Palynomorphological studies of some Ornamental Plants of Mall Road, Lahore

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ABSTRACT

The Research work was conducted to analyze the palynomorphological data of ornamental plants collected from Lahore city. The results compiled indicated that total 14 pollen taxa were identified belonging to 12 families and 14 different genera. The pollen identified belonging to woody, herbaceous and shrubby vegetation. Among them nine were exotic taxa and five were native species. Woody pollen was abundant in samples while the percentage of the herbaceous pollen consisted of only 21.42%. Colpate and prolate type of apertures were characterized in all the pollen taxa. It was observed that circular apertures were only present in Hibiscus rosa-sinensis Linn. and Cassia fistula Linn. The maximum pollen size was recorded in Hibiscus rosa-sinensis Linn. and Lagerstroemia indica Linn.

Keywords: Ornamental plants, palynomorphological studies, pollen

INTRODUCTION

Palynology is the science that studies fossil and contemporary palynomorphs that include spores, pollen, acritarchs, chitinozoans, scolecodonts, orbicules and dinoflagellate cysts particulate organic matter (POM) and together with kerogen found in sediments and sedimentary rocks. The knowledge of palynology is used in geography, geology and immunology. Palynology, as a forensic tool, has been considered as a discipline of plant ecology (Horrocks et al., 1998; Mildenhall, 2006; Mildenhall et al., 2006). The scope, aspects and prospects of the science have been discussed in India (Sahni, 1948; Nair, 1960; Mittre, 1961; Srivastava, 1962), and also abroad (Erdtman, 1955). The functional importance of pollen grains have been realized by the ancient Assyrians as early as 717 B.C. The potentialities of pollen and spores as a morphological entity in plants have become increasingly understood, since the time Hooke developed a prototype microscope in 1665 (cit. Wodehouse, 1935). The great advances in the technology of the microscope have been paralleled in the science of palynology. The increase in knowledge, the science has widened its scope of interest. Various aspects of palynological studies have been delimited under two main divisions, basic palynology and applied palynology (Erdtman, 1963).

Hyde & Williams (1945) coined the term palynology, for the science concerning the study of spores and pollen. Hyde & Williams chose the term palynology on the basis of two Greek words paluno meaning ‘to sprinkle’ and pale meaning ‘dust’ (Bhattacharya et al., 2006)

The publication of Pollen Morphology and Plant Taxonomy by Erdtman, (1952) marked the beginning of a new phase. He made available pollen
characters of all angiosperm families to taxonomists. Since then they are increasingly used in systematic work.

Pollen characters such as number and position of the furrows, number and position of the apertures and details of sculpturing of the exine are of taxonomic value. The exine possesses the unique morphological characters that are always specific to a particular taxon (Moore, 1978; Milne, 2005).

MATERIALS AND METHODS

Government College University Campus and its Botanical Garden were selected for the collection of samples. About 10-15 flowers were collected from selected trees and herbs. The samples were collected in the month of February and March 2010 because maximum ornamental flowers bloom in this season. The pollen grains were prepared for light microscopy by the standard methods described by Erdtman (1952) (Perveen et al., 2004; Perveen & Qaiser, 2002 and observation were made with a Meiji CO., LTD, Japan, Model NO. 35440, light microscope, using digital camera 4.1 mega pixel using 10X eye piece. The terminology used is in accordance with Erdtman (1952, 1960, 1969), Faegri & Iversen (1964) and Walker & Doyle (1975).

RESULTS AND DISCUSSION

A total of 15 mature flowers were collected from Lahore city-namely *Rosa damascena* Mill., *Cassia fistula* Linn., *Hibiscus rosa-sinensis* Linn., *Lagerstroemia indica* Linn., *Delonix regia* Rafin., *Justicia brandegeana* Wassh & Smith, *Punica granatum* Linn., *Papaver somniferum* Linn., *Jasminum mimosifolia* D.Don., *Bougainvillea glabra* Choisy, *Erythrina suberosa* Roxb., *Petunia hybrida* Vilm., *Amaryllis vittata* L’Herit., *Euphorbia milii* Ch. des Moulins. The plants collected belonged to 12 families and 14 different genera. The families identified included Rosaceae, Caesalpinaceae, Malvaceae, Lythraceae, Punicaceae, Papaveraceae, Bignoniacaeae, Nyctangiacaeae, Fabaceae, Solanaceae, Amaryllidaceae and Euphorbiaceae (Appendix I). Among them nine are exotic taxa and five are native. The palynomorphological studies of 14 pollen were identical. The percentage of the herbaceous pollen was 21.42 %, the woody pollen was 42.85 % and the shrubby pollen was 35.73 %. The size, symmetry, shape, aperture, spine and exine of the pollen were determined and the results were compiled as:

1. Family: Rosaceae
   - **Botanical name:** *Rosa damascena* Mill.
   - **Flowering Season:** Summer months
   - **Palynomorph:** Tricolpate, Perforate, striate, composed of muri and wide striae, striae run parallel and are deep. The apocolpium and mesocolpium is striate. The length of pollen 6μm, breadth 4μm, pollen size 24μm. Shape of pollen: Elliptical.

