

POLLEN FLORA OF PAKISTAN-LXIII. MORINGACEAE

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Abstract

Pollen morphology of 2 species of the family Moringaceae from Pakistan has been examined by light and scanning electron microscope. Pollen grains are usually radially symmetrical, isopolar, colpate, sub-prolate to oblate-spheroidal. Sexine slightly thinner than nexine or as thick as nexine. Tectum sub-psilate, sparsely punctate. On the basis of polar length two distinct pollen types viz., *Moringa concanensis*-type and *Moringa oleifera*-type are recognized.

Introduction

The family Moringaceae is a monotypic family of about 10 species, native of old world tropics (Mabberley, 1987). Trees was deciduous, alternate, petiolate, compound, stipulate or exstipulate. Flowers bisexual, somewhat irregular; zygomorphic. Androecium (7–)10, gynoecium 3 carpelled, pistil 1 celled, styles 1 (recurved). Placentation parietal. Fruit elongated capsule. *Moringa oleifera* (horseradish tree) has edible fruits.

Pollen morphology of the family has been examined by Erdtman (1952), Mitra (1978), Mitra & Mitra (1979), Moore & Webb (1978), Bonnefille & Riollet (1980), Verdcourt (1985) and Moore *et al.*, (1991). The most comprehensive survey on pollen morphology of Moringaceae is that of Ferguson (1985). There are no reports on pollen morphology of the family Moringaceae from Pakistan. Present investigations are based on the pollen morphology of 2 species of the family Moringaceae by light and scanning electron microscope.

Materials and Methods

Polleniferous material was obtained from Karachi University Herbarium (KUH) or collected from the field. The list of voucher specimens is deposited in KUH. The pollen grains were prepared for light (LM) by the standard methods described by Erdtman (1952) and scanning microscopy (SEM). For light microscopy, the pollen grains were mounted in unstained glycerin jelly and observations were made with a Nikon Type-2 microscope, under (E40, 0.65) and oil immersion (E100, 1.25), using 10x eye piece. For SEM studies, pollen grains were suspended in a drop of water and directly transferred with a fine pipette to a metallic stub using double sided cello tape and coated with gold in a sputtering chamber (Ion-sputter JFC-1100). Coating was restricted to 150 Å. The S.E.M examination was carried out on a Jeol microscope JSM-6380 A. The measurements are based on 15-20 readings from each specimen. Polar axis (P) and equatorial diameter (E), aperture size, apocolpium, mesocolpium and exine thickness were measured.

The terminology used is in accordance with Erdtman (1952), Kremp (1965), Faegri & Iversen (1964) and Walker & Doyle (1975).

General pollen characters of the family Moringaceae

Pollen grains are usually radially symmetrical, isopolar, tricolporate, sub-prolate. Sexine thinner than nexine. Tectum sub-psilate, sparsely punctate. On the basis of polar length two distinct pollen types are recognized viz ., *Moringa concanensis*- type and *Moringa oleifera*-type.

Key to the pollen types

- 1. + Polar length 30-37 μm *Moringa concanensis*-type
- Polar length 23-28 μm *Moringa oleifera*-type

Pollen type: *Moringa concanensis* type

Pollen class: Tricolporate

P/E ratio: 1.21.

Shape: Sub-prolate

Apertures: Colpus long sunken with acute ends.

Exine: Sexine thinner than nexine.

Ornamentation: Sub-psilate, sparsely punctate.

Measurements: Size: Polar axis $P = 30.00 (35.27 \pm 1.2) 37.0$, and equatorial diameter $E = 25 (28.91 \pm 2.1) 35.0 \mu\text{m}$. Colpi $30.61 (29.31 \pm 1.4) - 32.5 \mu\text{m}$ long. Mesocolpium $14.7(15.12)16.8 \mu\text{m}$. Apocolpium $10.5 (11.76) 13.65 \mu\text{m}$. Exine $1.7-4.0 \mu\text{m}$ thick, sexine thinner than nexine. Tectum sub-psilate-punctate.

Species included: *Moringa concanensis* Nimmo

Pollen type: *Moringa oleifera*-type (Fig. 1 A & B).

Pollen class: Tricolporate

P/E ratio: 101.

Shape: Oblate-spheroidal

Apertures: Colpus long sunken with acute ends.

Exine: Sexine thinner than nexine.

Ornamentation: Sub-psilate.

Measurements: Size: Polar axis $P 23.1(23.73)27.3 \mu\text{m}$ and equatorial diameter $E 22.05 (23.52)27.3 \mu\text{m}$. Oblate-spheroidal, tricolporate, trilobed, colpi length $21(21.63) 25.2 \mu\text{m}$ and breadth $12.6(13.00) 14.7 \mu\text{m}$. Mesocolpium $12.7(114.10) 15.7 \mu\text{m}$. Apocolpium $9.0 (12.76) 12.64 \mu\text{m}$. Exine $2.7(2.226) 3.024 \mu\text{m}$, ora slightly lalongate. Tectum sub-psilate.

