

## POLLEN FLORA OF PAKISTAN–XLIII. LYTHRACEAE

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### Abstract

Pollen morphology of 7 species representing 5 genera of the family Lythraceae from Pakistan have been examined by light and scanning electron microscope. Lythraceae is an eurypalynous family. Pollen grains are generally free, radially symmetrical, isopolar, colpate or heterocolpate. Shape of pollen grains are sub-prolate or prolate often oblate-spheroidal. Sexine thicker or as thick as nexine. Tectum reticulate rugulate or scabrate to sub-pilate.

The pollen morphology of the family Lythraceae is significantly helpful at generic and specific level. On the basis of apertural types 2 distinct pollen types viz., *Lagerstroemia indica* - type and *Ammannia baccifera*- type are recognized.

### Introduction

The Lythraceae are mostly tropical herbs or occasionally shrubs or trees comprising about 24 genera and 500 species (Mabberley, 1987). In Pakistan it is represented by 7 genera and 13 species (Dar, 1975). In the family Lythraceae, the leaves are simple, usually opposite or whorled; stipules are minute or absent. The flowers are strongly perigynous, actinomorphic or sometimes zygomorphic, commonly 4-, 6-, or 8-merous. The petals are distinct and usually crumpled. The stamens commonly are twice the number of petals, and are usually in two whorls, one with the filaments longer than the other. The fruit is commonly capsular. Erdtman (1952) examined pollen morphology of the family Lythraceae. Panigrahi (1976) studied the palynology of some herbaceous genera of the family Lythraceae. The exine structure and function of few genera (*Crenea*, *Lagerstroemia*, *Lafoensia* and *Diplusodon*) of Lythraceae and Sonneratiaceae has been examined by Muller (1981). Nowicke *et al.*, (1985) examined palynology of family Lythraceae in relation to taxonomy. Pollen morphology of family Lythraceae has also been examined by Graham & Graham (1971), Roa & Shukla (1975), Moore & Webb (1978). There are no reports on the pollen morphology of the family Lythraceae from Pakistan. Present study is based on pollen morphology of 8 species of the family Lythraceae 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 are deposited in KUH The pollen grains were prepared for light (LM) and scanning microscopy (SEM) by the standard methods described by Erdtman (1952). 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 was directly transferred with a fine pipette to a metallic stub using double sided cello tape and coated with gold in a

sputtering chamber (Ionsputter JFC-1100). Coating was restricted to 150A. The S.E.M examination was carried out on a Jeol microscope JSM-T200. The measurements are based on 15-20 readings from each specimen. Polar length, equatorial diameter, colpus length and exine thickness are given in Table 1-2.

The terminology used is in accordance with Erdtman (1952); Faegri & Iversen (1964); Kremp (1965) and Walker & Doyle (1976).

## Observations

### General pollen characters of the family Lythraceae

Pollen grains usually radially symmetrical, isopolar, colporate or heterocolpate. Shape of pollen grains are sub-prolate or prolate often oblate-spheroidal. Sexine thicker or as thick as nexine. Tectum reticulate-rugulate or scabrate to sub-psilate.

### Key to the pollen types

- 1 + Pollen grains tricolporate ..... *Lagerstroemia indica*-type
- Tectum grains heterocolpate ..... *Ammannia baccifera*-type

***Lagerstroemia indica*** – type (Fig 1. E-F).

**Pollen class:** Tricolporate.

**P/E ratio:** semi- erect.

**Shape:** Prolate.

**Aperture:** Long elliptic, acute ends.

**Exine:** Sexine thicker than nexine.

**Ornamentation:** Tectum rugulate to foveolate or densely rugulate.

**Outline:** More or less circular.

**Measurements:** Polar axis (P) 15 (30.7±1.0) 45.5 µm long, equatorial diameter (E)10 (22.5±1.25) 35 µm, colpi 12 (22.7±0.31) 32.5 µm long. Sexine thicker than nexine. Exine 3- (4.0) 5 µm thick.

**Species included:** *Lagerstroemia indica* L. *Woodfordia fruticosa* (L.) S. Kurz.

### Key to the species

- 1 + Tectum densely rugulate. polar length of pollen grains 15-25 µm .....  
..... *Woodfordia fruticosa*
- Tectum rugulate-foveolate, polar length of pollen grains c.37-45 µm .....  
..... *Lagerstroemia indica*