2. Family: Caesalpinaceae
   - **Botanical name:** *Cassia fistula* Linn.
   - **Flowering Season:** April-June
Palynomorph: Tricolpate, sub-porate, non-angular, length of colpi 21μm and breadth 12.6μm. Size of pollen is 263.6 μm. Grains 3-colporate prolate, small to medium, sub-triangualar, testate, granulate, colpi and pores distant, colpi 2-7 μm wide and more than the length of polar axis, spherical, diameter 3.6-4.6μm.

3. Family: Malvaceae  
   Botanical name: *Hibiscus rosa-sinensis* Linn.  
   Flowering Season: Throughout the year  
   Palynomorph: Pentoporate, isopolar, globose to spherical, bilateral symmetry in equatorial view and radial in polar view, circular to oval. Size of pollen is 143μm. Number of pores 16 μm. Number of spines 24 μm. Echinate. Echini regularly arranged. Central spines which form a ring are somewhat different. Dimorphic with blunt apex, rounded and bifurcated. Apex is as much wide as base in some spines. Tectums reticulate. Tectum densely granulated between spines and perforated. Aperture clear and large.

4. Family: Lythraceae  
   Botanical name: *Lagerstroemia indica* Linn.  
   Flowering Season: Spring and summer months  
   Palynomorph: Prolate, Tricolporate, elliptical long aperture, ends. The length of pollen 15μm, breadth 10μm, pollen size is 150 μm, sexine thicker than nexine. Colpi 12μm long.

5. Family: Caesalpiniaceae  
   Botanical name: *Delonix regia* Rafin.  
   Flowering Season: April-June  

6. Family: Acanthaceae  
   Botanical name: *Justicia brandegeana* Wassh. & Smith  
   Flowering Season: Summer season  
   Palynomorph: Pollen grains 3-8 colpate, isopolar, prolate-perprolate, colporate.

7. Family: Punicaceae  
   Botanical name: *Punica granatum* Linn.  
   Flowering Season: April-July, September-December  
   Palynomorph: Grains prolate, 3-colporate. Sexine slightly thicker than nexine, probably tegillate, the outer margins more lobed or undulated. Meridional ridges with a very faint pseudocolpus. Size of pollen 24 μm.
8. Family: Papaveraceae  
   **Botanical name:** *Papaver somniferum* Linn.  
   **Flowering Season:** April-June  
   **Palynomorph:** Pollen grains colpate, rupate, rugate, forate or provided with irregular apertures, sub-oblolate, prolate. Sexine usually as thick as nexine or thicker. Aperture membrane granulate, reticulate, sub-prolate.

9. Family: Bignoniaceae  
   **Botanical name:** *Jacaranda mimosifolia* D.Don.  
   **Flowering Season:** Mid April-May  
   **Palynomorph:** Grains 50 μm, spheroidal, prolate, exine 4 μm thick, surfaecereticulate.

10. Family: Nyctaginaceae  
    **Botanical name:** *Bougainvillea glabra* Choisy  
    **Flowering Season:** Throughout the year  
    **Palynomorph:** Grains 3-colpate, oblate, reticulate (muri provided with scattered spinuloid excrescences), lumina baculate; at low power of the microscope.

11. Family: Papilionaceae  
    **Botanical name:** *Erythrina suberosa* Roxb.  
    **Flowering Season:** March-April  
    **Palynomorph:** Grains 3-colporate, sub-triangular, small to medium, tectate, granulate to finely reticulate, anguloaperturate, colpi and pores distinct, pore diameter 5.2μm, exine 1.2 μm thick.

12. Family: Solanaceae  
    **Botanical name:** *Petunia hybrida* Vilm.  
    **Flowering Season:** March-April  
    **Palynomorph:** Grain 35 μm, Spheroidal, 3-4 zonocolporate, margins of colpi, thickened, endocolpium, and surface feveolate.

13. Family: Amaryllidaceae  
    **Botanical name:** *Amaryllis vittata* L'Herit.  
    **Flowering Season:** Twice every year  
    **Palynomorph:** Length about 60 μm, sexine with small spinules.