Species included: *Moringa oleifera* Lam.

Discussion

Moringaceae is a more or less stenopalynous family. However it shows considerable variation in their polar length of pollen. Present investigations are based on 2 species i.e., *Moringa concanensis* Nimmo and *M. oleifera* Lam. On the basis of polar length two distinct pollen types are recognized viz., *Moringa concanensis*-type and *Moringa oleifera*-type (See key to the species). Pollen of Moringaceae are generally considered to be similar to that of Resedaceae and Capparaceae. Cronquist (1968) and Dahlgren (1989) placed these families under the order Capparales. However, as far as pollen are concerned the only resemblance in these families is the prescence of tricolporate pollen grains (Perveen & Qaiser, 2001a,b).

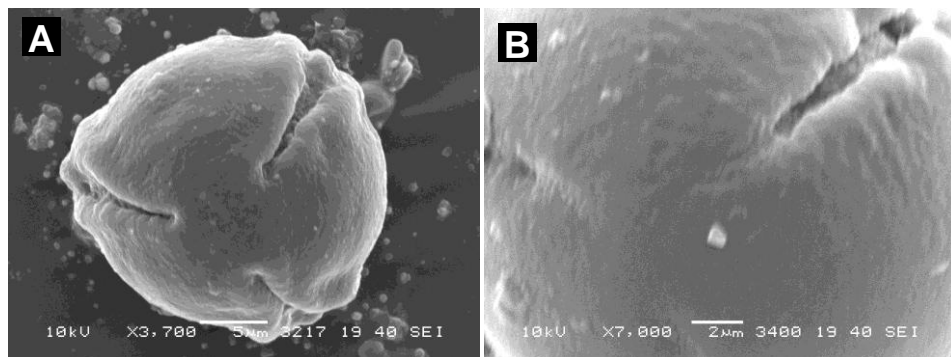


Fig. 1. Scanning Electron micrographs of pollen grains. *Moringa oleifera*: A, Polar view, B, , Exine pattern. Scale bar = 10 μ m.

The ornamentation of Capparaceae and Resedaceae are markedly different from that of Moringaceae. Mitra (1978), Mitra & Mitra (1979), Ferguson (1985) clearly demonstrated the differences in the exine ornamentation of all three families. The exine in Resedaceae and Capparaceae is reticulate and columellate, whereas in Moringaceae is sub-psilate (Ferguson, 1978).

Reference

- Bonnefille, R. and G. Rioulet. 1980. Pollens des Savanes d'Afrique Orientale. CNRS: Paris.
- Cronquist, A. 1968. *The evolution and classification of flowering plants*. Houghton Mifflin. Boston.
- Dahlgren, G. 1989. The last Dahlgrenogram. In: *System of classification of dicotyledons*. (Ed.): Kit.-Tan. The Davis and Hedge Festschrift. Edinburgh Univ., Press.
- Erdtman, G. 1952. *Pollen Morphology and Plant Taxonomy. Angiosperms*. Almqvist & Wiskell: Stockholm.
- Fægri, K. and J. Iversen. 1975. *Textbook of Pollen Analysis*. Blackwell: Oxford.
- Ferguson, I.K. 1985. Pollen morphology of the Moringaceae. *Kew Bulletin*. 40: 25-34.
- Kremp, G.O.W. 1965. *Encyclopaedia of Pollen Morphology*, Univ. Arizona Press, Tuscon, U.S.A.
- Mitra, K. 1978. Contribution to the pollen morphology of the family Capparaceae. *Bull. Bot. Surv. India*, 17: 7-31.
- Mitra, K. and S.N. Mitra. 1979. Pollen morphology in relation to taxonomy and plant geography of Resedaceae. *Bull. Bot. Surv. India*, 18: 194-202.
- Mabberley, D.I. 1987. *The Plant Book*. Camb. Univ. Press, Cambridge, New York.
- Moore, P.D. and J.A. Webb 1978. *An Illustrated Guide to Pollen Analysis*. Hodder and Stoughton, London.
- Moore, P.D. and J.A. Webb and M.E. Collinson. 1991. *Pollen analysis*. Blackwell scientific Publication.
- Perveen, A. and M. Qaiser. 2001. Pollen Flora of Pakistan-XXVIII. Resedaceae. *Turk. J. Bot.*, 25: 39-42.
- Perveen, A. and M. Qaiser. 2001. Pollen Flora of Pakistan-XXXI. Capparidaceae. *Turk., J. Bot.*, 25: 389-395.
- Qaiser, M. 1973. Moringaceae. In: *Flora of Pakistan*. (Eds.): E. Nasir, E. & S.I. Ali. 38: 1-14.
- Verdcourt, B. 1985. A synopsis of the Moringaceae. *Kew Bull.*, 40: 1-23.
- Walker, J.W. and J.A. Doyle. 1975. The bases of angiosperm phylogeny: palynology. *Ann. Missouri Bot. Gard.*, 62: 664-723.

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