23)25×17(20.2)24	23×1	4×3	1.5	Distinct reticulate	Prolate, spheroidal, colpi extend up to poles, slit-like.
9. *G. sumatrana* Jack. Malay CNH 77656	17(19)20×20(21.8)24	16×1	2×3.5	1.5	Rugulo-reticulate	Suboblate, colpi extend up to poles, margocolpate, mesocolpium undulate in polar view.
10. *Ouratea nana* Engl. Brazil CNH 77769	19(22.58)24×20(20.6)21	14×1	3×5	1	Fine reticulate	Prolate, spheroidal, colpi do not extend up to poles, slit-like.

11. *O. serrata* Engl. Brazil CNH 77775	24(24.6)25 × 20(22)24	16.6 × 1	3	1.5	Distinct reticulate	Prolate, spheroidal, colpi do not extend up to poles, slit-like.
12. *Euthemis leucocarpa* Jack. Singapore CNH 77786	23(24)25 × 21(23)25	22 × 1	3 × 4	1	Rugulate	Prolate, spheroidal, colpi extend up to poles, slit-like.
13. *Blastemanthus gemniflorus* Planch. S. America CNH 77809.	20(21.8)23 × 18(19)22	14 × 1	1 × 5	1	Obscure	Prolate, spheroidal, colpi do not extend up to poles. Ora slit-like.
14. *Cespedesia excelsa* Rusby Bolivia CNH 77812	17(18)20 × 17(18.4)20	13 × 1	2 × 5	1	Obscure	Spheroidal, colpi slit-like.
15. *C. spathulata* Planch. S. America CNH 77813	17(20.5)22 × 16(16.7)19	18 × 1	2 × 4	1	Obscure	Spheroidal, colpi tapering.

reticulate and rugulose. Sexine thicker than nexine. Columella distinct or very fine and compact supporting a tectum of same or more thickness. Polar view subangular (Table 1).

DISCUSSION

It is apparent from the observation that pollen morphologically two distinct groups exist—(1) Ora lalongate and exine ornamentation obscure or with very fine LO (e.g., *Ochna*, *Brackenridgea*, *Blastemanthus* and *Cespedesia*) and (2) Ora more or less circular and exine ornamented (e.g., *Ouratea*, *Gomphia* and *Euthemis*).

The following pollen types are distinguished on the basis of present observations :

1. *Ochna type*, e.g. **Ochna**

The *Ochna* species are homogeneous palynologically. The three different populations of *O. integerrima* from Assam, Bengal and Burma show that the size of pollen grain and Os is largest in Bengal population followed by more closer Assam and Burma. In the Burma material the occasional presence of parasyncolpate type of pollen grains along with free colporate type is noted. The two varieties of *O. obtusata*, var. *obtusata* and var. *pumila* are very similar except that latter is slightly larger in the range of polar axis size. All these species are palaeotropical in distribution. The only neotropic species studied *O. atropurpurea* (cultivated in Botanic Garden, Howrah) is very different from the other species. In this species the pollen grains are mostly 4 colporate and sometimes 3 colporate. Four colporate grains are euporate (*sensu* Erdtman, *l.c.*). Exine is tectate with verrucate or wart-like ornamentation. In its pollen characters it shows a close resemblance to the taxon of the family Meliaceae.

2. *Brackenridgea type*, e.g. **Brackenridgea**

The only representative of this type is *Brackenridgea zanguebarica*, an Australian species. This is an intermediate type between *Ochna* and *Ouratea*. In the range of pollen grain size it resembles *Ouratea* and in the exine characters its affinity with *Ochna* is clear.