14. Family: Euphorbiaceae  
    **Botanical name:** *Euphorbia milii* Ch. des Moulins  
    **Flowering Season:** February-November  
    **Palynomorph:** 3-colporate, 3-zonociprate, prolatespheroidal to prolate or sub-prolate, ectoaperturate colpi not sunken along long margin, irregular, end acute. Circular endoaperture.
### Table 1: List of Plants collected from Mall Road and GCU Botanic Garden

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Name of Plants</th>
<th>Habit</th>
<th>Family</th>
<th>Site of Collection</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Rosa damascene</em> Mill.</td>
<td>Shrubby</td>
<td>Rosaceae</td>
<td>GCU</td>
<td>Native</td>
</tr>
<tr>
<td>2.</td>
<td><em>Cassia fistula</em> Linn.</td>
<td>Woody</td>
<td>Caesalpinaceae</td>
<td>GCU</td>
<td>Native</td>
</tr>
<tr>
<td>3.</td>
<td><em>Hibiscus rosa-sinensis</em> Linn.</td>
<td>Shrubby</td>
<td>Malvaceae</td>
<td>GCU</td>
<td>Exotic</td>
</tr>
<tr>
<td>4.</td>
<td><em>Lagerstroemia indica</em> Linn.</td>
<td>Woody</td>
<td>Lythraceae</td>
<td>GCU</td>
<td>Exotic</td>
</tr>
<tr>
<td>7.</td>
<td><em>Punica granatum</em> Linn.</td>
<td>Woody</td>
<td>Punicaceae</td>
<td>GCU</td>
<td>Native</td>
</tr>
<tr>
<td>8.</td>
<td><em>Papaver somniferum</em> Linn.</td>
<td>Herbaceous</td>
<td>Papaveraceae</td>
<td>GCU</td>
<td>Native</td>
</tr>
<tr>
<td>9.</td>
<td><em>Jacaranda mimosifolia</em> D.Don.</td>
<td>Woody</td>
<td>Bignoniaceae</td>
<td>GCU</td>
<td>Exotic</td>
</tr>
<tr>
<td>10.</td>
<td><em>Bougainvillea glabra</em> Choisy</td>
<td>Shrubby Climber</td>
<td>Nyctaginaceae</td>
<td>GCU</td>
<td>Exotic</td>
</tr>
<tr>
<td>14.</td>
<td><em>Euphorbia milii</em> Ch. des Moulins</td>
<td>Shrubby</td>
<td>Euphorbiaceae</td>
<td>GCU</td>
<td>Exotic</td>
</tr>
</tbody>
</table>
It is clear from the figure 2 that the majority of the plants collected have woody habit. Similarly the percentage of the herbaceous plants was below the shrubby plants.
Fig. 3: Origin of the Different Plants

The above figure 3 shows that majority of the pollen collected from plants that were introduced from different parts of the world i.e., exotic and only five plants were native.

The pollen morphology of the species varies among different plant species e.g., *Rosa Damascena* Mill., *Cassia fistula* Linn., *Lagerstroemia indica* Linn., *Bougainvillea glabra* Choisy, *Papaver somniferum* Linn., *Justicia brandegeana* Wassh. and Smith, *Euphorbia miliii* Ch. Des Moulins and *Punica granatum* Linn. showed the colpate type, the same results were also reported by Noor et al. (2004). Similarly, the pollen having pores in their cell wall were *Hibiscus rosa-sinensis* Linn. and *Cassia fistula* Linn., also confirmed by Hussain et al. (2008) and Khola & Hanif (2012).

*Bougainvillea glabra* Choisy and *Papaver somniferum* Linn. also showed that their polar axis is shorter than the equatorial axis. But in *Jacaranda mimosaefolia* D. Don., *Delonix regia* Rafin., *Lagerstroemia indica* Linn., *Punica granatum* Linn. and *Papaver somniferum* Linn. the pollen axis was longer than the equatorial axis. The same results were also reported by Noor et al., (2009).

Pollen having both the elongated aperture and pores were observed only in *Delonix regia* Rafin., *Euphorbia miliii* Ch. Des Moulins, *Erythrina suberosa* Roxb. These results were also in agreement with Aftab & Perveren (2006).

The size of the pollen grains varies and it was observed that there is a great variation in the sizes of the pollen grains. Maximum pollen size was observed in *Hibiscus rosa-sinensis* Linn. and *Lagerstroemia indica* Linn. having 143μm and 150μm respectively.

As it is clear from the fig. 3 that the ratio of the exotic plants varies which is an indication that the many exotic plants introduced in the city because in the past the Lahore city was considered as the city of gardens (Kausar et al., 1990). So there is a need to conserve our native plants for the protection and sustainability of the ecosystem.
Fig. 1 *Hibiscus rosa-sinensis* Linn.

Fig. 2 *Delonix regia* Rafin.

Fig. 3 *Erythrina suberosa* Roxb.

Fig. 4 *Rosa damascene* Mill.

Fig. 5 *Cassia fistula* Linn.

Fig. 6 *Justicia brandegeana* Wassh. & Smith

Fig. 7 *Euphorbia millii* Ch. des Moulins

Fig. 8 *Lagerstroemia indica* Linn.

Fig. 9 *Punica granatum* Linn.

Fig. 10 *Papaver somniferum* Linn.
REFERENCES


Pollen Grains and Spores. Munksgaard, Copenhagen.