***Ammannia baccifera***– type (Fig. 1A-D).

**Pollen class:** Heterocolpate.

**P/E ratio:** Erect to smi-erect, often sub-transverse.

**Shape:** Sub-prolate to prolate or oblate-spheroidal.

**Aperture:** Small to long elliptic, acute ends.

**Exine:** Sexine thicker than nexine or as thick as nexine.

**Ornamentation:** Tectum rugulate–striate or rugulate-fossulate rarely scabrate or subsilate.

**Table 1. Pollen characters of the species included in pollen type - *Ammannia baccifera*.**

Name of taxa	Shape	Polar axis (P) $\mu\text{m}$	Equatorial diameter (E) $\mu\text{m}$	Colpus length (L) $\mu\text{m}$	Exine thickness $\mu\text{m}$	Tectum
<i>Lawsonia inermis</i> L.	Prolate	20.0 (22.13 $\pm$ 0.58) 22.50	12.5 (16.16 $\pm$ 0.10) 17.50	12.5 (16.16 $\pm$ 0.06) 17.50	2.25 (2.43 $\pm$ 0.10) 2.50	Scabrate
<i>Lythrum salicaria</i> L.	Oblate-Spheroidal	20.0 (21.15 $\pm$ 0.61) 25.00	22.5 (24.0 $\pm$ 0.50) 25.00	12.5 (15.66 $\pm$ 0.45) 17.50	2.25 (2.45 $\pm$ 0.04) 2.50	Rugulate-Striate
<i>Ammannia auriculata</i> Willd	Sub-Prolate	15.0 (17.15 $\pm$ 0.04) 17.50	12.5 (14.4 $\pm$ 0.06) 15.00	7.5 (10.7 $\pm$ 0.12) 13.75	2.50 (2.48 $\pm$ 0.10) 2.50	Rugulate-Striate
<i>A. baccifera</i> L.	Sub-Prolate	12.6 (13.9 $\pm$ 0.18) 14.70	7.8 (10.6 $\pm$ 0.12) 11.2	8.4 (11.04 $\pm$ 0.14) 11.20	0.7 (0.84 $\pm$ 0.09) 1.12	Sub-Psilate
<i>A. verticillata</i> (Ard.) Lam.	Prolate	12.5 (15.03 $\pm$ 0.26) 16.75	10.0 (12.7 $\pm$ 0.55) 14.75	10.0 (12.75 $\pm$ 0.55) 14.70	2.25 (5.10 $\pm$ 1.35) 2.5	Densely rugulate-fossulate

**Table 2. Pollen characters of the species included in pollen type - *Lagerstroemia indica*.**

Name of taxa	Shape	Polar axis in (P) $\mu\text{m}$	Equatorial diameter (E) $\mu\text{m}$	Colpus length (L) $\mu\text{m}$	Exine thickness in $\mu\text{m}$	Tectum
<i>Lagerstroemia indica</i> L.	Prolate	37.5 (40.1 $\pm$ 0.5) 45.00	25.0 (29.28 $\pm$ 0.44) 35.00	22.5 (29.68 $\pm$ 0.26) 32.50	3.75 (4.58 $\pm$ 0.04) 5.00	Rugulate-reticulate
<i>Woodfordia fruticosa</i> (L.) S. Kutz	Prolate	15.0 (19.05 $\pm$ 0.45) 22.50	10.0 (14.32 $\pm$ 1.01) 15.00	12.5 (15.25 $\pm$ 0.37) 17.50	-	Densely rugulate



Fig. 1 Scanning micrographs: *Ammania baccifera*: A, Polar view. B, Exine pattern. *A. verticillata*: C, Equatorial view, D, Exine pattern, *Lythrum salicaria*: E, Polar view, *Woodfordia fruticosa*: F, Pollen grains. Scale bar = A, C, E & F = 10; B & D = 1  $\mu$ m.

**Outline:** More or less circular.

**Measurements:** Polar axis (P) 12.5 (18.7±1.1) 25 µm long, equatorial diameter (E)7.8 (16.8±2.5) 25 µm, colpi 8.0 (12.5±0.4) 17.5 µm long. Sexine thicker than nexine or as thick as nexine. Exine 0.7 - (1.6) 2.5 µm thick.

**Species included:** *Ammannia baccifera* L., *A. auriculate* Willd., *A. verticillata* (Ard.) Lam., *Lawsonia inermis* L., *Lythrum salicaria* L.

#### Key to the species

- 1 + Tectum subsilate to scabrate ..... 2
  - Tectum not as above ..... 3
- 2 + Tectum rugulate-striate ..... 4
  - Tectum rugulate-fossulate ..... *Ammannia verticillata*
- 3 + Pollen oblate-spheroidal ..... *Lythrum salicaria*
  - Pollen sub-prolate ..... *Ammannia auriculata*
- 4 + Tectum sub-psilate, prolate sub-prolate ..... *Ammannia baccifera*
  - Tectum scabrate, prolate ..... *Lawsonia inermis*

#### Discussion

Lythraceae is an europalynous family (Erdtman, 1952). Pollen data is based on 5 genera 7 species. Pollen grains generally isopolar tricolporate or heterocolpate with reticulate-rugulate or rugulate-striate often scabrate or subsilate tectum. However, the most striking variation is found in the exine ornamentation and apertural types. On the basis of apertural types two 2 distinct pollen types viz., *Lagerstroemia indica* - type and *Ammannia baccifera*-type are recognized. Graham *et al.*, (1987) also reported similar types of pollen in the family Lythraceae.

Pollen type: *Lagerstroemia indica* is easily distinguished by its tricolporate pollen. Two genera are included in this type, each representing a single species, which are easily distinguished on the basis of polar length and exine types (see key to the species). Muller (1981), Graham *et al.*, (1987) reported similar types of pollen in the genus *Lagerstroemia*, Pollen type: *Ammannia baccifera* - is delimited by its heterocolpate pollen. In this type 3 genera are included i.e., *Ammannia*, *Lythrum*, *Lawsonia*. The species of these genera are further delimited on the basis of exine ornamentation and pollen shape. In *Ammannia baccifera* tectum is subsilate and in *Lawsonia inermis* scabrate tectum is found whereas in the remaining species tectum is rugulate-fossulate or rugulate-striate. *Ammannia auriculate* and *Lythrum salicaria* have rugulate-striate tectum and *Ammannia verticillata* have rugulate-fossulate tectum. Pollen morphology of the family Lythraceae is significantly helpful for generic and specific delimitation.

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