

POLLEN FLORA OF PAKISTAN–LIX. LINACEAE

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Abstract

Pollen morphology of 6 species representing 2 genera of the family Linaceae from Pakistan has been examined by light and scanning electron microscope. Pollen grains usually radially symmetrical, isopolar, tricolpate or non-aperturate. Mostly oblate-spheroidal rarely spheroidal, sexine thicker than nexine. Tectum baculate. On the basis of apertural types 2 distinct pollen types viz., *Linum perenne* – type and *Reinwardtia trigyna* –type are recognized.

Introduction

Linaceae is a small family of about 6 genera and 220 species, distributed in tropical and subtropical regions also extending to north and south temperate regions (Mebberley, 1987). Represented in Pakistan by 2 genera and 5 species (Abdullah, 1972). Plant mostly herb and shrub rarely trees. Leaves alternate, simple, entire, stipules present or absent, sometimes gland like. Flowers small, bisexual, actinomorphic, sepals (4-) 5, free or partly united. Petals (4-)5 free or clawed. Androecium 5, 10 or more, gynoecium compound pistil of 2 to 5 carpels with 2 loculed. Fruit a capsule or rarely drupe. The important species of this family is *Linum usitatissimum* also called flax. It is one of the oldest continuously cultivated plants in history. There are nearly 100 other flax species including mountain (or purging) flax (*L. cartharticum*), prairie flax (*L. lewissii* Pursh.) and perennial flax (*L. perenne*). From prehistoric times to the present, flax has been a source of food, fiber (linen) and oil. In ancient and modern times, one of its main uses has been for weaving linen from its stalk's fibers. Its seed also known as linseed is quite nutritious and is used in cereal and bakery products.

Pollen morphology of the family Linaceae has been examined by Erdtman (1952), Saad (1962), Nair & Sharma (1975), Kuprianova & Alyoshina (1978), Rogers (1980) and Moore *et al.*, (1991). Punt & de Breejen (2003) studied pollen morphology of the family Linaceae for Northwest pollen flora. There are no reports on pollen morphology of the family Linaceae from Pakistan. Present investigations are based on the pollen morphology of 3 species representing 2 genera of the family Linaceae by light and scanning electron microscope.

Materials and Methods

Pollen samples were 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 suspended in a drop of water were 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-2. The measurements are based on 15-20 readings from each specimen. Pollen polar axis (P) and equatorial diameter (E), aperture size and exine thickness were measured.

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

Pollen characters of the family Linaceae

Pollen grains usually radially symmetrical, isopolar rarely apolar. Mostly oblate - spheroidal. Tricolpate rarely non-aperturate, sexine thicker than nexine. Tectal surface baculate. On the basis of apertural type two distinct pollen types are recognized viz., *Linum perenne* -type and *Reinwardtia trigyna* -type.

Key to the pollen types

- 1 + Pollen grains tricolpate..... *Linum perenne*-type
- Pollen grains non-aperturate *Reinwardtia trigyna*-type

Pollen type: *Linum perenne* -type (Fig.1 A & B)

P/E ratio: 0.99

Shape: Oblate-spheroidal

Apertures: Ectocolpus long narrow with acute ends.

Exine: Sexine thicker than nexine.

Ornamentation: Baculate

Measurements: Size: Length = (47.5-) 51.00 ± 0.89 (-55.75) μm and breadth (50.31) 27.5 ± 0.48 (57.60) μm , colpi (32. 69-) 34.50 ± 0.42 (-37.31) μm long. Mesocolpium (30. 5 -) $24. 21 \pm 0. 27$ (-50. 9) μm . Apocolpium (6. 5 -) 7.2 ± 0.42 (7.95) μm . Exine 3.2.5-5.21 μm thick, sexine thicker than nexine. Tectum baculate.

Species included: *Linum perenne* L., and *Linum corymbulosum* Reichenb.

Key to the species

- 1 + Polar area index 0.82 *Linum perenne*
- Polar area index 0.66 *Linum corymbulosum*

Pollen type: *Reinwardtia trigyna*-type (Fig.1 C & D).

Pollen class: Non-aperturate

P/E ratio: 1.00

Shape: Spheroidal

Apertures: Ectocolpus long narrow with acute ends.

Exine: Sexine thicker than nexine.