3. *Ouratea type*, e.g. **Ouratea, Gomphia** and **Euthemis**

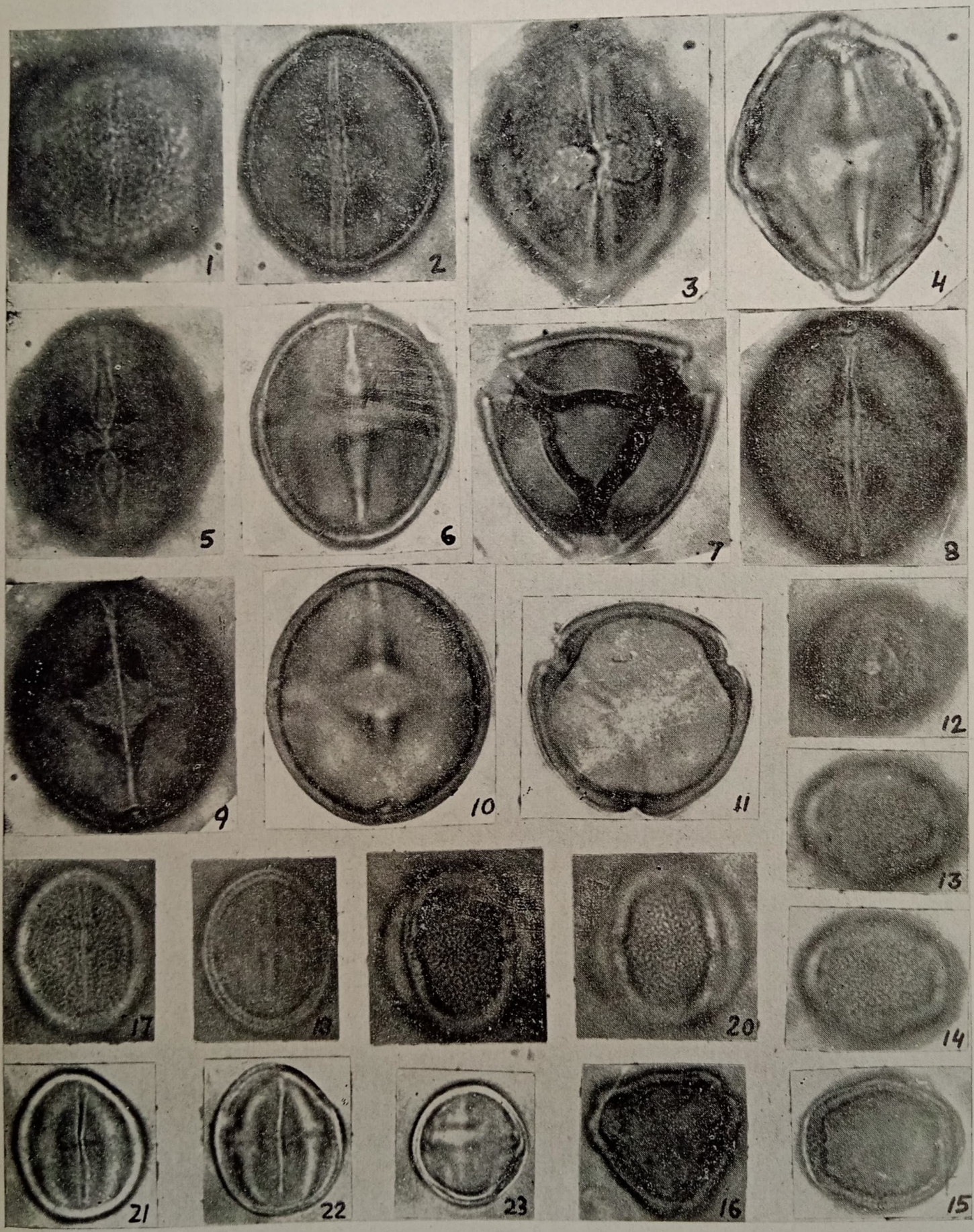
This pollen type is characterised by small-sized pollen grains with more or less circular Os and ornamented exine. *Ouratea* differs from *Gomphia* in colpi length. The two species of *Gomphia* are distinct. *G. angustifolia* is with distinct reticulate and *G. sumatrana* with rugulo-reticulate exine ornamentation. Moreover, in the latter species the ornamentation is very faint around the aperture to form a distinct zone (margo-colpate *sensu* Erdtman, *l.c.*) and the mesocolpium is undulate in optical section. *Euthemis leucocarpa* with rugulose exine ornamemtation differs from others.

4. *Cespedesia type*, e.g. **Blastemanthus** and **Cespedesia**

This type includes the pollen grains of the smallest size in the family. Both genera are neotropical in distribution. *Blastemanthus* differs from *Cespedesia* in having very narrow slit-like Os.

Taxonomy in relation to Palynology

Kanis (*l.c.*) on his recent revision of the family Ochnaceae divided the family into two sub-families viz., Ochnoideae and Sauvagesioideae, on the absence and presence of albumen respectively. The sub-family Ochnoideae comprises of the tribes (1) Ochneae with two sub-tribes (a) Ochninae with two genera *Ochna* and *Brackenridgea* and (b) Ouratinae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with the genera *Ouratea* and *Gomphia* in the Indo-Pacific area and (2) Elvasieae with *Elvasia*. The sub-family Sauvagesioideae includes three tribes—Euthemideae, Sauvagesidae and Lophireae. The tribe Sauvagesidae consists of two sub-tribes—Sauvagesiineae in the Pantropics and Luxumburgiineae in the neotropics.

From the synthesis of the palynolcgical information on the family Ochnaceae by MULLER (*l.c.*) and the present workers, it is found that palynological data substantiates the morphological classification (KANIS, *l.c.*) based on floral characters with little alteration as follows :

—The tribe Elvasieae under the sub-family Ochnoideae is more closer to the tribes Sauvagesieae and Lophireae under the sub-family Sauvagesioideae. According to MULLER *Elvasia* represents fairly isolated pollen type in the family. Floral morphologically carpels fused into a single ovary in the tribe Elvasieae suggest an affinity with the sub-familya Suvagesioideae.

—Pollen morphologically the tribe Euthemideae under the sub-family Sauvagesioideae is very close to the tribe Ouratinae under the sub-family Ochnoideae. Probably it represents a transitional type between the two sub-families. Carpels with one ovule in Ochnoideae, many-ovuled in Sauvageioideae and with two ovules in Euthemideae further indicate its intermediate character.

—Ochnaceae is a debated family regarding its position, interrelationships and relationships with other families. It will require a detailed study in the remaining taxa to arrive at a reasonable solution.

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EXPLANATION OF PLATE I

Plate 1 (Fig. 1-23)—Magnification ×1000

Fig. 1. *Ochna atropurpurea* ; Fig. 2. *O. integerrima,* Loc. Assam ; Fig. 3-4. *O. integerrima,* Loc. Bengal ; Fig. 5-7. *O. integerrima,* Loc. Burma ; Fig. 8-11. *O. obtusata* var. *obtusata* ; Fig. 12-16. *Gomphia sumatrana* ; Fig. 17-20. *Ouratea semiserrata* ; Fig. 21-22. *Blastemanthus geminiflorus* ; Fig. 23. *Cespedesia excelsa.*