Ornamentation: Baculate

Measurements: Size: Length = (60-) $70.1.51 \pm 1.24$ (-80.5) μm and breadth (60.15) 70.5 ± 0.90 (82.5). Exine 5 (5.16) $5.5 \mu\text{m}$ thick, sexine thicker than nexine. Tectum baculate.

Species included: *Reinwardtia trigyna* (Roxb.) Planch.

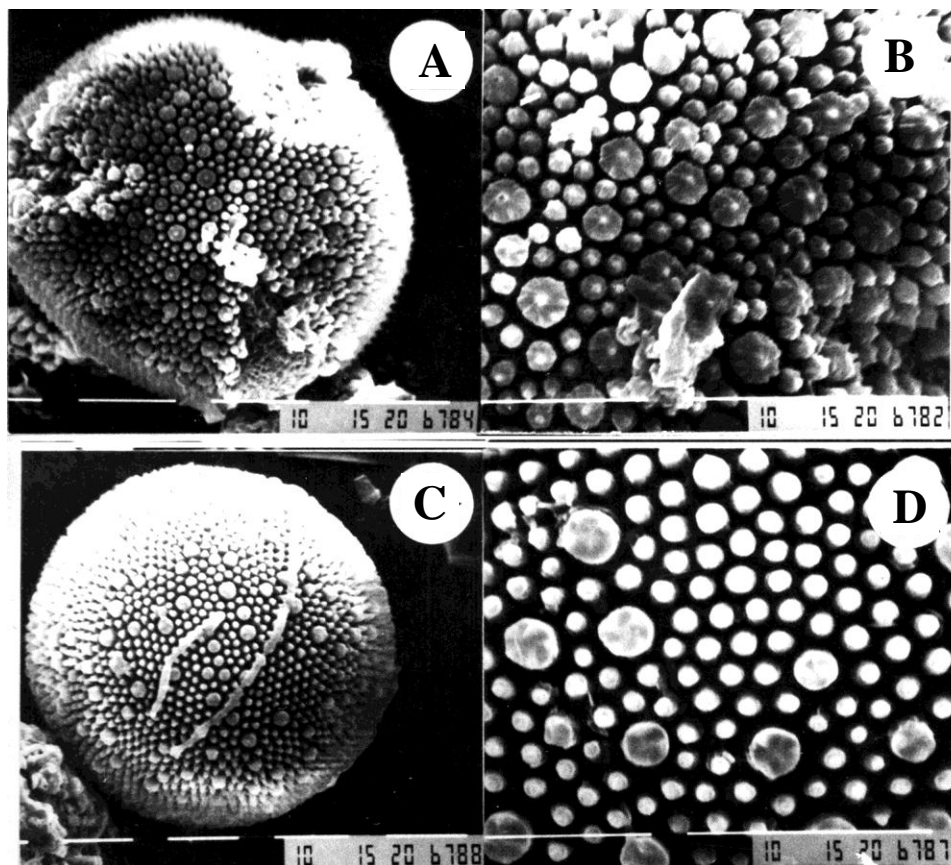


Fig. 1. Scanning Electron micrographs of pollen grains. *Linum perenne*: A, Polar view, B, Exine pattern. *Reinwardtia trigyna*: C, Pollen grain, D, Exine pattern.

Scale bar- A-D = 10 μ m

Discussion

Linaceae is an eurypalynous family. Pollen data is based on pollen morphology of 3 species representing 2 genera i.e., *Linum* and *Reinwardtia*. These two genera can easily be differentiated by their aperture types and pollen grains shape. In the genus *Linum* tricolpate, oblate-spheroidal pollen, while in the genus *Reinwardtia* spheroidal, non-aperturate pollen are found. However, tectum of both the genera is bacculate. Erdtman (1952) also reported non-aperturate pollen grains in the genus *Reinwardtia* and colpate, porate and colporate in the other genera of the family Linaceae. However, Yunus & Nair (1986) reported pantoporate pollen in the genus *Reinwardtia*. Takhtajan (1969) placed the family Linaceae under the order Geraniales, whereas Cronquist (1968), Dahlgren (1989) kept the family in the separate order Linales with Oxalidaceae. Present data supports Cronquist (1968) and Dahlgren (1989) treatment because in the family Linaceae colpate and non-aperturate pollen grains are found whereas in the family Geraniaceae and Zygophyllaceae (Perveen & Qasier, 1999, 2006) tricolpate grains are common.

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